

# Dzhankeldy 500MW Wind Farm Republic of Uzbekistan



## Environmental and Social Impact Assessment Volume 4 – Appendices: Part B

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3. Autumn Bird Monitoring Report
4. Winter Bird Monitoring Report
5. Spring 2021 Bird Monitoring Report
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10. Bat roost search report
11. Mammal survey report
12. Herpetological survey report
13. Invertebrates report

## Botanical survey report

<b>Report Title</b>	Botanical survey
<b>Scope</b>	BOTANY
<b>Areas Covered</b>	DZHANKELDY WF / DZHANKELDY TO BASH OHTL / BASH WF / BASH TO KARAKOL OHTL
<b>Seasons Covered</b>	SPRING 2021 / SUMMER 2021
<b>Notes</b>	

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# **Botanical survey**

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**BASH WIND FARM PROJECT  
DZANKELDY WIND FARM PROJECT**

**CLIENT: 5 CAPITALS**

Date: June 2021

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## 1. Aims and objectives

In accordance with TOR, the main tasks of expert-botanist are following:

- carrying out a field botanical survey at springtime and summer (April and early June) and processing of field data; particular attention should be given to the proposed turbine locations and any areas where new roads can be constructed;
- analysis of any previous botanical surveys and other available data (publications, reports, etc.) compared with the results of the field survey conducted in 2021;
- detailed description and GIS-based mapping of habitat types present within the project sites, compilation of Habitat map and LULC (Land Use – Land Cover) map;
- compilation of the check-list of plant species recorded within the project site (in particular, threatened species included in the Red Data Book of Uzbekistan and/or the IUCN Red List);
- reporting.

## 2. Background

### 2.1. Project area

The project area is situated in south-western part of the desert Kyzylkum, in Gizhduvan and Peshku administrative districts of the Bukhara Province of Uzbekistan, and consists of two sites and power lines between these two sites and Karakul substation (Figure 1). The distance between two sites is about 90 km. The 1<sup>st</sup> project site named “Dzhankeldy” covers an area of 26x20 km in the western part of insular low mountains Kuldzhuktau, in surroundings of the village Dzhankeldy. Within this area, preliminary locations of 125 wind turbines and 10 vantage points for the ornithological survey have been selected (Figure 2). The 2<sup>nd</sup> site named “Bash” is located in surroundings of depression Ayakagytm, to the east of the lake Ayakagytm, and covers an area of 18x18 km; locations of 105 wind turbines and 9 bird survey plots have been selected there (Figure 3).

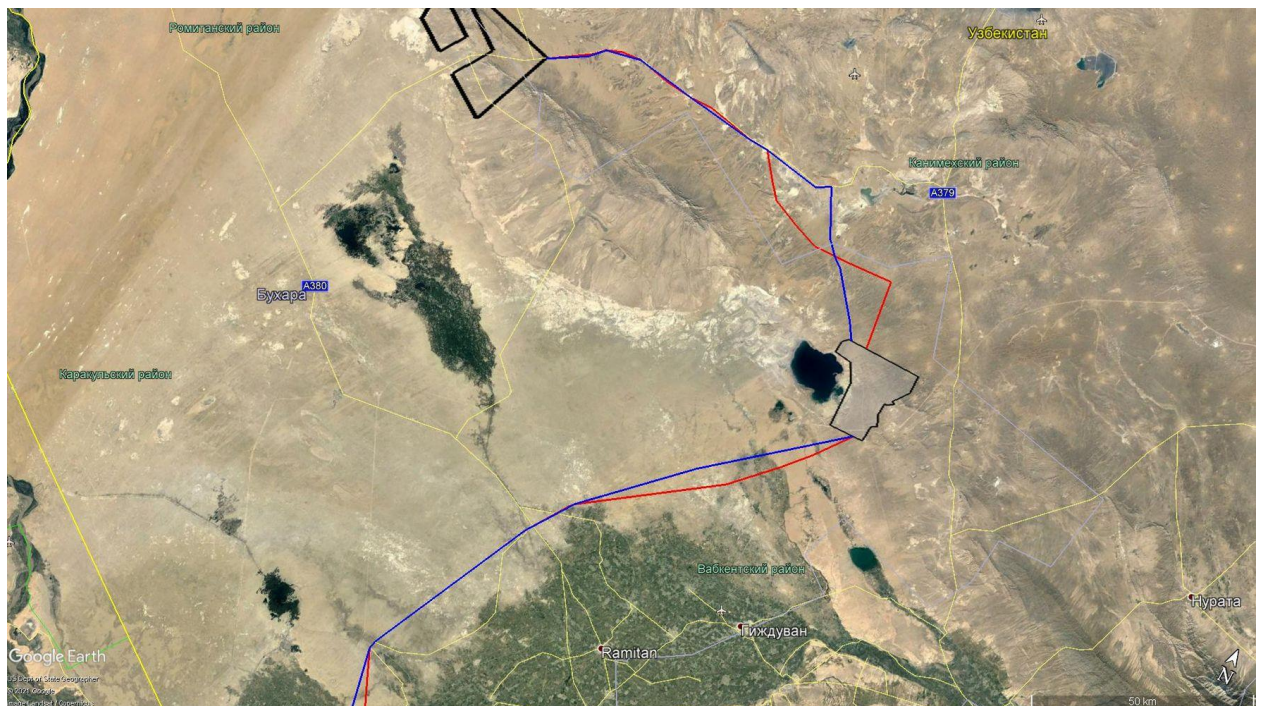


Figure 1. Project sites and proposed power lines



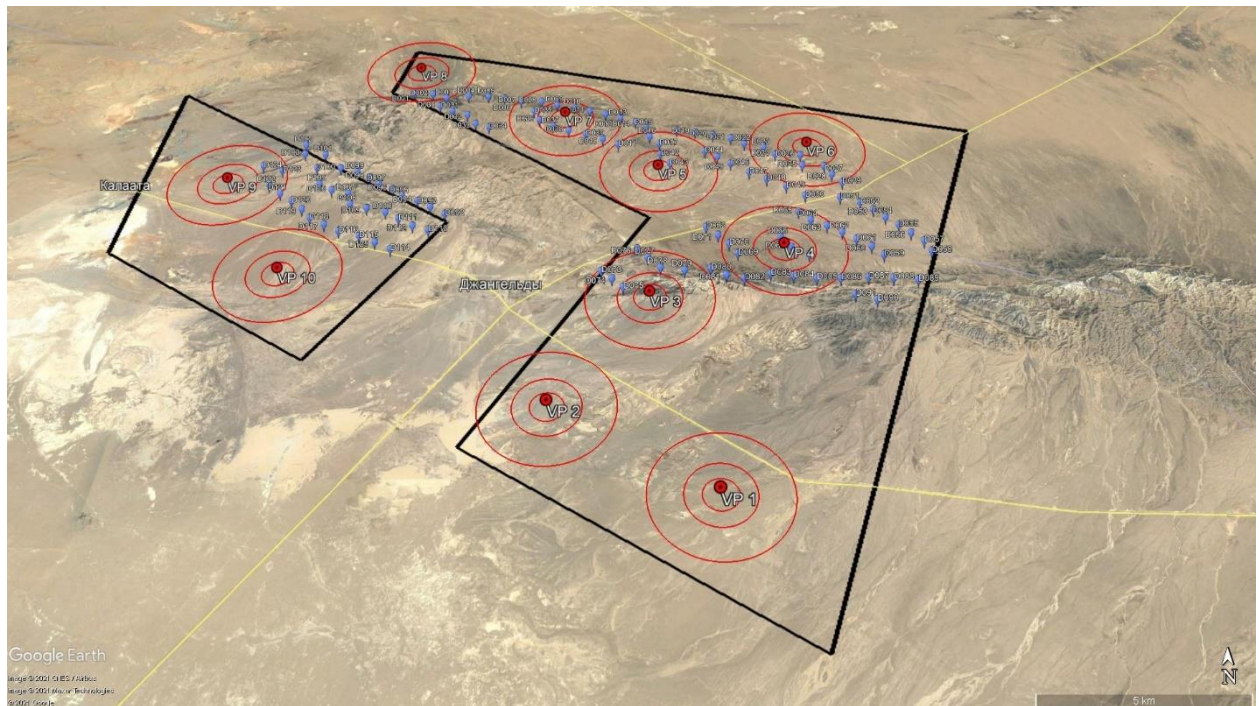


Figure 2. Project site “Dzhankeldy”. Symbols: VP 1–VP 10 – ornithological vantage points, D001–D125 – proposed turbine locations.

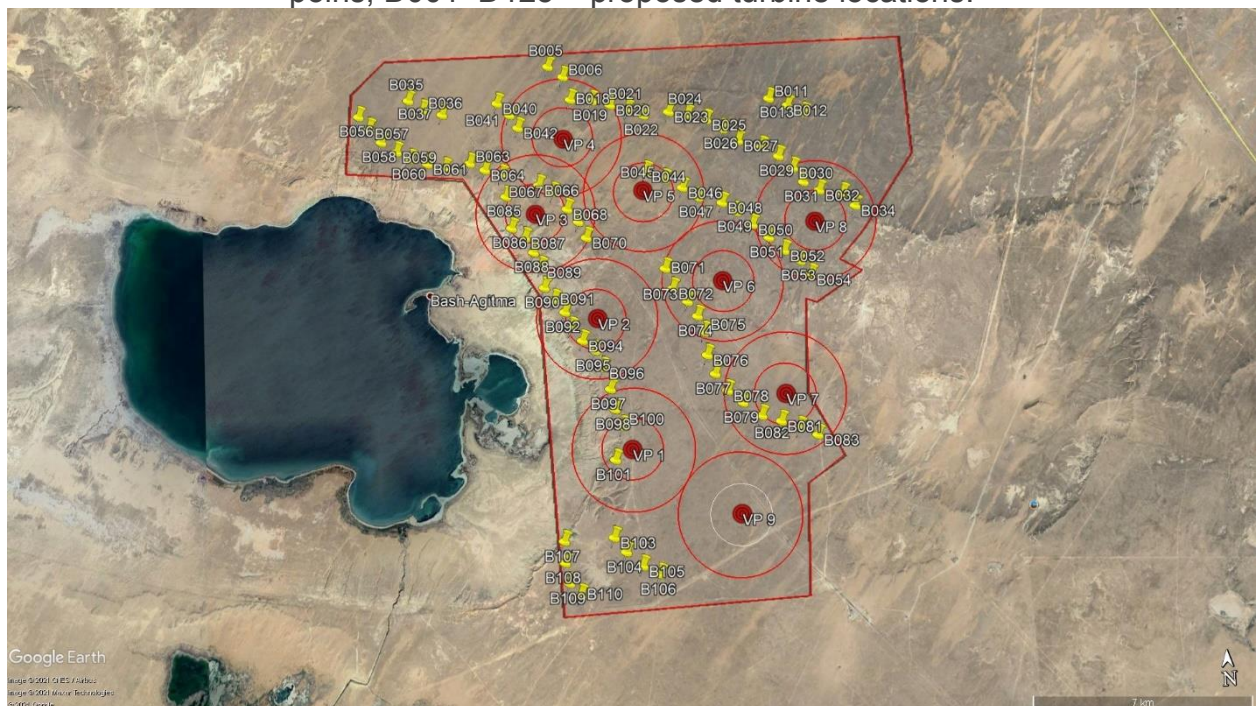


Figure 3. Project site “Bash”. Symbols: VP 1–VP 9 – ornithological vantage points, B005–B110 – proposed turbine locations.

## 2.2. Literature review

The flora of the south-western Kyzylkum has been well studied. The history of botanical research in this region has about 200 years. The first scientific data on landscapes and plant diversity of this region have been obtained in the 19th Century by European and Russian naturalists who took part in several Russian diplomatic missions to Bukhara Khanate (E.A. Ewersmann and G. von Meyendorff in 1820–1821, and A. Lehmann in 1841–1842, A.P. Khoroshkhin in 1872, M.N. Bogdanov and F.I. Lobysevich in 1873, N. Barbot-de-Marni in 1874, and others). In 1887–1903, Russian botanist



Vladimir Lipsky performed large-scale expeditions in Central Asia, including surroundings of Bukhara, and provided one of the first scientific descriptions of the flora and vegetation, as well as published detailed history of botanical research in this region in the 19th Century and early 20th Century in his work “Flora of Central Asia, i.e. Russian Turkestan and Bukhara and Khiva Khanates” (1902–1905). Many naturalists and officials of Russian Empire, who worked in Central Asia or visited this region in the late 19<sup>th</sup> and early 20<sup>th</sup> Century, also collected herbarium specimens and contributed to the accumulation of floristic data. E.g., Nikolay Korolkow, general of Russian army and naturalist-amateur collected herbarium, living plants, seeds and bulbs on the way from Tashkent to Khiva during the Khivan campaign of 1873, and sent these materials to the Imperial Botanical Garden in Saint Petersburg. Herbarium collections made by above mentioned pioneers of the study of Central Asian flora laid the basis for our contemporary knowledge on the plant diversity of the great desert Kyzylkum.

In 1908–1917, the Migration Department of Russian government organized a number of expeditions for investigation of soils and vegetation of Central Asia within the framework of colonization of this region. Thus, in 1913–1916, zoologist N.A. Zarudny and botanists E.P. Korovin and M.G. Popov studied some areas of the south-western Kyzylkum. As a result of these large-scale surveys, a huge amount of herbarium was collected, numerous new taxa and a diversity of plant communities were described for the first time, the first geobotanical maps were compiled, and the outlines of the theory of the genesis of Central Asian flora and vegetation were laid.

In 1918, the Turkestan State University was established in Tashkent (it was given a name of Central Asian State University from 1923 to 1960, Tashkent State University in 1960–2000, and National University of Uzbekistan since 2000). Several prominent botanists including M.G. Popov, E.P. Korovin, M.V. Kultiasow and A.I. Vvedensky began to work there since 1920. The department of botany and geography headed by Mikhail Popov, the herbarium headed by Aleksei Vvedensky and the Institute of Soil Science and Geobotany headed by Nikolay Dima have been created at the university in the initial period. Since early 1920s, botanists of the University performed field surveys covering the entire territory of Central Asia and focused mainly on the inventory of the flora, investigation of the vegetation cover and identification of plant resources. In the 1930–1940s, geobotanical studies (first of all, survey of pastures) were also carried out in different regions of Uzbekistan by special expeditions of the Committee of Sciences (which in 1940 was reorganized into the Academy of Sciences of Uzbekistan); the results were used for creation of the first geobotanical map of Uzbekistan. As a result of these expeditions, dozens of new species and genera were found and described from different regions of Central Asia.

In 1934–1936, the Kenimekh complex expedition led by prominent expert in phytosociology I.I. Granitov explored the south-western part of Kyzylkum, Kenimekhchul and the western piedmonts of the Nuratau Mountains. The mission of this expedition was a comprehensive study the climate, soil, vegetation, flora and fauna of this region. The Kenimekh expedition collected extensive data were on the natural conditions and biodiversity of the territory, including a huge amount of herbarium (currently kept at the National Herbarium of Uzbekistan, TASH).

After the completion of the Kenimekh expedition, I.I. Granitov continued studies of the flora and vegetation of south-western Kyzylkum; the results of his long-term research have been summarized in a 2-volume monograph “Vegetation cover of the South-Western Kyzylkum” (1964, 1967). I.I. Granitov provided the list of flora with 580 species from 290 genera and 55 families (272 species of them were reported for relic mountains Kuldzhuktau). Until now, this work remains the most fundamental publication on the plant diversity of south-western Kyzylkum. The monograph contains an essay of the history of botanical research, description of the physiographical and environmental conditions of

the region, provides the analysis of the flora and vegetation, and a scheme of phytogeographical division of the territory, as well as the assessment of the influence of humans and wildlife on the vegetation.

A significant amount of material was collected by the subsequent geobotanical expeditions of the 1950–1970s focused mainly on the investigation of rangelands. At that period, the specialists of the Institute of Botany of the Academy of Sciences of the Uzbek SSR experimented there with different methods of pastures restoration and improvement. Several prominent botanists from Uzbekistan and Russia, as T.A. Adylov, V.P. Botschantzev, R.V. Kamelin, E.V. Kljuykov, M.G. Pimenov, U.P. Prатов, M.I. Pryakhin, A.I. Vvedensky, I.F. Momotov, A.D. Lee, P.K. Zakirov and others performed numerous field expeditions in Kyzylkum. These scientists made a significant contribution to the knowledge of the flora and vegetation of this region.

The most important publications of the second half of the 20th Century containing the data on flora and vegetation of the south-western Kyzylkum also are the two-volume monograph by K.Z. Zakirov “Flora and vegetation of the Zeravshan River basin” (1955, 1961) and the monograph of his son P.K. Zakirov “The botanical geography of Nuratau Range and low mountains of Kyzylkum” (1971). K.Z. Zakirov compiled a summary checklist (with reference to herbarium collections) of 2588 plant species recorded for the entire Zeravshan River basin covering several phytogeographical regions of Mountain Central Asian and Turan provinces, among them, 320 species have been cited for lower reaches and ancient delta of Zeravshan River with adjacent areas of south-western Kyzylkum. PK Zakirov published a detailed description of the vegetation and a summary checklist of the flora of all relic mountains of Kyzylkum and the range Nuratau; it contains 983 species of vascular plants belonging to 312 genera and 65 families, 679 species of them recorded for relic mountains. Among them, 452 species from 233 genera and 46 families have been listed for the all insular low mountains of Central and South-Western Kyzylkum, including Kuldzhuktau.

“Weed vegetation of the Bukhara region and measures of its control” (Guzairov, 1951, 1968), I.F. Momotov “Theoretical foundations and methods of phytomelioration of desert pastures in south-western Kyzylkum” (Momotov, 1973) and “Guide to a botanical excursion to the southern edge of Western Kyzylkum” (Saidov et al., 1975) should also be mentioned among the important publications on the flora and vegetation of this area.

Several new botanical studies have been performed in the south-western Kyzylkum and Bukhara Oasis since 2000 (Tojibaev, Beshko, 2007; Khassanov et al., 2011; Esanov, 2017, 2019; Abduraimov, 2017; Akhmedov, 2018; Shomurodov et al., 2018; Shomurodov, 2018, etc.). In particular, F.O. Khassanov et al. (2011) estimated the entire flora of the Kyzylkum desert to be no less than 1043 species with 41 endemic and 11 sub-endemic species and noted that most of endemic species are localized in the relic mountains. However, the most actual data show that some species previously considered to be endemic to Kyzylkum have been found in neighboring areas and should be regarded as sub-endemics (Tojibaev et al., 2017).

The most important results of botanical research in the project region are summarized in recently published monographs, “Coenopopulations of rare and endangered plant species of remnant low mountains of Kyzylkum” (Shomurodov et al., 2018) which contains detailed data on populations of 12 threatened species, “Inventory of the flora of Uzbekistan: Navoi Province” (Tojibaev et al., 2019), and “Inventory of the flora of Uzbekistan: Bukhara Province” (Tojibaev et al., 2020). The “Inventory of the flora of Uzbekistan: Bukhara Province” contains a checklist of 764 species vascular plants growing in the wild in this large administrative region. The following information for each species is provided: life form, habitat, distribution within the Bukhara Province, conservation status, and economic use. Among them, 543 species are listed for the desert plain of Kyzylkum, 546 species – for lower reaches and ancient delta of Zeravshan

River (Bukhara Oasis), and 463 species are recorded for the remnant low mountains Kuldzhuktau; 25 species are red-listed at the national level (15 of them grow in the Kuldzhuktau Mountains); descriptions, photographs and distribution maps for threatened plant species are included.

Fundamental taxonomical treatments, as “Flora of the U.S.S.R.” (1934–1964, in 30 volumes), “Flora of Kazakhstan” (1956–1966, in 9 volumes), 1<sup>st</sup> edition of the “Flora of Uzbekistan” (1941–1962, in 6 volumes), “Conspectus Florae Asiae Mediae” (1963–2015, in 11 volumes), and recently published first three volumes of the 2<sup>nd</sup> edition of the “Flora of Uzbekistan” (2016, 2017, 2019), should also be mentioned among the most important sources of information on the plant diversity of the project zone. In the new “Flora of Uzbekistan” the treatment of 15 families with 58 genera and 375 species performed to date (8.6% of the national flora); for each species, herbarium specimens are cited and a distribution map based on their georeferencing is given. “Vegetation of Central Asia and South Kazakhstan” by E.P. Korovin (1934; 1961, 1962), “Vegetation cover of Uzbekistan and the ways of its practical use” (1971–1984, in 4 volumes), “Rangelands of the arid and semi-arid zones in Uzbekistan” (Gintzburger et al., 2003) and “Botanical geography of Kazakhstan and Middle Asia” by E.I. Rachkovskaya et al. (2003) also contains useful data about the flora and vegetation of the south-western Kyzylkum and their genesis. In particular, the general patterns of vegetation and a description of the main plant communities of Kyzylkum are given in the 2nd volume of the “Vegetation cover of Uzbekistan” (1973). The “Botanical Geography of Central Asia and Kazakhstan” by Rachkovskaya et al. (2003) describes in the main plant formations of the whole desert zone of Central Asia.

A huge amount of herbarium material collected from the south-western Kyzylkum and Bukhara Oasis during about two centuries is kept mainly in the National Herbarium of Uzbekistan in Tashkent (TASH), Herbarium of the Komarov Botanical Institute in St. Petersburg (LE), Herbarium of the Lomonosov Moscow State University (MW).

The list of plants of the Bukhara Province included in the Red Data Book of Uzbekistan (2019) and a map of their distribution in the project region (Figure 4) is presented below.

1. *Acanthophyllum cyrtostegium* Vved. UzbRDB Category 3. The Kuldzhuktau Mountains and their piedmonts. National endemic, endemic to south-western Kyzylkum and Zirabulak-Ziadin Mountains.

2. *Astragalus adylovii* F.O. Khass., Ergashev & Kadyrov. UzbRDB Category 1. The Kuldzhuktau Mountains. National endemic, endemic to Kuldzhuktau Mountains.

3. *Calligonum matteianum* Drobow. IUCN EN B2ab(iii,v). UzbRDB Category 1. Sundukli Sands. Endemic to sandy deserts of southern part of Central Asia.

4. *Calligonum molle* Litv. IUCN EN B2ab(iii,v). UzbRDB Category 2. Sundukli Sands. Endemic to southern Central Asian deserts.

5. *Calligonum paletzkianum* Litv. IUCN (VU B2ab(iii,v). UzbRDB Category 3. Sundukli Sands. Endemic to Irano-Turanian deserts.

6. *Calligonum zakirovii* (Khalk.) Czerep. UzbRDB Category 1. The Kuldzhuktau Mountains and their piedmonts. National endemic, endemic to relic mountains of Kyzylkum.

7. *Climacoptera amblyostegia* (Botsch.) Botsch. UzbRDB Category 2. Lower reaches and ancient delta of Zeravshan River.

8. *Climacoptera merkulowiczii* (Zakirov) Botsch. UzbRDB Category 2. Lower reaches and ancient delta of Zeravshan River. National endemic.

9. *Eremosparton flaccidum* Litv. UzbRDB Category 2. Sands of Kyzylkum. Endemic to sandy deserts of Central Asia.

10. *Eremostachys eriolarynx* Pazij & Vved. UzbRDB Category 1. South-western Kyzylkum, southern piedmonts of insular low mountains Kokchatau. National endemic, endemic to Kyzylkum.

11. *Ferula kyzylkumica* Korovin. UzbRDB Category 3. The Kuldzhuktau Mountains. National endemic, endemic to relic mountains of Kyzylkum with a disjunction in the Nuratau Mountains.

12. *Iris hippolyti* (Vved.) Kamelin. UzbRDB Category 1. Insular low mountains Kokchatau. National endemic, endemic to Kokchatau.

13. *Jurinea psammophila* Iljin. UzbRDB Category 3. The Kuldzhuktau Mountains and their piedmonts. National endemic, endemic to relic mountains of Kyzylkum.

14. *Lagochilus inebrians* Bunge. UzbRDB Category 3. The Kuldzhuktau and Kokchatau Mountains and their piedmonts. Endemic to western Pamir-Alay and adjacent areas including Kyzylkum, Karshi Steppe, valley of the river Zeravshan and Fergana valley.

15. *Lagochilus vvedenskyi* Kamelin & Zukerw. UzbRDB Category 3. The Kuldzhuktau Mountains and their piedmonts. National endemic, endemic to relic mountains of Kyzylkum.

16. *Lepidium subcordatum* Botsch. & Vved. UzbRDB Category 2. The Kuldzhuktau Mountains. National endemic, endemic to relic mountains of Kyzylkum and plateau Ustyurt.

17. *Oligochaeta vvedenskyi* (Popov) Tscherneva. UzbRDB Category 3. South-western Kyzylkum, Karnabchul. National endemic, endemic to Kyzylkum, Sundukli Sands and Karshi Steppe.

18. *Onobrychis tavernierifolia* Stocks ex Boiss. UzbRDB Category 1. The Kuldzhuktau Mountains and their piedmonts. Very rare species with fragmented range in Iran, Afghanistan and the Kuldzhuktau Mountains in Uzbekistan.

19. *Phlomoides aralensis* (Bunge) Salmaki (*Paraeremostachys aralensis* (Bunge) Adylov, Kamelin & Makhm.). UzbRDB Category 2. South-western Kyzylkum. National endemic, endemic to Kyzylkum desert.

20. *Phlomoides transoxana* (Bunge) Salmaki (*Paraeremostachys transoxana* (Bunge) Adylov, Kamelin & Makhm.). UzbRDB Category 2. South-western Kyzylkum. National endemic, endemic to Kyzylkum desert.

21. *Silene tomentella* Schischk. UzbRDB Category 2. The Kuldzhuktau Mountains. National endemic, endemic to relic mountains of Kyzylkum.

22. *Stipa aktauensis* Roshev. UzbRDB Category 2. The Kuldzhuktau Mountains. National endemic, endemic to relic mountains of Kyzylkum.

23. *Tulipa korolkowii* Regel. UzbRDB Category 3. Insular low mountains Kokchatau. Rare species of south-western Tien Shan and Pamir-Alay, Kokchatau is the most western site of distribution of this species.

24. *Tulipa lehmanniana* Merckl. UzbRDB Category 3. The Kuldzhuktau and Kokchatau Mountains and their piedmonts, south-western Kyzylkum, Karnabchul. Vulnerable species of Irano-Turanian deserts with decreasing range and populations.

25. *Tulipa micheliana* Th. M. Hoog. UzbRDB Category 3. Insular low mountains Kokchatau. Vulnerable species of Western Pamir-Alay and Kopetdag with decreasing range and populations.

Following species are endemic to the Kyzylkum desert: *Allium oxianum* F.O. Khass. et Tojibaev, *Allium rinae* F.O. Khass., Shomuradov & Tojibaev, *Astragalus adylovii* F.O.Khass., Ergashev & Kadyrov, *Astragalus centralis* Sheld., *Astragalus holargyreus* Bunge, *Astragalus kuldzhuktauense* F.O.Khass., Shomur. & Esankulov, *Astragalus leiophysa* Bunge, *Astragalus remanens* Nabiev, *Bryonia melanocarpa* Nabiev, *Calligonum zakirovii* (Khalk.) F.O. Khass., *Cleome quinquenervia* DC., *Convolvulus affanasevii* Luferov, *Cousinia juzepczukii* Tscherneva, *Cousinia dolichoclada* Juz.,



*Cousinia sylvicola* Bunge, *Cousinia umbilicata* Juz., *Diarrhron macrorhachis* (Pobed.) Kit Tan (*Dendrostellera macrorhachis* Pobed.), *Eremostachys eriolarinx* Pazij & Vved., *Eremurus korolkowii* Regel, *Evax arenaria* Smoljan., *Gagea deserticola* Levichev, *Jurinea psammophila* Iljin, *Lagochilus vvedenskyi* Kamelin & Tzukerv., *Lappula aktaviensis* Popov & Zakirov, *Lappula parvula* Nabiev & Zakirov, *Phlomoides aralensis* (Bunge) Salmaki, *Phlomoides transoxana* (Bunge) Salmaki, *Psylliostachys x androssovii* Roshkova, *Salsola androssovii* Litv., *Salsola angusta* Botsch., *Salsola deserticola* Iljin, *Scorzonera gageoides* Boiss., *Silene tomentella* Schischk., *Scrophularia rudolfii* F.O. Khass., Serekeeva & Kadyrov, *Stipa aktauensis* Roshev.

Sub-endemic species reported for south-western Kyzylkum are *Allium karakense* Regel, *Allium kysylkumi* Kamelin and *Ferula kyzylkumica* Korovin (fragmented range in relic mountains of Kyzylkum and western part of the Nuratau Mountains), *Calligonum matteianum* Drobow, *Calligonum molle* Litv. and *Eremosparton flaccidum* Litv. (sandy deserts of southern part of Central Asia), *Halimocnemis latifolia* Iljin (Kyzylkum and Karshi Steppe), *Cousinia sogdiana* Bornm. and *Oligochaeta vvedenskyi* (Popov) Tscherneva (Kyzylkum, Sundukli Sands and Karshi Steppe), *Lepidium subcordatum* Botsch. & Vved. (fragmented range in relic mountains Kyzylkum and plateau Ustyurt), *Jurinea derderioides* C. Winkl. and *Tulipa sogdiana* Bunge (Central Asian deserts), etc.

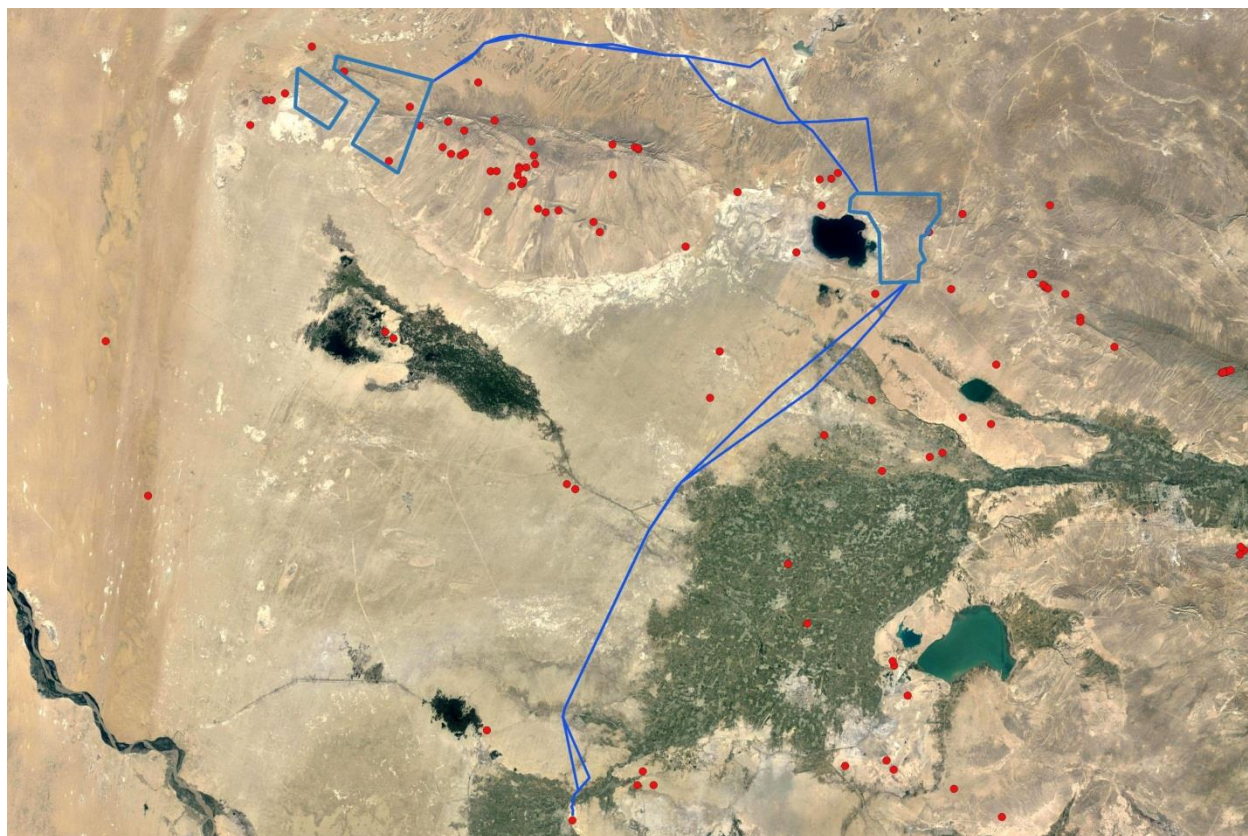


Figure 4. Distribution of nationally red-listed plants in the project region (according to “Inventory of the flora of Uzbekistan: Navoi Province”, 2019, and “Inventory of the flora of Uzbekistan: Bukhara Province”, 2020). Known locations of rare plants showed by red dots.

Since a number of threatened, endemic and restricted range plant species occurs in the project area, the Critical Habitat Assessment is required, according to IFC Performance Standard 6 (PS6) and EBRD Performance Requirement 6 (PR6).

An analysis of published data shows, that similar assessments of areas with high biodiversity conservation significance have been performed in Uzbekistan within the framework of UNDP-GEF project “Strengthening Sustainability of the National Protected

Area System by Focusing on Strictly Protected Areas” and CEPF project “Mountains of Central Asia Biodiversity Hotspot”. According to results of the first project published in the “Recommendations for protected areas system development in Uzbekistan” (Ismatov, 2013), 17 sites important for plant diversity were identified within Uzbekistan, among them, the insular range Kuldzhuktau was qualified as one of priority areas for conservation of diversity of natural landscapes, flora and fauna, and recommended for protected area. The second international project has been focused on the assessment of Key Biodiversity Areas within Mountains of Central Asia Global Biodiversity Hotspot using the KBA standards, and the region of south-western Kyzylkum was not included in this analysis (Mountains of Central Asia Biodiversity Hotspot, 2017).

At the global level, the screening of critical habitats was performed by UNEP-WCMC (2017) and Brauner et al. (2018). For Uzbekistan, potential critical habitats have been identified by authors mainly on the basis of assessment of Important Bird Areas (2008).

### 3. Materials and methods

The field studies were conducted 9–11 April, 12–20 May and 18–30 June 2021 by traditional methods of botanical survey commonly used for sampling and mapping of native non-forest vegetation, recognition of floristic composition and spatial patterns of plant communities (Field geobotany, 1959–1976; Granitov, 1980; Kent, 2011). All vantage points (bird survey circles) and the majority of proposed turbine locations within two project sites were inspected, as well as a strip about 100 m in width along the planned electric lines. The check-lists of plant species recorded for each project site were compiled.

Plant species were identified using special literature, as “*Conspectus Florae Asiae Mediae*” (1963–1993), “*Flora of Uzbekistan*” (1941–1963, 2016, 2017, 2019) and “*Flora of USSR*” (1934–1964). Available publications and online databases (Nikitin, 1983; IUCN/ISSG, 2014; CABI, 2017; Sennikov et al., 2018) were used for identification of alien species, while the Red Data Book of Uzbekistan (1984, 1998, 2006, 2009, 2019) and the IUCN Red List ([www.iucnredlist.org](http://www.iucnredlist.org)) were used for identification of threatened species. Other relevant published data on flora and vegetation of the region also has been analyzed (listed below in References).

In the general check-lists and check-lists compiled for survey plots and habitat types, species are arranged in alphabetic order. Accepted names of species are provided in accordance with the online global databases Plants of the World Online ([www.plantsoftheworldonline.org/](http://www.plantsoftheworldonline.org/)), International Plant Names Index ([www.ipni.org](http://www.ipni.org)) and Catalogue of Life ([www.catalogueoflife.org](http://www.catalogueoflife.org)), as well as with recently published treatments of different taxonomical groups of the flora of Uzbekistan (Sennikov, 2016, 2017, 2019).

The draft habitat maps for “Bash” and “Dzhankeldy” project sites were created on the basis of visual interpretation of free satellite imagery from USGS Earth Explorer (<https://earthexplorer.usgs.gov/>), Google Earth and Bing Maps, a topographic map (1:100,000, available online for free at <http://loadmap.net/>) and a soil map of the Bukhara Province (Geographical atlas of Uzbekistan, 2012). QGIS 3.18 free software was used for habitat mapping. During the field survey, all habitat types were inspected; their descriptions, boundaries and character of land use have been clarified and corrected.

The structure of vegetation communities was described on 50x50 m geobotanical sample plots (squares) chosen in an area with homogeneous vegetation, representative for each habitat type, as well as in proposed turbine locations. For each sample plot, photographs of the landscape and vegetation were taken using a digital camera, and following data were recorded: location and physical environment (including GPS coordinates, elevation, topography, and soil type), state of vegetation, landuse type and disturbance factors (grazing, roads, etc.), plant association, canopy cover (%), canopy height, all plant species present at the plot, their cover and abundance, phenological stage and height.

Coordinates of populations of endemic, redlisted or alien plant species, number of individuals and area occupied by population also were recorded.

Species cover and abundance was determined using the Braun-Blanquet cover-abundance scale (1965) widely used in geobotanical and ecological studies as rapid visual assessment technique, but robust and highly repeatable, minimizing among-observer differences:

- + – occasional and less than 1% cover of the sample plot area;
- 1 – abundant with low cover, or less abundant but with higher cover, 1–5% of the sample plot area;
- 2 – abundant with >5–25% of the sample plot area, irrespective of the number of individuals;



3 – >25–50% cover of the sample plot area, irrespective of the number of individuals;

4 – >50–75% cover of the sample plot area, irrespective of the number of individuals;

5 – >75% cover of the sample plot area, irrespective of the number of individuals.

The relative abundance of each species also was assessed using the DAFOR scale: D = Dominant; A = Abundant, F = Frequent, O = Occasional, R = Rare.

The conservation status of plant species is given according the Red Data Book of Uzbekistan (2019). National categories of threatened plants are follows: 0 (probably extinct species) – corresponds to EX or EW categories of the IUCN Red List ([www.iucnredlist.org](http://www.iucnredlist.org)), 1 (endangered, disappearing species) – meets CR or EN categories of IUCN, 2 (rare species) – meets VU category of IUCN and 3 (vulnerable, declining species) – corresponds to NT category of IUCN. To date, 5 editions of the Red Data Book of Uzbekistan have been published. The first (1984) included 163 plant species, the second (1998) – 301, the third (2006) – 302, the fourth (2009) – 321, and an actual, fifth edition (2019), includes 314 plant species.

IUCN Red List ([www.iucnredlist.org](http://www.iucnredlist.org)) is unapplicable in our case because currently only 236 taxa (5.4%) of more than 4380 species recorded for the flora of Uzbekistan were assessed by IUCN, 16 species of them were included in the IUCN Red List as threatened (CR, EN and VU categories), and only 5 of them are red-listed at the national level. The rest 94.6% of species have not yet been assessed by IUCN and belong to NE category – Not Evaluated. 350 plant species of 112 genera are national endemics of Uzbekistan (including all endemics of relic low mountains of Kyzylkum), 137 of them are red-listed at the national level, and none of them assessed as threatened (CR, EN, VU) in the IUCN Red List.

As defined by the International Finance Corporation (IFC) Performance Standard 6 (PS6) and EBRD Performance Requirement 6 (PR6), critical habitats are areas with high biodiversity value, including (i) habitat of significant importance to Critically Endangered and/or Endangered species; (ii) habitat of significant importance to endemic and/or restricted-range species; (iii) habitat supporting globally significant concentrations of migratory species and/or congregatory species; (iv) highly threatened and/or unique ecosystems; and/or (v) areas associated with key evolutionary processes. Numerical thresholds have been defined for the first four critical habitat criteria (i.e., CR/EN species; endemic/restricted-range species; migratory/congregatory species; threatened and unique ecosystems); these thresholds are based on these published by IUCN in “A Global Standard for the Identification of Key Biodiversity Areas” (2016) and “IUCN Red List Categories and Criteria” (2012). For Criterion 5, there are no numerical thresholds.

Criterion 1 is triggered by species listed as CR or EN on the IUCN Red List, and nationally/regionally listed species assessed using similar criteria. Criterion 2 is triggered by habitats of significant importance for endemic or restricted-range species. Criterion 3 (migratory species) is unapplicable for plants. As for Criterion 4, unfortunately, the officially approved national list of highly threatened and/or unique ecosystems and habitats does not exist in Uzbekistan. But the National Biodiversity Conservation Strategy (1998), National reports on biodiversity conservation (2006, 2015) and other documents (Ismatov, 2013) indicated that the problem of conservation of all types of forest ecosystems (including shrublands) is a very critical issue in Uzbekistan. A specific legislation, management and forest protection measures are present at the national level. Forests and shrublands are key habitats for the conservation of many rare animals and plants in Central Asia. In the sandy desert, psammophilous shrublands and saxaul stands have essential importance for sand fixation and combat desertification. But these ecosystems are under serious threat from over-exploitation and over-grazing. Therefore, natural and planted desert “forests” must be taken into account.



## 4. Results of the field survey

### 4.1. Bash site

A total check-list of vascular plants recorded within the project site “Bash” during the field survey in April and June includes 49 species (Appendix 1). In June, the same species were found in each survey area, the only difference was their phenological stage (all ephemers and ephemeroïds were fruiting or dried). Following habitat types (map units) were identified for the “Bash” site:

#### 4.1.1. Sandy and sandy-loamy desert plain

The field survey showed that the main habitat type in the western part of “Bash” area (to the west of railway) is sandy and sandy-loamy desert plain with flat and flat-wavy terrain, covered with native ephemeroïd-sagebrush (*Artemisia diffusa*, *Poa bulbosa*, *Carex subphysodes*) and saltwort-ephemeroïd-sagebrush vegetation (*Artemisia diffusa*, *Poa bulbosa*, *Carex subphysodes*, *Caroxylon orientale* (*Salsola orientalis*)) on sandy desert soil and sabulous-loamy grey-brown desert soil. *Ferula foetida* and *Iris songarica* are subdominants on local areas. There is no clear boundary between sandy and sandy-loamy desert plain, and between ephemeroïd-sagebrush and saltwort-ephemeroïd-sagebrush communities; thus, they can be combined into one type of habitat.

The plant species diversity is low (8 to 18 species). The canopy cover is 20–50%. The vegetation is more or less uniform (with local abundance of saltworts, *Ferula foetida* and *Iris songarica*). One moss species (*Tortula desertorum*) has been found in all plots; on some local areas it covers up to 5%. One nationally red-listed species, *Tulipa lehmanniana*, occurs sporadically within all territory of this habitat type, its abundance is R to O, population density varies from solitary specimens to 900–1000 per 1 hectare. Tulips were recorded mainly in April. In middle May and June, only solitary specimens were recorded because they finished the vegetation, and their aboveground part completely withered away.

The main type of land use is pasture; an impact of grazing is medium; several shepherds houses are situated in this territory. Local impact is connected with several ground roads, and with an underground gas pipeline that runs across the southern part of the project site.

Within this habitat type, following geobotanical sample plots were described.

#### B027, B028, B029, B030

40.671945 – 40.662653° N, 64.70655 – 64.727453° E, 315–333 m.s.l. Sandy desert plain with hilly-wavy terrain and native ephemeroïd-sagebrush vegetation (*Artemisia diffusa*, *Poa bulbosa*, *Carex subphysodes*) (Photo 1–3). 13 plant and 1 moss species were recorded (Table 1), none of them are red-listed or alien. The canopy cover is 25–30%. The differences between these 4 survey plots are negligible, species diversity is very low, and the vegetation cover is uniform.

Table 1. Check-list of plants recorded in survey plots B027–B030

Species	Life form	Height, cm	Abundance		Phenol. Stage
			DAFOR	Braun-Blanquet	
<i>Alyssum desertorum</i>	annual	5–6	O	+	flowering
<i>Artemisia diffusa</i>	semishrub	15–20	D	2–3	vegetation
<i>Carex subphysodes</i>	Perennial	12–15	A	1	flowering
<i>Caroxylon orientale</i> ( <i>Salsola orientalis</i> )	dwarf shrub	35–40	R	+	vegetation

<i>Ceratocarpus arenarius</i>	annual	15-20	R	+	Dried
<i>Convolvulus hamadae</i>	semishrub	25-30	R	+	vegetation
<i>Cousinia hamadae</i>	Perennial	15-20	R	+	vegetation
<i>Ferula foetida</i>	Perennial	30-35	R	+	vegetation
<i>Holosteum umbellatum</i>	annual	6-8	R	+	flowering
<i>Hypecoum pendulum</i>	annual	12-15	R	+	flowering
<i>Iris songarica</i>	Perennial	30-35	O	+	vegetation
<i>Peganum garmala</i>	Perennial	15-20	R	+	vegetation
<i>Poa bulbosa</i>	Perennial	15-17	A	1	vegetation
<i>Tortula desertorum</i>	moss	0.3-0.5	O	+	vegetation



Photo 1. Plot B027 (above). Sandy plain with hilly-wavy terrain and ephemeroïd-sagebrush vegetation





Photo 2. Plot B030 (below). Sandy plain with hilly-wavy terrain and ephemeroid-sagebrush vegetation



Photo 3. Sagebrush (*Artemisia diffusa*), a dominant plant of ephemeroid-sagebrush communities of the south-western Kyzylkum

### **B035**

40.690406° N, 64.576697° E, 271 m.s.l. Wavy sandy-stony desert plain with native ephemeroid-sagebrush-saltwort vegetation (*Xylosalsola arbuscula*, *Caroxylon orientale*, *Artemisia diffusa*, *Poa bulbosa*, *Carex physodes*) (Photo 4–5). 20 plant and 1 moss species were recorded (Table 2). The canopy cover is 35–40%. 6 generative and 17 pre-



generative specimens of red-listed *Tulipa lehmanniana* were found within the survey square.



Photo 4. Plot B035. Sandy plain with saltwort-ephemeroid-sagebrush vegetation



Photo 5. *Xylosalsola arbuscula* (*Salsola arbuscula*), or white saltwort

Table 2. Check-list of plants recorded in survey plot B035

Species	Life form	Height, cm	Abundance		Phenol. Stage
			DAFOR	Braun-Blanquet	
<i>Acanthophyllum elatius</i>	Perennial	40–45	R	+	vegetation
<i>Alyssum desertorum</i>	annual	5–6	O	+	flowering

<i>Artemisia diffusa</i>	semishrub	15–20	A	1	vegetation
<i>Astragalus villosissimus</i>	dwarf shrub	35–40	O	+	vegetation
<i>Carex physodes</i>	Perennial	12–15	A	1	flowering
<i>Caroxylon orientale</i> ( <i>Salsola orientalis</i> )	dwarf shrub	35–40	D	2	vegetation
<i>Ceratocarpus arenarius</i>	annual	15–20	R	+	Dried
<i>Ceratocephala falcata</i>	annual	3–4	R	+	flowering
<i>Convolvulus hamadae</i>	semishrub	25–30	O	+	vegetation
<i>Cousinia hamadae</i>	Perennial	15–20	R	+	vegetation
<i>Ferula foetida</i>	Perennial	30–35	R	+	vegetation
<i>Halothamnus subaphyllus</i>	semishrub	40–45	R	+	vegetation
<i>Holosteum umbellatum</i>	annual	6–8	O	+	flowering
<i>Hypecoum pendulum</i>	annual	12–15	O	+	flowering
<i>Iris songarica</i>	Perennial	30–35	O	+	vegetation
<i>Peganum garmala</i>	Perennial	15–20	R	+	vegetation
<i>Poa bulbosa</i>	Perennial	15–17	A	1	vegetation
<i>Streptoloma desertorum</i>	annual	6–7	R	+	flowering
<i>Tortula desertorum</i>	moss	0.3–0.5	O	+	vegetation
<i>Tulipa lehmanniana</i>	Perennial	10–15	R	+	vegetation
<i>Xylosalsola arbuscula</i> ( <i>Salsola arbuscula</i> )	shrub	40–50	A	1	vegetation

### **B036, B037**

40.68719 – 40.685428° N, 64.582273 – 64.589908° E, 270–272 m.s.l.

Sandy plain with native ephemeroïd-sagebrush-saltwort (*Xylosalsola arbuscula*, *Caroxylon orientale*, *Artemisia diffusa*, *Poa bulbosa*, *Carex physodes*) (photo 6–7); 18 plant and 1 moss species were recorded (Table 3). The canopy cover is 30–40%. 11 generative and 78 pre-generative specimens of red-listed *Tulipa lehmanniana* were found within the B037 survey square, and solitary pre-generative specimens were found within the B036 plot. Alien plants are absent. The terrain is somewhat wavy.





Photo 6. Plot B037. Sandy plain with saltwort-ephemeroid-sagebrush vegetation



Photo 7. Plot B036 (below). Sandy plain with saltwort-ephemeroid-sagebrush vegetation

Table 3. Check-list of plants recorded in survey plots B036–B037

Species	Life form	Height, cm	Abundance		Phenol. Stage
			DAFOR	Braun-Blanquet	
<i>Acanthophyllum elatius</i>	Perennial	40–45	O	+	vegetation
<i>Alyssum desertorum</i>	annual	5–6	O	+	flowering
<i>Artemisia diffusa</i>	semishrub	15–20	A	1	vegetation

<i>Astragalus villosissimus</i>	dwarf shrub	35-40	O	+	vegetation
<i>Carex physodes</i>	Perennial	12-15	A	1	flowering
<i>Caroxylon orientale</i> ( <i>Salsola orientalis</i> )	dwarf shrub	35-40	D	2	vegetation
<i>Ceratocarpus arenarius</i>	annual	15-20	R	+	Dried
<i>Ceratocephala falcata</i>	annual	3-4	O	+	flowering
<i>Convolvulus hamadae</i>	semishrub	25-30	O	+	vegetation
<i>Cousinia hamadae</i>	Perennial	15-20	R	+	vegetation
<i>Cousinia resinosa</i>	Perennial	30-35	R	+	vegetation
<i>Ferula foetida</i>	Perennial	30-35	R	+	vegetation
<i>Halothamnus subaphyllus</i>	semishrub	40-45	R	+	vegetation
<i>Holosteum umbellatum</i>	annual	6-8	O	+	flowering
<i>Hypecoum pendulum</i>	annual	12-15	O	+	flowering
<i>Iris songarica</i>	Perennial	30-35	O	+	vegetation
<i>Ixiolirion tataricum</i>	Perennial	12-15	R	+	vegetation
<i>Peganum garmala</i>	Perennial	15-20	R	+	vegetation
<i>Poa bulbosa</i>	Perennial	15-17	A	1	vegetation
<i>Tortula desertorum</i>	moss	0.3-0.5	O	+	vegetation
<i>Tulipa lehmanniana</i>	Perennial	10-15	R	+	vegetation
<i>Xylosalsola arbuscula</i> ( <i>Salsola arbuscula</i> )	shrub	40-50	A	1	vegetation

#### **B061, B062, B063, B064, B065**

40.665857 – 40.670540° N, 64.612417 – 64.583322° E, 260–267 m.s.l. Native saltwort-ephemeroid-sagebrush community (*Artemisia diffusa*, *Poa bulbosa*, *Carex physodes*, *Xylosalsola arbuscula*, *Caroxylon orientale*) on sandy desert soil (photo 8); 23 plant and 1 moss species were recorded (Table 4), including nationally red-listed *Tulipa lehmanniana* (numerous mainly pre-generative specimens occurs sporadically within and between survey plots). The canopy cover is 40–50%. Alien plants are absent. The differences between these 5 plots are negligible. The terrain is somewhat hilly-wavy.





Photo 8. Plot B065. Sandy plain with saltwort-ephemeroid-sagebrush vegetation. In the foreground – *Ferula foetida*.

Table 4. Check-list of plants recorded in survey plots B061–B065

Species	Life form	Height, cm	Abundance		Phenol. Stage
			DAFOR	Braun-Blanquet	
<i>Acanthophyllum elatius</i>	Perennial	40–45	O	+	vegetation
<i>Alyssum desertorum</i>	annual	5–6	O	+	flowering
<i>Artemisia diffusa</i>	semishrub	25–30	A	1	vegetation
<i>Astragalus villosissimus</i>	dwarf shrub	35–40	A	1	vegetation
<i>Bromus tectorum</i>	annual	12–15	O	+	flowering
<i>Carex physodes</i>	Perennial	12–15	D	1	flowering
<i>Caroxylon orientale</i> ( <i>Salsola orientalis</i> )	dwarf shrub	35–40	D	2	vegetation
<i>Ceratocarpus arenarius</i>	annual	15–20	R	+	Dried
<i>Ceratocephala falcata</i>	annual	3–4	O	+	flowering
<i>Convolvulus hamadae</i>	semishrub	25–30	A	1	vegetation
<i>Cousinia hamadae</i>	Perennial	15–20	R	+	vegetation
<i>Ferula foetida</i>	Perennial	50–60	O	1	flowering
<i>Halothamnus subaphyllus</i>	semishrub	40–45	O	1	vegetation
<i>Haplophyllum sp.</i>	Perennial	10–15	R	+	vegetation
<i>Holosteum umbellatum</i>	annual	6–8	O	+	flowering
<i>Hypocoum pendulum</i>	annual	12–15	O	+	flowering
<i>Iris longiscapa</i>	perennial	17–20	R	+	flowering
<i>Iris songarica</i>	Perennial	30–35	R	+	vegetation
<i>Mausolea eriocarpa</i>	semishrub	45–50	O	1	vegetation
<i>Peganum garmala</i>	Perennial	15–20	R	+	vegetation



<i>Poa bulbosa</i>	Perennial	15–17	A	1	vegetation
<i>Tortula desertorum</i>	moss	0.3–0.5	O	+	vegetation
<i>Tulipa lehmanniana</i>	Perennial	10–15	O	+	vegetation
<i>Xylosansola arbuscula</i> ( <i>Salsola arbuscula</i> )	shrub	40–50	A	1	vegetation

**B066**

40.662056° N, 64.626846° E, 255 m.s.l.

Sandy plain with native saltwort-ephemeroid-sagebrush community (*Artemisia diffusa*, *Poa bulbosa*, *Carex physodes*, *Xylosalsola arbuscula*, *Caroxylon orientale*) (photo 9); 23 plant and 1 moss species were recorded (Table 5), including nationally red-listed *Tulipa lehmanniana* (solitary mainly pre-generative specimens). The canopy cover is 50%. Alien plants are absent.

Table 5. Check-list of plants recorded in survey plot B066

Species	Life form	Height, cm	Abundance		Phenol. Stage
			DAFOR	Braun-Blanquet	
<i>Acanthophyllum elatius</i>	Perennial	40–45	R	+	vegetation
<i>Alyssum desertorum</i>	annual	5–6	O	+	flowering
<i>Artemisia diffusa</i>	semishrub	25–30	D	2	vegetation
<i>Astragalus flexus</i>	perennial	15–17	R	+	flowering
<i>Astragalus villosissimus</i>	dwarf shrub	35–40	O	+	vegetation
<i>Bromus tectorum</i>	annual	12–15	O	+	flowering
<i>Calligonum microcarpum</i>	shrub	50–70	R	+	vegetation
<i>Carex physodes</i>	Perennial	12–15	D	1	flowering
<i>Caroxylon orientale</i> ( <i>Salsola orientalis</i> )	dwarf shrub	40–50	D	1	vegetation
<i>Ceratocarpus arenarius</i>	annual	15–20	R	+	Dried
<i>Ceratocephala falcata</i>	annual	3–4	O	+	flowering
<i>Convolvulus hamadae</i>	semishrub	25–30	A	1	vegetation
<i>Cousinia hamadae</i>	Perennial	15–20	R	+	vegetation
<i>Ferula foetida</i>	Perennial	50–60	O	1	flowering
<i>Halothamnus subaphyllus</i>	semishrub	40–45	R	+	vegetation
<i>Holosteum umbellatum</i>	annual	6–8	O	+	flowering
<i>Hypecoum pendulum</i>	annual	12–15	O	+	flowering
<i>Iris songarica</i>	Perennial	30–35	R	+	vegetation
<i>Mausolea eriocarpa</i>	semishrub	45–50	O	1	vegetation
<i>Peganum garmala</i>	Perennial	15–20	R	+	vegetation
<i>Poa bulbosa</i>	Perennial	15–17	A	1	vegetation
<i>Tortula desertorum</i>	moss	0.3–0.5	O	+	vegetation
<i>Tulipa lehmanniana</i>	Perennial	10–15	R	+	vegetation
<i>Xylosalsola arbuscula</i> ( <i>Salsola arbuscula</i> )	shrub	40–50	O	+	vegetation



Photo 9. Plot B066. Sandy plain with saltwort-ephemeroid-sagebrush vegetation

**B069**

40.650226 ° N, 64.641662 ° E, 263 m.s.l.

Native saltwort-ephemeroid-sagebrush community (*Artemisia diffusa*, *Poa bulbosa*, *Carex subphysodes*, *Xylosalsola arbuscula*, *Caroxylon orientale*, *Ferula foetida*) (photo 10); 18 plant and 1 moss species were recorded (Table 6). The canopy cover is 40%. 23 generative and 131 pre-generative specimens of red-listed *Tulipa lehmanniana* were found within the survey square. Alien plants are absent. The the terrain is somewhat wavy.

Table 6. Check-list of plants recorded in survey plot B069

Species	Life form	Height, cm	Abundance		Phenol. Stage
			DAFOR	Braun-Blanquet	
<i>Artemisia diffusa</i>	semishrub	25–30	A	1	vegetation
<i>Astragalus flexus</i>	perennial	15-17	R	+	flowering
<i>Astragalus villosissimus</i>	dwarf shrub	35-40	O	+	vegetation
<i>Carex subphysodes</i>	Perennial	12–15	A	1	flowering
<i>Caroxylon orientale</i> ( <i>Salsola orientalis</i> )	dwarf shrub	35-40	A	1	vegetation
<i>Ceratocarpus arenarius</i>	annual	15-20	R	+	Dried
<i>Ceratocephala falcata</i>	annual	3–4	O	+	flowering
<i>Convolvulus hamadae</i>	semishrub	25–30	O	+	vegetation
<i>Ferula foetida</i>	Perennial	50–60	O	1	flowering
<i>Holosteum umbellatum</i>	annual	6–8	O	+	flowering
<i>Hypecoum pendulum</i>	annual	12–15	O	+	flowering
<i>Iris songarica</i>	Perennial	30–35	O	+	vegetation
<i>Peganum garmala</i>	Perennial	15-20	R	+	vegetation

<i>Phlomoides desertotum</i>	Perennial	15-20	R	+	vegetation
<i>Poa bulbosa</i>	Perennial	15–17	A	1	vegetation
<i>Salsola paulsenii</i>	annual	30–40	R	+	Dried
<i>Tortula desertorum</i>	moss	0.3–0.5	A	1	vegetation
<i>Tulipa lehmanniana</i>	Perennial	10–15	R	+	vegetation
<i>Xylosalsola arbuscula</i> ( <i>Salsola arbuscula</i> )	shrub	40–50	A	2	vegetation



Photo 10. Plot B069. Sandy plain with saltwort-ephemeroid-sagebrush vegetation

### B070

40.645274 ° N, 64.644478 ° E, 260 m.s.l.

This survey plot is situated near the border of flat sandy desert plain and steep slopes of saline depression. Native saltwort-ephemeroid-sagebrush community (*Artemisia diffusa*, *Poa bulbosa*, *Carex subphysodes*, *Caroxylon orientale*, *Ferula foetida*) (photo 11); 16 plant and 1 moss species were recorded (Table 7). The canopy cover is 40%. 25 generative and 121 pre-generative specimens of red-listed *Tulipa lehmanniana* were found within the survey square. Alien plants are absent. The the terrain is somewhat wavy.

Table 7. Check-list of plants recorded in survey plot B070

Species	Life form	Height, cm	Abundance		Phenol. Stage
			DAFOR	Braun-Blanquet	
<i>Artemisia diffusa</i>	semishrub	25–30	D	2	vegetation
<i>Astragalus rubromarginatus</i>	perennial	12-15	R	+	vegetation
<i>Astragalus villosissimus</i>	dwarf shrub	35-40	R	+	vegetation
<i>Carex subphysodes</i>	Perennial	12–15	A	1	flowering



<i>Caroxylon orientale</i> ( <i>Salsola orientalis</i> )	dwarf shrub	35-40	D	2	vegetation
<i>Caroxylon scleranthum</i> ( <i>Salsola sclerantha</i> )	annual	20-25	R	+	Dried
<i>Ceratocarpus arenarius</i>	annual	15-20	R	+	Dried
<i>Ceratocephala falcata</i>	annual	3-4	R	+	flowering
<i>Convolvulus hamadae</i>	semishrub	25-30	A	1	vegetation
<i>Ferula foetida</i>	Perennial	50-60	O	1	flowering
<i>Holosteum umbellatum</i>	annual	6-8	R	+	flowering
<i>Iris songarica</i>	Perennial	30-35	O	+	vegetation
<i>Peganum garmala</i>	Perennial	15-20	R	+	vegetation
<i>Poa bulbosa</i>	Perennial	15-17	A	1	vegetation
<i>Tortula desertorum</i>	moss	0.3-0.5	A	1	vegetation
<i>Tulipa lehmanniana</i>	Perennial	10-15	R	+	vegetation
<i>Xylosalsola arbuscula</i> ( <i>Salsola arbuscula</i> )	shrub	40-50	R	+	vegetation



Photo 11. Plot B070. Sandy plain with saltwort-ephemeroid-sagebrush vegetation. In the foreground – *Ferula foetida*.

#### **B085**

40.659246° N, 64.613665° E, 230 m.s.l. A flat sandy desert plain, near the border of saline depression. Native ephemeroid-saltwort community with canopy cover of 30% on sandy desert soil (Photo 12). 17 plant and 1 moss species were recorded (Table 8), including 3 generative and 18 pre-generative specimens of nationally red-listed *Tulipa lehmanniana*. Alien plants are absent.

Table 8. Check-list of plants recorded in survey plot B085

Species	Life form	Height, cm	Abundance		Phenol. Stage
			DAFOR	Braun-Blanquet	

<i>Acanthophyllum elatius</i>	Perennial	35-40	R	+	vegetation
<i>Alyssum desertorum</i>	annual	5-6	O	+	flowering
<i>Artemisia diffusa</i>	semishrub	20-25	D	2	vegetation
<i>Astragalus rubromarginatus</i>	Perennial	12-15	R	+	vegetation
<i>Astragalus villosissimus</i>	dwarf shrub	35-40	R	+	vegetation
<i>Caroxylon orientale</i> ( <i>Salsola orientalis</i> )	dwarf shrub	35-40	A	1	vegetation
<i>Ceratocarpus arenarius</i>	annual	15-20	R	+	Dried
<i>Ceratocephala falcate</i>	annual	3-4	O	+	flowering
<i>Convolvulus hamadae</i>	semishrub	25-30	O	+	vegetation
<i>Ferula foetida</i>	Perennial	30-35	O	+	flowering
<i>Halothamnus subaphyllus</i>	semishrub	40-45	R	+	vegetation
<i>Hypecoum pendulum</i>	annual	12-15	O	+	flowering
<i>Ixiolirion tataricum</i>	Perennial	12-15	R	+	vegetation
<i>Oreosalsola arbusculiformis</i> ( <i>Salsola arbusculiformis</i> )	dwarf shrub	35-40	O	+	vegetation
<i>Peganum garmala</i>	Perennial	15-20	R	+	vegetation
<i>Poa bulbosa</i>	Perennial	15-17	A	1	vegetation
<i>Tortula desertorum</i>	moss	0.3-0.5	O	+	vegetation
<i>Tulipa lehmanniana</i>	Perennial	12-15	R	+	vegetation



Photo 12. B085. Flat sandy desert plain with ephemeroid-saltwort vegetation, near the edge of the cliffs of saline depression



40.623187° N, 64.648509° E, 264 m.s.l. Native saltwort-ephemeroid-sagebrush community (*Artemisia diffusa*, *Poa bulbosa*, *Carex subphysodes*, *Caroxylon orientale*, *Ferula foetida*) on sabulous soil (photo 13); 11 plant and 1 moss species were recorded (Table 9). 9 pre-generative specimens of red-listed *Tulipa lehmanniana* were found. Alien plants are absent.

Table 9. Check-list of plants recorded in survey plot VP2

Species	Life form	Height, cm	Abundance		Phenol. Stage
			DAFOR	Braun-Blanquet	
<i>Artemisia diffusa</i>	semishrub	25–30	D	2	vegetation
<i>Astragalus villosissimus</i>	dwarf shrub	35-40	R	+	vegetation
<i>Bassia prostrata</i> ( <i>Kochia prostrata</i> )	semishrub	15–20	R	+	vegetation
<i>Carex subphysodes</i>	Perennial	12–15	A	1	flowering
<i>Caroxylon orientale</i> ( <i>Salsola orientalis</i> )	dwarf shrub	35-40	A	1	vegetation
<i>Convolvulus hamadae</i>	semishrub	25–30	R	+	vegetation
<i>Ferula foetida</i>	Perennial	40–50	O	1	Vegetation, flowering
<i>Peganum garmala</i>	Perennial	15-20	R	+	vegetation
<i>Poa bulbosa</i>	Perennial	15–17	A	1	vegetation
<i>Tortula desertorum</i>	moss	0.3–0.5	O	+	vegetation
<i>Tulipa lehmanniana</i>	Perennial	10–15	R	+	vegetation
<i>Xylosalsola arbuscula</i> ( <i>Salsola arbuscula</i> )	shrub	40–50	R	+	vegetation



Photo 13. Plot VP2. Sandy plain with saltwort-ephemeroid-sagebrush vegetation

**B092, B093, B094, B095, B096**

40.606105 – 40.623301° N, 64.648188 – 64.634463° E, 264 m.s.l. The same native ephemeroïd-sagebrush community (*Artemisia diffusa*, *Poa bulbosa*, *Carex subphysodes*) was described on 4 survey plots situated along the border of flat sandy desert plain and steep slopes of saline depression (photo 14–15); the differences between these areas are negligible. 12 plant and 1 moss species were recorded (Table 10), including solitary specimens of red-listed *Tulipa lehmanniana*. The second tulip species, *Tulipa sogdiana*, has been included in first, second and third editions of the Red Data Book of Uzbekistan (1984, 1998, 2006). As a result of field surveys performed during the last 20 years, it has been revealed that *Tulipa sogdiana* is common in desert zone of Uzbekistan, and it has been removed from the national Red Data Book. Alien plants are absent. The soil is sabulous and somewhat gravelly, and the terrain is flat.

Table 10. Check-list of plants recorded in survey plots B092–B096

Species	Life form	Height, cm	Abundance		Phenol. stage
			DAFOR	Braun-Blanquet	
<i>Artemisia diffusa</i>	semishrub	25–30	D	2	vegetation
<i>Astragalus villosissimus</i>	dwarf shrub	35–40	R	+	vegetation
<i>Bassia prostrata</i> ( <i>Kochia prostrata</i> )	semishrub	15–20	R	+	vegetation
<i>Carex subphysodes</i>	Perennial	12–15	A	1	flowering
<i>Caroxylon orientale</i> ( <i>Salsola orientalis</i> )	dwarf shrub	35–40	O	+	vegetation
<i>Ceratocarpus arenarius</i>	annual	15–20	R	+	Dried
<i>Convolvulus hamadae</i>	semishrub	25–30	R	+	vegetation
<i>Ferula foetida</i>	Perennial	30–35	O	+	Vegetation, flowering
<i>Peganum garmala</i>	Perennial	15–20	R	+	vegetation
<i>Poa bulbosa</i>	Perennial	15–17	A	1	vegetation
<i>Tortula desertorum</i>	moss	0.3–0.5	A	1	vegetation
<i>Tulipa lehmanniana</i>	Perennial	10–5	R	+	vegetation
<i>Tulipa sogdiana</i>	Perennial	7–10	R	+	vegetation





Photo 14. B096. Flat sandy desert plain with ephemeroid-sagebrush vegetation



Photo 15. B093. Flat sandy desert plain with ephemeroid-sagebrush vegetation

**B097**

40.599784° N, 64.650479° E, 262 m.s.l.

Native ephemeroid-sagebrush community (*Artemisia diffusa*, *Poa bulbosa*, *Carex subphysodes*) (photo 16); 11 plant and 1 moss species were recorded (Table 11). 3 specimens of red-listed *Tulipa lehmanniana* were found. Alien plants are absent. The soil is sabulous and somewhat gravelly, and the terrain is somewhat hilly-wavy.

Table 11. Check-list of plants recorded in survey plot B097



Species	Life form	Height, cm	Abundance		Phenol. Stage
			DAFOR	Braun-Blanquet	
<i>Artemisia diffusa</i>	semishrub	25–30	D	2	vegetation
<i>Astragalus villosissimus</i>	dwarf shrub	35–40	R	+	vegetation
<i>Bassia prostrata</i> ( <i>Kochia prostrata</i> )	semishrub	15–20	R	+	vegetation
<i>Carex subphysodes</i>	Perennial	12–15	A	1	flowering
<i>Caroxylon orientale</i> ( <i>Salsola orientalis</i> )	dwarf shrub	35–40	O	+	vegetation
<i>Caroxylon scleranthum</i> ( <i>Salsola sclerantha</i> )	annual	20–25	R	+	Dried
<i>Ceratocarpus arenarius</i>	annual	15–20	R	+	Dried
<i>Convolvulus hamadae</i>	semishrub	25–30	R	+	vegetation
<i>Peganum garmala</i>	Perennial	15–20	R	+	vegetation
<i>Poa bulbosa</i>	Perennial	15–17	O	+	vegetation
<i>Tortula desertorum</i>	moss	0.3–0.5	O	+	vegetation
<i>Tulipa lehmanniana</i>	Perennial	10–15	R	+	vegetation



Photo 16. B097. Hilly-wavy sandy desert plain with ephemeroid-sagebrush vegetation

### **B098**

40.593737° N, 64.651792° E, 259 m.s.l. Native ephemeroid-sagebrush community (*Artemisia diffusa*, *Poa bulbosa*, *Carex subphysodes*) (photo 17); 11 plant and 1 moss species were recorded (Table 12), red-listed and alien plants are absent. The soil is sabulous and somewhat gravelly, and the terrain is somewhat wavy.

Table 12. Check-list of plants recorded in survey plot B098

Species	Life form	Height, cm	Abundance	Phenol. stage
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			DAFOR	Braun-Blanquet	
<i>Artemisia diffusa</i>	semishrub	25–30	D	2	vegetation
<i>Astragalus villosissimus</i>	dwarf shrub	35–40	R	+	vegetation
<i>Bassia prostrata</i> ( <i>Kochia prostrata</i> )	semishrub	15–20	R	+	vegetation
<i>Carex subphysodes</i>	Perennial	12–15	A	1	flowering
<i>Caroxylon orientale</i> ( <i>Salsola orientalis</i> )	dwarf shrub	35–40	O	+	vegetation
<i>Ceratocarpus arenarius</i>	annual	15–20	R	+	Dried
<i>Convolvulus hamadae</i>	semishrub	25–30	R	+	vegetation
<i>Ferula foetida</i>	Perennial	50–60	R	+	flowering
<i>Peganum garmala</i>	Perennial	15–20	O	+	vegetation
<i>Poa bulbosa</i>	Perennial	15–17	O	+	vegetation
<i>Tortula desertorum</i>	moss	0.3–0.5	O	+	vegetation
<i>Tulipa sogdiana</i>	Perennial	7–10	R	+	vegetation



Photo 17. B098. Sandy desert plain with ephemeroid-sagebrush vegetation

### **B101**

40.57905° N, 64.65094° E, 259 m.s.l.

Native ephemeroid-sagebrush community (*Artemisia diffusa*, *Poa bulbosa*, *Carex subphysodes*) (photo 18); 8 plant and 1 moss species were recorded (Table 13), red-listed and alien plants are absent. The soil is sabulous and somewhat gravelly. The same vegetation is in the center of bird monitoring point VP1.

Table 13. Check-list of plants recorded in survey plot B101

Species	Life form	Height, cm	Abundance		Phenol. Stage
			DAFOR	Braun-Blanquet	
<i>Artemisia diffusa</i>	semishrub	25–30	D	2	vegetation



<i>Astragalus villosissimus</i>	dwarf shrub	35-40	R	+	vegetation
<i>Carex subphysodes</i>	Perennial	12–15	A	1	flowering
<i>Caroxylon orientale</i> ( <i>Salsola orientalis</i> )	dwarf shrub	25-30	R	+	vegetation
<i>Ceratocarpus arenarius</i>	annual	15-20	R	+	Dried
<i>Convolvulus hamadae</i>	semishrub	25–30	R	+	vegetation
<i>Peganum garmala</i>	Perennial	15-20	R	+	vegetation
<i>Poa bulbosa</i>	Perennial	15–17	O	+	vegetation
<i>Tortula desertorum</i>	moss	0.3–0.5	A	1	vegetation



Photo 18. B101. Flat sandy desert plain with ephemeroid-sagebrush vegetation

### **B103**

40.556723° N, 64.648712° E, 263 m.s.l.

Native ephemeroid-sagebrush community (*Artemisia diffusa*, *Poa bulbosa*, *Carex subphysodes*) (photo 19); 14 plant and 1 moss species were recorded (Table 14), one of them is nationally red-listed (*Tulipa lehmanniana*, photo 20); alien plants are absent. 1 generative and 8 pre-generative specimens of *Tulipa lehmanniana* have been count. A colony of gerbils (*Meriones sp.*) is situated on the area. The sandy soil is somewhat gravelly.

Table 14. Check-list of plants recorded in survey plot B103

Species	Life form	Height, cm	Abundance		Phenol. Stage
			DAFOR	Braun-Blanquet	
<i>Artemisia diffusa</i>	semishrub	25–30	D	2	vegetation
<i>Astragalus villosissimus</i>	dwarf shrub	35-40	R	+	vegetation
<i>Carex subphysodes</i>	Perennial	12–15	A	1	flowering
<i>Caroxylon orientale</i> ( <i>Salsola orientalis</i> )	dwarf shrub	25-30	R	+	vegetation

<i>Ceratocarpus arenarius</i>	annual	15-20	R	+	Dried
<i>Convolvulus hamadae</i>	semishrub	25–30	O	+	vegetation
<i>Cousinia hamadae</i>	Perennial	15–20	R	+	vegetation
<i>Ferula foetida</i>	Perennial	50–60	O	+	flowering
<i>Iris songarica</i>	Perennial	30–35	R	+	vegetation
<i>Oreosalsola arbusculiformis</i> ( <i>Salsola arbusculiformis</i> )	dwarf shrub	35-40	O	+	vegetation
<i>Peganum garmala</i>	Perennial	15-20	R	+	vegetation
<i>Poa bulbosa</i>	Perennial	15–17	A	1	vegetation
<i>Tortula desertorum</i>	moss	0.3–0.5	A	1	vegetation
<i>Tulipa lehmanniana</i>	Perennial	7–10	R	+	vegetation
<i>Tulipa sogdiana</i>	Perennial	7–10	R	+	vegetation



Photo 19. B103. Flat sandy desert plain with ephemeroid-sagebrush vegetation





Photo 20. Plot B103. Non-flowering generative specimen of nationally red-listed *Tulipa lehmanniana*

**B104**

40.552364° N, 64.653046° E, 265 m.s.l.

Native saltwort-ephemeroid-sagebrush community (*Artemisia diffusa*, *Poa bulbosa*, *Carex subphysodes*, *Salsola orientalis*) (photo 21); 13 plant species were recorded (Table 15), red-listed or alien plants are absent.

Table 15. Check-list of plants recorded in survey plot B104

Species	Life form	Height, cm	Abundance		Phenol. Stage
			DAFOR	Braun-Blanquet	
<i>Artemisia diffusa</i>	semishrub	25–30	D	2	vegetation
<i>Astragalus campylorrhynchus</i>	annual	10-12	R	+	vegetation
<i>Astragalus villosissimus</i>	dwarf shrub	35-40	R	+	vegetation
<i>Bassia prostrata</i> ( <i>Kochia prostrata</i> )	semishrub	15–20	R	+	vegetation
<i>Carex subphysodes</i>	Perennial	12–15	A	1	flowering
<i>Caroxylon orientale</i> ( <i>Salsola orientalis</i> )	dwarf shrub	25–30	A	1	vegetation
<i>Ceratocarpus arenarius</i>	annual	15-20	R	+	Dried
<i>Convolvulus hamadae</i>	semishrub	25–30	R	+	vegetation
<i>Ferula foetida</i>	Perennial	50–60	O	+	flowering
<i>Iris songarica</i>	Perennial	30–35	O	+	vegetation
<i>Oreosalsola arbusculiformis</i> ( <i>Salsola arbusculiformis</i> )	dwarf shrub	35-40	R	+	vegetation
<i>Poa bulbosa</i>	Perennial	15–17	A	1	vegetation
<i>Tortula desertorum</i>	moss	0.3–0.5	O	+	vegetation
<i>Tulipa sogdiana</i>	Perennial	7–10	R	+	vegetation



Photo 21. Plot B104. Flat sandy plain with saltwort-ephemeroid-sagebrush vegetation

#### **B105**

40.548117° N, 64.658976° E, 267 m.s.l. Native saltwort-ephemeroid-sagebrush community (*Artemisia diffusa*, *Poa bulbosa*, *Carex subphysodes*, *Ferula foetida*, *Iris songarica*, *Caroxylon orientale*) (photo 22); 17 plant species and 1 moss species (*Tortula desertorum*) were recorded (Table 16), one of them is nationally red-listed (*Tulipa lehmanniana*) (photo 23); alien plants are absent. Number of specimens of *Tulipa lehmanniana* is 16: 4 generative, 12 pre-generative. 22 generative and 34 pre-generative specimens also have been counted on 190–300 m from the plot. A colony of gerbils (*Meriones sp.*) is situated on the area.





Photo 22. Plot B105. Flat sandy plain with saltwort-ephemeroid-sagebrush vegetation with local abundance of giant umbelliferous *Ferula foetida*.



Photo 23. Non-flowering generative specimen of nationally red-listed species *Tulipa lehmanniana*.

Table 16. Check-list of plants recorded in survey plot B105

Species	Life form	Height, cm	Abundance	
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			DAFOR	Braun-Blanquet	Phenol. Stage
<i>Artemisia diffusa</i>	semishrub	25–30	D	2	vegetation
<i>Astragalus campylorrhynchus</i>	annual	10-12	R	+	vegetation
<i>Astragalus rubromarginatus</i>	perennial	12-15	R	+	vegetation
<i>Astragalus villosissimus</i>	dwarf shrub	35-40	R	+	vegetation
<i>Bassia prostrata</i> ( <i>Kochia prostrata</i> )	semishrub	15–20	R	+	vegetation
<i>Carex subphysodes</i>	Perennial	12–15	A	1	flowering
<i>Caroxylon orientale</i> ( <i>Salsola orientalis</i> )	dwarf shrub	35-40	A	1	vegetation
<i>Ceratocarpus arenarius</i>	annual	15-20	R	+	Dried
<i>Convolvulus hamadae</i>	semishrub	25–30	R	+	vegetation
<i>Cousinia hamadae</i>	Perennial	15–20	R	+	vegetation
<i>Ferula foetida</i>	Perennial	50–60	A	1	flowering
<i>Iris songarica</i>	Perennial	30–35	A	1	vegetation
<i>Peganum garmala</i>	Perennial	15-20	R	+	vegetation
<i>Poa bulbosa</i>	Perennial	15–17	D	2	vegetation
<i>Tortula desertorum</i>	moss	0.3–0.5	A	1	vegetation
<i>Tulipa lehmanniana</i>	Perennial	7–10	R	+	vegetation
<i>Tulipa sogdiana</i>	Perennial	7–10	R	+	Vegetation
<i>Xylosalsola arbuscula</i> ( <i>Salsola arbuscula</i> )	Shrub	50–60	R	+	vegetation

### B106

40.545494° N, 64.66536° E, 269 m.s.l. Native ephemeroid-sagebrush community (*Artemisia diffusa*, *Poa bulbosa*, *Carex subphysodes*) on sabulous, somewhat gravelly desert soil (photo 24). The canopy cover is 20–25%. One moss and 9 plant species were recorded (Table 17), none of them are red-listed or alien.

Table 17. Check-list of plants recorded in survey plot B106

Species	Life form	Height, cm	Abundance		Phenol. stage
			DAFOR	Braun-Blanquet	
<i>Artemisia diffusa</i>	semishrub	25–30	D	2	vegetation
<i>Bassia prostrata</i> ( <i>Kochia prostrata</i> )	semishrub	15–20	R	+	vegetation
<i>Carex subphysodes</i>	Perennial	12–15	A	1	flowering
<i>Cousinia hamadae</i>	Perennial	15–20	R	+	vegetation
<i>Ferula foetida</i>	Perennial	50–60	O	+	flowering
<i>Iris songarica</i>	Perennial	30–35	R	+	vegetation
<i>Poa bulbosa</i>	Perennial	15–17	A	1	vegetation
<i>Tortula desertorum</i>	moss	0.3–0.5	A	1	vegetation
<i>Tulipa sogdiana</i>	Perennial	7–10	R	+	vegetation
<i>Xylosalsola arbuscula</i> ( <i>Salsola arbuscula</i> )	Shrub	50–60	R	+	vegetation



Photo 24. B106. Flat sandy plain with ephemeroid-sagebrush vegetation

### B108

40.550329° N, 64.62948° E, 266 m.s.l. Native ephemeroid-sagebrush community (*Artemisia diffusa*, *Poa bulbosa*, *Carex subphysodes*) on sabulous, somewhat gravelly desert soil. One moss and 9 plant species were recorded (Table 18), none of them are red-listed or alien.

Table 18. Check-list of plants recorded in survey plot B108

Species	Life form	Height, cm	Abundance		Phenol. stage
			DAFOR	Braun-Blanquet	
<i>Artemisia diffusa</i>	semishrub	25–30	D	2	vegetation
<i>Astragalus villosissimus</i>	dwarf shrub	35–40	R	+	vegetation
<i>Carex subphysodes</i>	Perennial	12–15	A	1	flowering
<i>Caroxylon orientale</i> ( <i>Salsola orientalis</i> )	dwarf shrub	35–40	R	+	vegetation
<i>Convolvulus hamadae</i>	semishrub	25–30	R	+	vegetation
<i>Ferula foetida</i>	Perennial	50–60	F	+	flowering
<i>Iris songarica</i>	Perennial	30–35	R	+	vegetation
<i>Poa bulbosa</i>	Perennial	15–17	A	1	vegetation
<i>Tortula desertorum</i>	moss	0.3–0.5	A	1	vegetation
<i>Zygophyllum macrophyllum</i>	Perennial	10–12	R	+	flowering

### B109

40.544428° N, 64.6308° E, 265 m.s.l. Native ephemeroid-sagebrush community (*Artemisia diffusa*, *Poa bulbosa*, *Carex subphysodes*) (photo 25). One moss and 11 plant species were recorded (Table 19), none of them are red-listed or alien.

Table 20. Check-list of plants recorded in survey plot B109

Species	Life form	Height, cm	Abundance		Phenol. stage
			DAFOR	Braun-Blanquet	
<i>Artemisia diffusa</i>	semishrub	25–30	D	2	vegetation
<i>Astragalus villosissimus</i>	dwarf shrub	35–40	R	+	vegetation
<i>Bassia prostrata</i> ( <i>Kochia prostrata</i> )	semishrub	15–20	R	+	vegetation
<i>Carex subphysodes</i>	Perennial	12–15	A	1	flowering
<i>Caroxylon orientale</i> ( <i>Salsola orientalis</i> )	dwarf shrub	35–40	O	+	vegetation
<i>Convolvulus hamadae</i>	semishrub	25–30	R	+	vegetation
<i>Ferula foetida</i>	Perennial	50–60	R	+	flowering
<i>Iris songarica</i>	Perennial	30–35	R	+	vegetation
<i>Peganum garmala</i>	Perennial	15–20	R	+	vegetation
<i>Poa bulbosa</i>	Perennial	15–17	A	1	vegetation
<i>Tortula desertorum</i>	moss	0.3–0.5	O	+	vegetation
<i>Tulipa sogdiana</i>	Perennial	7–10	R	+	vegetation



Photo 25. B109. Flat sandy plain with ephemeroid-sagebrush vegetation

### **B110**

40.54095° N, 64.63479° E, 263 m.s.l. Native ephemeroid-sagebrush community (*Artemisia diffusa*, *Poa bulbosa*, *Carex subphysodes*, *Ferula foetida*). One moss and 18 plant species were recorded (Table 21), none of them are red-listed or alien.

Table 21. Check-list of plants recorded in survey plot B110

Species	Life form	Height, cm	Abundance		Phenol. Stage
			DAFOR	Braun-Blanquet	
<i>Alyssum desertorum</i>	annual	5–6	R	+	Flowering, fruiting
<i>Artemisia diffusa</i>	semishrub	25–30	D	2	vegetation



<i>Astragalus campylorrhynchus</i>	annual	10-12	R	+	vegetation
<i>Astragalus villosissimus</i>	dwarf shrub	35-40	R	+	vegetation
<i>Carex subphysodes</i>	Perennial	12–15	A	1	flowering
<i>Caroxylon orientale</i> ( <i>Salsola orientalis</i> )	dwarf shrub	35-40	O	+	vegetation
<i>Ceratocarpus arenarius</i>	annual	15-20	R	+	Dried
<i>Climacoptera sp.</i>	annual	7–10	R	+	vegetation
<i>Convolvulus hamadae</i>	semishrub	25–30	R	+	vegetation
<i>Cousinia hamadae</i>	Perennial	15–20	R	+	vegetation
<i>Ferula foetida</i>	Perennial	50–60	A	1	flowering
<i>Hypecoum pendulum</i>	annual	12–15	R	+	flowering
<i>Iris songarica</i>	Perennial	30–35	R	+	vegetation
<i>Peganum garmala</i>	Perennial	15-20	R	+	vegetation
<i>Poa bulbosa</i>	Perennial	15–17	D	2	vegetation
<i>Suaeda sp.</i>	annual	7–10	R	+	vegetation
<i>Tortula desertorum</i>	moss	0.3–0.5	A	1	vegetation
<i>Tulipa sogdiana</i>	Perennial	7–10	R	+	vegetation
<i>Xylosalsola arbuscula</i> ( <i>Salsola arbuscula</i> )	Shrub	50–60	R	+	vegetation



Photo 26. B110. Flat-wavy sandy plain with ephemeroïd-sagebrush vegetation

#### **4.1.2. Cliffs and eroded slopes of saline depression**

##### **B086, 087, 088, 089, and VP3**

40.637241 – 40.649545° N, 64.626063 – 64.615312 ° E, 256–210 m.s.l. Slopes and bottom of saline depression. Native sparse ephemeroïd-saltwort community was described on 4 survey plots on steep eroded sandstone slopes and bottom of saline depression (canopy cover is 0–10%); the differences between these areas are negligible.

17 plant and 1 moss species were recorded (Table 22), including solitary specimens of red-listed *Tulipa lehmanniana*. Alien plants are absent.

Table 22. Check-list of plants recorded in survey plots B086-B089 and VP3, April 2021.

Species	Life form	Height, cm	Abundance		Phenol. Stage
			DAFOR	Braun-Blanquet	
<i>Artemisia diffusa</i>	semishrub	20–25	O	+	vegetation
<i>Astragalus ammotrophus</i>	Perennial	12–15	R	+	vegetation
<i>Astragalus villosissimus</i>	dwarf shrub	35–40	R	+	vegetation
<i>Atraphaxis spinosa</i>	shrub	20–25	R	+	vegetation
<i>Bassia prostrata</i> ( <i>Kochia prostrata</i> )	semishrub	15–20	R	+	vegetation
<i>Caroxylon orientale</i> ( <i>Salsola orientalis</i> )	dwarf shrub	35–40	O	+	vegetation
<i>Ceratocarpus arenarius</i>	annual	15–20	R	+	Dried
<i>Climacoptera</i> sp.	annual	15–20	R	+	Dried
<i>Convolvulus hamadae</i>	semishrub	25–30	O	+	vegetation
<i>Cousinia hamadae</i>	Perennial	15–20	R	+	vegetation
<i>Ferula foetida</i>	Perennial	30–35	R	+	flowering
<i>Oreosalsola arbusculiformis</i> ( <i>Salsola arbusculiformis</i> )	dwarf shrub	35–40	A	1	vegetation
<i>Peganum garmala</i>	Perennial	15–20	R	+	vegetation
<i>Poa bulbosa</i>	Perennial	15–17	A	1	vegetation
<i>Tortula desertorum</i>	moss	0.3–0.5	O	+	vegetation
<i>Tulipa lehmanniana</i>	Perennial	12–15	R	+	vegetation
<i>Tulipa sogdiana</i>	Perennial	7–10	R	+	vegetation
<i>Zygophyllum macrophyllum</i>	Perennial	10–12	R	+	flowering





Photo 27. B089. Eroded sandstone slopes of saline depression with very sparse saltwort vegetation



Photo 28. B087. Eroded sandstone slopes of saline depression with very sparse saltwort vegetation

**B090**

40.630992° N, 64.62699° E, 210 m.s.l. Slopes of saline depression.

Native sparse saltwort community on steep eroded sandstone slopes and bottom of saline depression (canopy cover is 0–10%). One moss and 13 plant species were



recorded (Table 23), none of them are alien. 7 generative and 18 non-generative specimens of nationally red-listed *Tulipa lehmanniana* were found within the sample plot.

Table 23. Check-list of plants recorded in survey plot B090, April 2021.

Species	Life form	Height, cm	Abundance		Phenol. stage
			DAFOR	Braun-Blanquet	
<i>Artemisia diffusa</i>	semishrub	25–30	D	2	vegetation
<i>Astragalus villosissimus</i>	dwarf shrub	35–40	O	+	vegetation
<i>Atraphaxis spinosa</i>	shrub	20–25	R	+	vegetation
<i>Bassia prostrata</i> ( <i>Kochia prostrata</i> )	semishrub	15–20	R	+	vegetation
<i>Carex subphysodes</i>	Perennial	12–15	A	1	flowering
<i>Caroxylon orientale</i> ( <i>Salsola orientalis</i> )	dwarf shrub	35–40	O	+	vegetation
<i>Ceratocarpus arenarius</i>	annual	15–20	R	+	Dried
<i>Convolvulus hamadae</i>	semishrub	25–30	R	+	vegetation
<i>Ferula foetida</i>	Perennial	50–60	R	+	flowering
<i>Oreosalsola arbusculiformis</i> ( <i>Salsola arbusculiformis</i> )	dwarf shrub	35–40	O	+	vegetation
<i>Peganum garmala</i>	Perennial	15–20	R	+	vegetation
<i>Poa bulbosa</i>	Perennial	15–17	A	1	vegetation
<i>Tortula desertorum</i>	moss	0.3–0.5	O	+	vegetation
<i>Tulipa lehmanniana</i>	Perennial	12–15	R	+	vegetation





Photo 29, 30. B090. Flat sandy desert plain with sparse saltwort-ephemeroid-sagebrush vegetation intensively grazed by livestock on the top of cliff (above). Eroded steep sandstone slopes of saline depression with very sparse saltwort vegetation (below).

#### **B091**

40.627159° N, 64.630565° E, 223 m.s.l. A border of flat sandy desert plain and steep slopes of saline depression.

Intensively grazed by livestock native saltwort-ephemeroid-sagebrush community (*Artemisia diffusa*, *Poa bulbosa*, *Carex subphysodes*, *Caroxylon orientale*) with canopy cover of 10–15% on saline sabulous-loamy grey-brown desert soil on the top of cliff, and very sparse saltwort community on steep eroded sandstone slopes and bottom of saline depression (canopy cover is 0–10%). One moss and 14 plant species were recorded (Table 24), none of them are alien. 4 generative and 21 non-generative specimens of nationally red-listed *Tulipa lehmanniana* were found within the sample plot.

Table 24. Check-list of plants recorded in survey plot B091.

Species	Life form	Height, cm	Abundance		Phenol. stage
			DAFOR	Braun-Blanquet	
<i>Artemisia diffusa</i>	semishrub	25–30	A	1 to 2	vegetation
<i>Astragalus ammotrophus</i>	Perennial	12–15	R	+	vegetation
<i>Astragalus villosissimus</i>	dwarf shrub	35-40	O	+	vegetation
<i>Atraphaxis spinosa</i>	shrub	20–25	R	+	vegetation
<i>Bassia prostrata</i> ( <i>Kochia prostrata</i> )	semishrub	15–20	R	+	vegetation
<i>Carex subphysodes</i>	Perennial	12–15	A	+	flowering
<i>Caroxylon orientale</i> ( <i>Salsola orientalis</i> )	dwarf shrub	35-40	A	+ to 1	vegetation
<i>Ceratocarpus arenarius</i>	annual	15-20	R	+	Dried
<i>Convolvulus hamadae</i>	semishrub	25–30	O	+	vegetation



<i>Cousinia hamadae</i>	Perennial	15–20	R	+	vegetation
<i>Ferula foetida</i>	Perennial	30–35	R	+	vegetation
<i>Oreosalsola arbusculiformis</i> ( <i>Salsola arbusculiformis</i> )	dwarf shrub	35-40	A	+ to 1	vegetation
<i>Peganum garmala</i>	Perennial	15-20	R	+	vegetation
<i>Poa bulbosa</i>	Perennial	15–17	A	1	vegetation
<i>Tortula desertorum</i>	moss	0.3–0.5	O	+	vegetation
<i>Tulipa lehmanniana</i>	Perennial	12–15	R	+	vegetation
<i>Zygophyllum macrophyllum</i>	Perennial	10–12	R	+	flowering







Photo 31, 32, 33. B091. Eroded steep sandstone slopes of saline depression with very sparse saltwort vegetation (above and in the center). Flat sandy desert plain with sparse saltwort-ephemeroid-sagebrush vegetation intensively grazed by livestock on the top of cliff (below).

### **B100**

80 m to the south-west of B100 turbine location. 40.58805° N, 64.65367° E, 251 m.s.l. A border of flat sandy desert plain and steep slopes of saline depression.

Native ephemeroid-sagebrush community (*Artemisia diffusa*, *Poa bulbosa*, *Carex subphysodes*) with canopy cover of 30% on the top of cliff and very sparse saltwort community on steep eroded sandstone slopes (canopy cover is 0–10%). One moss and



13 plant species were recorded (Table 25), none of them are alien. 6 generative and 8 non-generative specimens of nationally red-listed *Tulipa lehmanniana* were found within the sample plot. A colony of gerbils (*Meriones sp.*) is situated on the area of turbine location.

Table 25. Check-list of plants recorded in survey plot B100.

Species	Life form	Height, cm	Abundance		Phenol. stage
			DAFOR	Braun-Blanquet	
<i>Artemisia diffusa</i>	semishrub	25–30	D	2	vegetation
<i>Astragalus villosissimus</i>	dwarf shrub	35–40	R	+	vegetation
<i>Atraphaxis spinosa</i>	shrub	20–25	R	+	vegetation
<i>Bassia prostrata</i> ( <i>Kochia prostrata</i> )	semishrub	15–20	R	+	vegetation
<i>Carex subphysodes</i>	Perennial	12–15	A	1	flowering
<i>Caroxylon orientale</i> ( <i>Salsola orientalis</i> )	dwarf shrub	35–40	O	+	vegetation
<i>Ceratocarpus arenarius</i>	annual	15–20	R	+	Dried
<i>Convolvulus hamadae</i>	semishrub	25–30	R	+	vegetation
<i>Ferula foetida</i>	Perennial	50–60	R	+	flowering
<i>Oreosalsola arbusculiformis</i> ( <i>Salsola arbusculiformis</i> )	dwarf shrub	35–40	O	+	vegetation
<i>Peganum garmala</i>	Perennial	15–20	R	+	vegetation
<i>Poa bulbosa</i>	Perennial	15–17	A	1	vegetation
<i>Tortula desertorum</i>	moss	0.3–0.5	O	+	vegetation
<i>Tulipa lehmanniana</i>	Perennial	7–10	R	+	vegetation





Photo 34, 35. B100. Flat sandy desert plain with ephemeroid-sagebrush vegetation on the top of cliff (above). Eroded steep sandstone slopes of saline depression with very sparse saltwort vegetation (below). Parallel paths trampled by livestock are visible in the foreground

### **B107**

100 m to the north-west of B107 turbine location. 40.557216° N, 64.629407° E, 251 m.s.l. A border of sandy desert plain and steep eroded slopes of saline depression.

Native ephemeroid-sagebrush community (*Artemisia diffusa*, *Poa bulbosa*, *Carex subphysodes*) on the top of cliff and very sparse saltwort community on steep sandstone slopes (canopy cover is less than 5%). One moss and 17 plant species were recorded (Table 26), none of them are alien. 4 generative and 11 non-generative specimens of nationally red-listed *Tulipa lehmanniana* were found.

Table 26. Check-list of plants recorded in survey plot B107.

Species	Life form	Height, cm	Abundance		Phenol. stage
			DAFOR	Braun-Blanquet	
<i>Artemisia diffusa</i>	semishrub	25–30	D	2	vegetation
<i>Astragalus villosissimus</i>	dwarf shrub	35–40	R	+	vegetation
<i>Atraphaxis spinosa</i>	shrub	20–25	R	+	vegetation
<i>Bassia prostrata</i> ( <i>Kochia prostrata</i> )	semishrub	15–20	R	+	vegetation
<i>Carex subphysodes</i>	Perennial	12–15	A	1	flowering
<i>Caroxylon orientale</i> ( <i>Salsola orientalis</i> )	dwarf shrub	35–40	O	+	vegetation
<i>Climacoptera</i> sp.	annual	12–15	R	+	vegetation
<i>Convolvulus hamadae</i>	semishrub	25–30	R	+	vegetation
<i>Ferula foetida</i>	Perennial	50–60	R	+	flowering
<i>Iris falcifolia</i>	Perennial	12–15	R	+	flowering
<i>Iris songarica</i>	Perennial	30–35	R	+	vegetation



<i>Oreosalsola arbusculiformis</i> ( <i>Salsola arbusculiformis</i> )	dwarf shrub	35-40	O	+	vegetation
<i>Peganum garmala</i>	Perennial	15-20	R	+	vegetation
<i>Poa bulbosa</i>	Perennial	15-17	A	1	vegetation
<i>Tortula desertorum</i>	moss	0.3-0.5	O	+	vegetation
<i>Tulipa lehmanniana</i>	Perennial	7-10	R	+	vegetation
<i>Tulipa sogdiana</i>	Perennial	7-10	R	+	vegetation
<i>Zygophyllum macrophyllum</i>	Perennial	10-12	R	+	flowering



Photo 36. Plot B107. Steep sandstone slopes of saline depression with very sparse saltwort vegetation

#### 4.1.3. Fixed and semi-fixed sands

Fixed and semi-fixed ridge-hilly sands prevail in the north-eastern part of “Bash” area. The vegetation of this habitat type is represented with native calligonum-saltwort-ephemeroid-sagebrush community (*Artemisia diffusa*, *Poa bulbosa*, *Carex physodes*, *Salsola arbuscula*, *Calligonum leucocladum*, *C. microcarpum*) and saltwort-ephemeroid-sagebrush vegetation (*Artemisia diffusa*, *Poa bulbosa*, *Carex physodes*, *Caroxylon orientale*). Psammophilous vegetation, particularly desert shrubs and saxaul woodlands, plays an important ecological role forming a unique landscape of sandy deserts of Central Asia and fixing sands.

The plant species diversity is higher than on flat and flat-wavy sandy desert plain (up to 30–31 species). The canopy cover is 40–50%. The vegetation is more or less uniform, only local abundance of saltworts and *Calligonum* varies on different areas. One moss species (*Tortula desertorum*) has been found in all plots; on some local areas it covers up to 5%. One nationally red-listed species, *Tulipa lehmanniana*, occurs sporadically within all territory of this habitat type, its abundance is R to O, population density varies from solitary specimens to 900–1000 per 1 hectare. The main type of land

use is pasture; an impact of grazing is medium; several shepherds houses are situated in this territory. Local impact is connected with several ground roads, railway and with electric lines. Within this habitat type, following geobotanical sample plots were described.

**B005, B006**

40.698465 – 40.694972° N, 64.63287 – 64.638676° E, 281–291 m.s.l.

Fixed hilly sands covered with native ephemeroïd-sagebrush vegetation (*Artemisia diffusa*, *Poa bulbosa*, *Carex physodes*), with psammophilous shrubs (*Calligonum leucocladum*, *C. microcarpum*) on the tops. The canopy cover is 30–40%. 25 plant and 1 moss species were recorded (Table 27), including solitary specimens of nationally red-listed *Tulipa lehmanniana*. Endemic to Central Asian deserts *Cousinia sogdiana* previously also was included in the Red Data Book of Uzbekistan (1984, 1998, 2006, 2009), but as a result of field surveys performed during the last 20 years, it has been revealed that this species is common in desert zone of Uzbekistan, and it has been removed from the 5<sup>th</sup> edition of the national Red Data Book. Alien plants are absent. Several colonies of gerbils (*Meriones sp.*) are situated on the area.

Table 27. Check-list of plants recorded in survey plots B005–B006.

Species	Life form	Height, cm	Abundance		Phenol. Stage
			DAFOR	Braun-Blanquet	
<i>Alyssum desertorum</i>	annual	5–6	O	+	flowering
<i>Artemisia diffusa</i>	semishrub	25–30	D	2	vegetation
<i>Astragalus villosissimus</i>	dwarf shrub	35–40	O	+	vegetation
<i>Bromus tectorum</i>	annual	12–15	O	+	flowering
<i>Calligonum leucocladum</i>	shrub	50–70	R	+	vegetation
<i>Calligonum microcarpum</i>	shrub	50–70	R	+	vegetation
<i>Carex physodes</i>	Perennial	12–15	D	1	flowering
<i>Caroxylon orientale</i> ( <i>Salsola orientalis</i> )	dwarf shrub	35–40	O	+	vegetation
<i>Caroxylon scleranthum</i> ( <i>Salsola sclerantha</i> )	annual	30–35	R	+	Dried
<i>Ceratocarpus arenarius</i>	annual	15–20	O	+	Dried
<i>Ceratocephala falcata</i>	annual	3–4	O	+	flowering
<i>Convolvulus divaricatus</i>	semishrub	25–30	O	+	vegetation
<i>Convolvulus hamadae</i>	semishrub	25–30	O	1	vegetation
<i>Cousinia sogdiana</i>	biennial	20–35	R	+	vegetation
<i>Ferula foetida</i>	Perennial	50–60	O	1	flowering
<i>Holosteum umbellatum</i>	annual	6–8	O	+	flowering
<i>Hypecoum pendulum</i>	annual	12–15	O	+	flowering
<i>Iris longiscapa</i>	perennial	17–20	R	+	flowering
<i>Peganum garmala</i>	Perennial	15–20	R	+	vegetation
<i>Poa bulbosa</i>	Perennial	15–17	A	1	vegetation
<i>Salsola paulsenii</i>	annual	40–45	R	+	Dried
<i>Sophora pachycarpa</i>	Perennial	15–20	R	+	vegetation
<i>Stipagrostis pennata</i>	Perennial	30–35	R	+	vegetation
<i>Tortula desertorum</i>	moss	0.3–0.5	O	+	vegetation
<i>Tulipa lehmanniana</i>	Perennial	10–15	R	+	vegetation



<i>Xylosalsola arbuscula</i> ( <i>Salsola arbuscula</i> )	shrub	40–50	O	+	vegetation
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Photo 37, 38. Plots B005 (above) and B006 (below). Fixed hilly sands with ephemeroïd-sagebrush vegetation, and with psammophilous shrubs (*Calligonum leucocladum*, *C. microcarpum*) on the tops

**B040, B041, B042, and VP4**

40.68791 – 40.678088° N, 64.611974 – 64.638916° E, 270–282 m.s.l.

Native calligonum-saltwort-ephemeroïd-sagebrush community (*Artemisia diffusa*, *Poa bulbosa*, *Carex physodes*, *Xylosalsola arbuscula*, *Calligonum leucocladum*, *C.*



*microcarpum*) on fixed hilly sands; 30 plant and 1 moss species were recorded (Table 28), including nationally red-listed *Tulipa lehmanniana* (occurs sporadically within and between plots). The canopy cover is 40–50%. Alien plants are absent. Several colonies of gerbils (*Meriones* sp.) are situated on the territory.

Table 28. Check-list of plants recorded in survey plots B040–B042 and VP4.

Species	Life form	Height, cm	Abundance		Phenol. Stage
			DAFOR	Braun-Blanquet	
<i>Acanthophyllum elatius</i>	Perennial	40–45	R	+	vegetation
<i>Alhagi pseudalhagi</i>	Perennial	35–40	O	+	Dried
<i>Alyssum desertorum</i>	annual	5–6	O	+	flowering
<i>Artemisia diffusa</i>	semishrub	25–30	A–D	1–2	vegetation
<i>Astragalus flexus</i>	perennial	15–17	R	+	flowering
<i>Astragalus villosissimus</i>	dwarf shrub	35–40	A	1	vegetation
<i>Bromus tectorum</i>	annual	12–15	O	+	flowering
<i>Calligonum leucocladum</i>	shrub	50–100	A–O	1–2	vegetation
<i>Calligonum microcarpum</i>	shrub	50–100	A–O	1–2	vegetation
<i>Carex physodes</i>	Perennial	12–15	D	1	flowering
<i>Caroxylon orientale</i> ( <i>Salsola orientalis</i> )	dwarf shrub	35–40	O	+	vegetation
<i>Caroxylon scleranthum</i> ( <i>Salsola sclerantha</i> )	annual	30–35	R	+	Dried
<i>Ceratocarpus arenarius</i>	annual	15–20	O	+	Dried
<i>Ceratocephala falcata</i>	annual	3–4	O	+	flowering
<i>Convolvulus divaricatus</i>	semishrub	25–30	O	+	vegetation
<i>Convolvulus hamadae</i>	semishrub	25–30	O	+	vegetation
<i>Cousinia hamadae</i>	Perennial	15–20	R	+	vegetation
<i>Cousinia sogdiana</i>	biennial	20–35	R	+	vegetation
<i>Ferula foetida</i>	Perennial	50–60	O	1	flowering
<i>Heliotropium arguzioides</i>	Perennial	25–30	R	+	vegetation
<i>Holosteum umbellatum</i>	annual	6–8	O	+	flowering
<i>Hypecoum pendulum</i>	annual	12–15	O	+	flowering
<i>Iris longiscapa</i>	perennial	17–20	R	+	flowering
<i>Iris songarica</i>	Perennial	30–35	R	+	vegetation
<i>Mausolea eriocarpa</i>	semishrub	45–50	O	1	vegetation
<i>Peganum garmala</i>	Perennial	15–20	R	+	vegetation
<i>Poa bulbosa</i>	Perennial	15–17	A	1	vegetation
<i>Salsola paulsenii</i>	annual	40–45	R	+	Dried
<i>Stipagrostis pennata</i>	Perennial	30–35	O	+	vegetation
<i>Tortula desertorum</i>	moss	0.3–0.5	O	+	vegetation
<i>Tulipa lehmanniana</i>	Perennial	10–15	O	+	vegetation

<i>Xylosalsola arbuscula</i> ( <i>Salsola arbuscula</i> )	shrub	40–50	A–O	1–+	vegetation
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Photo 39, 40. Plots B040 (above) and B041 (below). Fixed sands with calligonum-saltwort-ephemeroid-sagebrush vegetation





Photo 41. Plot B040. Flowering and non-flowering generative specimens of *Tulipa lehmanniana*, nationally red-listed plant

**B044, B045, and VP5**

40.664263 – 40.661484° N, 64.669446 – 64.676604° E, 290–300 m.s.l.

Native saltwort-ephemeroid-sagebrush community (*Artemisia diffusa*, *Poa bulbosa*, *Carex physodes*, *Xylosalsola arbuscula*, *Caroxylon orientale*) on fixed hilly sands; 24 plant and 1 moss species were recorded (Table 29), including nationally red-listed *Tulipa lehmanniana* (solitary specimens occur sporadically within and between plots). The canopy cover is 30–40%. Alien plants are absent. A shepherd's house is situated on this territory, but the impact of grazing is medium.

Table 29. Check-list of plants recorded in survey plots B044–B045 and VP5.

Species	Life form	Height, cm	Abundance		Phenol. Stage
			DAFOR	Braun-Blanquet	
<i>Alhagi pseudalhagi</i>	Perennial	35–40	R	+	Dried
<i>Alyssum desertorum</i>	annual	5–6	O	+	flowering
<i>Artemisia diffusa</i>	semishrub	25–30	D	2	vegetation
<i>Astragalus villosissimus</i>	dwarf shrub	35–40	R	+	vegetation
<i>Bromus tectorum</i>	annual	12–15	O	+	flowering
<i>Calligonum microcarpum</i>	shrub	50–100	R	+	vegetation
<i>Carex physodes</i>	Perennial	12–15	D	1	flowering
<i>Caroxylon orientale</i> ( <i>Salsola orientalis</i> )	dwarf shrub	35–40	A	1	vegetation
<i>Ceratocarpus arenarius</i>	annual	15–20	R	+	Dried
<i>Ceratocephala falcata</i>	annual	3–4	O	+	flowering
<i>Convolvulus divaricatus</i>	semishrub	25–30	R	+	vegetation

<i>Convolvulus hamadae</i>	semishrub	25–30	R	+	vegetation
<i>Cousinia hamadae</i>	Perennial	15–20	R	+	vegetation
<i>Cousinia sogdiana</i>	biennial	20–35	R	+	vegetation
<i>Ferula foetida</i>	Perennial	50–60	O–A	1	flowering
<i>Holosteum umbellatum</i>	annual	6–8	O	+	flowering
<i>Hypecoum pendulum</i>	annual	12–15	O	+	flowering
<i>Iris longiscapa</i>	perennial	17–20	R	+	flowering
<i>Iris songarica</i>	Perennial	30–35	R	+	vegetation
<i>Peganum garmala</i>	Perennial	15–20	R	+	vegetation
<i>Poa bulbosa</i>	Perennial	15–17	A	1	vegetation
<i>Salsola paulsenii</i>	annual	40–45	R	+	Dried
<i>Tortula desertorum</i>	moss	0.3–0.5	O	+	vegetation
<i>Tulipa lehmanniana</i>	Perennial	10–15	R	+	vegetation
<i>Xylosalsola arbuscula</i> ( <i>Salsola arbuscula</i> )	shrub	40–50	O	+	vegetation







Photo 42, 43. Plot B044. Fixed sands with saltwort-ephemeroid-sagebrush vegetation, and a shepherd's house (below)

**B067, B068**

40.654247 – 40.659515° N, 64.637586 – 64.632302° E, 263 m.s.l.

Native calligonum-saltwort-ephemeroid-sagebrush community (*Artemisia diffusa*, *Poa bulbosa*, *Carex physodes*, *Xylosalsola arbuscula*, *Calligonum leucocladum*, *C. microcarpum*) on fixed small-hilly sands; 31 plant and 1 moss species were recorded (Table 30), including nationally red-listed *Tulipa lehmanniana* (numerous mainly pre-generative specimens occurs sporadically within survey squares and between plots). The canopy cover is 40–50%. Alien plants are absent. Several colonies of gerbils (*Meriones* sp.) are situated on the area.

Table 30. Check-list of plants recorded in survey plots B067–B068.

Species	Life form	Height, cm	Abundance		Phenol. Stage
			DAFOR	Braun-Blanquet	
<i>Acanthophyllum elatius</i>	Perennial	40–45	R	+	vegetation
<i>Alyssum desertorum</i>	annual	5–6	O	+	flowering
<i>Artemisia diffusa</i>	semishrub	25–30	A	1	vegetation
<i>Astragalus chiwensis</i>	perennial	25–30	R	+	vegetation
<i>Astragalus flexus</i>	perennial	15–17	R	+	flowering
<i>Astragalus rubromarginatus</i>	Perennial	12–15	R	+	vegetation
<i>Astragalus villosissimus</i>	dwarf shrub	35–40	A	1	vegetation
<i>Bromus tectorum</i>	annual	12–15	O	+	flowering
<i>Calligonum leucocladum</i>	shrub	50–100	A	1	vegetation
<i>Calligonum microcarpum</i>	shrub	50–100	A	1	vegetation

<i>Carex physodes</i>	Perennial	12–15	D	1	flowering
<i>Caroxylon orientale</i> ( <i>Salsola orientalis</i> )	dwarf shrub	35-40	O	+	vegetation
<i>Ceratocarpus arenarius</i>	annual	15-20	R	+	Dried
<i>Ceratocephala falcata</i>	annual	3–4	O	+	flowering
<i>Convolvulus divaricatus</i>	semishrub	25–30	O	+	vegetation
<i>Convolvulus hamadae</i>	semishrub	25–30	A	1	vegetation
<i>Cousinia hamadae</i>	Perennial	15–20	R	+	vegetation
<i>Cousinia sogdiana</i>	biennial	20–35	R	+	vegetation
<i>Ferula foetida</i>	Perennial	50–60	O	1	flowering
<i>Heliotropium arguzioides</i>	Perennial	25–30	R	+	vegetation
<i>Holosteum umbellatum</i>	annual	6–8	O	+	flowering
<i>Hypecoum pendulum</i>	annual	12–15	O	+	flowering
<i>Iris longiscapa</i>	perennial	17-20	R	+	flowering
<i>Iris songarica</i>	Perennial	30–35	R	+	vegetation
<i>Mausolea eriocarpa</i>	semishrub	45–50	O	1	vegetation
<i>Peganum garmala</i>	Perennial	15-20	R	+	vegetation
<i>Phlomis desertorum</i>	Perennial	15-20	R	+	vegetation
<i>Poa bulbosa</i>	Perennial	15–17	A	1	vegetation
<i>Salsola paulsenii</i>	annual	40–45	R	+	Dried
<i>Stipagrostis pennata</i>	Perennial	30–35	O	+	vegetation
<i>Tortula desertorum</i>	moss	0.3–0.5	A	1	vegetation
<i>Tulipa lehmanniana</i>	Perennial	10–15	O	+	vegetation
<i>Xylosalsola arbuscula</i> ( <i>Salsola arbuscula</i> )	shrub	40–50	A	1	vegetation



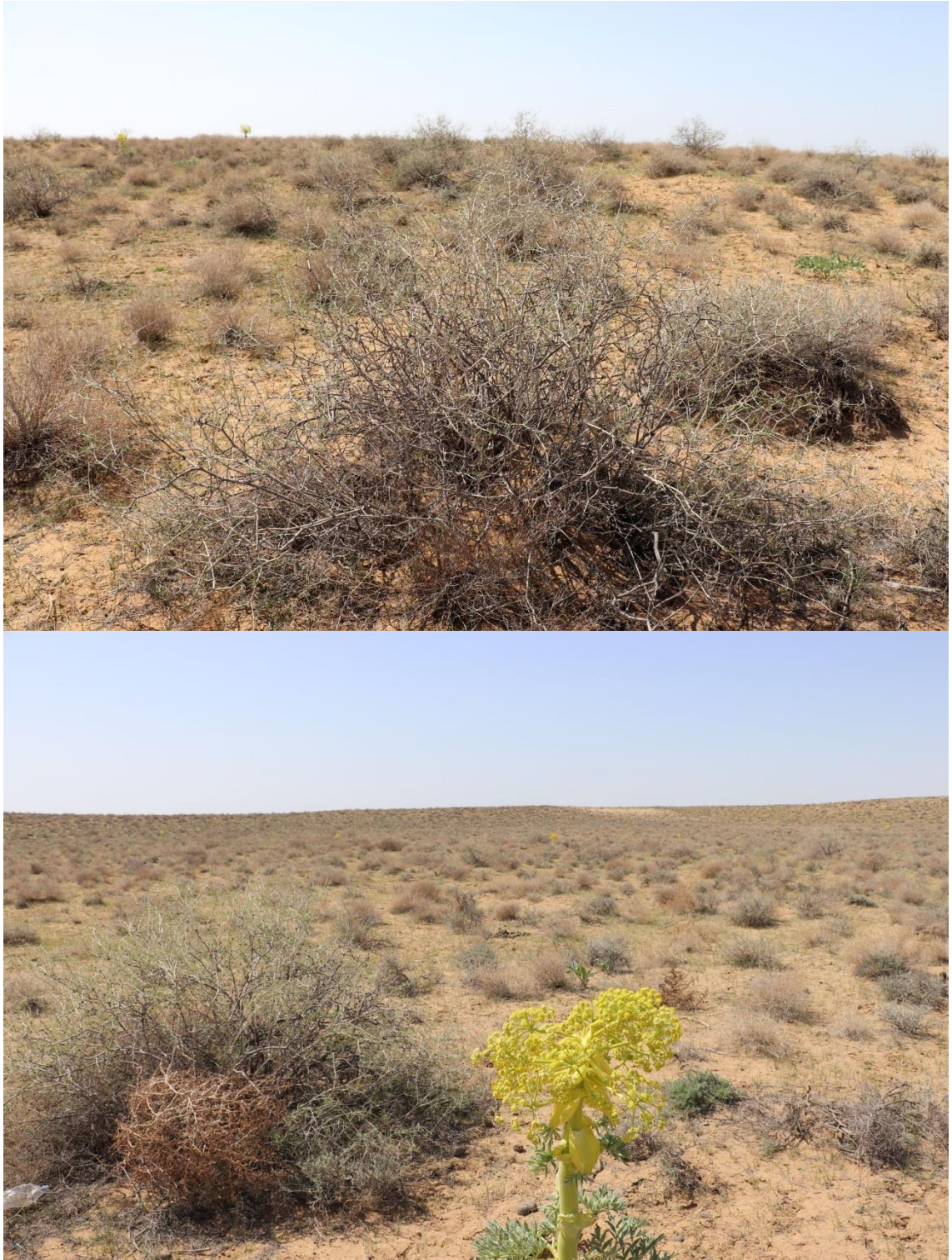


Photo 44, 45. Plots B068 (above) and B067 (below). Fixed sands with calligonum-saltwort-ephemeroid-sagebrush vegetation





Photo 46. *Calligonum microcarpum*, one of main dominant species of psammophilous shrubs of the Kyzylkum

#### **B071–B083, and VP7**

40.634589 – 40.582794° N, 64.674604 – 64.729295° E, 254–262 m.s.l.

The plantation of white saxaul (*Haloxylon persicum*), native dominant species of Central Asian sandy deserts, covers an area of 9x3 km of hilly sands between railway and electric line in the south-eastern part of project site. This plantation has been created in the past for fixation of sands. The saxaul stands are rather sparse, unclosed or partially closed on local areas; dominant plants of the herbaceous layer are sagebrush (*Artemisia diffusa*), desert sedge (*Carex physodes*), and *Ferula foetida*; 25 plant and 1 moss species were recorded in total within this area (Table 31), including nationally red-listed *Tulipa lehmanniana* (numerous generative and pre-generative specimens occur sporadically within and between survey squares). The canopy cover is 40–50%. Alien plants are absent. Several colonies of gerbils (*Meriones sp.*) are situated on the area.

Table 31. Check-list of plants recorded in survey plots B071–B083, and VP7.

Species	Life form	Height, cm	Abundance		Phenol. Stage
			DAFOR	Braun-Blanquet	
<i>Acanthophyllum elatius</i>	Perennial	40–45	R	+	vegetation
<i>Alyssum desertorum</i>	annual	5–6	O	+	flowering
<i>Artemisia diffusa</i>	semishrub	25–30	A	1	vegetation
<i>Astragalus flexus</i>	perennial	15–17	R	+	flowering
<i>Astragalus villosissimus</i>	dwarf shrub	35–40	O	+	vegetation
<i>Bromus tectorum</i>	annual	12–15	O	+	flowering
<i>Calligonum microcarpum</i>	shrub	50–100	R	+	vegetation
<i>Carex physodes</i>	Perennial	12–15	D	1	flowering



<i>Caroxylon orientale</i> ( <i>Salsola orientalis</i> )	dwarf shrub	35-40	O	+	vegetation
<i>Ceratocarpus arenarius</i>	annual	15-20	R	+	Dried
<i>Ceratocephala falcata</i>	annual	3-4	O	+	flowering
<i>Convolvulus divaricatus</i>	semishrub	25-30	O	+	vegetation
<i>Convolvulus hamadae</i>	semishrub	25-30	O	+	vegetation
<i>Ferula foetida</i>	Perennial	50-60	D-O	2-+	flowering
<i>Haloxylon persicum</i>	Small tree	180-200	A-D	1-3	
<i>Heliotropium arguzioides</i>	Perennial	25-30	R	+	vegetation
<i>Holosteum umbellatum</i>	annual	6-8	O	+	flowering
<i>Hypecoum pendulum</i>	annual	12-15	O	+	flowering
<i>Iris longiscapa</i>	perennial	17-20	R	+	flowering
<i>Iris songarica</i>	Perennial	30-35	O	+	vegetation
<i>Peganum garmala</i>	Perennial	15-20	R	+	vegetation
<i>Poa bulbosa</i>	Perennial	15-17	A-O	1-+	vegetation
<i>Salsola paulsenii</i>	annual	40-45	R	+	Dried
<i>Tortula desertorum</i>	moss	0.3-0.5	O	+	vegetation
<i>Tulipa lehmanniana</i>	Perennial	10-15	O	+	vegetation
<i>Xylosalsola arbuscula</i> ( <i>Salsola arbuscula</i> )	shrub	40-50	O	+	vegetation





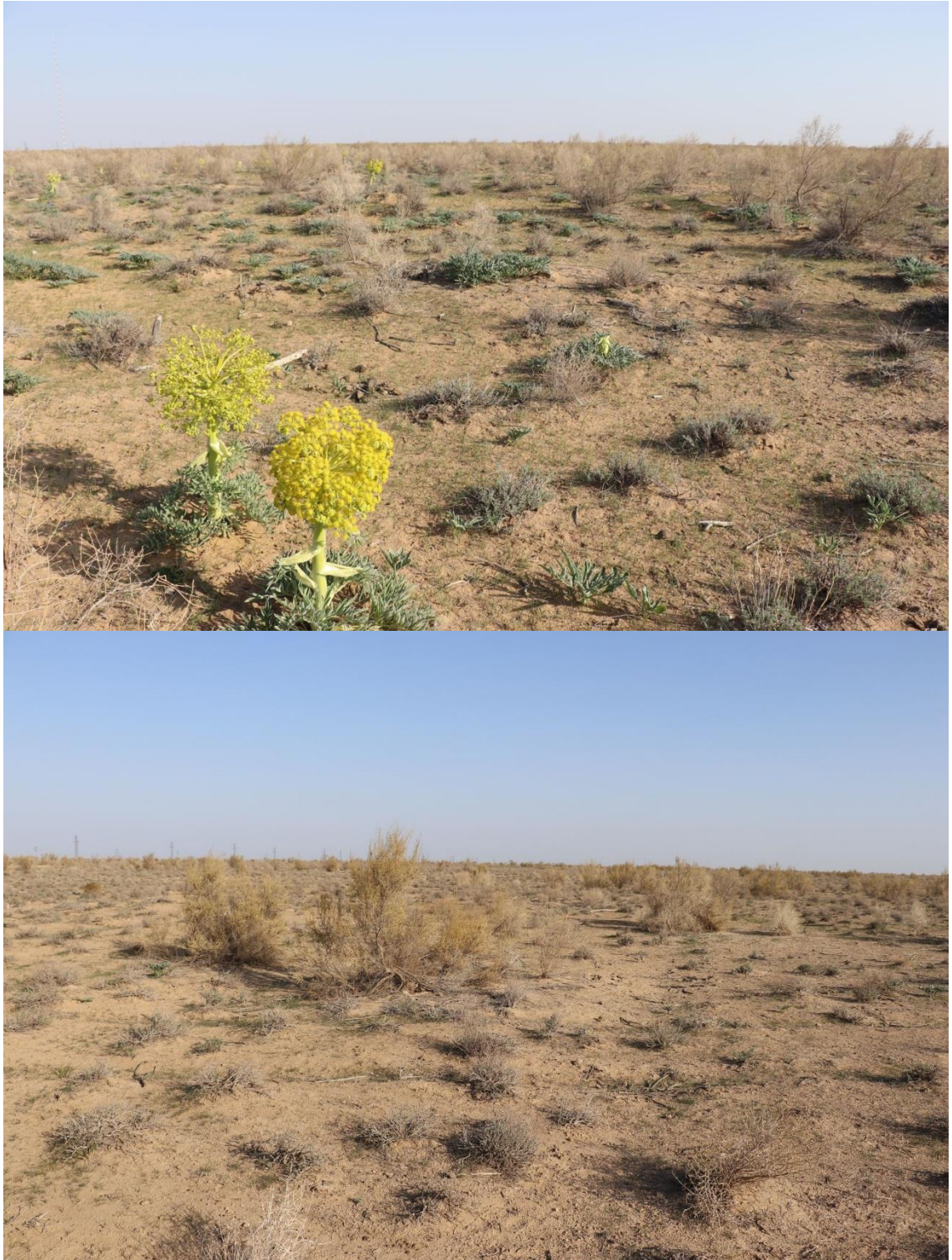


Photo 47, 48, 49. Plots B072 (above), B078 (middle) and B082 (below). Fixed sands with plantations of white saxaul and ephemeroid-sagebrush herbaceous layer





Photo 50. Plot B079. Flowering generative specimen of *Tulipa lehmanniana*, nationally red-listed plant

#### 4.1.4. Relic uplands

Gently sloping stony relic hills with blown sandy cover are situated in the eastern part of the project site, and small insular uplands are found in the north-western part, at the border of saline depression Ayakagytna. The landscape of its sabulous slopes covered with ephemeroid-sagebrush and ephemeroid-sagebrush-saltwort vegetation is similar with neighboring sandy desert plain. On the small areas with outcrops of beds, the stony desert with ephemeroid-dwarf shrub-sagebrush-saltwort vegetation is represented. The canopy cover varies from 10–20% on stony areas to 30–40% on sabulous places. As in other types of landscapes of the project site, the main type of land use is rangeland; an impact of grazing is medium; several shepherds houses are situated here. Local impact is connected with several ground roads and electric lines. Within this habitat type, following geobotanical sample plots were described.

##### **B032, B033, B034**

40.655382 – 40.650094° N, 64.737142 – 64.750785° E, 304–317 m.s.l.

Gently sloping sandy-stony relics hills with eroded slopes, small outcrops of beds, and with native ephemeroid-sagebrush vegetation (*Artemisia diffusa*, *Poa bulbosa*, *Carex subphysodes*); species diversity is low; 12 plant and 1 moss species were recorded (Table 32). The canopy cover is 25–30%. The impact of grazing is medium to low.

Table 32. Check-list of plants recorded in survey plots B032–B034.

Species	Life form	Height, cm	Abundance		Phenol. Stage
			DAFOR	Braun-Blanquet	
<i>Artemisia diffusa</i>	semishrub	15–20	D	2–3	vegetation
<i>Carex subphysodes</i>	Perennial	12–15	A	1	flowering
<i>Caroxylon orientale</i> ( <i>Salsola orientalis</i> )	dwarf shrub	35–40	R	+	vegetation
<i>Ceratocarpus arenarius</i>	annual	15–20	R	+	Dried

<i>Convolvulus hamadae</i>	semishrub	25–30	R	+	vegetation
<i>Cousinia hamadae</i>	Perennial	15–20	R	+	vegetation
<i>Ferula foetida</i>	Perennial	30–35	R–O	+	vegetation
<i>Holosteum umbellatum</i>	annual	6–8	R	+	flowering
<i>Iris songarica</i>	Perennial	30–35	R	+	vegetation
<i>Meniocus linifolius</i>	annual	6–7	O	+	Flowering, fruiting
<i>Oreosalsola arbusculoformis</i> ( <i>Salsola arbusculiformis</i> )	dwarf shrub	35–40	R	+	vegetation
<i>Poa bulbosa</i>	Perennial	15–17	A	1	vegetation
<i>Tortula desertorum</i>	moss	0.3–0.5	O–A	+–1	vegetation



Photo 51. Plot B034. Gently sloping sandy-stony relic hills with ephemeroid-sagebrush vegetation

#### **B048, B049**

40.653361 – 40.650308° N, 64.69859 – 64.704047° E, 293–300 m.s.l.

Gently sloping stony relic hill with sandy cover and with native ephemeroid-saltwort-sagebrush vegetation (*Oreosalsola arbusculiformis*, *Caroxylon orientale*, *Artemisia diffusa*, *Poa bulbosa*, *Carex subphysodes*). 16 plant and 1 moss species were recorded (Table 33), including solitary specimens of nationally red-listed *Tulipa lehmanniana*. The canopy cover is 40%.

Table 33. Check-list of plants recorded in survey plots B048 and B049.

Species	Life form	Height, cm	Abundance		Phenol. Stage
			DAFOR	Braun-Blanquet	
<i>Alyssum desertorum</i>	annual	5–6	O	+	flowering



<i>Artemisia diffusa</i>	semishrub	15–20	D	2	vegetation
<i>Astragalus villosissimus</i>	dwarf shrub	35–40	O	+	vegetation
<i>Carex subphysodes</i>	Perennial	12–15	A	1	flowering
<i>Caroxylon orientale</i> ( <i>Salsola orientalis</i> )	dwarf shrub	35–40	A	1	vegetation
<i>Ceratocarpus arenarius</i>	annual	15–20	R	+	Dried
<i>Convolvulus divaricatus</i>	semishrub	25–30	R	+	vegetation
<i>Convolvulus hamadae</i>	semishrub	25–30	O	+	vegetation
<i>Cousinia hamadae</i>	Perennial	15–20	R	+	vegetation
<i>Ferula foetida</i>	Perennial	30–35	R	+	vegetation
<i>Holosteum umbellatum</i>	annual	6–8	O	+	flowering
<i>Iris songarica</i>	Perennial	30–35	R	+	vegetation
<i>Oreosalsola arbusculiformis</i> ( <i>Salsola arbusculiformis</i> )	dwarf shrub	35–40	A	1	vegetation
<i>Poa bulbosa</i>	Perennial	15–17	A	1	vegetation
<i>Tortula desertorum</i>	moss	0.3–0.5	O	+	vegetation
<i>Tulipa lehmanniana</i>	Perennial	10–15	R	+	vegetation
<i>Tulipa sogdiana</i>	Perennial	7–10	R	+	vegetation



Photo 52. Plot 048. Gently sloping sandy-stony relic hill with ephemeroid-saltwort-sagebrush vegetation

**B050, B051, B052, B053, B054, and VP8**

40.646213 – 40.630183° N, 64.709880 – 64.731321° E, 274–300 m.s.l.

Gently sloping stony relic hill with blown sandy cover, sometimes with local outcrops of beds, and with native ephemeroid-sagebrush vegetation (*Artemisia diffusa*, *Poa bulbosa*, *Carex subphysodes*). 16 plant and 1 moss species were recorded (Table 34), including solitary specimens of nationally red-listed *Tulipa lehmanniana*. The giant umbelliferous *Ferula foetida* is abundant on local areas on top of the hills. The canopy cover is 25–30%. The impact of grazing is medium to low. Colonies of gerbils (*Meriones* sp.) occur sporadically on the area, and nationally red-listed Central Asian turtles (*Testudo horsfieldii*) are very numerous on this part of project site.

Table 34. Check-list of plants recorded in survey plots B050–B054, and VP8.

Species	Life form	Height, cm	Abundance		Phenol. Stage
			DAFOR	Braun-Blanquet	
<i>Acanthophyllum elatius</i>	Perennial	25–30	R	+	vegetation
<i>Alyssum desertorum</i>	annual	5–6	O	+	flowering
<i>Artemisia diffusa</i>	semishrub	15–20	D	2–3	vegetation
<i>Astragalus villosissimus</i>	dwarf shrub	30–35	R	+	vegetation
<i>Carex subphysodes</i>	Perennial	12–15	O–A	+–1	flowering
<i>Caroxylon orientale</i> ( <i>Salsola orientalis</i> )	dwarf shrub	35–40	R	+	vegetation
<i>Ceratocarpus arenarius</i>	annual	15–20	R	+	Dried
<i>Convolvulus hamadae</i>	semishrub	25–30	R	+	vegetation
<i>Cousinia hamadae</i>	Perennial	15–20	R	+	vegetation
<i>Ferula foetida</i>	Perennial	30–35	R–A	+–1	vegetation
<i>Holosteum umbellatum</i>	annual	6–8	R	+	flowering
<i>Iris songarica</i>	Perennial	30–35	R	+	vegetation
<i>Oreosalsola arbusculiformis</i> ( <i>Salsola arbusculiformis</i> )	dwarf shrub	35–40	R	+	vegetation
<i>Poa bulbosa</i>	Perennial	15–17	O–A	+–1	vegetation
<i>Tortula desertorum</i>	moss	0.3–0.5	O–A	+–1	vegetation
<i>Tulipa lehmanniana</i>	Perennial	10–15	R	+	vegetation
<i>Tulipa sogdiana</i>	Perennial	7–10	R	+	vegetation







Photo 53, 54, 55. Plots B052 (above), B053(middle) and B054 (below). Gently sloping sandy-stony relic hills with uniform ephemeroid-sagebrush vegetation

**B056, B057, B058, B059**

40.686278 – 40.674739° N, 64.556687 – 64.571255° E, 272–292 m.s.l.

Rather small, gently sloping stony hill with blown sandy cover and native ephemeroid-dwarf shrub-sagebrush-saltwort vegetation (*Oreosalsola arbusculiformis*, *Caroxylon orientale*, *Artemisia diffusa*, *Astragalus villosissimus*, *Convolvulus hamadae*, *Poa bulbosa*, *Carex subphysodes*). This insular relic hill is situated on the boundary between sandy desert plain and saline depression. 19 plant and 1 moss species were recorded (Table 35). The canopy cover is 20–30%. Solitary generative and numerous pre-generative specimens of nationally red-listed *Tulipa lehmanniana* occurs sporadically within and between the survey squares.

Table 35. Check-list of plants recorded in survey plots B056–B059.

Species	Life form	Height, cm	Abundance		Phenol. Stage
			DAFOR	Braun-Blanquet	
<i>Alyssum desertorum</i>	annual	5–6	O	+	flowering
<i>Artemisia diffusa</i>	semishrub	15–20	A	1	vegetation
<i>Astragalus villosissimus</i>	dwarf shrub	35–40	A	1	vegetation
<i>Carex subphysodes</i>	Perennial	12–15	A	1	flowering
<i>Caroxylon orientale</i> ( <i>Salsola orientalis</i> )	dwarf shrub	35–40	A	1	vegetation
<i>Ceratocarpus arenarius</i>	annual	15–20	R	+	Dried
<i>Convolvulus hamadae</i>	semishrub	25–30	A	1	vegetation
<i>Cousinia hamadae</i>	Perennial	15–20	O	+	vegetation
<i>Ferula foetida</i>	Perennial	30–35	R	+	vegetation



<i>Halothamnus subaphyllus</i>	semishrub	40–45	R	+	vegetation
<i>Holosteum umbellatum</i>	annual	6–8	O	+	flowering
<i>Iris songarica</i>	Perennial	30–35	R	+	vegetation
<i>Ixiolirion tataricum</i>	Perennial	12–15	R	+	vegetation
<i>Oreosalsola arbusculiformis</i> ( <i>Salsola arbusculiformis</i> )	dwarf shrub	35–40	A	1	vegetation
<i>Peganum garmala</i>	Perennial	15–20	R	+	vegetation
<i>Phlomis desertorum</i>	Perennial	15–20	R	+	vegetation
<i>Poa bulbosa</i>	Perennial	15–17	A	1	vegetation
<i>Tortula desertorum</i>	moss	0.3–0.5	O	+	vegetation
<i>Tulipa lehmanniana</i>	Perennial	10–15	R	+	vegetation
<i>Tulipa sogdiana</i>	Perennial	7–10	R	+	vegetation





Photo 56, 57. Plot 056 (above) and an area between plots B058 and B059 (below). Sandy-stony relic hill with ephemeroid- dwarf shrub-sagebrush-saltwort vegetation

#### **4.1.5. Anthropogenic disturbed areas**

At the present, technologically disturbed areas occupy only very small part of the project site, mainly in a narrow strip along the railway and underground gas pipeline (approximately 500–100 m wide). Small disturbed areas (construction sites or quarries about 250x150 and 350x250 m in size) with almost completely exterminated vegetation are located also in the south-eastern part of the project site, in surroundings of the survey plot B054. The plant species recorded here are the same that in surroundings of disturbed areas, but the canopy cover is extremely sparse, or the vegetation is almost completely exterminated (photo 58). Alien or red-listed plants are absent.

Such technogenically disturbed areas in the Kyzylkum desert, as well as overgrazed areas around farms, wells and villages, usually become centers of erosion which can lead to the formation of moving sands. Often this process can reach disaster scale. In the past, moving sands have frequently caused the death of cities and oases in desert zone of Central Asia.





Photo 58. Technologically disturbed area (construction site?) with almost completely exterminated vegetation, 1 km to the south of survey plot B054



Photo 59 *Peganum garmala*, an indicator of overgrazing and degradation of pastures

## **4.2. Dzhankeldy site**

A total check-list of vascular plants recorded within the project site “Dzhankeldy” during the field survey in springtime and early summer includes ... species (Appendix 2). Following habitat types (map units) were identified for the “Dzhankeldy” site:

### **4.2.1. Weakly inclined piedmont plain of relic low mountains**

The field survey showed that this habitat type is present mainly in the southern part of “Dzhankeldy” area (on the southern proluvial piedmont trails of the mountains Kuldzhuktau), including the bird survey circles VP1, VP2, VP9 and VP10, as well as in the north-eastern part of the project site. The terrain is flat, wavy or gently hilly, sometimes with dry riverbeds and debris cones. The vegetation is represented with native ephemeroide-sagebrush, ephemeroide-saltwort-sagebrush, sagebrush-saltwort and saltwort plant communities on sabulous, loamy, slightly saline, gypsaceous or skeleton sabulous-loamy grey-brown desert soil. Dominant plants are *Artemisia turanica*, *Artemisia diffusa*, *Poa bulbosa*, *Carex pachystylis*, *Caroxylon orientale* (*Salsola orientalis*) and *Oreosalsola arbusculiformis* (*Salsola arbusculiformis*). The dwarf shrub *Astragalus villosissimus*, giant umbellifer *Ferula foetida* and endemic desert-candle *Eremurus korolkowii* are subdominants on local areas. The canopy cover is sparse (10–30% or less), and plant species diversity is low (8 to 18 species). One moss species (*Tortula desertorum*) has been found in this habitat type; on some local areas it covers up to 1%. One nationally red-listed species, *Tulipa lehmanniana*, occurs sporadically within all territory of this habitat type, its abundance is R to O, population density varies from solitary specimens to 900–1000 per 1 hectare. The main type of land use is pasture; an impact of grazing is medium. Local impact is connected with asphalt road and several ground roads, and with geological exploration. Within this habitat type, following geobotanical sample plots were described.

**VP1 and VP2**

40.7843° N, 63.404295° E, 236 m.s.l.

Weakly inclined loamy-gravelly piedmont desert plain with native sagebrush-saltwort vegetation on gypsaceous, skeleton grey-brown desert soil (Photo 60–61). The canopy cover is 10–20%; 17 plant and 1 moss species were recorded (Table 36), none of them are alien. One species, *Eremurus korolkowii*, is national endemic of Uzbekistan and endemic to relic mountains of Kyzylkum (Photo 62). This species has been included in second and third editions of the Red Data Book of Uzbekistan (1998, 2006), but later it has been removed from the national Red Data Book (2009, 2019). This plant is not evaluated in the IUCN Red List.

Table 36. Check-list of plants recorded in survey plots VP1 and VP2

Species	Life form	Height, cm	Abundance		Phenol. Stage
			DAFOR	Braun-Blanquet	
<i>Artemisia diffusa</i>	semishrub	20–25	A	1	vegetation
<i>Artemisia turanica</i>	semishrub	20–25	A	1	vegetation
<i>Astragalus villosissimus</i>	dwarf shrub	30–35	O	+	vegetation
<i>Atraphaxis spinosa</i>	shrub	30–35	R	+	vegetation
<i>Carex pachystylis</i>	Perennial	12–15	O	+	flowering
<i>Caroxylon orientale</i> ( <i>Salsola orientalis</i> )	dwarf shrub	30–35	A	1	vegetation
<i>Ceratocarpus arenarius</i>	annual	15–20	O	+	Dried
<i>Climacoptera</i> sp.	annual	25–30	O	+	Dried
<i>Eremurus korolkowii</i>	Perennial	25–30	O	+	Vegetation, flowering



<i>Ferula foetida</i>	Perennial	50–60	R	+	Vegetation, flowering
<i>Lycium ruthenicum</i>	shrub	40–50	R	+	vegetation
<i>Nanophyton erinaceum</i>	semishrub	7–10	O	+	vegetation
<i>Oreosalsola arbusculiformis</i> ( <i>Salsola arbusculiformis</i> )	dwarf shrub	30–35	A	1	vegetation
<i>Peganum garmala</i>	Perennial	20–25	R	+	vegetation
<i>Poa bulbosa</i>	Perennial	15–17	O	+	vegetation
<i>Takhtajaniantha pusilla</i> ( <i>Scorzonera pusilla</i> )	Perennial	15–17	R	+	vegetation
<i>Tortula desertorum</i>	moss	0.3–0.5	R	+	vegetation
<i>Zygophyllum miniatum</i>	Perennial	10–15	R	+	Vegetation, flowering



Photo 60. Survey circle VP1. Southern piedmont plain of Kuldzhuktau mountains with sparse sagebrush-saltwort vegetation





Photo 61. Western part of survey circle VP2. Southern piedmont plain of Kuldzhuktau mountains with sparse sagebrush-saltwort vegetation



Photo 62. Korolkow's desert-candle (*Eremurus korolkowii*) national endemic of Uzbekistan and endemic to relic mountains of Kyzylkum

#### **VP9 and VP10**

40.87017–40.90958° N, 63.242–63.21672° E, 190–220 m.s.l. Weakly inclined loamy-gravelly piedmont desert plain and gently sloping foothills with native ephemeroid-saltwort-sagebrush and sagebrush-saltwort vegetation on gypsaceous, skeleton or gravelly grey-brown desert soil (Photo 63–64). The canopy cover is 5–20%; 23 plant and 1 moss species were recorded (Table 37), none of them are alien or red-listed. One



species, *Eremurus korolkowii*, is national endemic of Uzbekistan and endemic to relic mountains of Kyzylkum.

Table 37. Check-list of plants recorded in survey plots VP9 and VP10

Species	Life form	Height, cm	Abundance		Phenol. Stage
			DAFOR	Braun-Blanquet	
<i>Anabasis eriopoda</i>	semishrub	15–20	R	+	vegetation
<i>Artemisia diffusa</i>	semishrub	20–25	A	1	vegetation
<i>Artemisia turanica</i>	semishrub	20–25	A–D	1	vegetation
<i>Astragalus villosissimus</i>	dwarf shrub	30–35	R–O	+	vegetation
<i>Carex pachystylis</i>	Perennial	12–15	A–D	+–1	flowering
<i>Caroxylon gemmascens</i> ( <i>Salsola gemmascens</i> )	dwarf shrub	20–30	R–O	+	vegetation
<i>Caroxylon orientale</i> ( <i>Salsola orientalis</i> )	dwarf shrub	30–35	O–A	1	vegetation
<i>Ceratocarpus arenarius</i>	annual	15–20	R–O	+	Dried
<i>Climacoptera</i> sp.	annual	25–30	R	+	Dried
<i>Eremurus korolkowii</i>	Perennial	25–30	R–O	+	Vegetation, flowering
<i>Ferula foetida</i>	Perennial	50–60	R–O	+	Vegetation, flowering
<i>Haloxylon ammodendron</i> ( <i>Haloxylon aphyllum</i> )	Small tree	40–70	R	+–1	vegetation
<i>Iris longiscapa</i>	Perennial	15–17	R	+	flowering
<i>Koelpinia linearis</i>	annual	10–12	R	+	fruiting
<i>Lactuca orientalis</i>	semishrub	35–40	R	+	vegetation
<i>Lomelosia olivieri</i> ( <i>Scabiosa olivieri</i> )	annual	15–17	R	+	fruiting
<i>Lycium ruthenicum</i>	shrub	35–45	R	+	vegetation
<i>Nanophyton erinaceum</i>	semishrub	7–10	R–O	+	vegetation
<i>Oreosalsola arbusculiformis</i> ( <i>Salsola arbusculiformis</i> )	dwarf shrub	30–35	O–A	1	vegetation
<i>Peganum garmala</i>	Perennial	20–25	R	+	vegetation
<i>Poa bulbosa</i>	Perennial	15–17	O	+	vegetation
<i>Takhtajaniantha pusilla</i> ( <i>Scorzonera pusilla</i> )	Perennial	15–17	R	+	vegetation
<i>Tortula desertorum</i>	moss	0.3–0.5	R	+	vegetation
<i>Zygophyllum miniatum</i>	Perennial	10–15	R	+	Vegetation, flowering



Photo 63. VP10. Southern piedmont plain of Kuldzhuktau mountains with ephemeroid-saltwort-sagebrush vegetation



Photo 64. VP9. Gravelly southern piedmont plain of Kuldzhuktau mountains with sparse saltwort-sagebrush vegetation





Photo 65. Desert sedge (*Carex pachystylis*), a dominant of ephemeroid-saltwort-sagebrush and ephemeroid-sagebrush communities

#### **D050-D051**

Gently inclined northern piedmonts of the mountains Kuldzhuktau with native ephemeroid-saltwort-sagebrush vegetation and solitary black saxaul (remains of plantations) on sandy-loamy grey-brown desert soil (Photo 66–67). The canopy cover is 30%. 25 plant and 1 moss species were recorded (Table 38), none of them are alien or listed in the Red Data Book of Uzbekistan (2019).

Table 38. Check-list of plants recorded in survey plots D050-D051

Species	Life form	Height, cm	Abundance		Phenol. Stage
			DAFOR	Braun-Blanquet	
<i>Acanthophyllum elatius</i>	Perennial	25–35	R	+	vegetation
<i>Anabasis eriopoda</i>	semishrub	15–20	R	+	vegetation
<i>Artemisia diffusa</i>	semishrub	20–25	O	+	vegetation
<i>Artemisia turanica</i>	semishrub	20–25	A-D	1-2	vegetation
<i>Astragalus villosissimus</i>	dwarf shrub	30–35	O	+	vegetation
<i>Carex subphysodes</i>	Perennial	10–12	A	1	fruiting
<i>Caroxylon gemmascens</i> ( <i>Salsola gemmascens</i> )	dwarf shrub	20–30	R	+	vegetation
<i>Ceratocarpus arenarius</i>	annual	15–20	O–A	+	Dried
<i>Convolvulus hamadae</i>	semishrub	25–30	O	+	vegetation
<i>Ferula foetida</i>	Perennial	50–60	O–A	+–1	Vegetation, flowering
<i>Haloxylon ammodendron</i> ( <i>Haloxylon aphyllum</i> )	Small tree	100–150	R	+–1	vegetation
<i>Haplophyllum robustum</i>	perennial	25–30	R	+	vegetation
<i>Nanophyton erinaceum</i>	semishrub	7–10	O	+	vegetation



<i>Oreosalsola arbusculiformis</i> ( <i>Salsola arbusculiformis</i> )	dwarf shrub	30–40	A	1	vegetation
<i>Peganum garmala</i>	Perennial	20–25	R	+	vegetation
<i>Poa bulbosa</i>	Perennial	15–17	O	+	vegetation
<i>Tortula desertorum</i>	moss	0.3–0.5	O	1	vegetation
<i>Xylosalsola arbuscula</i> ( <i>Salsola arbuscula</i> )	shrub	40–50	R	+	vegetation



Photo 66. D050. Northern piedmonts of the mountains Kuldzhuktau with native ephemeroid-saltwort-sagebrush vegetation and solitary black saxaul





Photo 67. D051. Northern piedmonts of the mountains Kuldzhuktau with native ephemeroïd-saltwort-sagebrush vegetation and solitary black saxaul

**D114–D118, D125**

40.86467 – 40.87791° N, 63.285775 – 63.252131° E, 219–230 m.s.l.

Weakly inclined southern piedmont plain of and foothills with gently sloping terrain, covered with native ephemeroïd-saltwort-sagebrush vegetation and plantations of black saxaul on gypsaceous, loamy-gravelly grey-brown desert soil, sometimes with outcrops of variegated beds (Photo 68–72). The density of saxaul is up to 500–800 specimens per 1 hectare. The canopy cover is 5–30%. 23 plant and 1 moss species were recorded (Table 39), none of them are alien. One species, *Acanthophyllum cyrtostegium*, is listed in the Red Data Book of Uzbekistan (2019) with the category 3 (reducing); it is endemic to the south-western Kyzylkum and north-western spurs of Pamir-Alay, and national endemic. Solitary specimens of *Acanthophyllum cyrtostegium* occurs sporadically within and between survey plots D114–D118, the density of population is 40–45 individuals per 1 hectare. One species, *Eremurus korolkowii*, is national endemic of Uzbekistan and endemic to relic mountains of Kyzylkum.

Table 39. Check-list of plants recorded in survey plots D114–D118 and D125

Species	Life form	Height, cm	Abundance		Phenol. Stage
			DAFOR	Braun-Blanquet	
<i>Acanthophyllum cyrtostegium</i>	Perennial	20–25	R	+	vegetation
<i>Anabasis eriopoda</i>	semishrub	15–20	R	+	vegetation
<i>Artemisia diffusa</i>	semishrub	20–25	A	1	vegetation
<i>Artemisia turanica</i>	semishrub	20–25	A–D	1	vegetation
<i>Astragalus villosissimus</i>	dwarf shrub	30–35	R–O	+	vegetation
<i>Carex pachystylis</i>	Perennial	12–15	O	+	flowering
<i>Caroxylon orientale</i> ( <i>Salsola orientalis</i> )	dwarf shrub	30–35	A	1	vegetation
<i>Ceratocarpus arenarius</i>	annual	15–20	O	+	Dried
<i>Climacoptera sp.</i>	annual	25–30	O	+	Dried
<i>Eremurus korolkowii</i>	Perennial	25–30	R–O	+	Vegetation, flowering
<i>Ferula foetida</i>	Perennial	50–60	R	+	Vegetation, flowering
<i>Haloxylon ammodendron</i> ( <i>Haloxylon aphyllum</i> )	Small tree	100–180	O–A	1–2	vegetation
<i>Iris longiscapa</i>	Perennial	15–17	R	+	flowering
<i>Koelpinia linearis</i>	annual	10–12	R	+	fruiting
<i>Lycium ruthenicum</i>	shrub	40–50	R	+	vegetation
<i>Nanophyton erinaceum</i>	semishrub	7–10	R	+	vegetation
<i>Oreosalsola arbusculiformis</i> ( <i>Salsola arbusculiformis</i> )	dwarf shrub	30–35	A	1	vegetation
<i>Peganum garmala</i>	Perennial	20–25	R	+	vegetation
<i>Poa bulbosa</i>	Perennial	15–17	O	+	vegetation
<i>Scrophularia leucoclada</i>	semishrub	40–50	R	+	vegetation
<i>Takhtajaniantha pusilla</i> ( <i>Scorzonera pusilla</i> )	Perennial	15–17	R	+	vegetation

<i>Tortula desertorum</i>	moss	0.3–0.5	R	+	vegetation
<i>Zygophyllum macrophyllum</i>	Perennial	12–15	R	+	Vegetation, flowering
<i>Zygophyllum miniatum</i>	Perennial	10–15	R	+	Vegetation, flowering



Photo 68. D114. Southern piedmont plain of Kuldzhuktau mountains with saltwort-sagebrush vegetation and plantations of black saxaul (April)



Photo 69. D114. Southern piedmont plain of Kuldzhuktau mountains with saltwort-sagebrush vegetation and plantations of black saxaul (June)





Photo 70. D117. Southern piedmont plain of Kuldzhuktau mountains with saltwort-sagebrush vegetation and plantations of black saxaul (June)



Photo 71. Between D114 and D125. Southern piedmont plain of Kuldzhuktau mountains with saltwort-sagebrush vegetation and plantations of black saxaul (April)





Photo 72. D125. Southern piedmont plain of Kuldzhuktau Mountains with saltwort-sagebrush vegetation and plantations of black saxaul (June)

#### 4.2.2. Foothills of relic low mountains

This habitat type is characterized by more or less rugged hilly terrain, and the vegetation is represented with native saltwort-sagebrush vegetation on sandy-loamy, loamy, more or less skeleton grey-brown desert soils. The slopes of foothills are dissected with dry riverbeds.

##### D022–D029

Gently sloping foothills of the mountains Kuldzhuktau with native saltwort-sagebrush vegetation and solitary black saxaul on sabulous-loamy, skeleton grey-brown desert soil (Photo 73–76). The canopy cover is 20–30%. 31 plant and 1 moss species were recorded (Table 40), none of them are alien, and 3 species, *Acanthophyllum cyrtostegium*, *Ferula kyzylkumica* and *Tulipa lehmanniana*, are listed in the Red Data Book of Uzbekistan (2019) with the category 3 (reducing) (Photo 77–78). 3 generative and 11 pre-generative specimens of *Tulipa lehmanniana* and 6 specimens of *Acanthophyllum cyrtostegium* were count in survey plot D029; 6 generative and 31 pre-generative specimens of *Tulipa lehmanniana* and 4 specimens of *Acanthophyllum cyrtostegium* were count in survey plot D024; 8 specimens of *Ferula kyzylkumica* were found in survey plot D026.

Table 40. Check-list of plants recorded in survey plots D022–D029

Species	Life form	Height, cm	Abundance		Phenol. Stage
			DAFOR	Braun-Blanquet	
<i>Acanthophyllum cyrtostegium</i>	Perennial	20–25	R	+	vegetation
<i>Allium protensum</i>	perennial	15-20	R	+	fruiting
<i>Anabasis eriopoda</i>	semishrub	15–20	R	+	vegetation
<i>Artemisia diffusa</i>	semishrub	20–25	O	+	vegetation
<i>Artemisia turanica</i>	semishrub	20–25	A–D	1	vegetation



<i>Astragalus ammotrophus</i>	Perennial	12–15	R	+	vegetation
<i>Astragalus villosissimus</i>	dwarf shrub	30–35	R–O	+	vegetation
<i>Carex pachystylis</i>	Perennial	10–12	O–A	1	fruiting
<i>Carex subphysodes</i>	Perennial	10–12	A	1	fruiting
<i>Caroxylon gemmascens</i> ( <i>Salsola gemmascens</i> )	dwarf shrub	20–30	R	+	vegetation
<i>Ceratocarpus arenarius</i>	annual	15–20	A	+	Dried
<i>Ceratocephala falcata</i>	annual	3–4	R	+	fruiting
<i>Convolvulus hamadae</i>	semishrub	25–30	O	+	vegetation
<i>Ferula foetida</i>	Perennial	50–60	O	+	Vegetation
<i>Ferula kyzylkumica</i>	Perennial	10–15	R	+	Vegetation
<i>Fritillaria karelinii</i>	Perennial	10–12	R	+	fruiting
<i>Gagea afghanica</i>	Perennial	10–12	R	+	flowering
<i>Gagea bergii</i>	Perennial	5–7	R	+	flowering
<i>Halimocnemis villosa</i>	annual	10–12	O	+	vegetation
<i>Haloxyton ammodendron</i> ( <i>Haloxyton aphyllum</i> )	Small tree	50–70	R	+	vegetation
<i>Haplophyllum robustum</i>	perennial	25–30	R	+	vegetation
<i>Heliotropium arguzioides</i>	Perennial	20–25	R	+	vegetation
<i>Leontice inserta</i>	perennial	10–12	R	+	vegetation
<i>Nanophyton erinaceum</i>	semishrub	7–10	O	+	vegetation
<i>Oreosalsola arbusculiformis</i> ( <i>Salsola arbusculiformis</i> )	dwarf shrub	30–40	A	1	vegetation
<i>Peganum garmala</i>	Perennial	20–25	O	+	vegetation
<i>Poa bulbosa</i>	Perennial	15–17	A	1	vegetation
<i>Scorzonera gageoides</i>	Perennial	12–15	R	+	vegetation
<i>Tortula desertorum</i>	moss	0.3–0.5	O	+	vegetation
<i>Tulipa lehmanniana</i>	Perennial	10–20	R	+	Vegetation, flowering
<i>Tulipa sogdiana</i>	Perennial	7–10	R	+	fruiting
<i>Ziziphora tenuior</i>	annual	7–10	R	+	flowering



Photo 73. D029. Gently sloping foothills of Kuldzhuktau Mountains with saltwort-sagebrush vegetation (April)



Photo 74. D029. Gently sloping foothills of Kuldzhuktau Mountains with saltwort-sagebrush vegetation (June)





Photo 75. D026. Gently sloping foothills of Kuldzhuktau Mountains with saltwort-sagebrush vegetation (April)



Photo 76. D026. Gently sloping foothills of Kuldzhuktau Mountains with saltwort-sagebrush vegetation (June)





Photo 77. Plot D026. Pre- generative specimen of nationally red-listed *Ferula kyzylkumica*



Photo 78. Plot D024. One generative and 2 pre-generative specimens of nationally red-listed *Tulipa lehmanniana*

### **D030–D035**

Foothills with rather gently sloping, hilly terrain, covered with native ephemeroïd-saltwort-sagebrush and sagebrush-salthwort vegetation and sometimes with sparse plantations of black saxaul on loamy and skeleton-loamy grey-brown desert soil (Photo 79–81). The canopy cover is 10–30%. 24 plant and 1 moss species were recorded (Table 41), none of them are alien. Three species, *Acanthophyllum cyrtostegium*, *Ferula*



*kyzylkumica* and *Tulipa lehmanniana*, are listed in the Red Data Book of Uzbekistan (2019) with the category 3 (reducing) (photo 82–83); they occur sporadically within and between survey plots, solitary or in small groups.

Table 41. Check-list of plants recorded in survey plots D030–D035

Species	Life form	Height, cm	Abundance		Phenol. Stage
			DAFOR	Braun-Blanquet	
<i>Acanthophyllum cyrtostegium</i>	Perennial	20–25	R	+	vegetation
<i>Anabasis eriopoda</i>	semishrub	15–20	R	+	vegetation
<i>Artemisia diffusa</i>	semishrub	20–25	A-D	1	vegetation
<i>Artemisia turanica</i>	semishrub	20–25	O–D	+1	vegetation
<i>Astragalus ammotrophus</i>	Perennial	12–15	R	+	vegetation
<i>Astragalus villosissimus</i>	dwarf shrub	30–35	R–O	+	vegetation
<i>Atraphaxis spinosa</i>	shrub	50-70	R	+1	fruiting
<i>Carex pachystylis</i>	Perennial	12–15	O-A	+	flowering
<i>Carex subphysodes</i>	Perennial	10–12	O–A	+1	fruiting
<i>Caroxylon gemmascens</i> ( <i>Salsola gemmascens</i> )	dwarf shrub	20–30	R–O	+	vegetation
<i>Ceratocarpus arenarius</i>	annual	15–20	O	+	Dried
<i>Climacoptera sp.</i>	annual	25–30	O	+	Dried
<i>Convolvulus divaricatus</i>	semishrub	25–30	R	+	flowering
<i>Convolvulus hamadae</i>	semishrub	25–30	R	+	vegetation
<i>Cousinia hamadae</i>	Perennial	15–20	R	+	vegetation
<i>Eremurus korolkowii</i>	Perennial	25–30	R	+	Vegetation, flowering
<i>Gagea afghanica</i>	Perennial	10–12	R	+	flowering
<i>Ferula foetida</i>	Perennial	50–60	R–O	+	Vegetation, flowering
<i>Ferula kyzylkumica</i>	Perennial	10–15	R	+	Vegetation
<i>Halimocnemis villosa</i>	annual	10–12	R–O	+	vegetation
<i>Haloxylon ammodendron</i> ( <i>Haloxylon aphyllum</i> )	Small tree	50–100	R	+1	vegetation
<i>Haplophyllum robustum</i>	perennial	25-30	R	+	vegetation
<i>Koelpinia linearis</i>	annual	10–12	R	+	fruiting
<i>Nanophyton erinaceum</i>	semishrub	7–10	R	+	vegetation
<i>Oreosalsola arbusculiformis</i> ( <i>Salsola arbusculiformis</i> )	dwarf shrub	30–50	O–A	+1	vegetation
<i>Peganum garmala</i>	Perennial	20–25	R	+	vegetation
<i>Poa bulbosa</i>	Perennial	15–17	O–A	+1	vegetation
<i>Scorzonera gageoides</i>	Perennial	12–15	R	+	vegetation
<i>Tortula desertorum</i>	moss	0.3–0.5	R-O	+1	vegetation
<i>Tulipa lehmanniana</i>	Perennial	10–20	R	+	Vegetation, flowering
<i>Zygophyllum macrophyllum</i>	Perennial	12–15	R	+	Vegetation, flowering
<i>Zygophyllum miniatum</i>	Perennial	10–15	R	+	Vegetation, flowering



Photo 79. D032. Gently sloping foothills of Kuldzhuktau Mountains with ephemeroïd-saltwort-sagebrush vegetation (April)



Photo 80. D035. Gently sloping foothills of Kuldzhuktau Mountains with ephemeroïd-saltwort-sagebrush vegetation (April)





Photo 81. D034. Gently sloping foothills of Kuldzhuktau Mountains with sagebrush-salthwort vegetation (June)



Photo 82. D034. Dried generative specimen of nationally red-listed endemic *Ferula kyzylkumica* (June)





Photo 83. Plot D035. Flowering specimen of nationally red-listed *Tulipa lehmanniana*

#### **D059–D072**

Foothills with rather gentle hilly terrain, covered with native ephemeroid-saltwort-sagebrush vegetation and sparse plantations of black saxaul on sandy-loamy, loamy and skeleton-loamy grey-brown desert soil. The differences between these survey plots are negligible; landscapes and the vegetation cover are uniform (Photo 84–87). The canopy cover is 20–30%. 43 plant and 1 moss species were recorded (Table 42), none of them are alien, 3 species, *Acanthophyllum cyrtostegium*, *Calligonum zakirovii* and *Tulipa lehmanniana* are listed in the Red Data Book of Uzbekistan (2019). Solitary specimens and small groups of *Acanthophyllum cyrtostegium* and *Tulipa lehmanniana* occur sporadically within and between survey plots, the density of population is up to 40–50 individuals per 1 hectare. 23 individuals of *Calligonum zakirovii* (category 1 – endangered, disappearing species; national endemic, endemic to south-western Kyzylkum) were count on an area of 0.5 hectare between D066 and D067 (40.86532° N, 63.43467° E, 335 m.s.l.) (Photo 88).

Table 42. Check-list of plants recorded in survey plots D059–D072

Species	Life form	Height, cm	Abundance		Phenol. Stage
			DAFOR	Braun-Blanquet	
<i>Acanthophyllum cyrtostegium</i>	Perennial	20–25	R	+	vegetation
<i>Allium griffithianum</i>	Perennial	7–10	R	+	fruiting
<i>Allium sabulosum</i>	Perennial	15–20	R	+	vegetation
<i>Anabasis eriopoda</i>	semishrub	15–20	R	+	vegetation
<i>Artemisia diffusa</i>	semishrub	20–25	A–D	1	vegetation
<i>Artemisia juncea</i>	semishrub	30–35	O	+–1	vegetation
<i>Artemisia scoparia</i>	biennial	25–30	O	+	vegetation
<i>Artemisia turanica</i>	semishrub	20–25	A–D	1	vegetation
<i>Astragalus ammotrophus</i>	Perennial	12–15	R	+	vegetation



<i>Astragalus villosissimus</i>	dwarf shrub	30–35	R–O	+	vegetation
<i>Atraphaxis spinosa</i>	shrub	50–70	R	+–1	fruiting
<i>Calligonum leucocladum</i>	shrub	50–70	R	+–1	fruiting
<i>Calligonum zakirovii</i>	shrub	40–50	R	+	fruiting
<i>Carex pachystylis</i>	Perennial	7–10	O–A	+–1	flowering
<i>Carex physodes</i>	perennial	12–15	O	+	flowering
<i>Carex subphysodes</i>	Perennial	10–12	O–A	+–1	fruiting
<i>Caroxylon orientale</i> ( <i>Salsola orientalis</i> )	dwarf shrub	30–35	O	+	vegetation
<i>Ceratocarpus arenarius</i>	annual	15–20	O	+	Dried
<i>Climacoptera</i> sp.	Annual	25–30	O	+	Dried
<i>Convolvulus hamadae</i>	semishrub	25–30	O–A	+–1	vegetation
<i>Cousinia hamadae</i>	Perennial	15–20	R	+	vegetation
<i>Ephedra strobilacea</i>	shrub	40–50	R	+	vegetation
<i>Eremurus korolkowii</i>	Perennial	25–30	R	+	Vegetation
<i>Ferula foetida</i>	Perennial	50–60	R–O	+	Vegetation, flowering
<i>Gagea afghanica</i>	Perennial	10–12	R	+	flowering
<i>Haloxylon ammodendron</i> ( <i>Haloxylon aphyllum</i> )	Small tree	100–150	R–O	1	vegetation
<i>Haplophyllum robustum</i>	perennial	25–30	R	+	vegetation
<i>Holosteum umbellatum</i>	annual	6–8	R	+	fruiting
<i>Hypecoum pendulum</i>	annual	12–15	R	+	fruiting
<i>Iris songarica</i>	Perennial	20–25	R	+	vegetation
<i>Koelpinia linearis</i>	annual	10–12	R	+	fruiting
<i>Nanophyton erinaceum</i>	semishrub	7–10	R	+	vegetation
<i>Oreosalsola arbusculiformis</i> ( <i>Salsola arbusculiformis</i> )	dwarf shrub	30–35	O–A	+–1	vegetation
<i>Peganum garmala</i>	Perennial	20–25	R	+	vegetation
<i>Poa bulbosa</i>	Perennial	15–17	O	+	vegetation
<i>Scrophularia leucoclada</i>	semishrub	40–50	R	+	vegetation
<i>Smirnowia turkestanica</i>	Perennial	30–35	R	+	vegetation
<i>Stipa hohenackeriana</i>	Perennial	25–30	R	+	vegetation
<i>Takhtajaniantha pusilla</i> ( <i>Scorzonera pusilla</i> )	Perennial	15–17	R	+	vegetation
<i>Tortula desertorum</i>	moss	0.3–0.5	R	+	vegetation
<i>Tulipa lehmanniana</i>	Perennial	10–20	R	+	Vegetation, flowering
<i>Xylosalsola arbuscula</i> ( <i>Salsola arbuscula</i> )	shrub	40–50	R	+	vegetation
<i>Ziziphora tenuior</i>	annual	5–7	R	+	flowering



Photo 84. D061. Northern foothills of Kuldzhuktau mountains with saltwort-sagebrush vegetation (June)



Photo 85. D066. Northern foothills of Kuldzhuktau mountains with saltwort-sagebrush vegetation (June)





Photo 86. D067. Northern foothills of Kuldzhuktau mountains with saltwort-sagebrush vegetation (April)



Photo 87. D071. Northern foothills of Kuldzhuktau mountains with saltwort-sagebrush vegetation (June)





Photo 88. *Calligonum zakirovii*, nationally red-listed endemic to the south-western Kyzylkum, between D066 and D067, 40.86532° N, 63.43467° E.

#### 4.2.3. Outcrops of variegated beds

Variegated hills composed with outcrops of gypsaceous red, yellow or white clays, sandstones and limestones are very widely distributed in the southern and northern piedmonts of Kuldzhuktau Mountains.

##### VP2

40.796053–40.81528° N, 63.385813–64.34925 ° E, 200–230 m.s.l. Variegated southern foothills of Kuldzhuktau mountains within survey circle VP2 and between VP1 and VP2. Very sparse native community of saltworts and gypsophytes with *Artemisia turanica* (canopy cover is 1–10%) (photo 89–91); 22 plant species were recorded (Table 43); red-listed and alien plants are absent. One species, *Eremurus korolkowii*, is national endemic of Uzbekistan and endemic to relic mountains of Kyzylkum.

Table 43. Check-list of plants recorded for outcrops of variegated beds in survey plot VP2

Species	Life form	Height, cm	Abundance		Phenol. Stage
			DAFOR	Braun-Blanquet	
<i>Artemisia turanica</i>	semishrub	20–25	O–A	+–1	vegetation
<i>Astragalus ammotrophus</i>	Perennial	12–15	R	+	vegetation
<i>Astragalus villosissimus</i>	dwarf shrub	35–40	R	+	vegetation
<i>Atraphaxis spinosa</i>	shrub	20–25	R	+	vegetation
<i>Bassia prostrata</i> ( <i>Kochia prostrata</i> )	semishrub	15–20	R	+	vegetation
<i>Caroxylon orientale</i> ( <i>Salsola orientalis</i> )	dwarf shrub	35–40	O	+	vegetation
<i>Ceratocarpus arenarius</i>	annual	15–20	R	+	Dried
<i>Climacoptera</i> sp.	Annual	15–20	R	+	Dried



<i>Convolvulus hamadae</i>	semishrub	25–30	R	+	vegetation
<i>Cousinia hamadae</i>	Perennial	15–20	R	+	vegetation
<i>Eremurus korolkowii</i>	Perennial	25–30	R–O	+	Vegetation, flowering
<i>Ferula foetida</i>	Perennial	30–60	R	+	Vegetation, flowering
<i>Haloxylon ammodendron</i> ( <i>Haloxylon aphyllum</i> )	Small tree	40–70	R	1	vegetation
<i>Iris longiscapa</i>	Perennial	15–17	R	+	flowering
<i>Lycium ruthenicum</i>	shrub	40–50	R	+	vegetation
<i>Nanophyton erinaceum</i>	semishrub	7–10	O	+	vegetation
<i>Oreosalsola arbusculiformis</i> ( <i>Salsola arbusculiformis</i> )	dwarf shrub	35–40	R–O	+–1	vegetation
<i>Peganum garmala</i>	Perennial	15–20	R–O	+	vegetation
<i>Poa bulbosa</i>	Perennial	15–17	O	+	vegetation
<i>Takhtajaniantha pusilla</i> ( <i>Scorzonera pusilla</i> )	Perennial	15–17	R	+	vegetation
<i>Zygophyllum macrophyllum</i>	Perennial	10–15	R	+	flowering
<i>Zygophyllum miniatum</i>	Perennial	10–15	R	+	Vegetation, flowering



Photo 89. VP2. Outcrops of variegated beds with very sparse community of saltworts and gypsumphytes in southern piedmonts of Kuldzhuktau mountains.



Photo 90. VP2. Outcrops of variegated beds with very sparse saltworts and gypsophytes in southern piedmonts of Kuldzhuktau mountains.



Photo 91. VP2. Outcrops of variegated beds with very sparse saltworts and gypsophytes in southern piedmonts of Kuldzhuktau mountains.

### **VP3**

40.82622° N, 63.4114° E, 269 m.s.l. Variegated southern foothills of Kuldzhuktau mountains in the southern part of ornithological survey circle VP3. Very sparse native community of saltworts and gypsophytes with *Artemisia turanica* (canopy cover is 1–5%) (photo 92–93); 28 plant species were recorded (Table 44), including one species red-listed at the national level. It is *Calligonum zakirovii* (category 1 – endangered,



disappearing species; national endemic, endemic to south-western Kyzylkum) (photo 94). 17 individuals were count per 1 hectare. One species, *Eremurus korolkowii*, is national endemic of Uzbekistan and endemic to relic mountains of Kyzylkum. Alien plants are absent.

Table 44. Check-list of plants recorded on outcrops of variegated beds in survey circle VP3

Species	Life form	Height, cm	Abundance		Phenol. Stage
			DAFOR	Braun-Blanquet	
<i>Anabasis eriopoda</i>	semishrub	15–20	R	+	vegetation
<i>Artemisia turanica</i>	semishrub	20–25	O	+	vegetation
<i>Astragalus ammotrophus</i>	Perennial	12–15	R	+	dried
<i>Astragalus villosissimus</i>	dwarf shrub	35-40	R	+	fruiting
<i>Atraphaxis spinosa</i>	shrub	20–25	R	+	fruiting
<i>Bromus tectorum</i>	annual	12–15	R	+	dried
<i>Calligonum zakirovii</i>	shrub	40–50	R	+	fruiting
<i>Caroxylon orientale</i> ( <i>Salsola orientalis</i> )	dwarf shrub	35–40	O	+	vegetation
<i>Ceratocarpus arenarius</i>	annual	10–15	R	+	fruiting
<i>Climacoptera sp.</i>	Annual	10–15	R	+	vegetation
<i>Convolvulus hamadae</i>	semishrub	25–30	R	+	flowering
<i>Cousinia hamadae</i>	Perennial	15–20	R	+	fruiting
<i>Eremopyrum bonaepartis</i>	annual	7–10	R	+	dried
<i>Eremopyrum distans</i>	annual	7–10	R	+	dried
<i>Eremurus korolkowii</i>	Perennial	25–30	R–O	+	dried
<i>Ferula foetida</i>	Perennial	30–60	R	+	dried
<i>Halimocnemis gamocarpa</i>	annual	12–15	R	+	Vegetation
<i>Halimocnemis latifolia</i>	annual	12–15	R	+	Vegetation
<i>Haplophyllum robustum</i>	perennial	25-30	R	+	vegetation
<i>Haloxylon ammodendron</i> ( <i>Haloxylon aphyllum</i> )	Small tree	40–70	R	1	vegetation
<i>Lycium ruthenicum</i>	shrub	40–50	R	+	fruiting
<i>Nanophyton erinaceum</i>	semishrub	7–10	O	+	vegetation
<i>Oreosalsola arbusculiformis</i> ( <i>Salsola arbusculiformis</i> )	dwarf shrub	35–40	R–O	+–1	vegetation
<i>Peganum garmala</i>	Perennial	15–20	R–O	+	fruiting
<i>Poa bulbosa</i>	Perennial	15–17	O	+	dried
<i>Scrophularia leucoclada</i>	semishrub	40–50	R	+	vegetation
<i>Takhtajaniantha pusilla</i> ( <i>Scorzonera pusilla</i> )	Perennial	15–17	R	+	dried
<i>Zygophyllum macrophyllum</i>	Perennial	10–15	R	+	dried



Photo 92. VP3. Outcrops of variegated beds with very sparse saltworts and gypsophytes in southern piedmonts of Kuldzhuktau mountains



Photo 93. VP3. Outcrops of variegated beds with very sparse saltworts and gypsophytes in southern piedmonts of Kuldzhuktau mountains





Photo 94. *Calligonum zakirovii*, nationally red-listed endemic to the south-western Kyzylkum (category 1 – endangered, disappearing species), 40.82622° N, 63.4114° E.

#### 4.2.4. Stony slopes of relic low mountains

This habitat type is characterized by strongly rugged terrain, and the vegetation is represented with native sagebrush-saltwort and ephemeroid-saltwort-sagebrush vegetation on loamy and skeleton grey-brown desert soils with outcrops of bedrocks. The slopes are eroded and dissected with numerous dry riverbeds.

##### D001–D021, D036–D046

Stony and rocky slopes with rugged terrain, and wide watershed ridges with rather gentle, hilly terrain, covered with native saltwort-sagebrush and sagebrush vegetation on sandy-loamy, skeleton-loamy and skeleton grey-brown desert soil (Photo 95–99). The canopy cover is 5–30%. 43 plant and 1 moss species were recorded (Table 45), none of them are alien. Two species, *Ferula kyzylkumica* and *Tulipa lehmanniana* (photo 100), are listed in the Red Data Book of Uzbekistan (2019) with the category 3 (reducing); both species occur sporadically, solitary or in groups, within and between survey plots. One species, *Eremurus korolkowii*, is national endemic of Uzbekistan and endemic to relic mountains of Kyzylkum; it also occurs sporadically within and between survey plots.

Table 45. Check-list of plants recorded in survey plots D001–D021 and D36–D046

Species	Life form	Height, cm	Abundance		Phenol. Stage
			DAFOR	Braun-Blanquet	
<i>Alyssum desertorum</i>	annual	5–6	R–O	+	fruiting
<i>Alyssum linifolium</i> ( <i>Meniocus linifolius</i> )	annual	5–7	R–O	+	fruiting
<i>Anabasis eriopoda</i>	semishrub	15–20	R	+	vegetation
<i>Artemisia diffusa</i>	semishrub	20–25	O–A	+–1	vegetation
<i>Artemisia turanica</i>	semishrub	20–25	A–D	1–2	vegetation
<i>Astragalus ammotrophus</i>	Perennial	12–15	R	+	vegetation

<i>Astragalus villosissimus</i>	dwarf shrub	30–35	R–O	+	vegetation
<i>Carex pachystylis</i>	Perennial	10–12	O–A	+–1	Flowering, fruiting
<i>Carex physodes</i>	Perennial	12–15	O	+	fruiting
<i>Carex subphysodes</i>	Perennial	10–12	O–A	+–1	fruiting
<i>Caroxylon gemmascens</i> ( <i>Salsola gemmascens</i> )	dwarf shrub	20–30	R–O	+	vegetation
<i>Caroxylon orientale</i> ( <i>Salsola orientalis</i> )	dwarf shrub	30–35	O–A	+–1	vegetation
<i>Ceratocarpus arenarius</i>	annual	15–20	R–O	+	Dried
<i>Climacoptera</i> sp.	Annual	25–30	R–O	+	Dried
<i>Convolvulus hamadae</i>	semishrub	25–30	O	+	vegetation
<i>Cousinia hamadae</i>	Perennial	15–20	R	+	fruiting
<i>Eremopyrum bonaepartis</i>	annual	7–10	R	+	dried
<i>Eremopyrum distans</i>	annual	7–10	R	+	dried
<i>Eremurus korolkowii</i>	Perennial	25–30	R	+	Vegetation, flowering
<i>Ferula foetida</i>	Perennial	50–60	R–O	+	Vegetation, flowering
<i>Ferula kyzylkumica</i>	Perennial	15–20	R–O	+	Vegetation
<i>Fritillaria karelinii</i>	Perennial	10–12	R	+	fruiting
<i>Gagea afghanica</i>	Perennial	10–12	R	+	flowering
<i>Gagea bergii</i>	Perennial	5–7	R	+	flowering
<i>Halimocnemis villosa</i>	annual	10–12	R–O	+	vegetation
<i>Haloxylon ammodendron</i> ( <i>Haloxylon aphyllum</i> )	Small tree	100–180	R–O	+–1	vegetation
<i>Haplophyllum robustum</i>	perennial	25–30	R	+	vegetation
<i>Koelpinia linearis</i>	annual	10–12	R	+	fruiting
<i>Lactuca orientalis</i>	semishrub	35–40	R	+	vegetation
<i>Leontice inserta</i>	perennial	10–12	R	+	vegetation
<i>Leptaleum filifolium</i>	annual	4–5	R	+	fruiting
<i>Lomelosia olivieri</i> ( <i>Scabiosa olivieri</i> )	annual	15–17	R	+	fruiting
<i>Nanophyton erinaceum</i>	semishrub	7–10	R–O	+	vegetation
<i>Oreosalsola arbusculiformis</i> ( <i>Salsola arbusculiformis</i> )	dwarf shrub	30–35	O–A	1–2	vegetation
<i>Peganum garmala</i>	Perennial	20–25	R	+	vegetation
<i>Poa bulbosa</i>	Perennial	15–17	O–A	+–1	vegetation
<i>Rheum turkestanicum</i>	Perennial	20–40	R	+	vegetation
<i>Scrophularia leucoclada</i>	semishrub	40–50	R	+	vegetation
<i>Takhtajaniantha pusilla</i> ( <i>Scorzonera pusilla</i> )	Perennial	15–17	R	+	vegetation
<i>Tortula desertorum</i>	moss	0.3–0.5	R	+	vegetation
<i>Tulipa lehmanniana</i>	Perennial	10–20	R–O	+	Vegetation, fruiting
<i>Tulipa sogdiana</i>	Perennial	7–10	R	+	fruiting
<i>Ziziphora tenuior</i>	annual	7–10	R	+	flowering
<i>Zygophyllum macrophyllum</i>	Perennial	12–15	R	+	Vegetation, flowering





Photo 95. D001. Watershed of Kuldzhuktau range with gentle terrain and sparse saltwort-sagebrush vegetation (April)

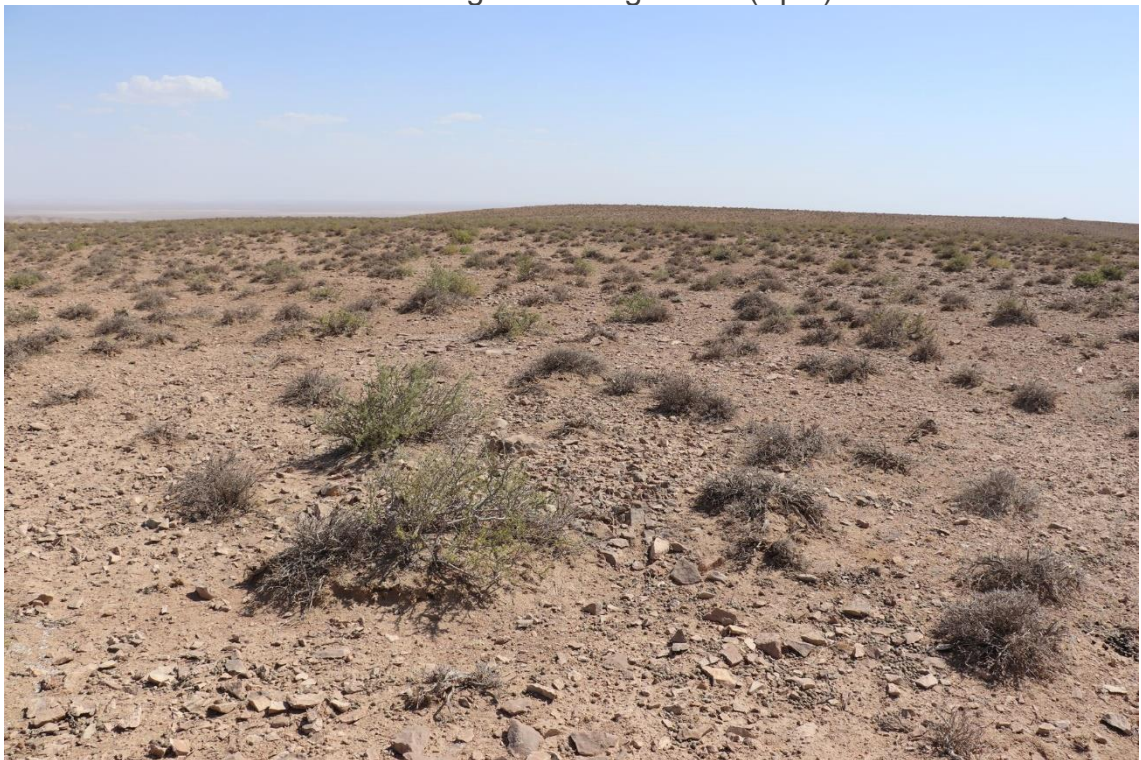


Photo 96. D001. Watershed of Kuldzhuktau range with gentle terrain and saltwort-sagebrush vegetation (June)





Photo 97. Surroundings of D001. Steep rocky northern slopes of Kuldzhuktau range with very sparse vegetation (April)



Photo 98. Surroundings of D001. Steep rocky northern slopes of Kuldzhuktau range with very sparse vegetation (June)





Photo 99. Surroundings of D003. Steep stony slopes of Kuldzhuktau range with sagebrush-saltwort vegetation, intensively grazed by livestock (April)



Photo 100. Plot D042. Flowering specimens of nationally red-listed *Tulipa lehmanniana*

#### **D073–D091**

Stony and rocky slopes with rugged terrain, and wide watersheds with rather gentle, hilly terrain, covered with native saltwort-sagebrush and sagebrush vegetation on loamy, skeleton-loamy and skeleton grey-brown desert soil (Photo 101–105). The canopy cover is 5–30%. 56 plant and 1 moss species were recorded (Table 46), none of them are alien. Two species, *Ferula kyzylkumica* and *Tulipa lehmanniana*, are listed in the Red Data Book of Uzbekistan (2019) with the category 3 (reducing) (Photo 106–107). Solitary

specimens and populations of 50–100 individuals occur sporadically within and between survey plots. One species, *Eremurus korolkowii*, is national endemic of Uzbekistan and endemic to relic mountains of Kyzylkum; it also occurs sporadically within and between survey plots D073–D091.

Table 46. Check-list of plants recorded in survey plots D073–D091

Species	Life form	Height, cm	Abundance		Phenol. Stage
			DAFOR	Braun-Blanquet	
<i>Allium griffithianum</i>	Perennial	7–10	R	+	fruiting
<i>Allium karakense</i>	Perennial	15–17	R	+	vegetation
<i>Allium sabulosum</i>	Perennial	15–20	R	+	vegetation
<i>Alyssum desertorum</i>	annual	5–6	R–O	+	fruiting
<i>Alyssum linifolium</i> ( <i>Meniocus linifolius</i> )	annual	5–7	R–O	+	fruiting
<i>Ammodendron conollyi</i>	Small tree	100–150	R	+	vegetation
<i>Anabasis eriopoda</i>	semishrub	15–20	R	+	vegetation
<i>Anabasis turkestanica</i>	semishrub	20–25	R	+	vegetation
<i>Artemisia diffusa</i>	semishrub	20–25	O	+–1	vegetation
<i>Artemisia juncea</i>	semishrub	30–35	O	+–1	vegetation
<i>Artemisia turanica</i>	semishrub	20–25	A–D	1–2	vegetation
<i>Astragalus ammotrophus</i>	Perennial	12–15	R	+	vegetation
<i>Astragalus villosissimus</i>	dwarf shrub	30–35	R–A	+–1	vegetation
<i>Atraphaxis spinosa</i>	shrub	50–70	O	1	fruiting
<i>Bassia prostrata</i> ( <i>Kochia prostrata</i> )	semishrub	20–25	R	+	vegetation
<i>Bromus tectorum</i>	annual	12–15	O	+	fruiting
<i>Carex pachystylis</i>	Perennial	10–12	O–A	+	flowering
<i>Caroxylon gemmascens</i> ( <i>Salsola gemmascens</i> )	dwarf shrub	20–30	R–O	+	vegetation
<i>Caroxylon orientale</i> ( <i>Salsola orientalis</i> )	dwarf shrub	30–35	O–A	+–1	vegetation
<i>Ceratocarpus arenarius</i>	annual	15–20	R–O	+	Dried
<i>Convolvulus hamadae</i>	semishrub	25–30	O–A	+–1	vegetation
<i>Cousinia hamadae</i>	Perennial	15–20	R	+	fruiting
<i>Eminium lehmannii</i>	Perennial	15–20	R	+	fruiting
<i>Ephedra intermedia</i>	shrub	15–30	R	+	vegetation
<i>Eremopyrum bonaepartis</i>	annual	7–10	R	+	dried
<i>Eremopyrum distans</i>	annual	7–10	R	+	dried
<i>Eremurus korolkowii</i>	Perennial	25–30	R–O	+	Vegetation, flowering
<i>Ferula foetida</i>	Perennial	50–60	R–O	+	Vegetation, flowering
<i>Ferula kyzylkumica</i>	Perennial	15–20	R–O	+	Vegetation
<i>Ferula varia</i>	Perennial	25–30	R	+	Vegetation
<i>Haloxylon ammodendron</i> ( <i>Haloxylon aphyllum</i> )	Small tree	100–150	R	+–1	vegetation
<i>Haplophyllum robustum</i>	perennial	25–30	R	+	vegetation
<i>Holosteum umbellatum</i>	annual	6–8	O	+	fruiting
<i>Hypecoum pendulum</i>	annual	12–15	R	+	Flowering, fruiting
<i>Isatis minima</i>	annual	15–17	R	+	fruiting



<i>Iris longiscapa</i>	Perennial	15–17	R	+	flowering
<i>Koelpinia linearis</i>	annual	10–12	R	+	fruiting
<i>Krascheninnikovia ceratoides</i>	semishrub	40–50	R	+	vegetation
<i>Lactuca orientalis</i>	semishrub	35–40	R–O	+–1	vegetation
<i>Lallemantia royleana</i>	annual	7–8	R	+	flowering
<i>Leptaleum filifolium</i>	annual	4–5	R	+	fruiting
<i>Lomelosia olivieri</i> ( <i>Scabiosa olivieri</i> )	annual	15–17	R	+	fruiting
<i>Nanophyton erinaceum</i>	semishrub	7–10	R–O	+	vegetation
<i>Oreosalsola arbusculiformis</i> ( <i>Salsola arbusculiformis</i> )	dwarf shrub	30–35	A–D	1–2	vegetation
<i>Peganum garmala</i>	Perennial	20–25	R–O	+	vegetation
<i>Poa bulbosa</i>	Perennial	15–17	O–A	+–+1	vegetation
<i>Rheum turkestanicum</i>	Perennial	20–40	R	+	vegetation
<i>Scrophularia leucoclada</i>	semishrub	40–50	R–O	+	vegetation
<i>Scorzonera gageoides</i>	Perennial	12–15	R	+	vegetation
<i>Stipa hohenackeriana</i>	Perennial	25–30	R–O	+	vegetation
<i>Takhtajaniantha pusilla</i> ( <i>Scorzonera pusilla</i> )	Perennial	15–17	R	+	vegetation
<i>Tortula desertorum</i>	moss	0.3–0.5	R	+	vegetation
<i>Tulipa sogdiana</i>	Perennial	7–10	R	+	Vegetation, fruiting
<i>Tulipa lehmanniana</i>	Perennial	10–20	R	+	Vegetation, flowering
<i>Ziziphora tenuior</i>	annual	7–8	R	+	flowering
<i>Zygophyllum macrophyllum</i>	Perennial	12–15	R	+	Vegetation, flowering
<i>Zygophyllum miniatum</i>	Perennial	10–15	R	+	Vegetation, flowering



Photo 101. D076. Stony slopes of Kuldzhuktau mountains with sagebrush-saltwort vegetation (June)



Photo 102. D077. Stony slopes of Kuldzhuktau mountains with sagebrush-saltwort vegetation (April)





Photo 103. D079. Stony slopes of Kuldzhuktau mountains with sagebrush-saltwort vegetation (April)



Photo 104. Between D081 and D082. Stony slopes of Kuldzhuktau mountains with sagebrush-saltwort vegetation (April)





Photo 105. D087. Stony northern slopes of Kuldzhuktau mountains with sparse sagebrush-saltwort vegetation (June)



Photo 106. D078. On the foreground – Korolkow's desert-candle (*Eremurus korolkowii*), national endemic of Uzbekistan and endemic to relic mountains of Kyzylkum, and on the background – black saltwort (*Oreosalsola arbusculiformis*), main dominant of sagebrush-saltwort communities of vegetation of relic mountains





Photo 107. D087. Dried generative specimen of nationally red-listed endemic *Ferula kyzylkumica* (June)

#### **D092–D113 and D119–D124**

Stony and rocky slopes with rugged terrain, and wide watershed ridges with rather gentle, hilly terrain, covered with native saltwort-sagebrush and sagebrush vegetation on loamy, skeleton-loamy and skeleton grey-brown desert soil (Photo 108–115). The canopy cover is 5–30%. 44 plant and 1 moss species were recorded (Table 47), none of them are alien. One species, *Ferula kyzylkumica*, is listed in the Red Data Book of Uzbekistan (2019) with the category 3 (reducing); it is endemic to the relic mountains of Kyzylkum with a disjunction in the Nuratau Mountains, and national endemic. Solitary specimens and populations of 50–100 individuals occur sporadically within and between survey plots D092–D113 and D119–D124. For example, 94 specimens *Ferula kyzylkumica* were count on a plot 50x10 m of near the D102 (40.9178° N, 63.2387° E, 259 m.s.l.) (photo 116). One species, *Eremurus korolkowii*, is national endemic of Uzbekistan and endemic to relic mountains of Kyzylkum; it also occurs sporadically within and between survey plots D092–D113 and D119–D124.

Table 47. Check-list of plants recorded in survey plots D092–D113 and D119–D124

Species	Life form	Height, cm	Abundance		Phenol. Stage
			DAFOR	Braun-Blanquet	
<i>Alyssum desertorum</i>	annual	5–6	R–O	+	fruiting
<i>Alyssum linifolium</i> ( <i>Meniocus linifolius</i> )	annual	5–7	R–O	+	fruiting
<i>Anabasis eriopoda</i>	semishrub	15–20	R	+	vegetation
<i>Anabasis turkestanica</i>	semishrub	20–25	R	+	vegetation
<i>Artemisia diffusa</i>	semishrub	20–25	O–A	+–1	vegetation
<i>Artemisia turanica</i>	semishrub	20–25	A–D	1–2	vegetation
<i>Astragalus ammotrophus</i>	Perennial	12–15	R	+	vegetation
<i>Astragalus villosissimus</i>	dwarf shrub	30–35	R–O	+	vegetation

<i>Atraphaxis spinosa</i>	shrub	50-70	R	+ -1	fruiting
<i>Carex pachystylis</i>	Perennial	10-12	O-A	+	flowering
<i>Caroxylon gemmascens</i> ( <i>Salsola gemmascens</i> )	dwarf shrub	20-30	R-O	+	vegetation
<i>Caroxylon orientale</i> ( <i>Salsola orientalis</i> )	dwarf shrub	30-35	O-A	+ -1	vegetation
<i>Ceratocarpus arenarius</i>	annual	15-20	R-O	+	Dried
<i>Cousinia hamadae</i>	Perennial	15-20	R	+	fruiting
<i>Ephedra intermedia</i>	shrub	15-30	R	+	vegetation
<i>Eremopyrum bonaepartis</i>	annual	7-10	R	+	dried
<i>Eremopyrum distans</i>	annual	7-10	R	+	dried
<i>Eremurus korolkowii</i>	Perennial	25-30	R	+	Vegetation, flowering
<i>Ferula foetida</i>	Perennial	50-60	R-O	+	Vegetation, flowering
<i>Ferula kyzylkumica</i>	Perennial	15-20	R-O	+	Vegetation
<i>Halimocnemis latifolia</i>	annual	12-15	R	+	Vegetation
<i>Haloxylon ammodendron</i> ( <i>Haloxylon aphyllum</i> )	Small tree	100-180	R-O	+ -1	vegetation
<i>Hypecoum pendulum</i>	annual	12-15	R	+	Flowering, fruiting
<i>Isatis minima</i>	annual	15-17	R	+	fruiting
<i>Iris longiscapa</i>	Perennial	15-17	R	+	flowering
<i>Koelpinia linearis</i>	annual	10-12	R	+	fruiting
<i>Krascheninnikovia ceratoides</i>	semishrub	40-50	R-O	+	vegetation
<i>Lactuca orientalis</i>	semishrub	35-40	R-O	+ -1	vegetation
<i>Lallemantia royleana</i>	annual	7-8	R	+	flowering
<i>Leptaleum filifolium</i>	annual	4-5	R	+	fruiting
<i>Lomelosia olivieri</i> ( <i>Scabiosa olivieri</i> )	annual	15-17	R	+	fruiting
<i>Lycium ruthenicum</i>	shrub	40-50	R-O	+ -1	vegetation
<i>Nanophyton erinaceum</i>	semishrub	7-10	R-O	+	vegetation
<i>Oreosalsola arbusculiformis</i> ( <i>Salsola arbusculiformis</i> )	dwarf shrub	30-35	O-A	1-2	vegetation
<i>Peganum garmala</i>	Perennial	20-25	R	+	vegetation
<i>Poa bulbosa</i>	Perennial	15-17	O-A	+ - +1	vegetation
<i>Rheum turkestanicum</i>	Perennial	20-40	R-O	+ -1	vegetation
<i>Scrophularia leucoclada</i>	semishrub	40-50	R-O	+	vegetation
<i>Scorzonera gageoides</i>	Perennial	12-15	R	+	vegetation
<i>Takhtajaniantha pusilla</i> ( <i>Scorzonera pusilla</i> )	Perennial	15-17	R	+	vegetation
<i>Tortula desertorum</i>	moss	0.3-0.5	R	+	vegetation
<i>Tulipa sogdiana</i>	Perennial	7-10	R	+	Vegetation, fruiting
<i>Ziziphora tenuior</i>	annual	7-8	R	+	flowering
<i>Zygophyllum macrophyllum</i>	Perennial	12-15	R	+	Vegetation, flowering
<i>Zygophyllum miniatum</i>	Perennial	10-15	R	+	Vegetation, flowering





Photo 108. D106. Southern slopes of Kuldzhuktau mountains with saltwort-sagebrush vegetation (April)



Photo 109. D100. Southern slopes of Kuldzhuktau mountains with saltwort-sagebrush vegetation (April)





Photo 110. D099. Southern slopes of Kuldzhuktau mountains with saltwort-sagebrush vegetation (April)



Photo 111. D099. Southern slopes of Kuldzhuktau mountains with saltwort-sagebrush vegetation (June)





Photo 112. D098. Stony slopes of Kuldzhuktau mountains with very sparse vegetation (April)



Photo 113. D092. Stony slopes of Kuldzhuktau mountains with sparse sagebrush-saltwort vegetation (June)





Photo 114. D123. Slopes of western part of Kuldzhuktau mountains with saltwort-sagebrush vegetation (June)



Photo 115. D121. Southern slopes of the relic ridge Kuldzhuktau with saltwort-sagebrush vegetation (June)





Photo 116. *Ferula kyzylkumica*, nationally red-listed endemic species, surroundings of D102, 40.9178° N, 63.2387° E

#### **4.2.5. Anthropogenic habitats**

Several small villages (the largest are Dzhankeldy and Kalata) and farmsteads are situated within the project site, on the piedmont plain and foothills of the relic ridge Kuldzhuktau (Photo 117–118). In addition, the impact of mining operations is more expressed in “Dzhankeldy” site than in “Bash”; there are numerous active and abandoned mines and quarries, geological exploration is underway at the present (Photo 119). Dense thickets of *Peganum harmala* typical for degraded rangelands of arid zone of Uzbekistan occur around settlements, farmsteads and wells. Halophytic shrubs (*Lycium ruthenicum*, *Halimodendron halodendron*, *Tamarix hispida* and *Tamarix laxa*) grows near the springs and wells. In surroundings of quarries and mines, the canopy cover is extremely sparse, or the vegetation is almost completely exterminated. Alien or red-listed plants were not found.





Photo 117. Surroundings of the village Kalata (April)



Photo 118. *Peganum harmala* in surroundings of the village Dzhankeldy (June)





Photo 119. Ruins of an abandoned mining village

### **4.3. “Bash-Dzhankeldy” power line**

Following types of habitats (mapping units) were identified along the “Bash-Dzhankeldy” line:

#### **4.3.1. Sandy and sandy-loamy desert plain**

This habitat type occupies the southernmost part of planned power line, at the northern edge of the “Bash” project site, as well as along the railway, between the “Bash” project site and the rail crossing.

Sandy and sandy-loamy desert plain with flat or flat-wavy terrain is covered with native ephemeroid-sagebrush (*Artemisia diffusa*, *Poa bulbosa*, *Carex physodes*, *Carex subphysodes*) and saltwort-ephemeroid-sagebrush vegetation (*Artemisia diffusa*, *Poa bulbosa*, *Carex physodes*, *Carex subphysodes*, *Caroxylon orientale* (*Salsola orientalis*), *Xylosalsola arbuscula*, (*Salsola arbuscula*), sometimes with small plots of fixed sands with psammophilous shrubs (*Calligonum leucocladum*, *C. microcarpum*), or with saxaul plantations (*Haloxylon ammodendron*) or solitary saxaul trees on sabulous grey-brown desert soil and sandy desert soil (photo 120–121). The elevation is 263–180 m a.s.l. The canopy cover is 20 to 40%, and the density saxaul stands is up to 0.1–0.2. Plant communities are characterized with low species diversity and low to medium level of anthropogenic disturbance. A check-list of 16 plant species and 1 moss recorded for this habitat is presented below (table 48).

Table 48. Check-list of plants recorded for sandy and sandy-loamy desert plain with ephemeroid-sagebrush and saltwort-ephemeroid-sagebrush vegetation, and with saxaul plantations

Species	Life form	Height, cm	Abundance		Phenol. Stage
			DAFOR	Braun-Blanquet	
<i>Acanthophyllum elatius</i>	Perennial	40–45	R	+	flowering

<i>Alyssum desertorum</i>	annual	5–6	R–O	+	dried
<i>Artemisia diffusa</i>	semishrub	25–35	A–D	1–2	vegetation
<i>Astragalus villosissimus</i>	dwarf shrub	30–35	O	+	vegetation
<i>Bromus tectorum</i>	annual	12–15	R–O	+	fruiting
<i>Calligonum leucocladum</i>	shrub	50–100	R–O	+	fruiting
<i>Calligonum microcarpum</i>	shrub	50–70	R–O	+	fruiting
<i>Carex physodes</i>	Perennial	12–15	O–A	+–1	dried
<i>Carex subphysodes</i>	Perennial	10–12	A–D	1	dried
<i>Caroxylon orientale (Salsola orientalis)</i>	dwarf shrub	30–35	R–A	+–1	vegetation
<i>Ceratocarpus arenarius</i>	annual	15–20	R–O	+	Dried
<i>Convolvulus hamadae</i>	semishrub	25–30	R–O	+	flowering
<i>Cousinia hamadae</i>	Perennial	15–20	R	+	vegetation
<i>Ferula foetida</i>	Perennial	30–35	R–A	+	Fruiting, dried
<i>Haloxylon ammodendron (Haloxylon aphyllum)</i>	Small tree	150–170	R–A	1–2	vegetation
<i>Heliotropium arguzioides</i>	Perennial	20–25	R	+	vegetation
<i>Iris songarica</i>	Perennial	30–35	R–O	+	vegetation
<i>Peganum garmala</i>	Perennial	30–35	R	+	flowering
<i>Poa bulbosa</i>	Perennial	15–17	O–A	+–1	dried
<i>Stipagrostis pennata</i>	Perennial	30–35	R	+	vegetation
<i>Tortula desertorum</i>	moss	0.3–0.5	O	+	vegetation
<i>Xylosalsola arbuscula (Salsola arbuscula)</i>	shrub	40–50	R–A	+–1	vegetation





Photo 121. Sandy-loamy desert plain with native ephemeroid-sagebrush plant community and sparse black saxaul (remains of plantations), 40.708281° N, 64.573836° E



Photo 122. Sandy plain with native ephemeroid-saltwort-sagebrush vegetation and plantations of black saxaul, 40.76059° N, 64.52554° E

#### **4.3.2. Fixed and semi-fixed sands**

Fixed and semi-fixed sands with hilly, ridge-hilly, ridge and wavy terrain are covered with psammophilous shrublands (photo 123). Dominants and subdominants are *Calligonum leucocladum*, *Calligonum microcarpum*, *Haloxylon persicum*, *H. ammodendron*,

*Astragalus villosissimus*, *Artemisia diffusa*, *Carex physodes*, and on local plots – sand acacia (*Ammodendron conollyi*). The grass cover of the sandy desert is formed by desert sedge (*Carex physodes*) which plays a key role in sands fixation through its densely branched root system. The giant Umbelliferae *Ferula foetida* often is a subdominant. 36 plant species and one moss were recorded for this habitat type (table 49), including one nationally red-listed species, *Tulipa lehmanniana* (solitary fruiting and dried specimens were found on the route between 40.80932° N, 64.48027° E and 40.85202° N, 64.4183° E). This habitat is located in the southern part of the previous variant of the power line (red line), and also along the railway, between the rail crossing and village Chengeldy.

Table 49. Check-list of plants recorded for fixed and semi-fixed sands with psammophilous shrubs and ephemeroïd-sagebrush vegetation

Species	Life form	Height, cm	Abundance		Phenol. Stage
			DAFOR	Braun-Blanquet	
<i>Acanthophyllum elatius</i>	Perennial	40–45	R–O	+	flowering
<i>Alhagi pseudalhagi</i>	Perennial	30–35	R–O	+	vegetation
<i>Alyssum desertorum</i>	annual	5–6	R	+	dried
<i>Ammodendron conollyi</i>	Small tree	100–150	R–A	+–1	fruiting
<i>Arnebia decumbens</i>	annual	15–20	R	+	fruiting
<i>Artemisia diffusa</i>	semishrub	35–40	A–D	1–2	vegetation
<i>Astragalus flexus</i>	perennial	15–17	R	+	dried
<i>Astragalus villosissimus</i>	dwarf shrub	35–40	A	1	vegetation
<i>Bromus tectorum</i>	annual	12–15	O–A	+	dried
<i>Calligonum leucocladum</i>	shrub	50–100	D–O	1–2	fruiting
<i>Calligonum microcarpum</i>	shrub	50–100	A–O	1	fruiting
<i>Carex physodes</i>	Perennial	12–15	D	1	flowering
<i>Caroxylon orientale (Salsola orientalis)</i>	dwarf shrub	35–40	R–O	+	vegetation
<i>Ceratocarpus arenarius</i>	annual	15–20	O	+	vegetation
<i>Convolvulus divaricatus</i>	semishrub	30–45	O	+	flowering
<i>Convolvulus hamadae</i>	semishrub	30–40	O	+	flowering
<i>Cousinia hamadae</i>	Perennial	30–35	R–O	+	vegetation
<i>Eremopyrum bonaepartis</i>	annual	10–12	O	+	fruiting
<i>Eremopyrum distans</i>	annual	10–12	O	+	fruiting



<i>Euphorbia turczaninowii</i>	annual	10–12	R	+	Flowering, fruiting
<i>Ferula foetida</i>	Perennial	50–60	O–A	1	Fruiting, dried
<i>Haplophyllum ramosissimum</i>	Perennial	25–30	R	+	vegetation
<i>Haloxylon ammodendron</i> ( <i>Haloxylon aphyllum</i> )	Small tree	150–170	R–O	+–1	vegetation
<i>Haloxylon persicum</i>	Small tree	150–170	O–A	1	vegetation
<i>Heliotropium arguzioides</i>	Perennial	25–30	R–O	+	flowering
<i>Iris songarica</i>	Perennial	30–35	R	+	vegetation
<i>Mausolea eriocarpa</i>	semishrub	45–50	O–A	1	flowering
<i>Oreosalsola arbusculiformis</i> ( <i>Salsola arbusculiformis</i> )	dwarf shrub	50–60	O	+–1	vegetation
<i>Peganum garmala</i>	Perennial	30–35	R–O	+	flowering
<i>Poa bulbosa</i>	Perennial	15–17	O	+	dried
<i>Salsola paulsenii</i>	annual	30–35	R	+	vegetation
<i>Sophora pachycarpa</i>	Perennial	20–25	R	+	flowering
<i>Smirnowia turkestanica</i>	Perennial	30–35	R–O	+	flowering
<i>Stipagrostis pennata</i>	Perennial	30–35	O	+	vegetation
<i>Tortula desertorum</i>	moss	0.3–0.5	O	+	vegetation
<i>Tulipa lehmanniana</i>	Perennial	10–15	R	+	fruiting
<i>Xylosalsola arbuscula</i> ( <i>Salsola arbuscula</i> )	shrub	40–50	R–O	+	vegetation



Photo 123. Fixed hilly sands with Calligonum-sagebrush vegetation with participation of black saxaul, 40.81108° N, 64.47365° E

#### **4.3.3. Complex of fixed and semi-fixed sands, saline depressions and takyr**

This habitat is located in surroundings of the village Shengeldy (2–6 km to the south), on the edge of the saline depression Karakata. Sandy areas are covered with psammophytic shrubs and ephemeroïd-sagebrush vegetation (photo 124). Dominants are sand acacia (*Ammodendron conollyi*), *Calligonum leucocladum*, *Artemisia diffusa*, *Carex physodes*, subdominants – *Haloxylon ammodendron*, *Calligonum microcarpum*, *Astragalus villosissimus*, *Oreosalsola arbusculiformis* (*Salsola arbusculiformis*), *Ferula foetida*. Small saline depressions and takyr have very sparse vegetation (canopy cover less than 10%) represented with the same species that on the sands, with participation of *Tamarix sp.* and *Lycium ruthenicum*. 35 plant species and one moss were recorded for this habitat type in total (table 50).

Table 50. Check-list of plants recorded for complex of fixed and semi-fixed hilly and wavy sands, small saline depressions and takyr

Species	Life form	Height, cm	Abundance		Phenol. Stage
			DAFOR	Braun-Blanquet	
<i>Acanthophyllum elatius</i>	Perennial	40–45	R	+	flowering
<i>Alhagi pseudalhagi</i>	Perennial	30–35	R–O	+	vegetation
<i>Alyssum desertorum</i>	annual	5–6	R	+	dried
<i>Ammodendron conollyi</i>	Small tree	100–150	O–D	+–12	fruiting
<i>Arnebia decumbens</i>	annual	15–20	R	+	fruiting
<i>Artemisia diffusa</i>	semishrub	35–40	O–A	+–1	vegetation



<i>Astragalus villosissimus</i>	dwarf shrub	35-40	O-A	+–1	vegetation
<i>Bassia eriophora</i>	annual	12–15	O	+	fruiting
<i>Bromus tectorum</i>	annual	12–15	O–A	+	dried
<i>Calligonum leucocladum</i>	shrub	50–100	A–O	1	fruiting
<i>Calligonum microcarpum</i>	shrub	50–100	A–O	1	fruiting
<i>Carex physodes</i>	Perennial	12–15	O–A	+	flowering
<i>Caroxylon orientale</i> ( <i>Salsola orientalis</i> )	dwarf shrub	35-40	R–O	+	vegetation
<i>Ceratocarpus arenarius</i>	annual	15-20	O–A	+	vegetation
<i>Convolvulus divaricatus</i>	semishrub	30–45	O–R	+	flowering
<i>Convolvulus hamadae</i>	semishrub	30–40	O–R	+	flowering
<i>Cousinia hamadae</i>	Perennial	30–35	R	+	vegetation
<i>Eremopyrum bonaepartis</i>	annual	10–12	O–R	+	fruiting
<i>Eremopyrum distans</i>	annual	10–12	O–R	+	fruiting
<i>Euphorbia turczaninowii</i>	annual	10–12	R	+	Flowering, fruiting
<i>Ferula foetida</i>	Perennial	50–60	O–R	+–1	Fruiting, dried
<i>Haplophyllum ramosissimum</i>	Perennial	25–30	R	+	vegetation
<i>Haloxylon ammodendron</i> ( <i>Haloxylon aphyllum</i> )	Small tree	150–170	R–O	+–1	vegetation
<i>Heliotropium arguzioides</i>	Perennial	25–30	R–O	+	flowering
<i>Lycium ruthenicum</i>	Shrub	50–70	R–O	+–1	flowering
<i>Mausolea eriocarpa</i>	semishrub	45–50	R–O	+–1	flowering
<i>Oreosalsola arbusculiformis</i> ( <i>Salsola arbusculiformis</i> )	dwarf shrub	50–60	O–A	+–1	vegetation
<i>Peganum garmala</i>	Perennial	30–35	R–A	+–1	flowering
<i>Poa bulbosa</i>	Perennial	15–17	R–O	+	dried
<i>Salsola paulsenii</i>	annual	30–35	R–O	+	vegetation
<i>Sophora pachycarpa</i>	Perennial	20–25	R–O	+	flowering
<i>Smirnowia turkestanica</i>	Perennial	30–35	R–O	+	flowering

<i>Stipagrostis pennata</i>	Perennial	30–35	R	+	vegetation
<i>Tamarix sp.</i>	Shrub	100–150	R	+–1	vegetation
<i>Tortula desertorum</i>	moss	0.3–0.5	O	+	vegetation
<i>Xylosalsola arbuscula</i> ( <i>Salsola arbuscula</i> )	shrub	40–50	R	+	vegetation



Photo 124. Fixed sands with native psammophilous vegetation with domination of sand acacia, 40.94366° N, 64.35031° E

#### **4.3.4. Weakly inclined piedmont plain of relic low mountains**

Weakly inclined piedmonts of relic low mountains Kuldzhuktau with flat, wavy or gently sloping terrain are covered with native ephemeroïd-sagebrush and saltwort-sagebrush vegetation, sometimes with *Calligonum* and plantations of black saxaul on sabulous grey-brown desert soil (photos 125–127). This habitat type is located along the road P-61, between the village Shengeldy and the eastern edge of “Dzhankeldy” project site. Canopy cover is 20–40%. 31 plant species and one moss were recorded for this habitat type (table 51), including 3 species listed in the Red Data Book of Uzbekistan (2019). They are *Acanthophyllum cyrtostegium* (category 3 – reducing; national endemic) (photo 128), *Calligonum zakirovii* (category 1 – endangered, disappearing species; national endemic) (photo 129), and *Tulipa lehmanniana* (category 3 – reducing). A small population of *Acanthophyllum cyrtostegium* (8 plants) was found near the route P-61 (40.95635° N, 64.3285° E); 11 plants were found near the village Shengeldy (40.9735° N, 64.3617° E). Solitary individuals of *Calligonum zakirovii* (30–40 per 1 hectare) were recorded among *Calligonum leucocladum* and *C. microcarpum* along the route P-61, on the border of saline depression (40.9846° N, 63.9094° E). During the April expedition, it has been noted that *Tulipa lehmanniana* (several dozens of individuals in each population, mostly pre-generative) occur sporadically along the road P-61, between the village Shengeldy and the eastern edge of “Dzhankeldy” project site (photo 130).



Table 51. Check-list of plants recorded for piedmont plains with ephemeroid-sagebrush and saltwort-sagebrush vegetation, with plantations of black saxaul

Species	Life form	Height, cm	Abundance		Phenol. Stage
			DAFOR	Braun-Blanquet	
<i>Acanthophyllum cyrtostegium</i>	Perennial	25–30	R	+	flowering
<i>Acanthophyllum elatius</i>	Perennial	40–45	R	+	flowering
<i>Alyssum desertorum</i>	annual	5–6	R	+	dried
<i>Anabasis eriopoda</i>	semishrub	15–20	R	+	vegetation
<i>Arnebia decumbens</i>	annual	15–20	R	+	fruiting
<i>Artemisia diffusa</i>	semishrub	30–35	A–D	1–2	vegetation
<i>Artemisia turanica</i>	semishrub	30–35	O–A	+–1	vegetation
<i>Astragalus villosissimus</i>	dwarf shrub	40–60	O–A	+–1	vegetation
<i>Bassia prostrata</i> ( <i>Kochia prostrata</i> )	semishrub	15–20	R	+	vegetation
<i>Bromus tectorum</i>	annual	12–15	R–O	+	fruiting
<i>Calligonum leucocladum</i>	shrub	50–100	R–O	+	fruiting
<i>Calligonum microcarpum</i>	shrub	50–70	R–O	+	fruiting
<i>Calligonum zakirovii</i>	shrub	40–50	R	+	fruiting
<i>Carex physodes</i>	Perennial	12–15	O–A	+	dried
<i>Carex subphysodes</i>	Perennial	10–12	O–A	+	dried
<i>Caroxylon orientale</i> ( <i>Salsola orientalis</i> )	dwarf shrub	35–40	O–A	+–1	vegetation
<i>Caroxylon scleranthum</i> ( <i>Salsola sclerantha</i> )	annual	15–20	R	+	vegetation
<i>Ceratocarpus arenarius</i>	annual	10–12	R–O	+	vegetation
<i>Convolvulus hamadae</i>	semishrub	25–30	O–A	+–1	flowering
<i>Cousinia hamadae</i>	Perennial	25–30	R	+	vegetation
<i>Eremopyrum bonaepartis</i>	annual	10–12	R–O	+	fruiting
<i>Eremopyrum distans</i>	annual	10–12	R–O	+	fruiting
<i>Ferula foetida</i>	Perennial	100–150	O–A	+–1	Fruiting, dried

<i>Haloxylon ammodendron</i> ( <i>Haloxylon aphyllum</i> )	Small tree	100–150	R–O	+–1	vegetation
<i>Heliotropium arguzioides</i>	Perennial	20–25	R	+	vegetation
<i>Oreosalsola arbusculiformis</i> ( <i>Salsola arbusculiformis</i> )	dwarf shrub	50–60	O	+–1	vegetation
<i>Peganum garmala</i>	Perennial	30–35	R–O	+	flowering
<i>Poa bulbosa</i>	Perennial	15–17	O–A	+	dried
<i>Salsola paulsenii</i>	annual	30–35	R	+	vegetation
<i>Smirnowia turkestanica</i>	Perennial	30–35	R	+	flowering
<i>Tortula desertorum</i>	moss	0.3–0.5	O	+	vegetation
<i>Tulipa lehmanniana</i>	Perennial	10–20	R–O	+	Vegetation, flowering
<i>Ziziphora tenuior</i>	annual	6–7	R–O	+	dried



Photo 125. Weakly inclined piedmont plain of the relic ridge Kuldzhuktau with saltwort-sagebrush vegetation, 40.9156° N, 63.51822° E





Photo 126. Piedmont plain of the relic ridge Kuldzhuktau with ephemeroïd-sagebrush vegetation and sparse black saxaul (remains of plantation), 40.94507° N, 64.28577° E



Photo 127. Piedmont plain of the relic ridge Kuldzhuktau with ephemeroïd-sagebrush vegetation and plantation of black saxaul, surroundings of the village Chontabay, 40.99858° N, 63.68805° E





Photo 128. *Acanthophyllum cyrtostegium*, nationally red-listed endemic species (category 3 – reducing species).



Photo 129. *Calligonum zakirovii*, nationally red-listed endemic to the south-western Kyzylkum (category 1 – endangered, disappearing species).





Photo 130. *Tulipa lehmanniana*, nationally red-listed species. Roadside of the road P-61, between the villages Shengeldy and Chontabay, April 2021

#### 4.3.5. Foothills of relic low mountains

This habitat type is found on some plots along the previous variant of the power line (red line) running across the foothills of the relic ridge Kuldzhuktau. The terrain is more or less rugged, and the vegetation is represented with native saltwort-sagebrush communities on gypsiferous grey-brown desert soil and outcrops of variegated beds (photo 131), sometimes with tamarisk along dry riverbeds. Canopy cover is 10–30%. 27 plant species and one moss were recorded for this habitat type (table 52).

Table 52. Check-list of plants recorded for eroded foothills with outcrops of variegated beds and saltwort-sagebrush vegetation

Species	Life form	Height, cm	Abundance		Phenol. Stage
			DAFOR	Braun-Blanquet	
<i>Anabasis turkestanica</i>	semishrub	15–20	R	+	vegetation
<i>Arnebia decumbens</i>	annual	15–20	R	+	fruiting
<i>Artemisia diffusa</i>	semishrub	30–35	A	1–2	vegetation
<i>Artemisia turanica</i>	semishrub	30–35	O–A	+–1	vegetation
<i>Astragalus villosissimus</i>	dwarf shrub	40–60	O	+	vegetation
<i>Bassia prostrata</i> ( <i>Kochia prostrata</i> )	semishrub	15–20	R	+	vegetation
<i>Bromus tectorum</i>	annual	12–15	R	+	fruiting
<i>Caroxylon orientale</i> ( <i>Salsola orientalis</i> )	dwarf shrub	35–40	A	1	vegetation

<i>Caroxylon scleranthum</i> ( <i>Salsola sclerantha</i> )	annual	15–20	R–O	+	vegetation
<i>Ceratocarpus arenarius</i>	annual	10–12	R–O	+	vegetation
<i>Climacoptera</i> sp.	annual	10–15	R–O	+	vegetation
<i>Convolvulus hamadae</i>	semishrub	25–30	O–A	+–1	flowering
<i>Cousinia hamadae</i>	Perennial	25–30	R–O	+	vegetation
<i>Eremopyrum bonaepartis</i>	annual	10–12	R–O	+	fruiting
<i>Eremopyrum distans</i>	annual	10–12	R–O	+	fruiting
<i>Ferula foetida</i>	Perennial	100–120	R	+	Fruiting, dried
<i>Halimocnemis villosa</i>	annual	10–15	R–O	+	vegetation
<i>Haloxylon ammodendron</i> ( <i>Haloxylon aphyllum</i> )	Small tree	100–150	R	+	vegetation
<i>Haplophyllum bungei</i>	perennial	20–25	R	+	flowering
<i>Haplophyllum robustum</i>	perennial	25–30	R	+	flowering
<i>Heliotropium arguzioides</i>	Perennial	20–25	R	+	vegetation
<i>Oreosalsola arbusculiformis</i> ( <i>Salsola arbusculiformis</i> )	dwarf shrub	50–60	O–A	+–1	vegetation
<i>Peganum garmala</i>	Perennial	30–35	R–O	+	flowering
<i>Poa bulbosa</i>	Perennial	15–17	O	+	dried
<i>Salsola paulsenii</i>	annual	30–35	R	+	vegetation
<i>Tamarix</i> sp.	shrub	100–120	R	+	vegetation
<i>Tortula desertorum</i>	moss	0.3–0.5	O	+	vegetation
<i>Ziziphora tenuior</i>	annual	6–7	R	+	dried





Photo 131. Eroded foothills of the relic ridge Kuldzhuktau with saltwort-sagebrush vegetation, 40.87604° N, 64.25413° E

#### **4.3.6. Outcrops of variegated beds**

This habitat type is found on rather small plots along the previous variant of the power line (red line) running across the northern foothills of the relic ridge Kuldzhuktau. The terrain is more or less rugged; the vegetation is very sparse (canopy cover is 1–10%) and composed by saltworts and gypsophytes. The species composition is the same that is described in 4.2.3.

#### **4.3.7. Saline lands**

Several rather small saline depressions with very sparse saltworts or with takyr and without any vegetation are situated along the road P-61, between the village Shengeldy and the eastern edge of “Dzhankeldy” project site, among the weakly inclined northern piedmonts of the relic mountains Kuldzhuktau (photos 132–133). Canopy cover is 0–5%. 22 plant species were recorded for this habitat type (table 53), including one red-listed species, *Tulipa lehmanniana* (4 dried pre-generative specimens, 40.46116° N, 64.21558° E).

Note: “takyr” is a peculiar type of landscape occurring in the deserts of Central Asia, which is formed on periodically inundated depressions with loamy soil, forming a cracked crust at the dry season.

Table 53. Check-list of plants recorded for saline depressions and takyr

Species	Life form	Height, cm	Abundance		Phenol. Stage
			DAFOR	Braun-Blanquet	
<i>Alhagi pseudalhagi</i>	Perennial	30–35	R–O	+	vegetation
<i>Anabasis turkestanica</i>	semishrub	15–20	R	+	vegetation
<i>Artemisia turanica</i>	semishrub	30–35	R–O	+	vegetation

<i>Bassia eriophora</i>	annual	12–15	O	+	fruiting
<i>Caroxylon orientale</i> ( <i>Salsola orientalis</i> )	dwarf shrub	35–40	R–O	+	vegetation
<i>Caroxylon scleranthum</i> ( <i>Salsola sclerantha</i> )	annual	15–20	R–O	+	vegetation
<i>Ceratocarpus arenarius</i>	annual	10–12	R–O	+	vegetation
<i>Climacoptera</i> sp.	annual	10–15	R–O	+	vegetation
<i>Convolvulus hamadae</i>	semishrub	25–30	R–O	+	flowering
<i>Cousinia hamadae</i>	Perennial	25–30	R–O	+	vegetation
<i>Eremopyrum bonaepartis</i>	annual	10–12	R	+	fruiting
<i>Eremopyrum distans</i>	annual	10–12	R	+	fruiting
<i>Ferula foetida</i>	Perennial	70–100	R	+	Fruiting, dried
<i>Halimocnemis villosa</i>	annual	10–15	R–O	+	vegetation
<i>Halimodendron halodendron</i>	Shrub	50–70	R	+	vegetation
<i>Haloxylon ammodendron</i> ( <i>Haloxylon aphyllum</i> )	Small tree	100–150	R	+	vegetation
<i>Lycium ruthenicum</i>	Shrub	50–70	R–O	+–1	flowering
<i>Oreosalsola arbusculiformis</i> ( <i>Salsola arbusculiformis</i> )	dwarf shrub	50–60	R–O	+1	vegetation
<i>Peganum garmala</i>	Perennial	30–35	R–O	+	flowering
<i>Tamarix</i> sp.	shrub	100–120	R	+	vegetation
<i>Tulipa lehmanniana</i>	Perennial	10–15	R	+	dried
<i>Ziziphora tenuior</i>	annual	6–7	R	+	dried





Photo 132. Saline depression with sparse saltworts, 40.96116° N, 64.21218° E.



Photo 133. Depression with takyr, vegetation is absent, 40.96262° N, 64.08994° E

It has been found that the vegetation along the planned power line “Bash-Dzhankeldy” is represented with native plant communities typical for South-western Kyzylkum, somewhere with saxaul plantations created in the past to prevent erosion of soils. The vegetation of studied area is characterized with sparse canopy cover, low species diversity and low to medium level of anthropogenic disturbance. At the present, the human impact is connected mainly with use of rangelands and a network of ground roads, as well as with littering by household waste near farms and villages and along roads.

A total check-list of vascular plants recorded along the planned power line “Bash-Dzhankeldy” during the field survey in May includes 52 species (Appendix 1); 3 species are nationally red-listed. *Calligonum zakirovii*, an endemic to south-western Kyzylkum and national endemic, is included in the Red Data Book of Uzbekistan (2019) with the status 1 (endangered, disappearing species). *Acanthophyllum cyrtostegium* and *Tulipa lehmanniana* are included in the Red Data Book of Uzbekistan (2019) with the status 3 (reducing).

#### **4.4. “Bash-Karakul” power line**

Following types of habitats (mapping units) were identified along the “Bash-Karakul” line:

##### **4.4.1. Sandy and sandy-loamy desert plain**

Sandy and sandy-loamy desert plain with flat, flat-wavy or wavy terrain is covered with native ephemeroïd-sagebrush (*Artemisia diffusa*, *Poa bulbosa*, *Carex physodes*, *Carex subphysodes*) and ephemeroïd-saltwort-sagebrush vegetation (*Artemisia diffusa*, *Poa bulbosa*, *Carex physodes*, *Caroxylon orientale* (*Salsola orientalis*), *Xylosalsola arbuscula*, (*Salsola arbuscula*)), sometimes with psammophilous shrubs (*Calligonum leucocladum*, *C. microcarpum*) and with saxaul plantations (*Haloxylon ammodendron*) on sandy desert soil (photo 134–135). On some areas, subdominants are *Alhagi pseudalhagi*, *Ferula foetida* and *Iris songarica* (photo 136–137). Local thickets of *Peganum garmala* have been found on overgrazed areas around farms and wells (photo 138). The elevation is 265–223 m a.s.l. The canopy cover is 10 to 40%, and the density of saxaul stands is up to 10–20%. A check-list of 29 plant species and 1 moss recorded for this habitat is presented below (table 54). This habitat is situated in the northern part of the power line, between the “Bash” project site and the discharge channel Agytma.

Table 54. Check-list of plants recorded for sandy desert plain with ephemeroïd-sagebrush ephemeroïd-saltwort-sagebrush vegetation, with psammophilous shrubs and saxaul plantations

Species	Life form	Height, cm	Abundance		Phenol. Stage
			DAFOR	Braun-Blanquet	
<i>Acanthophyllum elatius</i>	Perennial	40–45	R	+	flowering
<i>Alhagi pseudalhagi</i>	Perennial	30–35	R–A	+–1	vegetation
<i>Alyssum desertorum</i>	annual	5–6	R	+	dried
<i>Artemisia diffusa</i>	semishrub	20–35	A–D	1–2	vegetation
<i>Astragalus villosissimus</i>	dwarf shrub	35–45	O–A	+	vegetation
<i>Bromus tectorum</i>	annual	12–15	R–O	+	fruiting
<i>Calligonum leucocladum</i>	shrub	50–100	R–O	+	fruiting
<i>Calligonum microcarpum</i>	shrub	50–70	R–O	+	fruiting
<i>Carex physodes</i>	Perennial	12–15	A–D	1	dried
<i>Carex subphysodes</i>	Perennial	10–12	O–D	1	dried
<i>Calligonum leucocladum</i>	shrub	50–100	R–O	+–1	fruiting
<i>Calligonum microcarpum</i>	shrub	50–100	R–O	+–1	fruiting



<i>Caroxylon orientale (Salsola orientalis)</i>	dwarf shrub	35-40	R-A	+—1	vegetation
<i>Ceratocarpus arenarius</i>	annual	10-12	R-A	+—1	vegetation
<i>Convolvulus divaricatus</i>	semishrub	25–35	R-O	+	flowering
<i>Convolvulus hamadae</i>	semishrub	25–30	R-A	+—1	flowering
<i>Cousinia hamadae</i>	Perennial	25–30	R-O	+	vegetation
<i>Ferula foetida</i>	Perennial	50–80	R-A	+—1	Fruiting, dried
<i>Halothamnus subaphyllus</i>	semishrub	50–60	R	+	vegetation
<i>Haloxylon ammodendron (Haloxylon aphyllum)</i>	Small tree	100–150	R-A	+—2	vegetation
<i>Heliotropium arguzioides</i>	Perennial	20–25	R	+	vegetation
<i>Iris songarica</i>	Perennial	30–35	R-A	+—1	vegetation
<i>Peganum garmala</i>	Perennial	30–35	R-A	+—1	flowering
<i>Poa bulbosa</i>	Perennial	15–17	A	+	dried
<i>Salsola paulsenii</i>	annual	30–35	R	+	vegetation
<i>Sophora pachycarpa</i>	Perennial	20–25	R-O	+	flowering
<i>Smirnowia turkestanica</i>	Perennial	30–35	R	+	flowering
<i>Stipagrostis pennata</i>	Perennial	30–35	R	+	vegetation
<i>Tortula desertorum</i>	moss	0.3–0.5	O-A	+—1	vegetation
<i>Xylosalsola arbuscula (Salsola arbuscula)</i>	shrub	40–50	O-A	+—1	vegetation



Photo 134. Sandy plain with native ephemeroid-sagebrush vegetation and remains of plantations of black saxaul, 40.538601° N, 64.69604° E



Photo 135. Sandy plain with native ephemeroid-saltwort-sagebrush vegetation and plantations of black saxaul, 40.42977° N, 64.57947° E





Photo 136. Sandy plain with native ephemeroid-sagebrush vegetation, with abundance of *Ferula foetida* and *Iris songarica*, 40.42856° N, 64.555° E



Photo 137. Wavy sandy plain with native ephemeroid-sagebrush vegetation, with abundance of *Ferula foetida*, 40.46222° N, 64.58032° E





Photo 138. Overgrazed rangelands with abundance of *Peganum garmala* on sandy plain near the sheep farm, 40.48734° N, 64.64465° E

#### 4.4.2. Fixed and semi-fixed sands

Fixed and semi-fixed sands with hilly, ridge-hilly, ridge and wavy terrain are covered with native stands of saxaul, communities of psammophytic shrubs, dwarf shrubs, ephemers and ephemeroids (photo 139–141), and with plots of saxaul plantations. This habitat prevails in the central and southern part of the power line, between the discharge channel Agytma and Karakul. Dominants and subdominants are *Haloxylon persicum*, *H. ammodendron*, *Ammodendron conollyi*, species of *Calligonum* and *Xylosalsola*, *Artemisia diffusa*, *Astragalus villosissimus*, *Carex physodes*, *Ferula foetida*, *Convolvulus divaricatus*. The density of saxaul stands is up to 0.3–0.4. Local plots of unfixed moving sands and communities of pastoral weeds *Peganum garmala* and *Sophora pachycarpa* have been found on overgrazed and other disturbed areas around farms and wells, and along roads (photo 142). 48 plant species and one moss were recorded for this habitat type (table 55), including one nationally red-listed species, *Calligonum zakirovii* (fruiting specimens were found near the southern edge of saline wetland situated along the discharge channel Agytma, 40.80932° N, 64.48027° E) (photo 143).

Table 55. Check-list of plants recorded for fixed and semi-fixed sands with psammophytic shrubs and ephemeroid-sagebrush vegetation

Species	Life form	Height, cm	Abundance		Phenol. Stage
			DAFOR	Braun-Blanquet	
<i>Acanthophyllum elatius</i>	Perennial	40–45	R–O	+	flowering
<i>Agriophyllum lateriflorum</i>	annual	20–30	R–O	+	vegetation
<i>Alhagi pseudalhagi</i>	Perennial	30–40	R–A	+–1	vegetation



<i>Alyssum desertorum</i>	annual	5–6	R	+	dried
<i>Ammodendron conollyi</i>	Small tree	100–150	R–A	+–1	fruiting
<i>Arnebia decumbens</i>	annual	15–20	R	+	fruiting
<i>Artemisia diffusa</i>	semishrub	35–40	O–D	+–2	vegetation
<i>Astragalus unifoliolatus</i>	dwarf shrub	35–40	R–O	+	fruiting
<i>Astragalus villosissimus</i>	dwarf shrub	35–40	O–A	+–1	fruiting
<i>Atriplex dimorphostegia</i>	annual	10–15	R	+	fruiting
<i>Bassia eriophora</i>	annual	10–15	R	+	fruiting
<i>Bromus tectorum</i>	annual	12–15	O–A	+	dried
<i>Calligonum caput-medusae</i>	shrub	100–150	R–O	+–1	fruiting
<i>Calligonum eriopodum</i>	shrub	150–170	R–O	+	fruiting
<i>Calligonum leucocladum</i>	shrub	100–150	O–D	1–2	fruiting
<i>Calligonum microcarpum</i>	shrub	50–100	O–A	1	fruiting
<i>Calligonum zakirovii</i>	shrub	40–50	R	+	fruiting
<i>Carex physodes</i>	Perennial	12–15	A–D	+–1	flowering
<i>Caroxylon orientale</i> ( <i>Salsola orientalis</i> )	dwarf shrub	35–40	R–O	+	vegetation
<i>Caroxylon scleranthum</i> ( <i>Salsola sclerantha</i> )	annual	20–25	R–O	+	vegetation
<i>Ceratocarpus arenarius</i>	annual	15–20	O–A	+	vegetation
<i>Climacoptera sp.</i>	annual	15–20	R–O	+	vegetation
<i>Convolvulus divaricatus</i>	semishrub	30–45	R–A	+–1	flowering
<i>Convolvulus hamadae</i>	semishrub	30–40	R–A	+–1	flowering
<i>Cousinia hamadae</i>	Perennial	30–35	R–O	+	vegetation
<i>Ephedra strobilacea</i>	shrub	50–150	R–O	+	fruiting
<i>Eremopyrum bonaepartis</i>	annual	10–12	R–O	+	fruiting
<i>Eremopyrum distans</i>	annual	10–12	R–O	+	fruiting
<i>Euphorbia cheirolepis</i>	annual	25–30	R	+	Flowering, fruiting

<i>Euphorbia turczaninowii</i>	annual	10–12	R	+	Flowering, fruiting
<i>Ferula foetida</i>	Perennial	50–60	R–A	+–1	Fruiting, dried
<i>Haplophyllum ramosissimum</i>	Perennial	25–30	R	+	vegetation
<i>Haloxylon ammodendron</i> ( <i>Haloxylon aphyllum</i> )	Small tree	150–200	R–A	+–1	vegetation
<i>Haloxylon persicum</i>	Small tree	150–200	O–D	1–3	vegetation
<i>Heliotropium arguzioides</i>	Perennial	25–30	R–O	+	flowering
<i>Iris songarica</i>	Perennial	30–35	R	+	vegetation
<i>Mausolea eriocarpa</i>	semishrub	45–50	O–A	1	flowering
<i>Oreosalsola arbusculiformis</i> ( <i>Salsola arbusculiformis</i> )	dwarf shrub	50–60	O	+–1	vegetation
<i>Peganum garmala</i>	Perennial	30–35	R–A	+–1	flowering
<i>Poa bulbosa</i>	Perennial	15–17	O	+	dried
<i>Salsola paulsenii</i>	annual	30–35	R	+	vegetation
<i>Sophora pachycarpa</i>	Perennial	20–25	R–A	+–1	flowering
<i>Smirnowia turkestanica</i>	Perennial	30–35	R–O	+	flowering
<i>Stipagrostis karelinii</i>	Perennial	35–45	O	+	vegetation
<i>Stipagrostis pennata</i>	Perennial	30–35	O	+	vegetation
<i>Tortula desertorum</i>	moss	0.3–0.5	O	+	vegetation
<i>Xylosalsola arbuscula</i> ( <i>Salsola arbuscula</i> )	shrub	40–50	R–O	+–1	vegetation
<i>Xylosalsola richteri</i> ( <i>Salsola richteri</i> )	shrub	100–150	R–O	+–1	vegetation





Photo 139. Semi-fixed hilly sands with native stands of saxaul and psammophytic shrubs, 40.31608° N, 64.3448° E



Photo 140. Fixed hilly sands with native stands of saxaul, 40.01175° N, 64.01932° E





Photo 141. Fixed sands with native community of *Calligonum* in surroundings of Karakul, 39.5784° N, 63.87543° E



Photo 142. An overgrazed area with unfixed sands and community of pastoral weeds *Peganum garmala* and *Sophora pachycarpa*, 40.24304° N, 64.28011° E





Photo 143. *Calligonum zakirovii*, nationally red-listed endemic to the south-western Kyzylkum (category 1 – endangered, disappearing species), 40.48764° N, 64.60557° E.

#### 4.4.3. Saline lands and wetlands

Saline lands and wetlands are situated in the ancient delta of the Zeravshan River, in depressions and along several irrigation and discharge channels and collectors of the irrigation system of Bukhara oasis (Agytma and Echkiliksay discharge channels, Northern and Central Bukhara collectors, Gazli channel, Karakuldarya, etc.). The vegetation is represented by tugay and salt marsh communities with halophilic shrubs (*Tamarix sp.*, *Halimodendron halodendron*, *Halostachys belangeriana*, *Lycium ruthenicum*), reeds (*Phragmites australis*, *Typha latifolia*, *T. minima*), camel thorn (*Alhagi pseudalhagi*), saltworts (*Halocnemum strobilaceum*, *Ceratocarpus arenarius*, *Climacoptera sp.*, *Salicornia europaea*, *Salsola paulsenii*, *Suaeda sp.*), other halophytes, halomesophytes and halohydrophytes, as *Limonium otolepis*, *Karelinia caspia*, and pastoral weeds (*Peganum garmala*, *Sophora pachycarpa*). Canopy cover and species composition are variable in different locations (photos 144–149). In total, 43 plant species were recorded for this habitat type (table 56), red-listed plants are absent.

Note: “tugay” (or “tugai”) is a local name of riparian ecosystems occurring in the river valleys of the desert zone of Central Asia.

Table 56. Check-list of plants recorded for saline lands and wetlands

Species	Life form	Height, cm	Abundance		Phenol. Stage
			DAFOR	Braun-Blanquet	
<i>Aeluropus litoralis</i>	Perennial	10–20	O–A	+–1	Vegetation, flowering
<i>Alhagi persarum</i>	Perennial	35–45	O	+	vegetation
<i>Alhagi pseudalhagi</i>	Perennial	35–45	O–D	+–3	vegetation
<i>Artemisia scoparia</i>	Annual, biennial	35–40	R–A	+–1	vegetation

<i>Bassia eriophora</i>	annual	12–15	R–O	+	fruiting
<i>Bromus tectorum</i>	annual	12–15	O–A	+	dried
<i>Caroxylon scleranthum</i> ( <i>Salsola sclerantha</i> )	annual	20–25	R–O	+	vegetation
<i>Ceratocarpus arenarius</i>	annual	10–12	R–A	+–1	vegetation
<i>Climacoptera sp.</i>	Annual	10–15	R–O	+	vegetation
<i>Convolvulus hamadae</i>	semishrub	25–30	R–O	+	flowering
<i>Cousinia resinosa</i>	Perennial	25–30	R–O	+	vegetation
<i>Elaeagnus angustifolia</i>	tree	250–350	R	1	vegetation
<i>Eremopyrum bonaepartis</i>	annual	10–12	R–O	+	fruiting
<i>Eremopyrum distans</i>	annual	10–12	R–O	+	fruiting
<i>Erianthus ravennae</i>	perennial	150–250	R	+	vegetation
<i>Euphorbia granulata</i>	annual	5–10	R–O	+	Flowering, fruiting
<i>Ferula foetida</i>	Perennial	70–100	R–O	+	Fruiting, dried
<i>Glycyrrhiza glabra</i>	Perennial	50–100	R–O	+	Vegetation
<i>Halimocnemis villosa</i>	annual	10–15	R–O	+	vegetation
<i>Halimodendron halodendron</i>	Shrub	70–150	R–O	1–2	vegetation
<i>Halocnemum strobilaceum</i>	semishrub	40–100	R–A	+–1	vegetation
<i>Halostachys belangeriana</i>	Shrub	50–100	R–O	+–1	vegetation
<i>Haloxylon ammodendron</i> ( <i>Haloxylon aphyllum</i> )	Small tree	100–150	R–O	1–2	vegetation
<i>Heliotropium ellipticum</i>	annual	15–20	R–O	+	flowering
<i>Karelinia caspia</i>	Perennial	40–100	R–A	+–1	vegetation
<i>Limonium otolepis</i>	Perennial	35–50	R–A	+–1	flowering
<i>Limonium suffruticosum</i>	semishrub	25–35	R–O	+	vegetation
<i>Lycium ruthenicum</i>	Shrub	50–70	R–A	+–2	flowering
<i>Peganum garmala</i>	Perennial	30–35	R–A	+–1	flowering
<i>Phragmites australis</i>	Perennial	200–400	O–D	1–4	vegetation
<i>Poa bulbosa</i>	Perennial	15–17	O–A	+	dried
<i>Salicornia europaea</i>	annual	10–20	O	+	vegetation



<i>Salsola paulsenii</i>	annual	30–35	R–O	+	vegetation
<i>Sophora pachycarpa</i>	Perennial	20–25	R–A	+–1	flowering
<i>Sphaerophysa salsula</i>	Perennial	30–35	R–O	+	vegetation
<i>Suaeda altissima</i>	annual	25–35	R–O	+	vegetation
<i>Suaeda sp.</i>	Annual	10–20	R–O	+	vegetation
<i>Tamarix hispida</i>	shrub	70–150	R–A	1–2	vegetation
<i>Tamarix laxa</i>	shrub	70–150	R–A	1–2	vegetation
<i>Tamarix ramosissima</i>	shrub	150–200	R–D	+–4	vegetation
<i>Typha latifolia</i>	Perennial	150–200	R–O	+–1	vegetation
<i>Typha minima</i>	Perennial	100–150	R	+	vegetation
<i>Zygophyllum oxianum</i>	Perennial	20–30	R	+	fruiting



Photo 144. Saline wetland and a seasonal lake with tamarisk, reeds and halophytes in a small depression between the “Bash” site and Agytma discharge channel, 40.4746° N, 64.63179° E.





Photo 145. Reeds along the Echkiliksay discharge channel, 40.412075° N, 64.50982° E.



Photo 146. Saline wetland and a seasonal lake with tamarisk, reeds and halophytes in a small depression between the “Bash” site and Agytma discharge channel, 40.4746° N, 64.63179° E.





Photo 147. Sparse tamarisk in saline depression near the collector Karakyr, 40.12676° N, 64.105211° E.



Photo 148. Saline land with community of *Lycium ruthenicum* and camel thorn near the Echkiliksay discharge channel, 40.42561° N, 64.52462° E.





Photo 149. Camel thorn community on saline sands near the Agytma discharge channel (at the border between saline lands and sandy desert, 40.47556° N, 64.59086° E.

#### **4.4.5. Agricultural lands**

This is the anthropogenic agricultural landscape of the ancient Bukhara Oasis situated in the lower course and the ancient delta of Zeravshan River. There are irrigated croplands, saline fallow lands, wastelands, villages, farmsteads, branched irrigation system of numerous channels and collectors, roads, power lines, and other disturbed areas; vegetation is represented by cultural crops (wheat, rice, cotton, vegetables, etc.), weeds (*Cynodon dactylon*, *Descurainia sophia*, *Peganum harmala*, *Sophora pachycarpa*, *Tribulus terrestris*) and small plots of above-mentioned vegetation of saline lands and wetlands (photo 150–151). Canopy cover and species composition are variable in different locations. The check-list of wild growing plant species is almost the same than the previous habitat type (table 57); 42 species were recorded; red-listed plants are absent, and 2 species are alien (*Cynodon dactylon*, *Tribulus terrestris*).

Table 57. Check-list of plants recorded for agricultural lands

Species	Life form	Height, cm	Abundance		Phenol. Stage
			DAFOR	Braun-Blanquet	
<i>Aeluropus litoralis</i>	Perennial	10–20	O–A	+–1	Vegetation, flowering
<i>Alhagi kirghisorum</i>	Perennial	35–45	O–A	+–2	vegetation
<i>Alhagi persarum</i>	Perennial	35–45	O	+	vegetation
<i>Alhagi pseudalhagi</i>	Perennial	35–45	O–D	+–3	vegetation
<i>Artemisia scoparia</i>	Annual, biennial	35–40	R–A	+–1	vegetation
<i>Bromus tectorum</i>	annual	12–15	O–A	+	dried



<i>Ceratocarpus arenarius</i>	annual	10-12	R-A	+–1	vegetation
<i>Climacoptera sp.</i>	Annual	10–15	R-O	+	vegetation
<i>Cousinia resinosa</i>	Perennial	25–30	R-O	+	vegetation
<i>Cynodon dactylon</i>	Perennial	10–15	R-O	+	Vegetation, flowering
<i>Descurainia sophia</i>	annual	20–25	O	+	fruiting
<i>Elaeagnus angustifolia</i>	tree	250–350	R	1	vegetation
<i>Eremopyrum bonaepartis</i>	annual	10–12	R-O	+	fruiting
<i>Eremopyrum distans</i>	annual	10–12	R-O	+	fruiting
<i>Erianthus ravennae</i>	perennial	150–250	R	+	vegetation
<i>Euphorbia granulata</i>	annual	5–10	R-O	+	Flowering, fruiting
<i>Glycyrrhiza glabra</i>	Perennial	50–100	R-O	+	Vegetation
<i>Halimocnemis villosa</i>	annual	10–15	R-O	+	vegetation
<i>Halimodendron halodendron</i>	Shrub	70–150	R-O	1–2	vegetation
<i>Halocnemum strobilaceum</i>	semishrub	40–100	R-A	+–1	vegetation
<i>Halostachys belangeriana</i>	Shrub	50–100	R-O	+–1	vegetation
<i>Haloxylon ammodendron</i> ( <i>Haloxylon aphyllum</i> )	Small tree	50–150	R	+–1	vegetation
<i>Heliotropium ellipticum</i>	annual	15–20	R-O	+	flowering
<i>Karelinia caspia</i>	Perennial	40–100	R-A	+–1	vegetation
<i>Limonium otolepis</i>	Perennial	35–50	R-A	+–1	flowering
<i>Lycium ruthenicum</i>	Shrub	50–70	R-A	+–2	flowering
<i>Peganum garmala</i>	Perennial	30–35	R-A	+–1	flowering
<i>Phragmites australis</i>	Perennial	200–400	O-D	1–4	vegetation
<i>Poa bulbosa</i>	Perennial	15–17	O-A	+	dried
<i>Populus pruinosa</i>	tree	400–600	R-O	1–2	Vegetation, fruiting
<i>Salicornia europaea</i>	annual	10–20	O	+	vegetation
<i>Salsola paulsenii</i>	annual	30–35	R-O	+	vegetation
<i>Sophora pachycarpa</i>	Perennial	20–25	R-A	+–1	flowering
<i>Suaeda altissima</i>	annual	25–35	R-O	+	vegetation
<i>Suaeda sp.</i>	Annual	10–20	R-O	+	vegetation
<i>Tamarix hispida</i>	shrub	70–150	R-A	1–2	vegetation

<i>Tamarix laxa</i>	shrub	70–150	R–A	1–2	vegetation
<i>Tamarix ramosissima</i>	shrub	150–200	R–D	+–4	vegetation
<i>Tribulus terrestris</i>	annual	10–20	R–O	+	Vegetation, flowering
<i>Typha latifolia</i>	Perennial	150–200	R–O	+–1	vegetation
<i>Typha minima</i>	Perennial	100–150	R–O	+	vegetation
<i>Zygophyllum oxianum</i>	Perennial	20–30	R–O	+	fruiting



Photo 150. Rice fields, 40.04997° N, 64.63179° E.





Photo 151. Saline fallow lands, 40.4215° N, 64.50701° E.

## 5. Conclusion

Results of the field surveys conducted in both project sites in springtime (April) and early summer (middle May and middle June) showed that the species composition has been identified almost completely during the first survey. The main difference between data of springtime and summer surveys is that all ephemers and ephemeroïds completed their vegetation and dried, so their abundance and coverage decreased. Some representatives of Amarantaceae family (Climacoptera, Suaeda) were identified only at generic level, because the correct identification of these plants is possible at the flowering or fruiting stage (second half of August to October).

It has been found that the vegetation of the project zone, including “Bash” and “Dzhankeldy” sites, and an area between these sites along the planned power line, is represented with native ephemeroïd-sagebrush, saltwort-sagebrush, saltwort-ephemeroïd-sagebrush and saltwort plant communities on sandy, sandy-loamy and skeleton grey-brown desert soils, with sparse halophilous and gypsophilous vegetation on saline depressions and outcrops of variegated beds, with psammophilous shrubs on fixed and semi-fixed sands, and sometimes with saxaul plantations created in the past for fixation of sands and combat soil deflation. The vegetation of the project zone is typical for South-western Kyzylkum (and for the desert zone of Central Asia). The field survey showed that the draft maps of habitats created on the basis of proxy data are generally correct, and only some adjustments are necessary.

Plant communities of the project zone are characterized with sparse canopy cover, low species diversity and low to medium level of anthropogenic disturbance. The canopy cover is 20–40% on most areas, less than 10% (sometimes almost 0%) on saline depressions, takyrs and outcrops of variegated beds, and up to 40–50% for communities of psammophilous shrubs or saxaul stands.

A total check-list of vascular plants were recorded within the project site “Bash” during the field surveys includes 49 species (Annex 1); 85 species were recorded within the “Dzhankeldy” site (Annex 2), 52 species – along the planned power line “Bash-Dzhankeldy” (Annex 3), and 76 species – along the “Bash-Karakul” line (Annex 4). Among them, 4 species are nationally red-listed. *Calligonum zakirovii*, an endemic to south-western Kyzylkum and national endemic, is included in the Red Data Book of Uzbekistan (2019) with the status 1 (endangered, disappearing species). *Acanthophyllum cyrtostegium*, *Ferula kyzylkumica* and *Tulipa lehmanniana* are included in the Red Data Book of Uzbekistan (2019) with the status 3 (reducing). Among them, 3 species are endemics with restricted range (*Acanthophyllum cyrtostegium*, *Calligonum zakirovii*, *Ferula kyzylkumica*).

Nationally red-listed *Tulipa lehmanniana* occurs sporadically within two project sites and along the planned power line “Bash-Dzhankeldy”; its relative abundance according the DAFOR scale is R (rare) to O (occasional), population density varies from solitary specimens to 900–1000 per 1 hectare. Due to the dry weather conditions of last winter and this spring, mainly pre-generative and non-flowering generative specimens of this tulip were observed; the number of flowering specimens is very low. *Tulipa lehmanniana* included in the Red Data Book of Uzbekistan (2019) with the status 3 (vulnerable, reducing), it is nationally red-listed also in Kazakhstan, Tajikistan and Turkmenistan, and not evaluated in the IUCN Red List. The main threats are overgrazing, habitat loss, collection of flowers and bulbs. This species is quite widely spread in the desert zone of Irano-Turanian region of Tethyan (Ancient Mediterranean) floristic subkingdom of Holarctic (Takhtajan, 1986), and it grows in Uzbekistan, Kazakhstan, Tajikistan, Turkmenistan, Afghanistan, Pakistan, and Iran. Recent field studies (Abduraimov, 2017; Shomurodov & al., 2018) showed that large populations with thousands of specimens grow in the Uzbek part of the Kyzylkum desert. Tojibaev &



Beshko (2015) noted that this species can be assessed as Least Concern (LC) by the IUCN Red List Categories and Criteria (IUCN, 2012).

Another plant listed in the Red Data Book of Uzbekistan (2019) with the category 3 (reducing), *Ferula kyzylkumica*, is endemic to the relic mountains of Kyzylkum with a disjunction in the Nuratau Mountains, and national endemic. This species also is widely spread in the Kuldzhuktau Mountains; solitary specimens and populations of 50–100 individuals occur sporadically on stony slopes and foothills within and between survey plots in “Dzhankeldy” project site.

Nationally red-listed endemic to south-western Kyzylkum and Zirabulak-Ziadin Mountains, *Acanthophyllum cyrtostegium*, occurs sporadically in the piedmont plains and foothills of Kuldzhuktau, solitary or in small groups, the population density is up to 40–50 individuals per 1 hectare.

As for *Calligonum zakirovii*, only several small populations were found in “Dzhankeldy” project site and along the “Bash-Dzhankeldy” power line during the field studies.

Three species (*Cousinia sogdiana*, *Eremurus korolkowii* and *Tulipa sogdiana*) are endemic to Central Asian deserts, which previously were included in the Red Data Book of Uzbekistan, but on the basis of field surveys performed during the last 20 years they have been removed from the national Red Data Book. Among them, endemic to relic mountains of Kyzylkum *Eremurus korolkowii* has most restricted range and habitat.

None of these nationally red-listed or endemic plants were evaluated in the IUCN Red List.

Other threatened or endemic species known for the study area from literature (see Chapter 2.2 above) were not recorded during our field surveys in 2021, but can potentially be found with more detailed studies in the future. Taking into account the published and field data, the insular mountains Kuldzhuktau (and “Dzhankeldy” project site in particular) meets the critical habitat criteria 1 and 2 as a habitat of several nationally red-listed and restricted range endemic plant species (Annex 5).

Within the whole project area, anthropogenically transformed ecosystems are mainly concentrated along the “Bash-Karakul” power line; there are irrigated croplands, fallow lands, wastelands, villages, farmsteads, irrigation systems, roads, power lines, and other infrastructure; vegetation is represented by cultural crops, weeds and small plots of vegetation of saline lands and wetlands.

At the present, the human impact within the “Bash” and “Dzhankeldy” sites and along the “Bash-Dzhankeldy” power line is connected mainly with economical activities of local people inhabiting several small villages and farmsteads (use of rangelands and ground roads). *Peganum harmala*, a plant species which is an indicator of overgrazing and degradation of pastures, has been found in all natural habitats and majority of survey plots, but its abundance is low. Within the “Navoi-Bah” site, we did not observe dense thickets of *Peganum harmala* typical for degraded rangelands of arid zone of Uzbekistan, but in “Dzhankeldy” site and along the power lines these thickets occur around settlements, farmsteads and wells. As for invasive alien plants, these were not recorded during our field surveys in “Bash” and “Dzhankeldy” sites and along “Bash-Dzhankeldy” power line, and 2 alien weeds (*Cynodon dactylon* and *Tribulus terrestris*) were found along the “Bash-Karakul” power line, in anthropogenic landscapes.

Technologically disturbed areas occupy very small part of the “Bash” project site in a narrow strip along the railway and underground gas pipeline. Small disturbed areas (construction sites or quarries about 250x150 and 350x250 m in size) with almost completely exterminated vegetation are located also in the south-eastern part of this project site. In “Dzhankeldy” site, the impact of mining operations is more expressed (there are numerous active and abandoned mines and quarries, geological exploration is underway at the present). Such technogenically disturbed areas in the Kyzylkum desert,

as well as overgrazed territories around farms, wells and villages, usually become centers of erosion which can lead to the formation of moving sands.

*Table 58. Summary table*

SPECIES	ABUNDANCE ON SITE (RARE/OCCASIONAL/FREQUENT/DOMINANT)	RANGE (ENDEMIC / REGIONAL / TRANSCONTINENTAL)	IUCN /RDB STATUS
<b>“Bash WF” site</b>			
Tulipa lehmanniana Merckl.	Occasional to Rare	Regional	Not Evaluated (NE) / UzbRDB 3 (vulnerable, declining species)
<b>“Dzhankeldy WF” site</b>			
Acanthophyllum cyrtostegium Vved.	Rare	Endemic	Not Evaluated (NE) / UzbRDB 3 (vulnerable, declining species)
Calligonum zakirovii (Khalk.) Czerep.	Rare	Endemic	Not Evaluated (NE) / UzbRDB 1 (endangered species)
Eremurus korolkowii Regel (see note below)	Occasional to Rare	Endemic	Not Evaluated (NE) / UzbRDB 2 (rare species) in former editions, currently excluded
Ferula kyzylkumica Korovin	Occasional to Rare	Endemic	Not Evaluated (NE) / UzbRDB 3 (vulnerable, declining species)
Tulipa lehmanniana Merckl.	Occasional to Rare	Regional	Not Evaluated (NE) / UzbRDB 3 (vulnerable, declining species)
<b>OHTL segment 1 (“Bash WF – Dzhankeldy WF”)</b>			
Acanthophyllum cyrtostegium Vved.	Rare	Endemic	Not Evaluated (NE) / UzbRDB 3 (vulnerable, declining species)
Calligonum zakirovii (Khalk.) Czerep.	Rare	Endemic	Not Evaluated (NE) / UzbRDB 1 (endangered species)
Tulipa lehmanniana Merckl.	Occasional to Rare	Regional	Not Evaluated (NE) / UzbRDB 3 (vulnerable, declining species)
<b>OHTL segment 2 (“Bash WF – Karakul sub-station”)</b>			
Calligonum zakirovii (Khalk.) Czerep.	Rare	Endemic	Not Evaluated (NE) / UzbRDB 1 (endangered species)

*Note: In the international taxonomic databases, Eremurus korolkowii currently treated as a synonym of Eremurus anisopterus (assessed as LC by IUCN). But experts in Central Asian flora do not support this point of view and consider these plants as two separated species, which morphologically and ecologically well differ from each other. Additional molecular-genetic studies are needed.*



	NAME OF SPECIES		IUCN /RDB STATUS	ABUNDANCE/ DENSITY
	LATIN	ENGLISH		
1	<i>Acanthophyllum cyrtostegium</i> Vved.	-	Not Evaluated (NE) / UzbRDB 3 (vulnerable, declining species)	Rare / up to 40–50 individuals per 1 hectare
2	<i>Calligonum zakirovii</i> (Khalk.) Czerep.	Zakirov's calligonum	Not Evaluated (NE) / UzbRDB 1 (endangered species)	Rare / density varies from solitary plants to 30–40 per 1 hectare
3	<i>Eremurus korolkowii</i> Regel	Korolkow's desert-candle	Not Evaluated (NE) / UzbRDB 2 (rare species) in former editions, currently excluded	Occasional to Rare / density varies from solitary plants to 100–150 per 1 hectare
4	<i>Ferula kyzylkumica</i> Korovin	Kyzylkum's ferula	Not Evaluated (NE) / UzbRDB 3 (vulnerable, declining species)	Occasional to Rare / density varies from solitary plants to 50–100 per 1 hectare
5	<i>Tulipa lehmanniana</i> Merckl.	Lehmann's tulip	Not Evaluated (NE) / UzbRDB 3 (vulnerable, declining species)	Occasional to Rare / density varies from solitary plants to 900–1000 per 1 hectare

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### Annex 1. A check-list of plants recorded in “Bash” site

Plant species	Life form	Family	Abundance	Habitat
1. <i>Acanthophyllum elatius</i>	Perennial	Caryophyllaceae	O–R	Sandy and sandy-loamy desert plain, fixed and semi-fixed sands, relic hills
2. <i>Alhagi pseudalhagi</i>	Perennial	Fabaceae	O–R	Fixed and semi-fixed sands
3. <i>Alyssum desertorum</i>	annual	Brassicaceae	O–R	Sandy and sandy-loamy desert plain, fixed and semi-fixed sands, relic hills
4. <i>Artemisia diffusa</i>	semishrub	Asteraceae	D–A	All natural habitats and all survey plots
5. <i>Atraphaxis spinosa</i>	shrub	Polygonaceae	R	Cliffs and eroded slopes of saline depression
6. <i>Astragalus ammotrophus</i>	perennial	Fabaceae	R	Cliffs and eroded slopes of saline depression
7. <i>Astragalus chiwensis</i>	perennial	Fabaceae	R	Fixed and semi-fixed sands (B067, B068)
8. <i>Astragalus flexus</i>	perennial	Fabaceae	R	Sandy and sandy-loamy desert plain, fixed and semi-fixed sands
9. <i>Astragalus rubromarginatus</i>	perennial	Fabaceae	R	Sandy and sandy-loamy desert plain, fixed and semi-fixed sands
10. <i>Astragalus villosissimus</i>	dwarf shrub	Fabaceae	A–R	All natural habitats and majority of survey plots
11. <i>Bassia prostrata</i> ( <i>Kochia prostrata</i> )	semishrub	Amaranthaceae	R	Sandy and sandy-loamy desert plain, cliffs and eroded slopes of saline depression
12. <i>Bromus tectorum</i>	annual	Poaceae	O	Sandy and sandy-loamy desert plain, fixed and semi-fixed sands
13. <i>Calligonum leucocladum</i>	shrub	Polygonaceae	A–R	Fixed and semi-fixed sands
14. <i>Calligonum microcarpum</i>	shrub	Polygonaceae	A–R	Sandy and sandy-loamy desert plain, fixed and semi-fixed sands
15. <i>Carex physodes</i>	Perennial	Cyperaceae	D–A	Sandy and sandy-loamy desert plain, fixed and semi-fixed sands
16. <i>Carex subphysodes</i>	Perennial	Cyperaceae	A–O	Sandy and sandy-loamy desert plain, cliffs and eroded

				slopes of saline depression, relic hills
17. <i>Caroxylon orientale</i> ( <i>Salsola orientalis</i> )	dwarf shrub	Amaranthaceae	D-R	All natural habitats and all survey plots
18. <i>Caroxylon scleranthum</i> ( <i>Salsola sclerantha</i> )	annual	Amaranthaceae	R	Sandy and sandy-loamy desert plain, fixed and semi-fixed sands
19. <i>Ceratocarpus arenarius</i>	annual	Amaranthaceae	R	All natural habitats and majority of survey plots
20. <i>Ceratocephala falcata</i>	annual	Ranunculaceae	O-R	Sandy and sandy-loamy desert plain, fixed and semi-fixed sands
21. <i>Climacoptera</i> sp.	Annual	Amaranthaceae	R	Sandy and sandy-loamy desert plain, cliffs and eroded slopes of saline depression
22. <i>Convolvulus divaricatus</i>	semishrub	Convolvulaceae	O-R	fixed and semi-fixed sands, relic hills
23. <i>Convolvulus hamadae</i>	semishrub	Convolvulaceae	A-R	All natural habitats and majority of survey plots
24. <i>Cousinia hamadae</i>	perennial	Asteraceae	R	All natural habitats and majority of survey plots
25. <i>Cousinia sogdiana</i>	biennial	Asteraceae	R	fixed and semi-fixed sands
26. <i>Cousinia resinosa</i>	perennial	Asteraceae	R	Sandy and sandy-loamy desert plain (B036, B037)
27. <i>Ferula foetida</i>	Perennial, ephemeroid	Apiaceae	D-R	All natural habitats and majority of survey plots
28. <i>Halothamnus subaphyllus</i>	semishrub	Amaranthaceae	R	Sandy and sandy-loamy desert plain, relic hills
29. <i>Haloxylon persicum</i>	Small tree	Amaranthaceae	A-D	fixed and semi-fixed sands
30. <i>Heliotropium arguzioides</i>	Perennial	Boraginaceae	R	fixed and semi-fixed sands
31. <i>Holosteum umbellatum</i>	annual	Caryophyllaceae	O-R	Sandy and sandy-loamy desert plain, cliffs and eroded slopes of saline depression, relic hills
32. <i>Hypecoum pendulum</i>	annual	Papaveraceae	O-R	Sandy and sandy-loamy desert plain, fixed and semi-fixed sands
33. <i>Iris falcifolia</i>	Perennial	Iridaceae	R	cliffs and eroded slopes of saline depression



34. <i>Iris longiscapa</i>	Perennial	Iridaceae	R	Sandy and sandy-loamy desert plain, fixed and semi-fixed sands
35. <i>Iris songarica</i>	Perennial	Iridaceae	A-R	All natural habitats and majority of survey plots
36. <i>Ixiolirion tataricum</i>	Perennial, ephemeroid	Ixioliriaceae	R	Sandy and sandy-loamy desert plain, relic hills
37. <i>Mausolea eriocarpa</i>	semishrub	Asteraceae	O	fixed and semi-fixed sands
38. <i>Oreosalsola arbusculiformis</i> ( <i>Salsola arbusculiformis</i> )	dwarf shrub	Amaranthaceae	A-R	Sandy and sandy-loamy desert plain, cliffs and eroded slopes of saline depression, relic hills
39. <i>Peganum harmala</i> <b>Indicator of overgrazing</b>	Perennial	Nitrariaceae	R	All natural habitats and majority of survey plots
40. <i>Phlomis desertotum</i>	Perennial	Lamiaceae	R	Sandy and sandy-loamy desert plain, fixed and semi-fixed sands, relic hills
41. <i>Poa bulbosa</i>	Perennial	Poaceae	A-O	All natural habitats and all survey plots
42. <i>Salsola paulsenii</i>	annual	Amaranthaceae	R	Sandy and sandy-loamy desert plain, fixed and semi-fixed sands
43. <i>Sophora pachycarpa</i>	Perennial	Fabaceae	R	fixed and semi-fixed sands (B005, B006)
44. <i>Stipagrostis pennata</i>	Perennial	Poaceae	O-R	fixed and semi-fixed sands
45. <i>Streptoloma desertorum</i>	annual	Brassicaceae	R	Sandy and sandy-loamy desert plain
46. <i>Tulipa lehmanniana</i> <b>Nationally red-listed (status 3 – reducing species)</b>	Perennial	Liliaceae	O-R	All natural habitats and majority of survey plots
47. <i>Tulipa sogdiana</i>	Perennial	Liliaceae	R	Sandy and sandy-loamy desert plain, cliffs and eroded slopes of saline depression, relic hills
48. <i>Xylosalsola arbuscula</i> ( <i>Salsola arbuscula</i> .)	Shrub	Amaranthaceae	A-R	Sandy and sandy-loamy desert plain, fixed and semi-fixed sands
49. <i>Zygophyllum macrophyllum</i>	Perennial	Zygophyllaceae	R	Sandy and sandy-loamy desert plain, cliffs and eroded slopes of saline depression

**Annex 2. A check-list of plants recorded in the “Dzhankeldy” site during the field survey in 2021**

Plant species	Life form	Family	Abundance	Habitat
1. <i>Acanthophyllum cyrtostegium</i> <b>Nationally red-listed (status 3 – reducing species), national endemic</b>	Perennial	Caryophyllaceae	R	Weakly inclined piedmont plain and foothills
2. <i>Acanthophyllum elatius</i>	Perennial	Caryophyllaceae	R	weakly inclined piedmont plain
3. <i>Alhagi pseudalhagi</i>	Perennial	Fabaceae	R–O	Anthropogenic disturbed areas
4. <i>Allium griffithianum</i>	perennial	Amaryllidaceae	R	Foothills, stony slopes
5. <i>Allium karakense</i>	perennial	Amaryllidaceae	R	Stony slopes
6. <i>Allium protensum</i>	perennial	Amaryllidaceae	R	All habitats, except for anthropogenic
7. <i>Allium sabulosum</i>	perennial	Amaryllidaceae	R	Foothills, stony slopes
8. <i>Alyssum desertorum</i>	annual	Brassicaceae	R–O	All habitats
9. <i>Alyssum linifolium</i> ( <i>Meniocus linifolius</i> )	annual	Brassicaceae	R–O	Foothills, stony slopes
10. <i>Ammodendron conollyi</i>	Small tree	Fabaceae	R	weakly inclined piedmont plain, foothills
11. <i>Anabasis eriopoda</i>	semishrub	Amaranthaceae	R	All habitats, except for anthropogenic
12. <i>Anabasis turkestanica</i>	semishrub	Amaranthaceae	R	weakly inclined piedmont plain, foothills, outcrops of variegated beds
13. <i>Arnebia decumbens</i>	annual	Boraginaceae	R	All habitats, except for anthropogenic
14. <i>Artemisia diffusa</i>	semishrub	Asteraceae	A–D	All habitats, except for anthropogenic and outcrops of variegated beds
15. <i>Artemisia juncea</i>	semishrub	Asteraceae	R–O	Foothills, stony slopes
16. <i>Artemisia scoparia</i>	Annual, biennial	Asteraceae	A–D	All habitats
17. <i>Artemisia turanica</i>	semishrub	Asteraceae	O–D	All habitats
18. <i>Astragalus ammotrophus</i>	perennial	Fabaceae	R	All habitats, except for anthropogenic
19. <i>Astragalus villosissimus</i>	dwarf shrub	Fabaceae	A–R	All habitats, except for anthropogenic
20. <i>Atraphaxis spinosa</i>	shrub	Polygonaceae	R	All habitats, except for anthropogenic



21. <i>Bassia eriophora</i>	annual	Amaranthaceae	O	outcrops of variegated beds
22. <i>Bassia prostrata</i> ( <i>Kochia prostrata</i> )	semishrub	Amaranthaceae	R	Foothills, outcrops of variegated beds
23. <i>Bromus tectorum</i>	annual	Poaceae	R–O	All habitats
24. <i>Calligonum leucocladum</i>	shrub	Polygonaceae	A–R	weakly inclined piedmont plain
25. <i>Calligonum microcarpum</i>	shrub	Polygonaceae	A–R	weakly inclined piedmont plain
26. <i>Calligonum zakirovii</i> <b>Nationally red-listed (status 1 – endangered species), national endemic</b>	shrub	Polygonaceae	R	weakly inclined piedmont plain, outcrops of variegated beds
27. <i>Carex pachystylis</i>	Perennial	Cyperaceae	D–A	All habitats, except for anthropogenic
28. <i>Carex subphysodes</i>	Perennial	Cyperaceae	D–O	weakly inclined piedmont plain
29. <i>Carex physodes</i>	Perennial	Cyperaceae	O	weakly inclined piedmont plain
30. <i>Caroxylon gemmascens</i> ( <i>Salsola gemmascens</i> )	dwarf shrub	Amaranthaceae	O–R	All habitats, except for anthropogenic
31. <i>Caroxylon orientale</i> ( <i>Salsola orientalis</i> )	dwarf shrub	Amaranthaceae	A–R	All habitats, except for anthropogenic
32. <i>Caroxylon scleranthum</i> ( <i>Salsola sclerantha</i> )	annual	Amaranthaceae	R–O	All habitats, except for anthropogenic
33. <i>Ceratocarpus arenarius</i>	annual	Amaranthaceae	R	All habitats
34. <i>Ceratocephala falcata</i>	annual	Ranunculaceae	O–R	All habitats
35. <i>Climacoptera</i> sp.	Annual	Amaranthaceae	R	All habitats, except for anthropogenic
36. <i>Convolvulus divaricatus</i>	semishrub	Convolvulaceae	O–R	weakly inclined piedmont plain
37. <i>Convolvulus hamadae</i>	semishrub	Convolvulaceae	A–R	All habitats, except for anthropogenic
38. <i>Cousinia hamadae</i>	perennial	Asteraceae	R–O	All habitats, except for anthropogenic
39. <i>Eminium lehmannii</i>	perennial	Araceae	R	Foothills, stony slopes
40. <i>Ephedra intermedia</i>	shrub	Ephedraceae	R–O	Foothills, stony slopes
41. <i>Eremopyrum bonaepartis</i>	annual	Poaceae	R–O	All habitats
42. <i>Eremopyrum distans</i>	annual	Poaceae	R–O	All habitats
43. <i>Ferula foetida</i>	Perennial, ephemeroi d	Apiaceae	A–R	All habitats
44. <i>Ferula kyzylkumica</i>	perennial	Apiaceae	A–R	Stony slopes

<b>Nationally red-listed (status 3 – reducing species), national endemic</b>				
45. <i>Fritillaria karelinii</i>	Perennial	Liliaceae	R	Foothills, stony slopes
46. <i>Gagea afghanica</i>	Perennial	Liliaceae	R	Foothills, stony slopes
47. <i>Gagea bergii</i>	Perennial	Liliaceae	R	Foothills, stony slopes
48. <i>Halimocnemis gamocarpa</i>	annual	Amaranthaceae	R	Foothills, stony slopes, outcrops of variegated beds
49. <i>Halimocnemis latifolia</i>	annual	Amaranthaceae	R	Foothills, stony slopes, outcrops of variegated beds
50. <i>Halimocnemis villosa</i>	annual	Amaranthaceae	R–O	Foothills, outcrops of variegated beds
51. <i>Halimodendron halodendron</i>	Shrub	Fabaceae	R	Foothills, outcrops of variegated beds, anthropogenic habitats
52. <i>Haloxylon ammodendron</i> ( <i>Haloxylon aphyllum</i> )	Small tree	Amaranthaceae	R–A	All habitats
53. <i>Haplophyllum bungei</i>	perennial	Rutaceae	R	Foothills, outcrops of variegated beds
54. <i>Haplophyllum robustum</i>	perennial	Rutaceae	R	All habitats, except for anthropogenic
55. <i>Heliotropium arguzioides</i>	Perennial	Boraginaceae	R	weakly inclined piedmont plain
56. <i>Holosteum umbellatum</i>	annual	Caryophyllaceae	R	Foothills, stony slopes
57. <i>Hypecoum pendulum</i>	annual	Papaveraceae	R	foothills, stony slopes
58. <i>Iris longiscapa</i>	Perennial	Iridaceae	R	Foothills, stony slopes, outcrops of variegated beds
59. <i>Iris songarica</i>	Perennial	Iridaceae	R–O	weakly inclined piedmont plain, foothills
60. <i>Isatis minima</i>	annual	Brassicaceae	R	stony slopes
61. <i>Koelpinia linearis</i>	annual	Asteraceae	R	All habitats
62. <i>Krascheninnikovia ceratoides</i>	semishrub	Amaranthaceae	R–O	stony slopes
63. <i>Lactuca orientalis</i>	semishrub	Asteraceae	R	All habitats, except for anthropogenic
64. <i>Leontice inserta</i>	perennial	Berberidaceae	R	Stony slopes, outcrops of variegated beds



65. <i>Leptaleum filifolium</i>	annual	Brassicaceae	R–O	foothills, stony slopes
66. <i>Lycium ruthenicum</i>	Shrub	Solanaceae	R–O	All habitats, except for anthropogenic
67. <i>Nanophyton erinaceum</i>	semishrub	Amaranthaceae	R–O	All habitats, except for anthropogenic
68. <i>Oreosalsola arbusculiformis</i> ( <i>Salsola arbusculiformis</i> )	dwarf shrub	Amaranthaceae	D–O	All habitats, except for anthropogenic
69. <i>Peganum harmala</i> <b>Indicator of overgrazing</b>	Perennial	Nitrariaceae	R–A	All habitats
70. <i>Poa bulbosa</i>	Perennial	Poaceae	A–O	All habitats
71. <i>Rheum turkestanicum</i>	Perennial	Polygonaceae	R–O	Stony slopes
72. <i>Salsola paulsenii</i>	annual	Amaranthaceae	R	All habitats
73. <i>Scorzonera gageoides</i>	perennial	Asteraceae	R	foothills, stony slopes
74. <i>Scrophularia leucoclada</i>	semishrub		R–O	All habitats, except for anthropogenic
75. <i>Smirnowia turkestanica</i>	Perennial	Fabaceae	R–O	weakly inclined piedmont plain
76. <i>Stipa hohenackeriana</i>	Perennial	Poaceae	R	foothills, stony slopes
77. <i>Takhtajaniantha pusilla</i> ( <i>Scorzonera pusilla</i> )	Perennial	Asteraceae	R	All habitats, except for anthropogenic
78. <i>Tamarix hispida</i>	shrub	Tamaricaceae	R–O	Anthropogenic habitats
79. <i>Tamarix laxa</i>	shrub	Tamaricaceae	R–O	All habitats
80. <i>Tulipa lehmanniana</i> <b>Nationally red-listed (status 3 – reducing species)</b>	Perennial	Liliaceae	R–O	All habitats, except for anthropogenic
81. <i>Tulipa sogdiana</i>	Perennial	Liliaceae	R	All habitats, except for anthropogenic
82. <i>Xylosalsola arbuscula</i> ( <i>Salsola arbuscula</i> .)	Shrub	Amaranthaceae	O–R	weakly inclined piedmont plain
83. <i>Ziziphora tenuior</i>	annual	Lamiaceae	R	All habitats, except for anthropogenic
84. <i>Zygophyllum macrophyllum</i>	Perennial	Zygophyllaceae	R	All habitats, except for anthropogenic
85. <i>Zygophyllum miniatum</i>	Perennial	Zygophyllaceae	R	All habitats, except for anthropogenic

**Annex 3. A check-list of plants recorded along the planned power line “Bash-Dzhankeldy” during the field survey in 2021**

Plant species	Life form	Family	Abundance	Habitat
1. <i>Acanthophyllum cyrtostegium</i> <b>Nationally red-listed (status 3 – reducing species), national endemic</b>	Perennial	Caryophyllaceae	R	Weakly inclined piedmont plain and foothills of relic low mountains
2. <i>Acanthophyllum elatius</i>	Perennial	Caryophyllaceae	R–O	Sandy and sandy-loamy desert plain, fixed and semi-fixed sands, weakly inclined piedmont plain
3. <i>Alhagi pseudalhagi</i>	Perennial	Fabaceae	R–O	Fixed and semi-fixed sands, saline depressions and takyrs
4. <i>Alyssum desertorum</i>	annual	Brassicaceae	R	Sandy and sandy-loamy desert plain, fixed and semi-fixed sands, weakly inclined piedmont plain
5. <i>Ammodendron conollyi</i>	Small tree	Fabaceae	R–A	fixed and semi-fixed sands
6. <i>Anabasis eriopoda</i>	semishrub	Amaranthaceae	R	eroded foothills with outcrops of variegated beds, saline depressions and takyrs
7. <i>Anabasis turkestanica</i>	semishrub	Amaranthaceae	R	eroded foothills with outcrops of variegated beds, saline depressions and takyrs
8. <i>Arnebia decumbens</i>	annual	Boraginaceae	R	fixed and semi-fixed sands, weakly inclined piedmont plain, eroded foothills with outcrops of variegated beds
9. <i>Artemisia diffusa</i>	semishrub	Asteraceae	A–D	All habitats, except for saline depressions and takyrs
10. <i>Artemisia turanica</i>	semishrub	Asteraceae	O–A	weakly inclined piedmont plain,



				eroded foothills with outcrops of variegated beds, saline depressions
11. <i>Astragalus flexus</i>	perennial	Fabaceae	R	fixed and semi-fixed sands
12. <i>Astragalus villosissimus</i>	dwarf shrub	Fabaceae	A–R	All habitats, except for saline depressions and takys
13. <i>Bassia eriophora</i>	annual	Amaranthaceae	O	Fixed and semi-fixed sands, saline depressions and takys
14. <i>Bassia prostrata</i> ( <i>Kochia prostrata</i> )	semishrub	Amaranthaceae	R	eroded foothills with outcrops of variegated beds
15. <i>Bromus tectorum</i>	annual	Poaceae	R–O	All habitats, except for saline depressions and takys
16. <i>Calligonum leucocladum</i>	shrub	Polygonaceae	A–R	Sandy desert plain, fixed and semi-fixed sands, weakly inclined piedmont plain
17. <i>Calligonum microcarpum</i>	shrub	Polygonaceae	A–R	Sandy and sandy-loamy desert plain, fixed and semi-fixed sands, weakly inclined piedmont plain
18. <i>Calligonum zakirovii</i> <b>Nationally red-listed (status 1 – endangered species), national endemic</b>	shrub	Polygonaceae	R	weakly inclined piedmont plain
19. <i>Carex physodes</i>	Perennial	Cyperaceae	D–A	Sandy desert plain, fixed and semi-fixed sands
20. <i>Carex subphysodes</i>	Perennial	Cyperaceae	D–O	Sandy and sandy-loamy desert plain, weakly inclined piedmont plain
21. <i>Caroxylon orientale</i> ( <i>Salsola orientalis</i> )	dwarf shrub	Amaranthaceae	A–R	All habitats
22. <i>Caroxylon scleranthum</i> ( <i>Salsola sclerantha</i> )	annual	Amaranthaceae	R	weakly inclined piedmont plain, eroded foothills with outcrops of variegated beds,

				saline depressions and takyrs
23. <i>Ceratocarpus arenarius</i>	annual	Amaranthaceae	R	All habitats
24. <i>Climacoptera sp.</i>	annual	Amaranthaceae	R	eroded foothills with outcrops of variegated beds, saline depressions and takyrs
25. <i>Convolvulus divaricatus</i>	semishrub	Convolvulaceae	O-R	fixed and semi-fixed sands
26. <i>Convolvulus hamadae</i>	semishrub	Convolvulaceae	A-R	All habitats
27. <i>Cousinia hamadae</i>	perennial	Asteraceae	R-O	All habitats
28. <i>Eremopyrum bonaepartis</i>	annual	Poaceae	R-O	fixed and semi-fixed sands, weakly inclined piedmont plain, eroded foothills with outcrops of variegated beds, saline depressions and takyrs
29. <i>Eremopyrum distans</i>	annual	Poaceae	R-O	fixed and semi-fixed sands, weakly inclined piedmont plain, eroded foothills with outcrops of variegated beds, saline depressions and takyrs
30. <i>Euphorbia turczaninowii</i>	annual	Euphorbiaceae	R	fixed and semi-fixed sands
31. <i>Ferula foetida</i>	Perennial, ephemeroi d	Apiaceae	A-R	All habitats
32. <i>Halimocnemis villosa</i>	annual	Amaranthaceae	R-O	eroded foothills with outcrops of variegated beds, saline depressions and takyrs
33. <i>Halimodendron halodendron</i>	Shrub	Fabaceae	R	saline depressions and takyrs
34. <i>Haloxylon ammodendron (Haloxylon aphyllum)</i>	Small tree	Amaranthaceae	R-A	All habitats
35. <i>Haloxylon persicum</i>	Small tree	Amaranthaceae	A-D	fixed and semi-fixed sands
36. <i>Haplophyllum bungei</i>	perennial	Rutaceae	R	eroded foothills with outcrops of variegated beds



37. <i>Haplophyllum ramosissimum</i>	Perennial	Rutaceae	R	fixed and semi-fixed sands
38. <i>Haplophyllum robustum</i>	perennial	Rutaceae	R	eroded foothills with outcrops of variegated beds
39. <i>Heliotropium arguzioides</i>	Perennial	Boraginaceae	R–O	fixed and semi-fixed sands
40. <i>Iris songarica</i>	Perennial	Iridaceae	A–R	Sandy and sandy-loamy desert plain, fixed and semi-fixed sands
41. <i>Lycium ruthenicum</i>	Shrub	Solanaceae	R–O	saline depressions and takyr
42. <i>Mausolea eriocarpa</i>	semishrub	Asteraceae	O–A	fixed and semi-fixed sands
43. <i>Oreosalsola arbusculiformis</i> ( <i>Salsola arbusculiformis</i> )	dwarf shrub	Amaranthaceae	A–R	fixed and semi-fixed sands, weakly inclined piedmont plain, eroded foothills with outcrops of variegated beds, saline depressions and takyr
44. <i>Peganum harmala</i> <b>Indicator of overgrazing</b>	Perennial	Nitrariaceae	R–O	All habitats
45. <i>Poa bulbosa</i>	Perennial	Poaceae	A–O	All habitats, except for saline depressions and takyr
46. <i>Salsola paulsenii</i>	annual	Amaranthaceae	R	fixed and semi-fixed sands, weakly inclined piedmont plain, eroded foothills with outcrops of variegated beds, saline depressions and takyr
47. <i>Sophora pachycarpa</i>	Perennial	Fabaceae	R–O	fixed and semi-fixed sands
48. <i>Smirnowia turkestanica</i>	Perennial	Fabaceae	R–O	fixed and semi-fixed sands, weakly inclined piedmont plain
49. <i>Stipagrostis pennata</i>	Perennial	Poaceae	R–O	fixed and semi-fixed sands
50. <i>Tamarix</i> sp.	Shrub	Tamaricaceae	R	saline depressions and takyr
51. <i>Tulipa lehmanniana</i> <b>Nationally red-listed</b>	Perennial	Liliaceae	R	fixed and semi-fixed sands, saline

(status 3 – reducing species)				depressions and takys
52. <i>Xylosalsola arbuscula</i> ( <i>Salsola arbuscula</i> .)	Shrub	Amaranthaceae	A–R	Sandy and sandy-loamy desert plain, fixed and semi-fixed sands
53. <i>Ziziphora tenuior</i>	annual	Lamiaceae	R	weakly inclined piedmont plain, eroded foothills with outcrops of variegated beds, saline depressions and takys



**Annex 4. A check-list of plants recorded along the planned power line “Bash-Karakul” during the field survey in 2021**

Plant species	Life form	Family	Abundance	Habitat
1. <i>Acanthophyllum elatius</i>	Perennial	Caryophyllaceae	R–O	Sandy and sandy-loamy desert plain, fixed and semi-fixed sands
2. <i>Agriophyllum lateriflorum</i>	annual	Amaranthaceae	R–O	Fixed and semi-fixed sands
3. <i>Alhagi pseudalhagi</i>	Perennial	Fabaceae	R–O	All habitats
4. <i>Alyssum desertorum</i>	annual	Brassicaceae	R	Sandy and sandy-loamy desert plain, fixed and semi-fixed sands
5. <i>Ammodendron conollyi</i>	Small tree	Fabaceae	R–A	fixed and semi-fixed sands
6. <i>Arnebia decumbens</i>	annual	Boraginaceae	R	fixed and semi-fixed sands
7. <i>Artemisia diffusa</i>	semishrub	Asteraceae	A–D	Sandy and sandy-loamy desert plain, fixed and semi-fixed sands
8. <i>Artemisia turanica</i>	semishrub	Asteraceae	O–A	Sandy and sandy-loamy desert plain
9. <i>Astragalus flexus</i>	perennial	Fabaceae	R	fixed and semi-fixed sands
10. <i>Astragalus unifoliolatus</i>	dwarf shrub	Fabaceae	O–R	fixed and semi-fixed sands
11. <i>Astragalus villosissimus</i>	dwarf shrub	Fabaceae	A–R	Sandy and sandy-loamy desert plain, fixed and semi-fixed sands
12. <i>Atriplex dimorphostegia</i>	annual	Amaranthaceae	R	fixed and semi-fixed sands
13. <i>Bassia eriophora</i>	annual	Amaranthaceae	O	Fixed and semi-fixed sands, saline lands
14. <i>Bromus tectorum</i>	annual	Poaceae	R–O	All habitats
15. <i>Calligonum leucocladum</i>	shrub	Polygonaceae	A–R	Sandy and sandy-loamy desert plain, fixed and semi-fixed sands
16. <i>Calligonum microcarpum</i>	shrub	Polygonaceae	A–R	Sandy and sandy-loamy desert plain, fixed and semi-fixed sands
17. <i>Calligonum zakirovii</i> <b>Nationally red-listed (status 1 – endangered species), national endemic</b>	shrub	Polygonaceae	R	fixed and semi-fixed sands

18. <i>Carex physodes</i>	Perennial	Cyperaceae	D–A	Sandy and sandy-loamy desert plain, fixed and semi-fixed sands
19. <i>Carex subphysodes</i>	Perennial	Cyperaceae	D–O	Sandy and sandy-loamy desert plain
20. <i>Caroxylon orientale</i> ( <i>Salsola orientalis</i> )	dwarf shrub	Amaranthaceae	A–R	Sandy and sandy-loamy desert plain, fixed and semi-fixed sands
21. <i>Caroxylon scleranthum</i> ( <i>Salsola sclerantha</i> )	annual	Amaranthaceae	R	fixed and semi-fixed sands, saline lands
22. <i>Ceratocarpus arenarius</i>	annual	Amaranthaceae	R	All habitats
23. <i>Climacoptera</i> sp.	annual	Amaranthaceae	R	fixed and semi-fixed sands, saline lands
24. <i>Convolvulus divaricatus</i>	semishrub	Convolvulaceae	O–R	fixed and semi-fixed sands
25. <i>Convolvulus hamadae</i>	semishrub	Convolvulaceae	A–R	Sandy and sandy-loamy desert plain, fixed and semi-fixed sands
26. <i>Cousinia hamadae</i>	perennial	Asteraceae	R–O	Sandy and sandy-loamy desert plain, fixed and semi-fixed sands
27. <i>Cousinia resinosa</i>	perennial	Asteraceae	R–O	All habitats
28. <i>Cousinia sogdiana</i>	biennial	Asteraceae	R	fixed and semi-fixed sands
29. <i>Cynodon dactylon</i> <b>Alien weed</b>	Perennial	Poaceae	R–O	agricultural lands
30. <i>Descurainia sophia</i>	annual	Brassicaceae	O	agricultural lands
31. <i>Elaeagnus angustifolia</i>	tree	Elaeagnaceae	R–O	Saline and agricultural lands
32. <i>Eremopyrum bonaepartis</i>	annual	Poaceae	R–O	All habitats
33. <i>Eremopyrum distans</i>	annual	Poaceae	R–O	All habitats
34. <i>Erianthus ravennae</i>	perennial	Poaceae	R–O	Saline and agricultural lands
35. <i>Euphorbia cheirolepis</i>	annual	Euphorbiaceae	R	fixed and semi-fixed sands
36. <i>Euphorbia granulata</i>	annual	Euphorbiaceae	R–O	Saline and agricultural lands
37. <i>Euphorbia turczaninowii</i>	annual	Euphorbiaceae	R	fixed and semi-fixed sands
38. <i>Ferula foetida</i>	Perennial, ephemeroi d	Apiaceae	A–R	All habitats, except for agricultural



39. <i>Glycyrrhiza glabra</i>	Perennial	Fabaceae	R–O	Saline and agricultural lands
40. <i>Halimocnemis villosa</i>	annual	Amaranthaceae	R–O	eroded foothills with outcrops of variegated beds, saline depressions and takyr
41. <i>Halimodendron halodendron</i>	Shrub	Fabaceae	R	Saline and agricultural lands
42. <i>Halocnemum strobilaceum</i>	semishrub	Amaranthaceae	R–A	Saline and agricultural lands
43. <i>Halostachys belangeriana</i>	Shrub	Amaranthaceae	R–O	Saline and agricultural lands
44. <i>Halothamnus subaphyllus</i>	semishrub	Amaranthaceae	R	Sandy and sandy-loamy desert plain, fixed and semi-fixed sands
45. <i>Haloxylon ammodendron</i> ( <i>Haloxylon aphyllum</i> )	Small tree	Amaranthaceae	R–A	All habitats
46. <i>Haloxylon persicum</i>	Small tree	Amaranthaceae	A–D	fixed and semi-fixed sands
47. <i>Haplophyllum ramosissimum</i>	Perennial	Rutaceae	R	fixed and semi-fixed sands
48. <i>Heliotropium arguzioides</i>	Perennial	Boraginaceae	R–O	fixed and semi-fixed sands
49. <i>Heliotropium ellipticum</i>	annual			
50. <i>Iris songarica</i>	Perennial	Iridaceae	A–R	Sandy and sandy-loamy desert plain, fixed and semi-fixed sands
51. <i>Karelinia caspia</i>	Perennial	Asteraceae	R–A	Saline and agricultural lands
52. <i>Limonium otolepis</i>	Perennial	Plumbaginaceae	R–A	Saline and agricultural lands
53. <i>Limonium suffruticosum</i>	semishrub	Plumbaginaceae	R–O	Saline lands
54. <i>Lycium ruthenicum</i>	Shrub	Solanaceae	R–O	Saline and agricultural lands
55. <i>Mausolea eriocarpa</i>	semishrub	Asteraceae	O–A	fixed and semi-fixed sands
56. <i>Oreosalsola arbusculiformis</i> ( <i>Salsola arbusculiformis</i> )	dwarf shrub	Amaranthaceae	A–R	fixed and semi-fixed sands, weakly inclined piedmont plain, eroded foothills with outcrops of variegated beds, saline depressions and takyr

57. <i>Peganum harmala</i> <b>Indicator of overgrazing</b>	Perennial	Nitrariaceae	R–O	All habitats
58. <i>Phragmites australis</i>	Perennial	Poaceae	O–D	Saline and agricultural lands
59. <i>Poa bulbosa</i>	Perennial	Poaceae	A–O	All habitats, except for saline depressions and takys
60. <i>Populus pruinosa</i>	tree	Salicaceae	R–O	agricultural lands
61. <i>Salicornia europaea</i>	annual	Amaranthaceae	O	Saline and agricultural lands
62. <i>Salsola paulsenii</i>	annual	Amaranthaceae	R	fixed and semi-fixed sands, weakly inclined piedmont plain, eroded foothills with outcrops of variegated beds, saline depressions and takys
63. <i>Sophora pachycarpa</i>	Perennial	Fabaceae	R–O	fixed and semi-fixed sands
64. <i>Smirnowia turkestanica</i>	Perennial	Fabaceae	R–O	fixed and semi-fixed sands, weakly inclined piedmont plain
65. <i>Stipagrostis pennata</i>	Perennial	Poaceae	R–O	fixed and semi-fixed sands
66. <i>Suaeda altissima</i>	annual	Amaranthaceae	R–O	Saline and agricultural lands
67. <i>Suaeda sp.</i>	Annual	Amaranthaceae	R–O	Saline and agricultural lands
68. <i>Tamarix hispida</i>	Shrub	Tamaricaceae	A–R	Saline and agricultural lands
69. <i>Tamarix laxa</i>	Shrub	Tamaricaceae	A–R	Saline and agricultural lands
70. <i>Tamarix ramosissima</i>	Shrub	Tamaricaceae	A–R	Saline and agricultural lands
71. <i>Tribulus terrestris</i> <b>Alien weed</b>	annual	Zygophyllaceae	R–O	agricultural lands
72. <i>Typha latifolia</i>	Perennial	Typhaceae	R–O	Saline and agricultural lands
73. <i>Typha minima</i>	Perennial	Typhaceae	R–O	Saline and agricultural lands
74. <i>Xylosalsola arbuscula</i> ( <i>Salsola arbuscula</i> )	Shrub	Amaranthaceae	A–R	Sandy and sandy-loamy desert plain, fixed and semi-fixed sands
75. <i>Xylosalsola richteri</i> ( <i>Salsola richteri</i> )	Shrub	Amaranthaceae	R–O	fixed and semi-fixed sands



76. <i>Zygophyllum oxianum</i>	Perennial	Zygophyllaceae	R-O	Saline and agricultural lands
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### Annex 5. Trigger plant species for critical habitat assessment (recorded during the field survey)

Species	IUCN RL status	National status	Population	Distribution	Data sources	Threats	Criteria	Assessment
Acanthophyllum cyrtostegium Vved.	Not Evaluated (NE)	UzbrDB 2009 – 2 (rare) UzbrDB 2019 – 3 (vulnerable, declining)	Estimated population – about 500–600 individuals	National endemic, endemic to south-western Kyzylkum and Zirabulak-Ziadin Mountains, estimated AOO – about 50 hectares. Within the “Dzhankeldy” project site occurs sporadically, solitary or in small groups	Field survey - 2021 Red Data Book of the Republic of Uzbekistan (2009) Vol. 1. Plants and Fungi. Chinor ENK, Tashkent. 360 p. Red Data Book of the Republic of Uzbekistan (2019) Vol. 1. Plants. Tasvir, Tashkent. 356 p. Tojibaev K.Sh., Beshko N.Yu., Shomurodov Kh.F. & al. (2019) Inventory of the flora of Uzbekistan: Navoi Province. Fan Publishers, Tashkent. 216 p. Tojibaev K.Sh., Beshko N.Yu., Shomurodov Kh.F. & al. (2020) Inventory of the flora of Uzbekistan: Bukhara Province. O'kituvchi Publishers, Tashkent. 128 p.	Overgrazing, mining, road and infrastructure construction	Critical habitat Criterion 2. Habitat of significant importance to endemic and/or restricted-range species. KBA Criterion B1	Due to the restricted geographic range and population of the species, project area likely to support $\geq 10\%$ of the global habitat and population. Triggering Critical Habitat Criterion 2

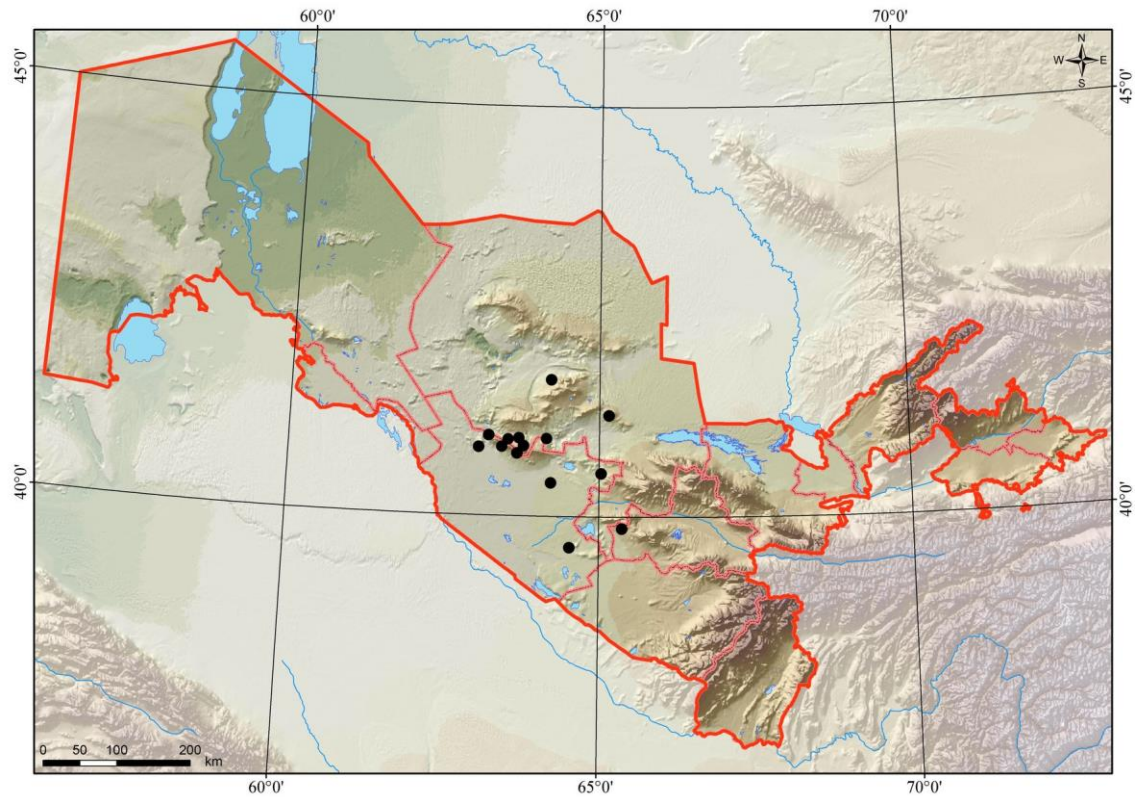


Calligonum zakirovii (Khalk.) Czerep.	Not Evaluated (NE)	UzbrDB 2019 – 1 (endangered)	Estimated population – about 500 individuals	National endemic, endemic to relic mountains of Kyzylkum, estimated AOO – about 50 hectares. Within the “Dzhankeldy” project site occurs sporadically, solitary or in small groups	Field survey - 2021 Red Data Book of the Republic of Uzbekistan (2009) Vol. 1. Plants and Fungi. Chinor ENK, Tashkent. 360 p. Red Data Book of the Republic of Uzbekistan (2019) Vol. 1. Plants. Tasvir, Tashkent. 356 p. Tojibaev K.Sh., Beshko N.Yu., Shomurodov Kh.F. & al. (2019) Inventory of the flora of Uzbekistan: Navoi Province. Fan Publishers, Tashkent. 216 p. Tojibaev K.Sh., Beshko N.Yu., Shomurodov Kh.F. & al. (2020) Inventory of the flora of Uzbekistan: Bukhara Province. O'kituvchi Publishers, Tashkent. 128 p.	Overgrazing, mining, road and infrastructure construction	Critical habitat Criterion 1. (i) Habitat of significant importance to species listed as CR or EN on the IUCN Red List, and nationally/regionally listed species assessed using similar criteria. Criterion 2. Habitat of significant importance to endemic and/or restricted-range species. KBA Criterion B1	Due to the national status, restricted geographic range and population of the species, project area likely to support ≥ 10% of the global habitat and population. Triggering Critical Habitat Criterion 1 and 2
Ferula kyzylkumica Korovin	Not Evaluated (NE)	UzbrDB 2009 – 2 (rare) UzbrDB 2019 – 3 (vulnerable, declining)	Estimated population – about 4000–4500 individuals in Navoi Province and 400–500 in Bukhara Province	National endemic, endemic to relic mountains of Kyzylkum with disjunction in Nuratau Mountains, estimated AOO in Bukhara Province – about 10	Field survey - 2021 Red Data Book of the Republic of Uzbekistan (2009) Vol. 1. Plants and Fungi. Chinor ENK, Tashkent. 360 p. Red Data Book of the Republic of Uzbekistan (2019) Vol. 1. Plants. Tasvir, Tashkent. 356 p. Tojibaev K.Sh., Beshko N.Yu., Shomurodov Kh.F. & al. (2019) Inventory of the flora of	Overgrazing, mining	Critical habitat Criterion 2. Habitat of significant importance to endemic and/or restricted-range species. KBA Criterion B1	Due to the restricted geographic range and population of the species, project area likely to support ≥ 10% of the global habitat and population. Triggering Critical Habitat Criterion 2

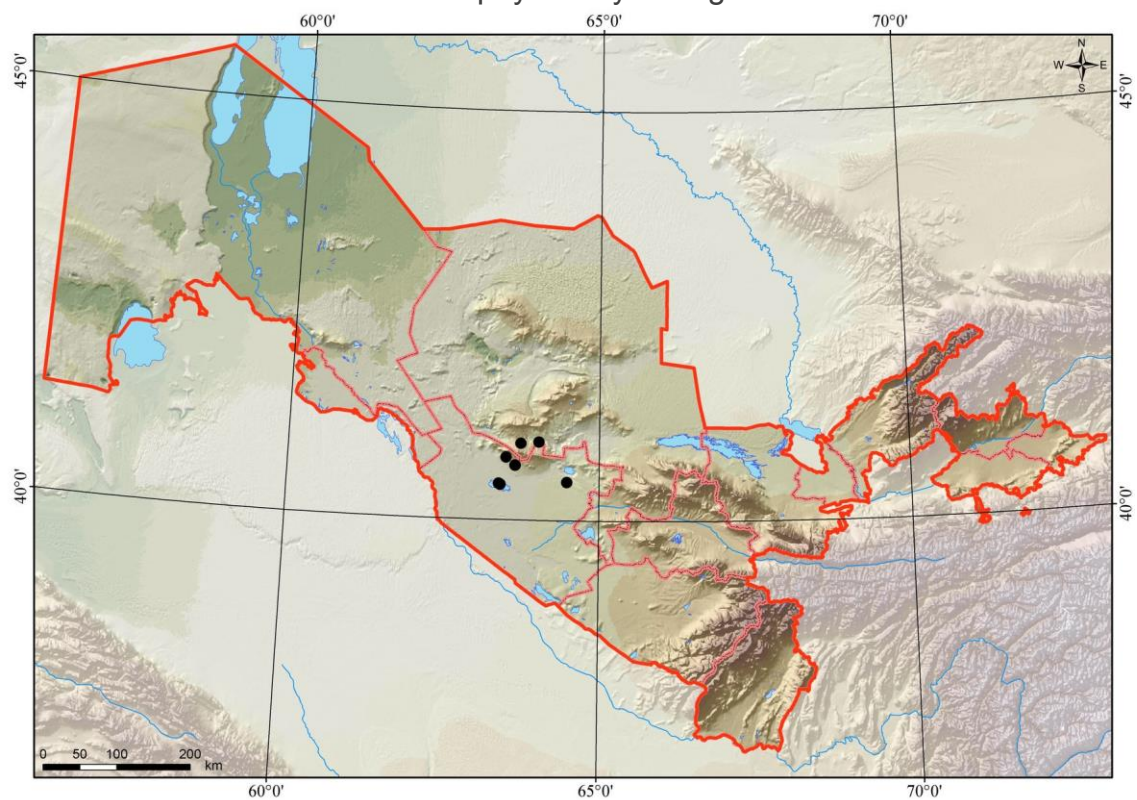
				hectares. Within the “Dzhankeldy” project site occurs sporadically, solitary or in groups	Uzbekistan: Navoi Province. Fan Publishers, Tashkent. 216 p. Tojibaev K.Sh., Beshko N.Yu., Shomurodov Kh.F. & al. (2020) Inventory of the flora of Uzbekistan: Bukhara Province. O'kituvchi Publishers, Tashkent. 128 p.			



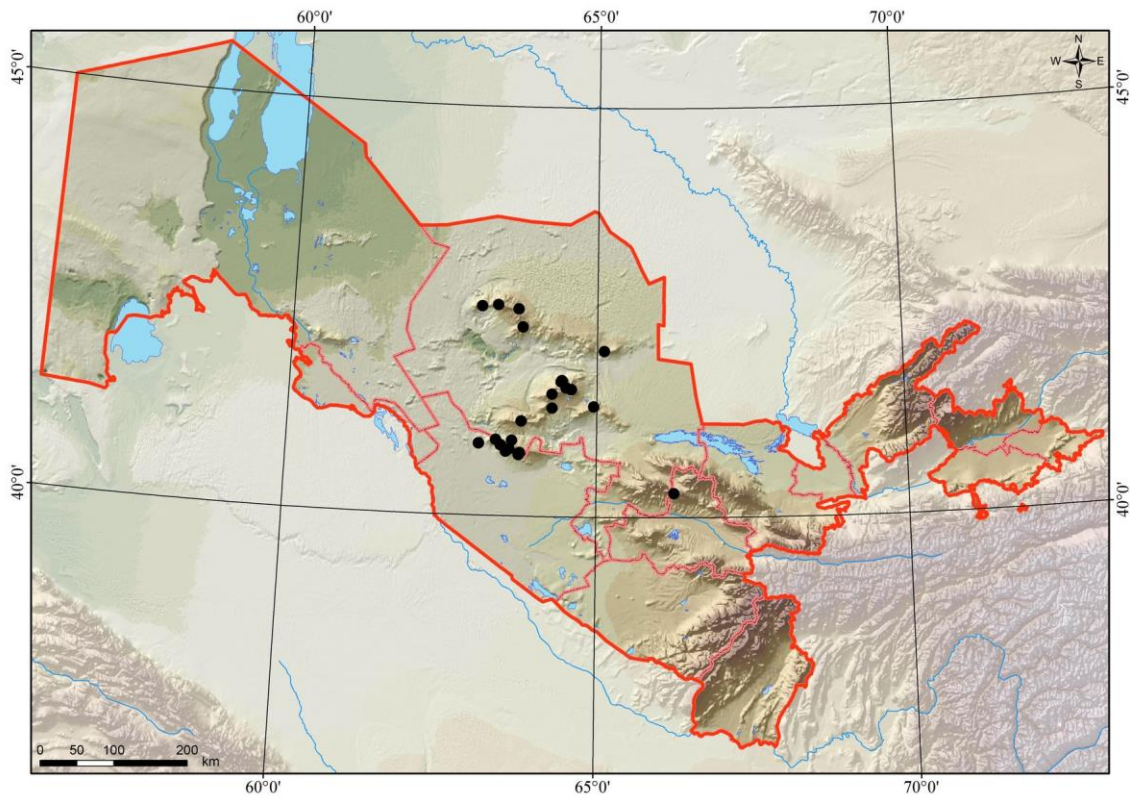
**Annex 6. Distribution maps of trigger plant species (based on the field survey, herbarium and published data)**



*Acanthophyllum cyrtostegium*



*Calligonum zakirovii*



*Ferula kyzylkumica*



## SUMMER QUARTERLY BIRD MONITORING REPORT

<b>Report Title</b>	SUMMER QUARTERLY BIRD MONITORING REPORT
<b>Scope</b>	BIRDS VP / BIRDS NESTING
<b>Areas Covered</b>	DZHANKELDY WF
<b>Seasons Covered</b>	SUMMER 2020
<b>Notes</b>	

# Summer Quarterly Bird monitoring Report



Dzhankeldy Farm Site

Client: 5 Capitals

This report is prepared by: Juru Energy

Date: \_\_\_\_\_

CHECKED BY \_\_\_\_\_

Date: \_\_\_\_\_

APPROVED BY \_\_\_\_\_

Date: \_\_\_\_\_



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## INTRODUCTION

The Renewable energy resources Sector in Uzbekistan started to develop rapidly after the Law “On the Use of Renewable Resources of Energy” No.ZRU-539 was passed on the 21 May 2019, closely followed by the Decree “On Acceleration of Measures to Improve Energy Efficiency of Economic Sectors and Social Spheres, Implementation of Energy Saving Technologies and Developing of Renewable Energy Resources” No. PP-4422 by the President of Uzbekistan on 22 August 2019.

Wind power is defined under Uzbekistan law as renewable energy resource along with solar, geothermal, hydro power, and biomass energy.

Bird baseline studies are necessary part of the Environmental Impact Assessment for Wind Power Plant projects. The primary objective of bird baseline studies at wind farms is to estimate the risk that the proposed project poses to characteristic bird species.

Birds are the most mobile animals among vertebrates and are an important bio indicator of the changing environment. As far as we know, the impact of wind power plants on birds depends on several factors, such as the topography of a particular site and the entire range, the surrounding ecosystems, natural habitats, the number of bird species permanently resident or migratory in the vast project area, etc.

The main potential hazards to birds from windfarms are:

- disturbance leading to displacement or exclusion, including barriers to movement
- collision mortality
- loss of, or damage to, habitat resulting from wind turbines and associated infrastructure.



Being previously involved in projects directly connected with Wind-power stations (Support for the Implementation of Wind Auctions in Uzbekistan; Local support for ESIA for the Zarafshan Wind Project in Uzbekistan), Juru Energy Ltd. has experience in bird monitoring.

The Dzankeldy Wind Farm Project is being developed by ACWA Power. ESIA studies for the project are undertaken by 5 Capitals Environmental & Management Consulting who have subcontracted Juru Energy to undertake Bird Monitoring studies in accordance with international Lenders requirements.

In the framework of the Dzankeldy Wind Farm Project, bird survey was conducted in the project area in Summer 2020. The purpose of ornithological monitoring was to conduct systematic field studies at specific vantage points to assess bird species composition that occur within the project's area of influence, its abundance and territorial distribution, the nature of the stay, and daily activity of birds during spring migration and the beginning of nesting and also to identify birds that are of conservation interest under IUCN and Uzbekistan Redlist.

This report presents the primary materials of field studies in this territory from May 15 to August 31, 2020.

It is planned to conduct regular bird monitoring, which will allow us to take into account the risks from the wind farm for birds in the project area.

This report is a statement of work made by Juru Energy` local senior ornitologists Alisher Atakhodjaev and Yakub Ametov, and ornitologists Ramzjon Sohibnazarov and Asilbek Sokhibnazarov. This report was review by the international expert Caleb Gordon.

## SURVEY METHODS

The research methods were based on international best practice recommendations, in particular those set forth in the Scottish Natural Heritage: recommended bird survey methods to justify the assessment of the impact of surface wind farms. The range of detection and identification of large species as golden eagles was up to 2 km, and small passerines 50 m. Directions and flight altitude were taken into account.

The observations were carried out at 10 Vantage points (Table 2). The number and location of Vantage points for stationary observation in the project area have been agreed with the company employees and international expert. The points are located so as to cover the territory as completely as possible (Fig.1).

The duration of one bird count at each Vantage point (VP) was 3 hours. The total duration of all the observations in the territory was **384 hours** (Table 3).

During observations weather conditions such as wind speed and direction, and air temperature were recorded. Wind speed and air temperature were measured using an anemometer. Whenever possible, the number of species, approximate flight altitude, speed, and flight direction of each target species were recorded every 15 seconds.

During the observations, photographing and short video shooting of birds were carried out, which is used to confirm the correct determination of species and obtain additional data on the number of individuals. Following equipment was used: binoculars (Viking) with 10x zoom; cameras (Nikon P1000, Canon 550D) with 24x and 50x zoom, with focal length of 550 mm and 1200 mm, respectively; field telescope (Viking).

### Target and Secondary Species

Defining a project-specific subset of sensitive, or “target” species provides a basis for designing a project-specific set of biological monitoring and mitigation programs that is optimally suited for the key wildlife risk issues associated with a wind project. It is important to note that any bird or bat species, if impacted severely enough, can become a significant



risk concern for a wind energy facility. For this reason, any potentially impacted species has a level of sensitivity, warranting a taxonomically comprehensive approach to impact monitoring and adaptive management and mitigation during the operational phase.

Nonetheless, some species are more sensitive than others from a wind farm risk management standpoint. This is generally because they are classified as highly protected species by national and/or international authorities, because they are known or suspected to be highly susceptible to wind farm impacts (especially collision with rotors), or both. In addition, some species may be regarded as sensitive due to their cultural or iconic significance, or based on ecological/demographic factors (e.g., slow reproductive rate, naturally low population density).

In the present section, these different criteria have been integrated and considered together to produce a preliminary list of suggested target species for the DWEP, to be used to prioritize the Project's biological monitoring and mitigation programs, including the biological baseline studies. Table 1 below presents a suggested list of sensitive, or "target" bird species for the DWEP, subdivided into two tiers, reflecting different priority levels (tier 1 is higher sensitivity, higher priority than tier 2).

#### Selection and classification of target/priority species

The objective of identifying a list of Project-specific target/priority species is to focus the Project's biodiversity monitoring and management programs on key, potentially-affected species, as such represent the most important biodiversity risk issues for the Project.

Characteristics, and specific elements of the list include the following:

- includes all raptor species that are either known to occur, or likely to occur within the Project area
- includes all nationally- or internationally-listed species that are either known to occur, or likely to occur within the Project area

- includes selected additional species, especially other large-bodied birds, that could represent significant risk issues if significant impact occurs
- the list is intended to be comprehensive of all potentially affected species that could represent significant risk issues for the Project, potentially requiring management actions, if serious impacts are detected. Regarding this point, we note that any bird or bat species could become a risk issue for the project requiring management actions if serious enough impacts are detected during Project operations. For this reason, the monitoring efforts are inclusive of all bird and bat species observed, and such is expected to be the case for operations-phase impact monitoring and management programs.
- the list is intended to be adaptable, and subject to revision in the future under the auspice of adaptive management, for example if a species that was not initially expected to occur with the Project area is detected on-site, or if impacts to specific species differ substantially from initial predictions (the latter could, in principle, result in an upgrade or downgrade in the Project priority level of a species, for example, under the auspice of adaptive management)

The process for generating the list was as follows:

- An initial draft list was generated by the international wind-wildlife specialist on the basis of the criteria described below, based on information from the following sources: IUCN distribution maps, eBird data on bird distributions, species- and country-specific information in the BirdLife International Data Zone, initial bird monitoring results from the Project area, technical literature and prior experience with studying and managing wildlife impacts at wind energy facilities, IFC policy, guidelines, and typical practice for the management of biodiversity impacts at development projects, and specifically the management of wildlife impacts at wind energy facilities.
- The list was revised with input from regional expert ornithologists



- The list is periodically updated based on ongoing monitoring data being conducted at the facility (e.g. inclusion of newly documented species)

The criteria for classifying species initially as tier 1(primary) or tier 2 (secondary) target species are multiple and varied, and initial classification was based on synthesizing and balancing all of the factors listed below. Note that these classifications are subject to revision on an ongoing basis under the auspice of adaptive management, in light of ongoing monitoring results:

- IUCN listed status
- Uzbek redlist status
- Other potential conservation sensitivity factors (i.e. societal values)
- known susceptibility of the species, or similar species, to wind turbine collisions
- where specific susceptibility of species, or very closely related species is not known, predicted collision susceptibility as a function of flight morphology, ecology, and behaviour
- demographic and ecological factors that contribute to relatively high sensitivity to anthropogenic mortality (e.g. slow reproduction rate, late age of first reproduction, low population density)
- expected or known abundance of the species within the Project site (i.e. species expected to occur very rarely at the Project site are considered lower risk than are species expected to have higher abundance at the site, all other factors being equal)

Table 1 below presents a suggested list of sensitive, or “target” bird species for the Dzankeldy project, subdivided into two tiers, reflecting different priority levels (tier 1 is higher sensitivity, higher priority than tier 2).

Table 1 Target and secondary species

Latin name	English name	IUCN status	Uzbek status	Notes on Likely Occurrence/Risk <sup>1</sup>
<b>Tier 1 Target Species (top priority)</b>				
<i>Aquila nipalensis</i>	Steppe Eagle	EN	VU	Likely present, though uncommon at site based on nearby, recent eBird records in similar habitat
<i>Neophron percnopterus</i>	Egyptian Vulture	EN	VU	Nested in region. Observed in 2018 in project area (Ten, Soldatov 2018), present at DWEP site, confirmed with four separate observations of single individuals during May 2020 VP surveys at three different VP
<i>Falco cherrug</i>	Saker Falcon	EN	EN	Nested in project area, observed in 2018 (Ten, Soldatov 2018)
<i>Aquila chrysaetos</i>	Golden Eagle	LC	VU	Common resident and nests in project area (Ten, Soldatov 2018)
<i>Aquila heliaca</i>	Imperial Eagle	VU	VU	Migrant
<i>Chlamydotis macqueenii</i>	Asian Houbara	VU	VU	Common nesting and migrant species (Burnside)
<i>Vanellus gregarius</i>	Sociable Lapwing	CR	VU	possible rarity, recent eBird photo record in desert habitat ca 60km SE suggests possibility of occurrence. Extremely sensitive species with CR status
<b>Tier 2 Target Species (second priority)</b>				
<i>Aegypius monachus</i>	Cinereous Vulture	NT	VU	Resident in region
<i>Gyps fulvus</i>	Eurasian Griffon	NT	VU	Resident in region

<sup>1</sup> Patterns of regional and seasonal abundance determined from analysis of eBird data (ebird.org) accessed 10 June, 2020



<i>Circaetus gallicus</i>	Short-toed Snake-Eagle	LC	?	Likely present at site based on recent, nearby eBird records, though uncommon in region
<i>Hieraaetus pennatus</i>	Booted Eagle	LC	?	Very rare in region according to eBird records. Two individuals documented at DWEP during May 2020 during a VP Survey (VP 4)
<i>Circus aeruginosus</i>	Eurasian Marsh-Harrier	LC	?	Fairly common in region, several individuals documented at DWEP during May, 2020 VP surveys
<i>Circus cyaneus</i>	Hen Harrier	LC	?	Fairly common in region
<i>Circus macrourus</i>	Pallid Harrier	NT	?	Fairly common in region
<i>Circus pygargus</i>	Montagu's Harrier	LC	?	Uncommon in region
<i>Accipiter badius</i>	Shikra	LC	?	Uncommon in region
<i>Accipiter nisus</i>	Eurasian Sparrowhawk	LC	?	Uncommon in region
<i>Buteo rufinus</i>	Long-legged Buzzard	LC	?	Fairly common in region, documented at DWEP site in May, 2020
<i>Buteo buteo</i>	Common Buzzard	LC	?	Fairly common in region
<i>Milvus migrans</i>	Black Kite	LC	?	Uncommon in region
<i>Anthropoides virgo</i>	Demoiselle Crane	LC	?	Uncommon in region
<i>Grus grus</i>	Common Crane	LC	?	Uncommon in region
<i>Falco tinnunculus</i>	Common Kestrel	LC	?	Common in region, documented at DWEP site in May, 2020

## TERRITORY DESCRIPTION

The project territory is located in the Southwestern part of Uzbekistan in the Peshku district of Bukhara region. The landscape of the project area is steppe and arid. Accordingly, steppe and desert species of animals and plants are common here. But during the migration period, representatives of other biotopes can also be met there.

The village of Dzhankeldy is located near the project territory. About 90 families live in the village, there is one school and one preschool (kindergarten). The local population is mainly ethnic Kazakhs - they are engaged in breeding small cattle, camels and horse breeding. Due to lack of water, they practically do not engage in agriculture. In most cases, young people leave village to work in the cities of Bukhara and Navoi. Some houses are abandoned. Geological works are being carried out near the village.

The project area includes mountains of Beltau, which are considered as the spurs of the Kul'dzhuktau mountains, - a mountain island range in the Central part of the Kyzylkum desert (length about 100 km, width up to 15 km, height up to 785 m). The southern slopes of Kul'dzhuktau Mountains are slanting, dissected by dry canyons; the Northern slopes are rocky and steep. It is composed mainly of crystalline shales and limestones; along the margin — Jurassic, Cretaceous and Paleogene sedimentary strata, on the surface of which there are sometimes sifted sands.



## VANTAGE POINTS

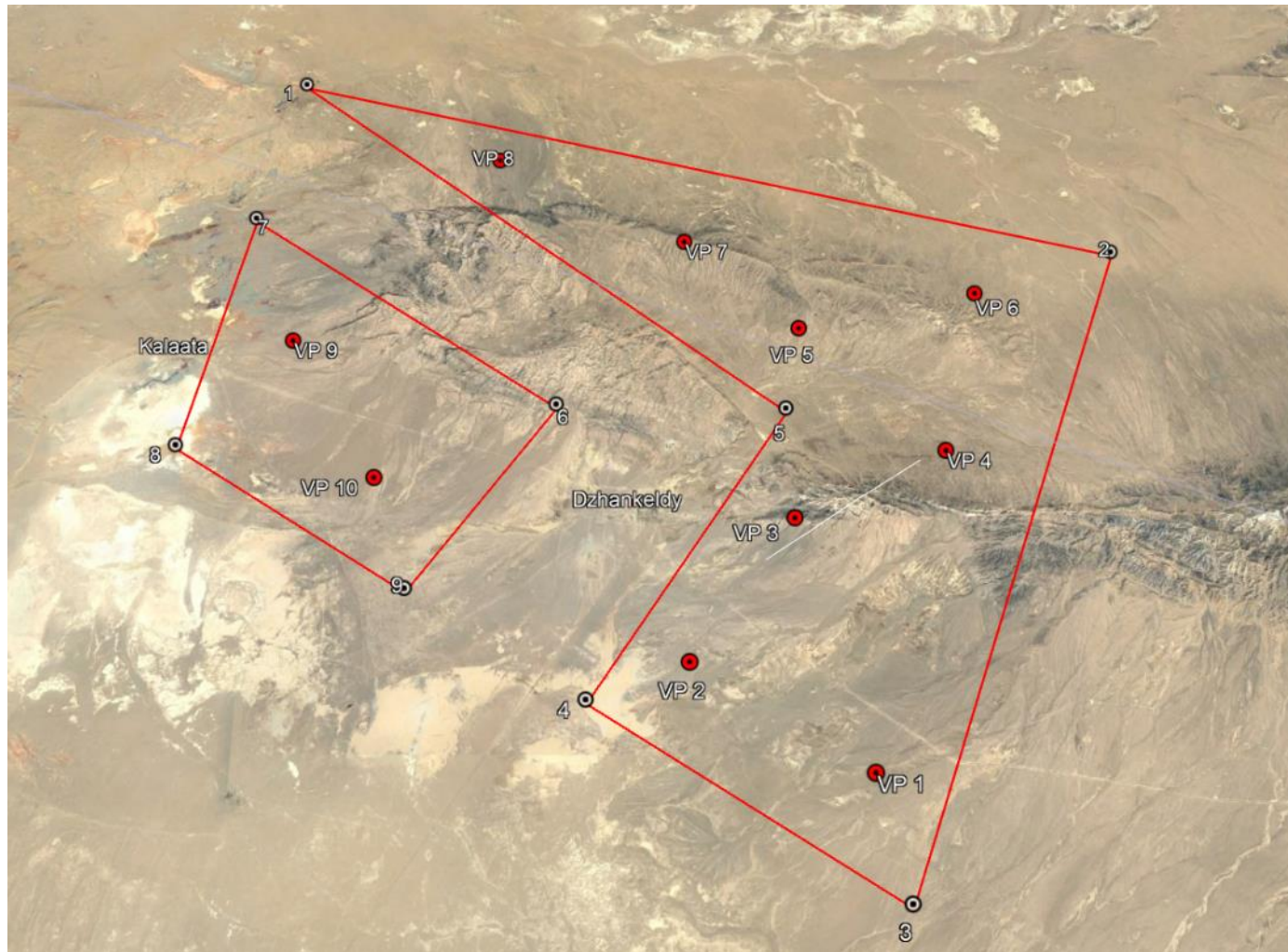


Fig. 1 Vantage Points locations

The number of Vantage Points was agreed with the Client. Points are located so as to cover the project territory as fully as possible. The coordinates of the Vantage Points of Dzankeldy are shown in Table 2. The radius of a single observation point is 2 km. Time spent at one point is 3 hours' average.

Table 2 Coordinates of the VPs of Dzankeldy project territory

<b>Vantage Points</b>	<b>Coordinates</b>	
VP 1	40.784300°	63.404295°
VP 2	40.811066°	63.347802°
VP 3	40.847481°	63.383422°
VP 4	40.865322°	63.434670°
VP 5	40.899852°	63.388194°
VP 6	40.909887°	63.449732°
VP 7	40.925033°	63.349676°
VP 8	40.951100°	63.284526°
VP 9	40.896820°	63.214673°
VP 10	40.858649°	63.244772°

384 total hours of VP survey effort were conducted at the 10 VP survey points in the project area during the reporting period (Table 3), which corresponds to the summer season (May 16-Aug 31). This is equivalent to an average of 38.4 hours per point for the season, and each of the 10 points received at least 36 hours of VP survey effort during the summer season. This satisfies, and slightly exceeds the recommended effort level (which was a minimum of 36 survey hours per point per season). This is a strong level of effort, and will provide a strong source of data for a robust seasonal collision risk modelling effort, and overall interpretation of summer season collision risk for target bird species.



Table 3 Total Number of VP survey hours

	VP 1	VP 2	VP 3	VP 4	VP 5	VP 6	VP 7	VP 8	VP 9	VP 10	
Total hours											
May hr	-	-	-	3	3	3	3	3	3	3	
June hr	15	15	15	12	12	15	12	12	12	12	
July hr	15	15	15	12	12	12	12	12	12	12	
August hr	6	6	6	12	12	12	12	12	12	12	
accounts for Summer	36	36	36	39	39	42	39	39	39	39	<b>384</b>

## BIRD OBSERVATIONS RESULTS

Among birds registered during bird survey in from May 16 to August 31, 2020 (Tables 4-7), following bird species belonging to top priority target species were found in the project area: Steppe Eagle (*Aquila nipalensis*), Egyptian Vulture (*Neophron percnopterus*).

Among the secondary species, following bird species were found in the project area: Eurasian Marsh-Harrier (*Circus aeruginosus*), Cinereous Vulture (*Aegypius monachus*), Eurasian Griffon (*Aegypius monachus*), Hen Harrier (*Circus cyaneus*), Eurasian Sparrowhawk (*Accipiter nisus*), Long-legged Buzzard (*Buteo rufinus*), Common Buzzard (*Buteo buteo*), Common Kestrel (*Falco tinnunculus*).

Table 4 Results of bird observations in May

SPECIES			VANTAGE POINTS										IUCN status	Uzb Red Book status	Nature of stay
No	Latin	English	VP 1	VP 2	VP 3	VP 4	VP 5	VP 6	VP 7	VP 8	VP 9	VP 10			
TARGET SPECIES															
	<i>Aquila nipalensis</i>	Steppe Eagle									1		EN	2 (VU:D)	NMW
2.	<i>Neophron percnopterus</i>	Egyptian Vulture	1			1			2		1	1	EN	listed 2 (VU:R)	R
3.	<i>Falco cherrug</i>	Saker Falcon											EN	2 (VU:D)	NMS
4.	<i>Aquila chrysaetos</i>	Golden Eagle											LC	2 (VU:D)	NMW
5.	<i>Aquila heliaca</i>	Imperial Eagle											VU	2 (VU:D)	NM



6.	<i>Chlamydotis macqueenii</i>	Asian Houbara										VU	2 (VU:R)	<b>M</b>
7.	<i>Vanellus gregarius</i>	Sociable Lapwing										CR		
<b>SECONDARY SPECIES</b>														
	<i>Aegypius monachus</i>	Cinereous Vulture										NT	3 (NT)	<b>R</b>
	<i>Gyps fulvus</i>	Eurasian Griffon										NT	2 (VU:D)	<b>R</b>
	<i>Circaetus gallicus</i>	Short-toed Snake - Eagle										LC	2 (VU:D)	<b>NM</b>
	<i>Hieraaetus pennatus</i>	Booted Eagle										LC	2 (VU:D)	<b>NM</b>
	<i>Circus aeruginosus</i>	Eurasian Marsh-Harrier									1	LC	<i>not listed</i>	<b>NMW</b>
	<i>Circus cyaneus</i>	Hen Harrier										LC	<i>not listed</i>	<b>MW</b>
	<i>Circus macrourus</i>	Pallid Harrier										NT	3 (NT)	<b>MS</b>
	<i>Circus pygargus</i>	Montagu's Harrier										LC	<i>not listed</i>	<b>NM</b>
	<i>Accipiter badius</i>	Shikra										LC	<i>not listed</i>	<b>NM</b>
	<i>Accipiter nisus</i>	Eurasian Sparrowhawk			1					1	1	LC	<i>not listed</i>	<b>NMW</b>
	<i>Buteo rufinus</i>	Long-legged					1					LC	<i>not listed</i>	<b>NMW</b>

		Buzzard												
	<i>Buteo buteo</i>	Common Buzzard										LC	<i>not listed</i>	<b>MW</b>
	<i>Milvus migrans</i>	Black Kite										LC	<i>not listed</i>	<b>NMW</b>
	<i>Anthropoides virgo</i>	Demoiselle Crane										LC	<i>not listed</i>	<b>M</b>
	<i>Grus grus</i>	Common Crane										LC	<i>not listed</i>	<b>MW</b>
	<i>Falco tinnunculus</i>	Common Kestrel							1			LC	<i>not listed</i>	<b>NMW</b>



Table 5 Results of bird observations in June

SPECIES			VANTAGE POINTS										IUCN status	Uzb Red Book status	Nature of stay
No	Latin	English	VP 1	VP 2	VP 3	VP 4	VP 5	VP 6	VP 7	VP 8	VP 9	VP 10			
TARGET SPECIES															
1.	<i>Aquila nipalensis</i>	Steppe Eagle			1		1		1				EN	2 (VU:D)	NMW
2.	<i>Neophron percnopterus</i>	Egyptian Vulture	1		1, 1, 2		2	2	1	1	2		EN	listed 2 (VU:R)	R
3.	<i>Falco cherrug</i>	Saker Falcon											EN	2 (VU:D)	NMS
4.	<i>Aquila chrysaetos</i>	Golden Eagle											LC	2 (VU:D)	NMW
5.	<i>Aquila heliaca</i>	Imperial Eagle											VU	2 (VU:D)	NM
6.	<i>Chlamydotes macqueenii</i>	Asian Houbara											VU	2 (VU:R)	M
7.	<i>Vanellus gregarius</i>	Sociable Lapwing											CR		
SECONDARY SPECIES															
1.	<i>Aegypius monachus</i>	Cinereous Vulture					1	1		1, 1			NT	3 (NT)	R

2.	<i>Gyps fulvus</i>	Eurasian Griffon											NT	2 (VU:D)	R
3.	<i>Circaetus gallicus</i>	Short-toed Snake - Eagle											LC	2 (VU:D)	NM
4.	<i>Hieraaetus pennatus</i>	Booted Eagle											LC	2 (VU:D)	NM
5.	<i>Circus aeruginosus</i>	Eurasian Marsh-Harrier	2	1	1	1		1					LC	not listed	NMW
6.	<i>Circus cyaneus</i>	Hen Harrier					1			1				not listed	MW
7.	<i>Circus macrourus</i>	Pallid Harrier											NT	3 (NT)	MS
8.	<i>Circus pygargus</i>	Montagu's Harrier											LC	not listed	NM
9.	<i>Accipiter badius</i>	Shikra											LC	not listed	NM
10.	<i>Accipiter nisus</i>	Eurasian Sparrowhawk											LC	not listed	NMW
11.	<i>Buteo rufinus</i>	Long-legged Buzzard			1, 1, 1			1, 1					LC	not listed	NMW
12.	<i>Buteo buteo</i>	Common Buzzard		1			1						LC	not listed	MW
13.	<i>Milvus migrans</i>	Black Kite											LC	not listed	NMW
14.	<i>Anthropoides virgo</i>	Demoiselle Crane											LC	not listed	M



15.	<i>Grus grus</i>	Common Crane											LC	<i>not listed</i>	<b>MW</b>
16.	<i>Falco tinnunculus</i>	Common Kestrel			2	2		1	1			2	LC	<i>not listed</i>	<b>NMW</b>
<b>OTHER SPECIES OF BIRDS</b>															
1.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	2, 3	3, 2, 3	2, 1, 1, 3, 1	2, 5, 2	1, 3, 2	1, 2, 1, 2, 3, 3	3, 2, 1	1, 1	2, 3, 2	2, 2, 3	LC	3 (NT)	<b>NM</b>
2.	<i>Merops supercilios</i>	Blue-cheeked Bee-eater	16, 9, 5, 8	4, 5, 6, 8	2, 4, 6, 6	5, 5, 5	3, 4, 8	3, 12, 3, 3	5, 4, 6	2, 5, 3	5, 3, 9	9, 5, 9	LC	-	<b>NM</b>
3.	<i>Caprimulgus aegyptius</i>	Egyptian nightjar	2	2	1			2, 1	1		1	2, 2, 2	LC	-	
4.	<i>Galerida cristata</i>	Crested Lark	6, 6, 4, 7	3, 6, 3, 6, 7, 7	4, 6, 9, 7, 15	2, 4, 4, 8	2, 6, 7, 6	5, 3, 6, 9, 6	1, 4, 3, 9	3, 3, 11, 8	5, 9, 12, 12	6, 2, 7	LC	-	<b>R</b>
5.	<i>Columba livia</i>	Rock Dove	5, 3	2	7, 3	3	3		2, 2	15		3, 5	LC	-	<b>R</b>
6.	<i>Lanius pallidirostris</i>	Southern grey shrike	2, 2	1, 1	2, 1	2, 2	2, 1	1, 1	2, 1	1	1	2	LC	Not listed	<b>NM</b>
7.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	11, 13	22	17, 10	5		13, 15	19,	16, 8		13, 26	LC	Not listed	<b>NMW</b>
8.	<i>Rhodospiza obsoleta</i>	Black-billed Desert Finch			2	10, 8	7, 9	3	15		12, 8	11	LC		<b>R</b>
9.	<i>Pica pica</i>	Black-billed Magpie									2		LC	-	
10.	<i>Pterocles orientalis</i>	Black-bellied sandgrouse	6	2, 8, 2				2	11, 4	2, 2, 2	2		LC	-	<b>NMW</b>
11.	<i>Muscicapa striata</i>	Spotted Flycatcher	1			1, 2		1			2	1	LC		<b>NM</b>

12.	<i>Upupa epops</i>	Hoopoe	1, 1			1					1, 1	LC	Not listed	NMW	
13.	<i>Hirundo rustica</i>	Barn swallow	6	5				3			5	4, 6	LC		NM
14.	<i>Acridotheres tristis</i>	Common mayna		4				2		2	2	3	LC		R
15.	<i>Pterocles orientalis</i>	<i>Pterocles orientalis</i>	6	2, 8, 2				2	11, 4	2, 2, 2	2		LC	Not listed	NMW
16.	<i>Corvus corone</i>	Eurasian Carrion Crow		2	2		2			1			LC		
17.	<i>Corvus ruficollis</i>	Brown-necked Raven									2	1	LC		R
18.	<i>Oenanthe pleschanka</i>	Pied Wheatear			1	1	2						LC		NM
19.	<i>Coracias garrulus</i>	Eurasian Roller	2	4	1	3, 3	3, 3, 2	2, 2	4, 1, 2	1, 2, 1	3, 2	1	LC	Not listed	NM
20.	<i>Scotocerca inquieta</i>	Streaked Scrub Warbler			1	2			1				LC		
21.	<i>Athene noctua</i>	Little Owl		1	1, 1		1		1			1	LC	Not listed	R



Table 6 Results of bird observations in July

SPECIES			VANTAGE POINTS										IUCN status	Uzb Red Book status	Nature of stay
No	Latin	English	VP 1	VP 2	VP 3	VP 4	VP 5	VP 6	VP 7	VP 8	VP 9	VP 10			
TARGET SPECIES															
1.	<i>Aquila nipalensis</i>	Steppe Eagle			2			1, 1					EN	2 (VU:D)	NMW
2.	<i>Neophron percnopterus</i>	Egyptian Vulture		1	2, 1		2		1	1		1	EN	listed 2 (VU:R)	R
3.	<i>Falco cherrug</i>	Saker Falcon											EN	2 (VU:D)	NMS
4.	<i>Aquila chrysaetos</i>	Golden Eagle											LC	2 (VU:D)	NMW
5.	<i>Aquila heliaca</i>	Imperial Eagle											VU	2 (VU:D)	NM
6.	<i>Chlamydotis macqueenii</i>	Asian Houbara											VU	2 (VU:R)	M
7.	<i>Vanellus gregarius</i>	Sociable Lapwing											CR		
SECONDARY SPECIES															
1.	<i>Aegypius monachus</i>	Cinereous Vulture					1						NT	3 (NT)	R
2.	<i>Gyps fulvus</i>	Eurasian Griffon					1	1		2			NT	2 (VU:D)	R

3.	<i>Circaetus gallicus</i>	Short-toed Snake - Eagle											LC	2 (VU:D)	<b>NM</b>
4.	<i>Hieraaetus pennatus</i>	Booted Eagle											LC	2 (VU:D)	<b>NM</b>
5.	<i>Circus aeruginosus</i>	Eurasian Marsh-Harrier	1			1		1					LC	<i>not listed</i>	<b>NMW</b>
6.	<i>Circus cyaneus</i>	Hen Harrier			1		1			1		1	LC	<i>not listed</i>	<b>MW</b>
7.	<i>Circus macrourus</i>	Pallid Harrier											NT	3 (NT)	<b>MS</b>
8.	<i>Circus pygargus</i>	Montagu's Harrier											LC	<i>not listed</i>	<b>NM</b>
9.	<i>Accipiter badius</i>	Shikra											LC	<i>not listed</i>	<b>NM</b>
10.	<i>Accipiter nisus</i>	Eurasian Sparrowhawk											LC	<i>not listed</i>	<b>NMW</b>
11.	<i>Buteo rufinus</i>	Long-legged Buzzard			1, 1			1	1		1		LC	<i>not listed</i>	<b>NMW</b>
12.	<i>Buteo buteo</i>	Common Buzzard		1			1						LC	<i>not listed</i>	<b>MW</b>
13.	<i>Milvus migrans</i>	Black Kite											LC	<i>not listed</i>	<b>NMW</b>
14.	<i>Anthropoides virgo</i>	Demoiselle Crane											LC	<i>not listed</i>	<b>M</b>
15.	<i>Grus grus</i>	Common Crane											LC	<i>not listed</i>	<b>MW</b>

16.	<i>Falco tinnunculus</i>	Common Kestrel			1	1		2		1		1	LC	<i>not listed</i>	<b>NMW</b>
<b>OTHER SPECIES OF BIRDS</b>															
1.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	1, 2	1, 2, 1	3, 2, 2, 2	2, 2, 1	1, 2, 1	2, 1 1, 3	2, 1	2, 1, 2	2, 2, 2	3, 1	LC	3 (NT)	<b>NM</b>
2.	<i>Merops supercilios</i>	Blue-cheeked Bee-eater	4, 5, 4	6, 4, 6, 6	14, 2, 4, 2	5, 3, 4	3, 4, 6	5, 9, 4	2, 4, 5	5, 3	3	4, 1 0, 5, 6	LC	-	<b>NM</b>
3.	<i>Caprimulgus aegyptius</i>	Egyptian nightjar											LC	-	
4.	<i>Galerida cristata</i>	Crested Lark	6, 5, 2, 3, 11	4, 8, 3, 7, 5	6, 6, 9, 7, 8	7, 4, 4, 6	3, 5, 6	6, 6, 6, 6, 8	3, 4, 3, 5	3, 6, 6, 4	6, 6, 9, 9	4, 6, 9, 5	LC	-	<b>R</b>
5.	<i>Columba livia</i>	Rock Dove	4, 5	12		5	5		15		3	5	LC	-	<b>R</b>
6.	<i>Lanius pallidirostris</i>	Southern grey shrike	3, 1	1, 1	2, 1	2, 1, 2	2	1, 1	1	2, 2			LC	Not listed	<b>NM</b>
7.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	15	18	14, 15, 8	5		14, 15	8	16	6	2 6	LC	Not listed	<b>NMW</b>
8.	<i>Rhodospiza obsoleta</i>	Black-billed Desert Finch	9	1		8	7, 9	3			6	1 2, 1 2	LC		<b>R</b>
9.	<i>Pica pica</i>	Black-billed Magpie									3		LC	-	



10.	<i>Pterocles orientalis</i>	Black-bellied sandgrouse	4	4, 2, 1	4			4	3	6, 2, 2, 2		4	LC	-	<b>NMW</b>
11.	<i>Muscicapa striata</i>	Spotted Flycatcher				1, 2					3	1	LC		<b>NM</b>
12.	<i>Upupa epops</i>	Hoopoe	1			2	1					1	LC	Not listed	<b>NMW</b>
13.	<i>Hirundo rustica</i>	Barn swallow	5	5				3			3, 5		LC		<b>NM</b>
14.	<i>Acridotheres tristis</i>	Common myna		3									LC		<b>R</b>
15.	<i>Pterocles orientalis</i>	<i>Pterocles orientalis</i>	4	4, 2, 1	4			4	3	6, 2, 2, 2		4	LC	Not listed	<b>NMW</b>
16.	<i>Corvus corone</i>	Eurasian Carrion Crow			2		4			1			LC		
17.	<i>Corvus ruficollis</i>	Brown-necked Raven									2	1	LC		<b>R</b>
18.	<i>Oenanthe pleschanka</i>	Pied Wheatear	1			2	1						LC		<b>NM</b>
19.	<i>Coracias garrulus</i>	Eurasian Roller	2		2, 1	2, 2	3, 3, 2	2, 2	1, 2	2	1, 2	2	LC	Not listed	<b>NM</b>
20.	<i>Scotocerca inquieta</i>	Streaked Scrub Warbler		2		2							LC		
21.	<i>Athene noctua</i>	Little Owl		1					1		1		LC	Not listed	<b>R</b>

Table 7 Results of bird observations in August

SPECIES			VANTAGE POINTS										IUCN status	Uzb Red Book status	Nature of stay
No	Latin	English	VP 1	VP 2	VP 3	VP 4	VP 5	VP 6	VP 7	VP 8	VP 9	VP 10			
TARGET SPECIES															
1.	<i>Aquila nipalensis</i>	Steppe Eagle											EN	2 (VU:D)	NMW
2.	<i>Neophron percnopterus</i>	Egyptian Vulture						1, 1		1			EN	listed 2 (VU:R)	R
3.	<i>Falco cherrug</i>	Saker Falcon											EN	2 (VU:D)	NMS
4.	<i>Aquila chrysaetos</i>	Golden Eagle											LC	2 (VU:D)	NMW
5.	<i>Aquila heliaca</i>	Imperial Eagle											VU	2 (VU:D)	NM
6.	<i>Chlamydotis macqueenii</i>	Asian Houbara											VU	2 (VU:R)	M
7.	<i>Vanellus gregarius</i>	Sociable Lapwing											CR		
SECONDARY SPECIES															
1.	<i>Aegypius monachus</i>	Cinereous Vulture		1									NT	3 (NT)	R
2.	<i>Gyps fulvus</i>	Eurasian Griffon			1								NT	2 (VU:D)	R
3.	<i>Circaetus gallicus</i>	Short-toed Snake											LC	2 (VU:D)	NM

		- Eagle													
4.	<i>Hieraaetus pennatus</i>	Booted Eagle										LC	2 (VU:D)	NM	
5.	<i>Circus aeruginosus</i>	Eurasian Marsh-Harrier			2		1				1	LC	not listed	NMW	
6.	<i>Circus cyaneus</i>	Hen Harrier									1	LC	not listed	MW	
7.	<i>Circus macrourus</i>	Pallid Harrier										NT	3 (NT)	MS	
8.	<i>Circus pygargus</i>	Montagu's Harrier										LC	not listed	NM	
9.	<i>Accipiter badius</i>	Shikra										LC	not listed	NM	
10.	<i>Accipiter nisus</i>	Eurasian Sparrowhawk										LC	not listed	NMW	
11.	<i>Buteo rufinus</i>	Long-legged Buzzard		1			1	1		1		LC	not listed	NMW	
12.	<i>Buteo buteo</i>	Common Buzzard				1		1				LC	not listed	MW	
13.	<i>Milvus migrans</i>	Black Kite										LC	not listed	NMW	
14.	<i>Anthropoides virgo</i>	Demoiselle Crane										LC	not listed	M	
15.	<i>Grus grus</i>	Common Crane										LC	not listed	MW	
16.	<i>Falco tinnunculus</i>	Common Kestrel					1		1		1	LC	not listed	NMW	
	OTHER SPECIES OF BIRDS														



1.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	3	2		3, 2, 1	1	1, 2, 2	1	1, 1	3, 1	2	LC	3 (NT)	NM
2.	<i>Merops supercilios</i>	Blue-cheeked Bee-eater		4, 5	4	3, 5	4, 2, 3	6, 4, 2	2, 2, 2	4		5, 4, 3	LC	-	NM
3.	<i>Caprimulgus aegyptius</i>	Egyptian nightjar											LC	-	
4.	<i>Galerida cristata</i>	Crested Lark	5, 5	3, 6	5, 6	7, 6, 5, 2	5, 3, 4	4, 4, 3, 4, 7	4, 3, 2, 3	3, 2, 5, 2	6, 3, 4	6, 2, 6, 3	LC	-	R
5.	<i>Columba livia</i>	Rock Dove				4	3		15		3		LC	-	R
6.	<i>Lanius pallidirostris</i>	Southern grey shrike		1	1	2, 1	1	1	1	1			LC	Not listed	NM
7.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	12		9, 6	5		12, 6	8, 2		4	26	LC	Not listed	NMW
8.	<i>Rhodospiza obsoleta</i>	Black-billed Desert Finch	8			7	5	2, 4			5	8	LC		R
9.	<i>Pica pica</i>	Black-billed Magpie									2		LC	-	
10.	<i>Pterocles orientalis</i>	Black-bellied sandgrouse	2	4	6					3, 4, 2, 2		6	LC	-	NMW
11.	<i>Muscicapa striata</i>	Spotted Flycatcher									2	1	LC		NM
12.	<i>Upupa epops</i>	Hoopoe					1						LC	Not listed	NMW
13.	<i>Hirundo rustica</i>	Barn swallow	2	4		5		3, 3			4		LC		NM
14.	<i>Acridotheres tristis</i>	Common mayna											LC		R

15.	<i>Pterocles orientalis</i>	<i>Pterocles orientalis</i>	2	4	6				3, 4, 2, 2		6	LC	Not listed	<b>NMW</b>
16.	<i>Corvus corone</i>	Eurasian Carrion Crow					1		1			LC		
17.	<i>Corvus ruficollis</i>	Brown- necked Raven								2	1	LC		<b>R</b>
18.	<i>Oenanthe pleschanka</i>	Pied Wheatear	3			1	1					LC		<b>NM</b>
19.	<i>Coracias garrulus</i>	Eurasian Roller	2			2	1, 3, 2	1, 2	2	3, 2	1	LC	Not listed	<b>NM</b>
20.	<i>Scotocerca inquieta</i>	Streaked Scrub Warbler		2		1						LC		
21.	<i>Athene noctua</i>	Little Owl		1				1		1		LC	Not listed	<b>R</b>

## **SPECIALIZED RAPTOR NEST SURVEY**

On August 12-13, 2020, we examined cliffs and ledges on the Northern sides of the Western Kuljuktai mountain range in search of nests of large birds of prey. The weather was sunny with no precipitation, windy; air temperature 16-20°C, cool. The destination cliffs were reached by car and then the survey was carried out on foot using binoculars.

By the time of the survey, for the majority of raptors breeding period had already ended and the autumn migration had begun. In most places we examined, cliffs were not suitable for building nests, because they do not ensure the safety of nests of large birds of prey. The cliffs are accessible to humans and terrestrial predators. Only one old nest of a large bird of prey was found and, apparently, it was abandoned for a long time as no signs of recent occupation (as traces of droppings and food leftovers) were present. During our survey of the territory, only 2 species of birds of prey were encountered: Egyptian Vulture and Common Kestrel.



Fig. 2 The old nest of a large bird of prey (40°51'17.00"C, 63°24'24.59"B)



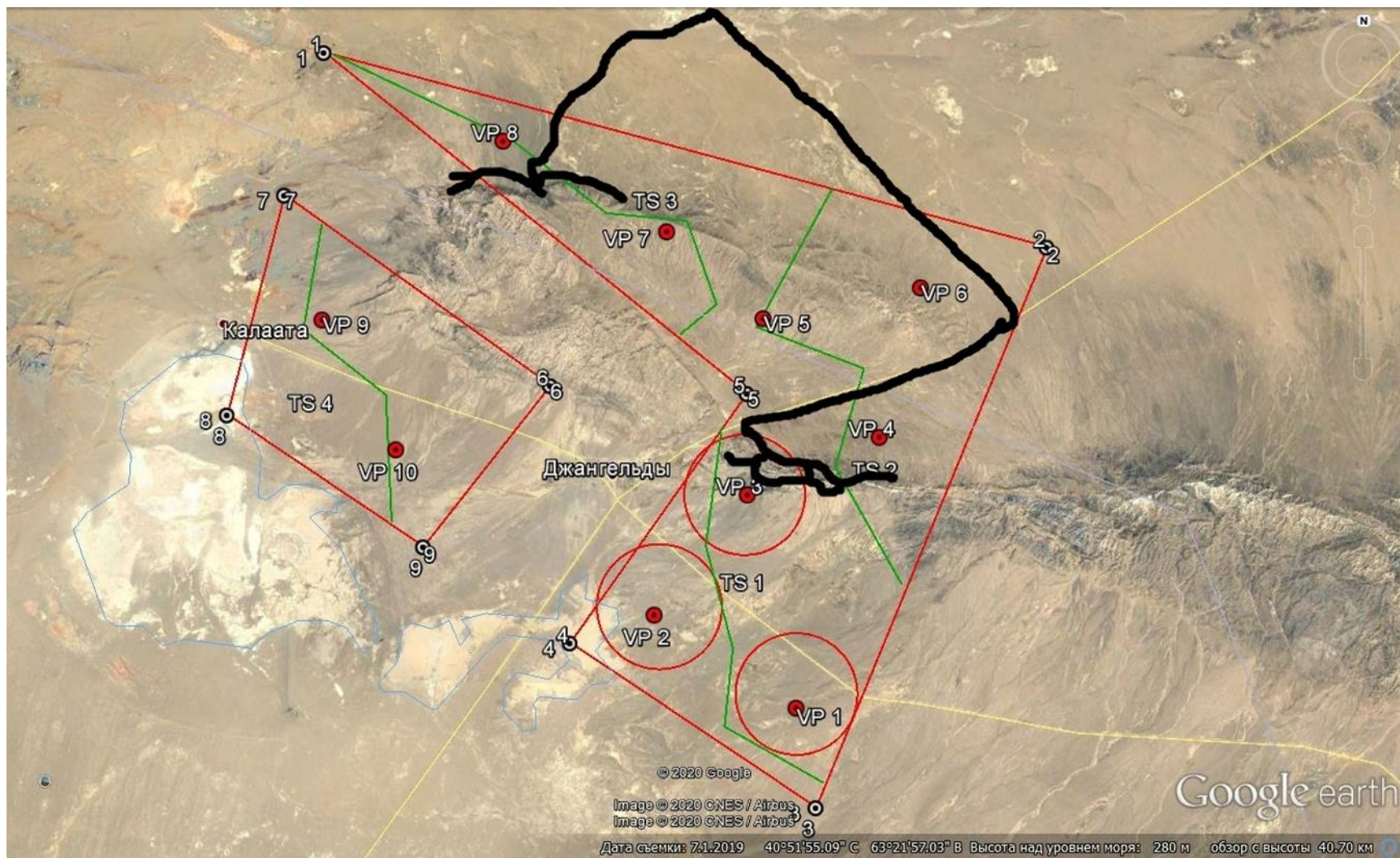


Fig. 3 Raptor nest survey transects

Table 8 List of birds encountered during raptors nests survey on August, 12-13

<b>№</b>	<b>Latin name</b>	<b>English name</b>	<b>Number</b>	<b>IUCN status</b>	<b>Uzbekistan Red Book status</b>	<b>Nature of stay</b>
1.	<i>Neophron percnopterus</i>	Egyptian Vulture	1	EN	2 (VU:D)	<b>NMW</b>
2.	<i>Falco tinnunculus</i>	Common Kestrel	1	LC	-	<b>NMW</b>
3.	<i>Columba livia</i>	Pigeon	14	LC	-	<b>R</b>
4.	<i>Pterocles orientalis</i>	Black-bellied Sandgrouse	2	LC	-	<b>NMW</b>
5.	<i>Merops superciliosus</i>	Blue-cheeked Bee-eater	22	LC	-	<b>NMW</b>
6.	<i>Hirundo rustica</i>	Barn Swallow	6	LC	-	<b>NM</b>
7.	<i>Galerida cristata</i>	Crested Lark	15	LC	-	<b>R</b>
8.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	38	LC	-	<b>NMW</b>
9.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	4	LC	-	<b>NM</b>

**Note:** *R* – *residens*, *W* – *wintering*, *M* – *migrant*, *N* – *Nesting*, *S* – *summer visitor*

## CONCLUSIONS AND RECCOMENDATIONS

### Houbara Bustard

The Dzankeldy project territory is located in the research area of the scientific group of the University of East-Anglia UK (led by dr. John Burnside), which surveys were founded by Ahmed bin Zayed Charitable Foundation. Asian Houbara is common nesting and migrating species on the project area, based on data from Burnside's team<sup>23</sup>. During the breeding season (mid March– mid May) displaying males are conspicuous and can be apparent from long distances. In summer however, Houbara Bustards are very shy and therefore difficult to see.

Although we did not observe Houbara Bustard on the project area during VP surveys in summer, there are a number of studies that indicate the presence of Houbara Bustard in this region. Houbara Bustard breeding program is being implementing in Uzbekistan by Emirates Center for the Conservation of Houbara<sup>4</sup> located in Navoi and Bukhara regions. From two nurseries operating since 2006, 16.32 thousand birds were released into the wild. In August 2020 itself more than 2.3 thousand bustards were released into the wild in Uzbekistan.

### Birds of prey

The raptor nesting survey during the summer season focused on the north-facing cliffs of the Kuljuktai mountains within the Project area. During the survey effort, only a single raptor nest was discovered, and it was believed to be an old nest (not used during the 2020 season), it can be because raptor breeding activity in the area had already finished by the time of survey. However, data from the Vantage Point surveys indicate that some of the target

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<sup>2</sup> Burnside, R.J., Collar, N.J., Dolman, P.M. (2017) Comparative migration strategies of wild and captive-bred Asian Houbara *Chlamydotis macqueenii*. Ibis 159,374–389. doi: 10.1111/ibi.12462

<sup>3</sup> Burnside, Buchan, C., Salliss, D., Collar, N.J., Dolman, P.M. (2020) Releases of Asian houbara must respect genetic and geographic origin to preserve inherited migration behaviour: evidence from a translocation experiment. Royal Society Open Science, <https://doi.org/10.1098/rsos.200250>

<sup>4</sup> <https://www.sustainablehoubaramanagement.org/>



species of raptor and vulture, for example the Egyptian Vulture (*Neophron percnopterus*) and Steppe Eagle (*Aquila nipalensis*) were active in the Project area during the entire summer season, and therefore may have nested in the vicinity of the Project area. Raptor nests surveys are secondary in importance to the Vantage Surveys for determining the level of collision risk for target bird species, including raptors and vultures whose breeding home ranges may overlap the Project area. Nonetheless, they provide an important complement to the VP surveys, as breeding populations may be regarded as more sensitive, and exposed to a greater degree of collision risk, than migratory populations. Hence, it would be beneficial to repeat the effort in the 2021 breeding season, if possible.

The territory of the planned Dzankeldy wind farm is located in the Northwestern part of the Kuldzhuktau mountain range, located in the Central part of the Kyzylkum desert. The Kuldzhuktau Mountains are low and dry. It is a home to desert species adapted to the lack of water. No large concentrations of birds or mammals were found here. Mostly only crested and gray larks are visible, sometimes black-bellied grouse and pigeons fly by, and rare voices of the brown Nightjar can be heard. Even birds of prey are not observed every day.

It should be noted that near the project territory there are no lakes or other water reservoirs that could attract waterfowl during nesting or migration, and there are not enough places suitable for nesting of large birds of prey (like large trees or sheltered cliffs), nor there is a narrow migration corridor. The project territory does not border on any protected or unprotected important natural territories, like Important bird areas (IBA). During summer observation period, bird encounters on this territory were the lowest in comparison with other project territories.

All of the above shows that the project area near the village of Dzankeldy is the most optimal in terms of the risk of birds' collision with wind turbines, which would be less than on other project territories (like Navoi-Bash).

Bird observations during the Autumn migration will give the final picture.

## Appendix 1. Weather conditions during VP Summer surveys

Table 9. Weather conditions and visibility in May<sup>5</sup>

	VP 1	VP 2	VP 3	VP 4	VP 5	VP 6	VP 7	VP 8	VP 9	VP 10
3 May		sunny, 1-3 m/s	sunny, 2-4 m/s	sunny, 2-3 m/s						
4 May									sunny, 1-3 m/s	sunny, 2-3 m/s
10 May	sunny, 2-4 m/s	sunny, 3-5 m/s	sunny, 2-3 m/s							
11 May							sunny, 2-5 m/s	sunny, 2-3 m/s		
19 May				sunny, 2-5 m/s	sunny, 2-5 m/s	sunny, 2-5 m/s				
20 May									sunny, 2-5 m/s	sunny, 3-5 m/s
21 May							sunny, 5-7 m/s	sunny, 5-7 m/s		

<sup>5</sup> Green color means good visibility, yellow-average visibility

Table 10 Weather conditions and visibility in June

	VP 1	VP 2	VP 3	VP 4	VP 5	VP 6	VP 7	VP 8	VP 9	VP 10
1 June	sunny, 5-6 m/s	sunny, 5-6 m/s	sunny, 5-6m/s							
2 June				sunny, 3-6 m/s	sunny, 4-6m/s	sunny, 3-6 m/s				
3 June							sunny, 3-5 m/s	sunny, 4-6 m/s		
4 June									sunny, 3-5 m/s	sunny, 2-5m/s
June	sunny, 4-6 m/s	sunny, 2-4 m/s	sunny, 2-5 m/s							
6 June				sunny, 4-6 m/s	sunny, 2-4 m/s	sunny, 4-6 m/s				
7 June							sunny, 5-6 m/s	sunny, 6-8 m/s		
12 June									sunny, 3-4 m/s	sunny, 3-5 m/s
13 June	sunny, 3-5 m/s	sunny, 6-8 m/s	sunny, 5-6 m/s							
14 June				sunny, 6-7 m/s	sunny, 5-6 m/s	sunny, 3-4 m/s				



15 June							sunny, 4-5 m/s	sunny, 6-7 m/s		
16 June									sunny, 3-6 m/s	sunny, 2-4 m/s
17 June	sunny, 5-6 m/s	sunny, 6-7 m/s	sunny, 4-6 m/s							
18 June				sunny, 4-6 m/s	sunny, 4-6 m/s	sunny, 3-5 m/s				
19 June							sunny, 5-6 m/s	sunny, 5-6 m/s		
24 June									sunny, 4-6 m/s	sunny, 2-4 m/s
25 June	sunny, 4-6 m/s	sunny, 5-6 m/s	sunny, 4-6 m/s							

Table 11 Weather conditions and visibility in July

	VP 1	VP 2	VP 3	VP 4	VP 5	VP 6	VP 7	VP 8	VP 9	VP 10
1 July	sunny, 4-6 m/s	sunny, 3-4 m/s	sunny, 6-8 m/s							
2 July				sunny, 3-5 m/s	sunny, 5-6m/s	sunny, 3-6 m/s				
3 July							sunny, 4-6 m/s	sunny, 3-5 m/s		
4 July									sunny, 2-5 m/s	sunny, 3-5m/s
5 July	sunny, 2-4 m/s	sunny, 5-6 m/s	sunny, 3-5 m/s							
6 July				sunny, 4-6 m/s	sunny, 4-5 m/s	sunny, 5-6 m/s				
7 July							sunny, 5-6 m/s	sunny, 6-8 m/s		
12 July									sunny, 2-4 m/s	sunny, 3-5 m/s
13 July	sunny, 3-5 m/s	sunny, 2-3 m/s	sunny, 5-6 m/s							
14 July				sunny, 6-7 m/s	sunny, 5-6 m/s	sunny, 3-4 m/s				

15 July							sunny, 4-5 m/s	sunny, 6-7 m/s		
16 July									sunny, 3-6 m/s	sunny, 2-4 m/s
17 July	sunny, 5-6 m/s	sunny, 6-7 m/s	sunny, 4-6 m/s							
18 July				sunny, 3-5 m/s	sunny, 4-6 m/s	sunny, 4-6 m/s				
19 July							sunny, 5-6 m/s	sunny, 5-6 m/s		
24 July									sunny, 5-6 m/s	sunny, 3-4 m/s
25 July	sunny, 5-6 m/s	sunny, 5-6 m/s	sunny, 4-6 m/s							



Table 12 Weather conditions and visibility in August

	VP 1	VP 2	VP 3	VP 4	VP 5	VP 6	VP 7	VP 8	VP 9	VP 10
1 August	sunny, 5-6 m/s	sunny, 5-7 m/s	sunny, 6-8 m/s							
2 August				sunny, 3-5 m/s	sunny, 6-7 m/s	sunny, 3-4 m/s				
3 August							sunny, 4-6 m/s	sunny, 2-3 m/s		
4 August									sunny, 3-5 m/s	sunny, 3-5m/s
5 August	sunny, 4-5m/s	sunny, 5-6 m/s	sunny, 2-5 m/s							
6 August				sunny, 4-6 m/s	sunny, 4-5 m/s	sunny, 5-6 m/s				
7 August							sunny, 5-6 m/s	sunny, 6-8 m/s		
12 August									sunny, 5-6 m/s	sunny, 3-5 m/s
14 August				sunny, 6-7 m/s	sunny, 5-6 m/s	sunny, 2-4 m/s				
15 August							sunny, 4-5 m/s	sunny, 6-7 m/s		

16 August									sunny, 3-6 m/s	sunny, 2-4 m/s
17 August				sunny, 3-4 m/s	sunny, 4-5 m/s	sunny, 3-4 m/s				
18 August							sunny, 5-6 m/s	sunny, 5-7 m/s		
19 August									sunny, 5-6 m/s	sunny, 2-4 m/s

## Appendix 2. Vantage Point Data Logs

### VP survey results in May

#### VP. 4

Date: 19.05.2020 Start and end time: 8:25 – 11:25

Weather:

The air temperature around 20-25°C is clear.

Wind speed approx. (2-5 m/s) No precipitation

Primary species not found

Table 13 Secondary species log (VP 4), 19.05.2020

No.	Latin names	English names	Amount
1.	<i>Accipiter nisus</i>	Eurasian Sparrowhawk	1



### VP. 5

Date: 19.05.2020 Start and end time: 11:45 – 14:45

Weather:

The air temperature around 25-28°C is clear.

Wind speed approx. (2-5 m/s) No precipitation

Primary and secondary species not found

### VP. 6

Date: 19.05.2020 Start and end time: 15:58 – 18:58

Weather:

The air temperature around 28-30°C is clear.

Wind speed approx. (2-5 m/s) No precipitation

Primary species not found

Table 14 Secondary species log (VP 6), 19.05.2020

No.	Latin names	English names	Amount
1.	<i>Buteo rufinus</i>	Long-legged Buzzard	1

## VP. 10

Date: 20.05.2020 Start and end time: 9:23 – 12:23

Weather:

The air temperature around 25-29°C is clear.

Wind speed approx. (2-3 m/s) No precipitation

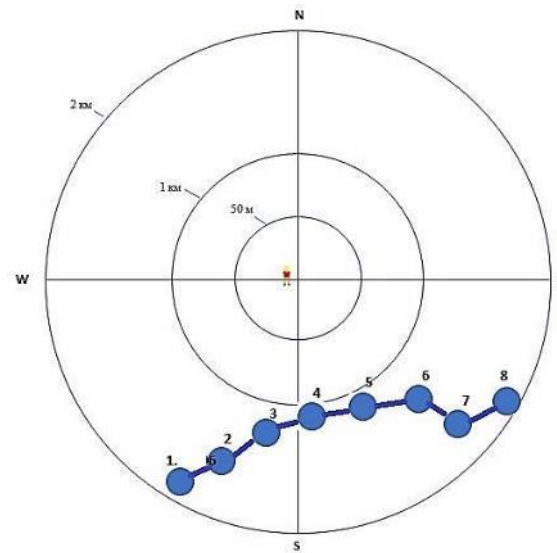


Fig. 4 Flight path (VP 10) , 20.05.2020

Table 15 Target species data log (VP 10), 20.05.2020


	<i>Neophron percnopterus</i>	1- 40 m	2- 40 m	3- 45 m	4- 40 m	5- 45 m	6- 45 m	7- 45 m	8- 40 m
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Table 16 Secondary species (VP 10), 20.05.2020

Latin names	English names	Amount
<i>Circus aeruginosus</i>	Marsh Harrier	1
<i>Accipiter nisus</i>	Sparowhawk	1

**VP. 9**

Date: 20.05.2020 Start and end time: 12:37 – 15:41

Weather:

The air temperature around 30-34°C is clear.

Wind speed approx. (2-5 m/s) No precipitation



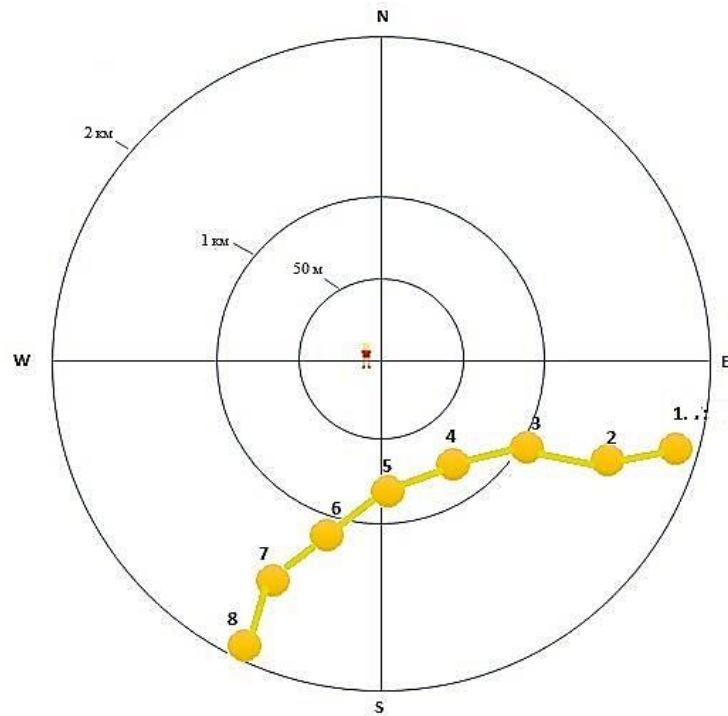


Fig. 5 Flight path (VP 9), 20.05.2020

Table 17 Target species data log (VP 9), 20.05.2020


	<i>Neophron percnopterus</i>	1-40 m	2-40 m	3-45 m	4-40 m	5-45 m	6-45 m	7-45 m	8-40 m
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Table 18 Secondary species (VP 9), 20.05.2020

No.	Latin names	English names	Amount
	<i>Accipiter nisus</i>	Eurasian Sparrowhawk	1

## VP. 7

Date: 21.05.2020 Start and end time: 8:25 – 11:25

Weather:

The air temperature around 18-20°C is clear.

Wind speed approx. (5-7 m/s) No precipitation

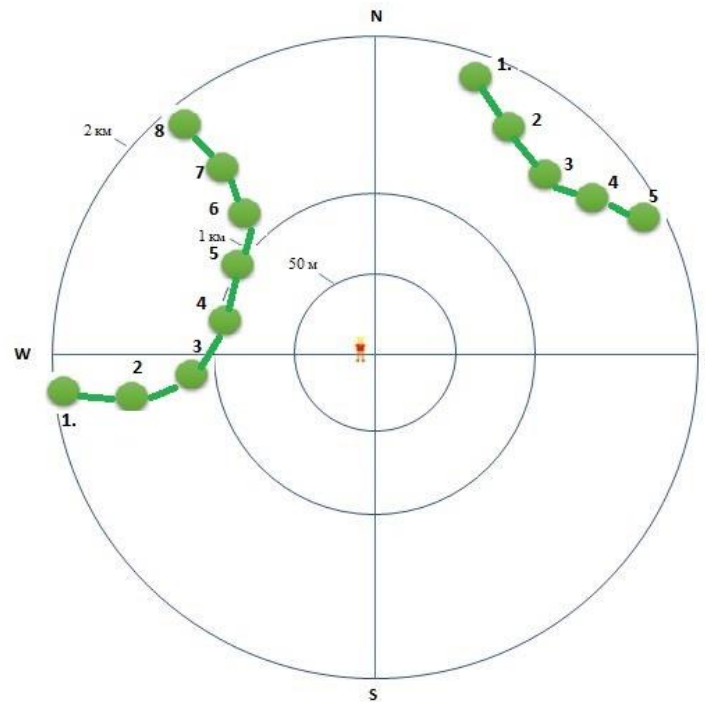




Fig. 6 Flight path (VP 7), 21.05.2020

Table 19 Secondary species (VP 7), 21.05.2020

	<i>Neophron percnopterus</i> (1)	1-30 m	2-30 m	3-35 m	4-30 m	5-35 m				
	<i>Neophron percnopterus</i> (2)	1-20 m	2-20 m	3-25 m	4-25m	5-30 m	6-35 m	7-35 m	1-40 m	

Secondary species not found

### VP. 8

Date: 20.05.2020 Start and end time: 11:40 – 14:40

Weather:

The air temperature around 25-28°C is clear, hot.

Wind speed approx. (5-7 m/s) No precipitation

Primary and, secondary species not found.



## VP survey results in June

### VP. 3

Date: 01.06.2020 Start and end time: 8:32 – 11:32

**Weather:**

The air temperature: start 24°C end 29°C Clear

Wind speed approx. (5-6 m/s) No precipitation

**Primary species not found**

Table 20 Secondary and other species 01.06.2020 VP 3

No.	Latin names	English names	Amount	Altitude (m)
1.	<i>Circus aeruginosus</i>	Marsh Harrier	1	23
2.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	17	0-4
3.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	2	0-5
4.	<i>Galerida cristata</i>	Crested Lark	4	3-15
5.	<i>Oenanthe pleschanka</i>	Pied Wheatear	1	2-3
6.	<i>Columba livia</i>	Rock Dove	7	12-15

## VP. 2

Date: 01.06.2020 Start and end time: 12:06 – 15:06

**Weather:**

The air temperature: start 30°C end 33°C Clear

Wind speed approx. (5-6 m/s) No precipitation

**Primary species not found**

Table 21 Secondary and other species 01.06.2020 VP 2

No.	Latin names	English names	Amount	Altitude (m)
1.	<i>Galerida cristata</i>	Crested Lark	3	2-10
2.	<i>Merops supercilios</i>	Blue-cheeked Bee-eater	4	12
3.	<i>Athene noctua</i>	Little Owl	1	0-6
4.	<i>Columba livia</i>	Rock Dove	2	14
5.	<i>Lanius pallidirostris</i>	Southern grey shrike	1	5-8
6.	<i>Corvus corone</i>	Eurasian Carrion Crow	2	0

### VP. 1

Date: 01.06.2020 Start and end time: 15:46 – 18:46

**Weather:**

The air temperature: start 34°C end 31°C Clear

Wind speed approx. (5-6 m/s) No precipitation

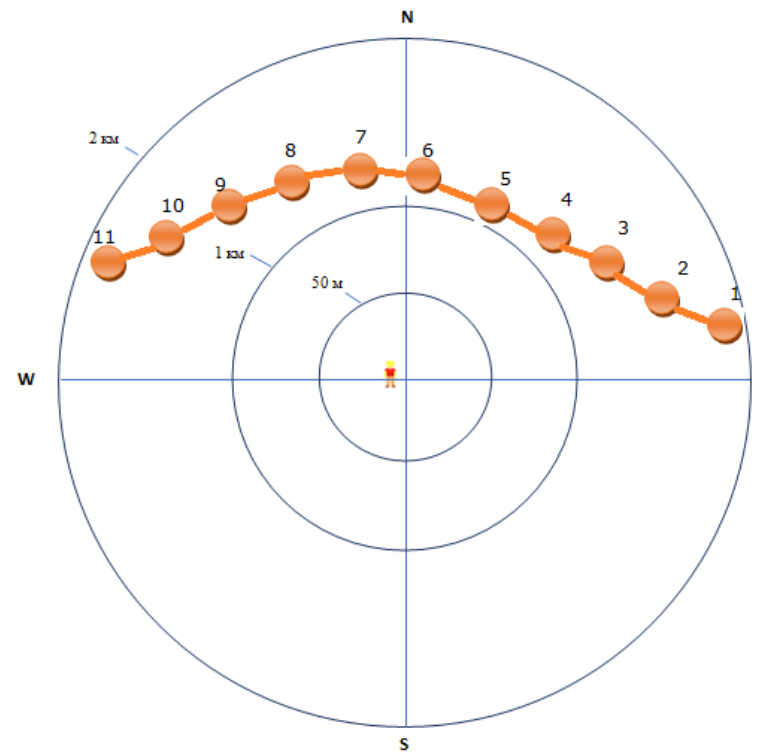


Fig. 7 Flight path (VP 1), 01.06.2020



Table 22 Target species log (VP 1), 01.06.2020


	<i>Neophron percnopterus</i>	1 65m	2 65m	3 70m	4 70m	5 75m	6 75m	7 70m	8 70m	9 65m	10 60m	11 60m
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Table 23 Secondary and other species 01.06.2020 VP 1

No.	Latin names	English names	Amount	Altitude (m)
1.	<i>Pterocles orientalis</i>	Black-bellied sandgrouse	6	5-12
2.	<i>Coracias garrulus</i>	Eurasian Roller	2	9
3.	<i>Galerida cristata</i>	Crested Lark	6	3-6
4.	<i>Merops supercilios</i>	Blue-cheeked Bee-eater	16	15-25
5.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	11	0

**VP. 4**

Date: 02.06.2020 Start and end time: 7:46 – 10:46

**Weather:**

The air temperature: start 23°C end 28°C Clear

Wind speed approx. (3-6 m/s) No precipitation

**Primary species not found**

Table 24 Secondary and other species 02.06.2020 VP 4

No.	Latin names	English names	Amount	Altitude (m)
1.	<i>Galerida cristata</i>	Crested Lark	2	2-8
2.	<i>Upupa epops</i>	Hoopoe	1	0-3
3.	<i>Coracias garrulus</i>	Eurasian Roller	3	5
4.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	5	3-5
5.	<i>Muscicapa striata</i>	Spotted Flycatcher	1	1
6.	<i>Merops supercilios</i>	Blue-cheeked Bee-eater	5	6-12
7.	<i>Lanius pallidirostris</i>	Southern grey shrike	2	3-15

**VP. 6**

Date: 02.06.2020 Start and end time: 11:16 – 14:16

**Weather:**

The air temperature: start 30°C end 33 °C Clear

Wind speed approx. (3-6 m/s) No precipitation

**Primary species not found**

Table 25 Secondary and other species 02.06.2020 VP 6

No.	Latin names	English names	Amount	Altitude (m)
1.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	1	0-3
2.	<i>Galerida cristata</i>	Crested Lark	5	2-8
3.	<i>Coracias garrulus</i>	Eurasian Roller	2	6
4.	<i>Muscicapa striata</i>	Spotted Flycatcher	1	1
5.	<i>Merops supercilios</i>	Blue-cheeked Bee-eater	3	6-11
6.	<i>Lanius pallidirostris</i>	Southern grey shrike	1	3-12
7.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	13	0



### VP5

Date: 02.06.2020 Start and end time: 14:56 – 17:56

#### **Weather:**

The air temperature: start 33°C end 31 °C Clear

Wind speed approx. (4-6 m/s) No precipitation

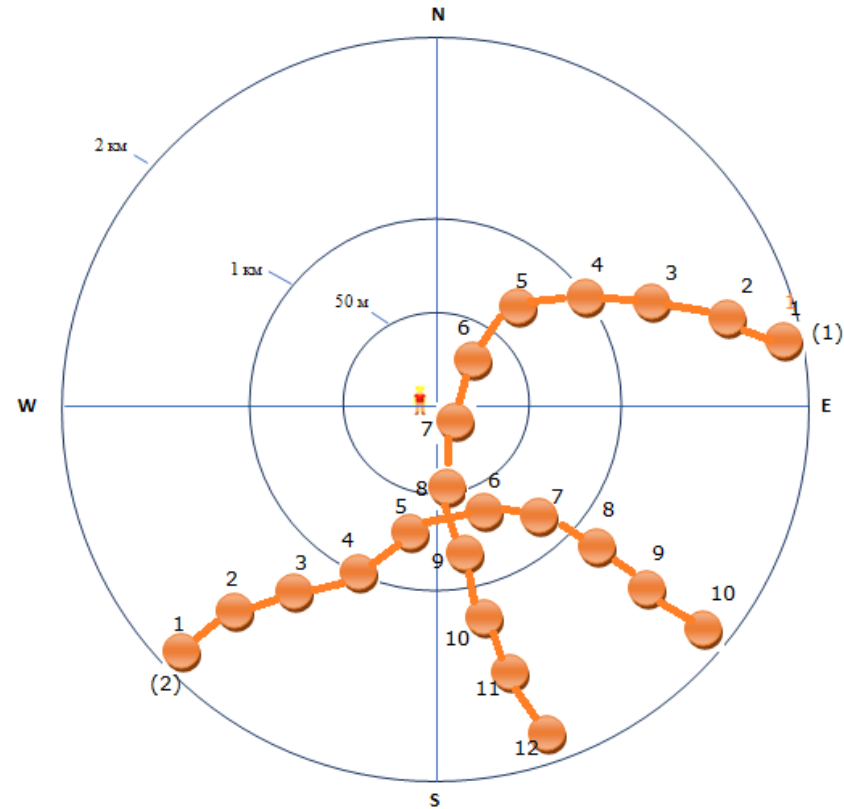


Fig. 8 Flight path (VP 6), 02.06.2020

Table 26 Target species log (VP 6), 02.06.2020



	<i>Neophron percnopterus</i> (1)	1 75 m	2 75 m	3 70 m	4 70 m	5 75 m	6 75 m	7 70 m	8 70 m	9 70 m	10 70 m	11 75 m	12 75 m
	<i>Neophron percnopterus</i> (2)	1 75 m	2 75 m	3 70 m	4 70 m	5 65 m	6 65 m	7 60 m	8 60 m	9 60 m	10 60 m		

Table 27 Secondary and other species 02.06.2020 VP 6

No.	Latin names	English names	Amount	Altitude (m)
1.	<i>Falco tinnunculus</i>	Kestrel	1	12-20
2.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	2	3
3.	<i>Galerida cristata</i>	Crested Lark	3	2-12
4.	<i>Caprimulgus aegyptius</i>	Egyptian nightjar	2	6-13
5.	<i>Merops supercilios</i>	Blue-cheeked Bee-eater	12	15

**VP. 7**

Date: 03.06.2020 Start and end time: 07:56 – 10:56

**Weather:**

The air temperature: start 23°C end 28°C Clear

Wind speed approx. (3-5 m/s) No precipitation

**Primary species not found**

Table 28 Secondary and other species 03.06.2020 VP 7

No.	Latin names	English names	Amount	Altitude (m)
1.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	3	2
2.	<i>Coracias garrulus</i>	Eurasian Roller	4	8
3.	<i>Galerida cristata</i>	Crested Lark	1	3-12
4.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	19	0-4
5.	<i>Lanius pallidirostris</i>	Southern grey shrike	2	6
6.	<i>Scotocerca inquieta</i>	Streaked Scrub Warbler	1	0-3
7.	<i>Pterocles orientalis</i>	Black-bellied sandgrouse	11	5-6
8.	<i>Falco tinnunculus</i>	Kestrel	1	10-23



**VP. 8**

Date: 03.06.2020 Start and end time: 12:14 – 15:14

**Weather:**

The air temperature around 29-32°C is clear.

Wind speed approx. (4-6 m/s) No precipitation

**Primary species not found**

Table 29 Secondary and other species 03.06.2020 VP 8

No.	Latin names	English names	Amount	Altitude (m)
1.	<i>Galerida cristata</i>	Crested Lark	3	2
2.	<i>Coracias garrulus</i>	Eurasian Roller	1	12
3.	<i>Acridotheres tristis</i>	Common mayna	2	8
4.	<i>Columba livia</i>	Rock Dove	15	12
5.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	16	6

**VP. 10**

Date: 04.06.2020 Start and end time: 07:56 – 10:56

**Weather:**

The air temperature: start 23°C end 28°C Clear

Wind speed approx. (2-5 m/s) No precipitation

**Primary species not found**

Table 30 Secondary and other species 04.06.2020 VP10

No.	Latin names	English names	Amount	Altitude (m)
1.	<i>Athene noctua</i>	Little Owl	1	2
2.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	2	3
3.	<i>Acridotheres tristis</i>	Common myna	3	5-10
4.	<i>Caprimulgus aegyptius</i>	Egyptian nightjar	2	4-6
5.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	13	0
6.	<i>Columba livia</i>	Rock Dove	3	16
7.	<i>Hirundo rustica</i>	Barn swallow	4	3-9
8.	<i>Coracias garrulus</i>	Eurasian Roller	1	6

**VP. 9**

Date: 04.06.2020 Start and end time: 11:26 – 14:30

**Weather:**

The air temperature: start 29°C end 33°C Clear

Wind speed approx. (3-5 m/s) No precipitation

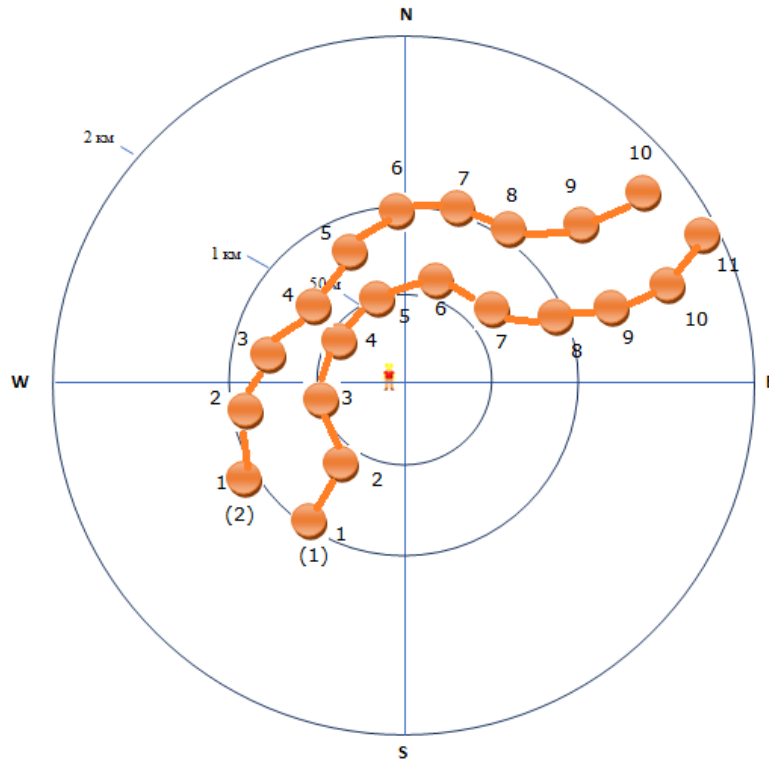


Fig. 9 Flight path (VP 9), 04.06.2020



Table 31 Target species log (VP 9), 04.06.2020



	<i>Neophron percnopterus</i> (1)	1 50m	2 50m	3 50m	4 55m	5 55m	6 50m	7 55m	8 55m	9 50m	10 50m	11 50m
	<i>Neophron percnopterus</i> (2)	1 50m	2 50m	3 50m	4 55m	5 55m	6 50m	7 55m	8 55m	9 50m	10 50m	

Table 32 Secondary and other species 04.06.2020 VP 9

No.	Latin names	English names	Amount	Altitude (m)
1.	<i>Falco naumanni</i>	Lesser Kestrel	2	9-20
2.	<i>Rhodospiza obsoleta</i>	Black-billed Desert Finch	12	2
3.	<i>Galerida cristata</i>	Crested Lark	5	3-10
4.	<i>Pterocles orientalis</i>	Black-bellied sandgrouse	2	8
5.	<i>Merops supercilios</i>	Blue-cheeked Bee-eater	5	8-20
6.	<i>Coracias garrulus</i>	Eurasian Roller	3	6

**VP. 3**

Date: 05.06.2020 Start and end time: 8:26 – 11:30

**Weather:**

The air temperature: start 24°C end 29°C Clear

Wind speed approx. (2-5 m/s) No precipitation

**Primary species not found**

Table 33 Secondary and other species 05.06.2020 VP 3

No.	Latin names	English names	Amount	Altitude (m)
1.	<i>Galerida cristata</i>	Crested Lark	6	0-9
2.	<i>Buteo rufinus</i>	Long-legged Buzzard	1	8
3.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	10	0-3
4.	<i>Lanius pallidirostris</i>	Southern grey shrike	2	3-5
5.	<i>Merops supercilios</i>	Blue-cheeked Bee-eater	2	15
6.	<i>Scotocerca inquieta</i>	Streaked Scrub Warbler	1	1-2

**VP. 2**

Date: 05.06.2020 Start and end time: 12:06 – 15:06

**Weather:**

The air temperature: start 30°C end 34°C Clear

Wind speed approx. (2-4 m/s) No precipitation

**Primary species not found**

Table 34 Secondary and other species 09.06.2020 VP4

<b>No.</b>	<b>Latin names</b>	<b>English names</b>	<b>Amount</b>	<b>Altitude (m)</b>
1.	<i>Circus aeruginosus</i>	Marsh-Harrier	1	23
2.	<i>Merops supercilios</i>	Blue-cheeked Bee-eater	5	10
3.	<i>Pterocles orientalis</i>	Black-bellied sandgrouse	2	1
4.	<i>Rhodospiza obsoleta</i>	Black-billed Desert Finch	10	2
5.	<i>Coracias garrulus</i>	Eurasian Roller	4	10
6.	<i>Galerida cristata</i>	Crested Lark	6	5



### VP.1

Date: 05.06.2020 Start and end time: 15:36 – 18:36

**Weather:**

The air temperature: start 34°C end 31°C Clear

Wind speed approx. (4-6 m/s) No precipitation

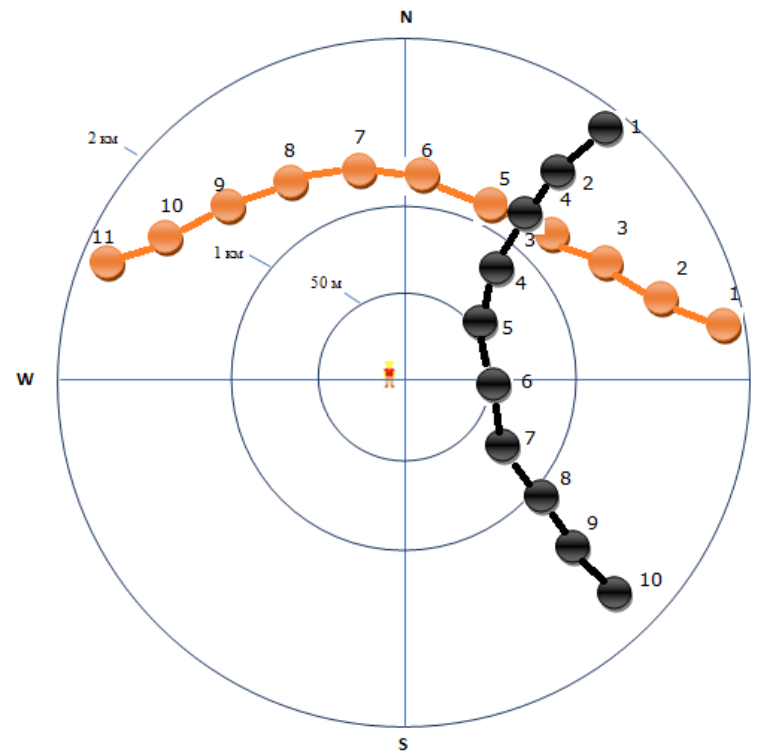


Fig. 10 Flight path (VP 3), 05.06.2020

Table 35 Target species log (VP 3), 05.06.2020



	<i>Aquila nipalensis</i>	1 90m	2 80m	3 80m	4 75m	5 65m	6 60m	7 75m	8 75m	9 80m	10 90m	
	<i>Neophron percnopterus</i>	1 50m	2 50m	3 50m	4 55m	5 55m	6 60m	7 65m	8 65m	9 70m	10 70m	11 70m

Table 36 Secondary and other species 03.06.2020 VP3

No.	Latin names	English names	Amount	Altitude (m)
1.	<i>Merops supercilios</i>	Blue-cheeked Bee-eater	4	10
2.	<i>Galerida cristata</i>	Crested Lark	3	5
3.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	1	2
4.	<i>Athene noctua</i>	Little Owl	1	0-16
5.	<i>Rhodospiza obsoleta</i>	Black-billed Desert Finch	2	0-2

#### VP 4

Date: 06.06.2020 Start and end time: 8:36 – 11:36

**Weather:**

The air temperature: start 24°C end 29°C Clear

Wind speed approx. (4-6 m/s) No precipitation

**Primary species not found**

Table 37 Secondary and other species 06.06.2020 VP4

No.	Latin names	English names	Amount	Altitude (m)
1.	<i>Merops supercilios</i>	Blue-cheeked Bee-eater	5	6-12
2.	<i>Galerida cristata</i>	Crested Lark	4	2-9
3.	<i>Rhodospiza obsoleta</i>	Black-billed Desert Finch	8	2
4.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	2	1-3
5.	<i>Falco tinnunculus</i>	Kestrel	2	16-20



**VP. 5**

Date: 06.06.2020 Start and end time: 12:06 – 15:06

**Weather:**

The air temperature: start 31°C end 34°C Clear

Wind speed approx. (2-4 m/s) No precipitation

**Primary species not found**

Table 38 Secondary and other species 06.06.2020 VP5

<b>No.</b>	<b>Latin names</b>	<b>English names</b>	<b>Amount</b>	<b>Altitude (m)</b>
1.	<i>Galerida cristata</i>	Crested Lark	2	3
2.	<i>Buteo buteo</i>	Common Buzzard	1	5
3.	<i>Coracias garrulus</i>	Eurasian Roller	3	12
4.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	1	1
5.	<i>Merops supercilios</i>	Blue-cheeked Bee-eater	3	6-9
6.	<i>Lanius pallidirostris</i>	Southern grey shrike	2	3-5

## VP 6

Date: 06.06.2020 Start and end time: 15:46 – 18:46

### Weather:

The air temperature: start 34°C end 31°C Clear

Wind speed approx. (4-6 m/s) No precipitation

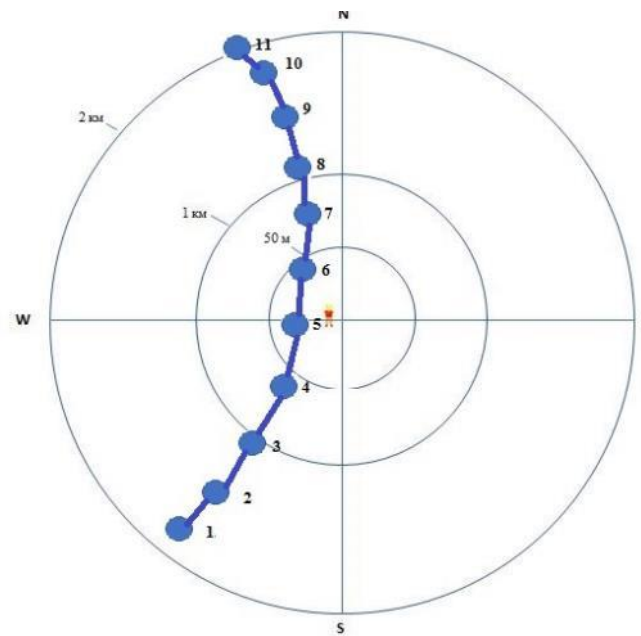


Fig. 11 Flight path (VP 6), 06.06.2020

Table 39 Target species log (VP 6),06.06.2020


	<i>Aegypius monachus</i>	1	2	3	4	5	6	7	8	9	10	11
		120 m	120 m	120 m	125 m	125 m	120 m	125 m	125 m	120 m	120 m	120 m

Table 40 Secondary and other species 06.06.2020 VP 6

<b>No.</b>	<b>Latin names</b>	<b>English names</b>	<b>Amount</b>	<b>Altitude (m)</b>
1.	<i>Galerida cristata</i>	Crested Lark	6	2-6
2.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	1	1-2
3.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	15	0
4.	<i>Rhodospiza obsoleta</i>	Black-billed Desert Finch	3	2
5.	<i>Pterocles orientalis</i>	Black-bellied sandgrouse	2	13
6.	<i>Lanius pallidirostris</i>	Southern grey shrike	1	5
7.	<i>Acridotheres tristis</i>	Common myna	2	5-10



**VP.7**

Date: 07.06.2020 Start and end time: 7:46 – 11:46

**Weather:**

The air temperature: start 23°C end 29°C Clear

Wind speed approx. (5-6 m/s) No precipitation

**Primary species not found**

Table 41 Secondary and other species 07.06.2020 VP7

No.	Latin names	English names	Amount	Altitude (m)
1.	<i>Galerida cristata</i>	Crested Lark	4	2
2.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	8	0
3.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	2	2
4.	<i>Pterocles orientalis</i>	Black-bellied sandgrouse	4	13
5.	<i>Merops supercilios</i>	Blue-cheeked Bee-eater	5	18
6.	<i>Coracias garrulus</i>	Eurasian Roller	1	12

### VP. 8

Date: 07.06.2020 Start and end time: 12:16 – 15:16

**Weather:**

The air temperature: start 32°C end 33°C Clear

Wind speed approx. (6-8 m/s) No precipitation

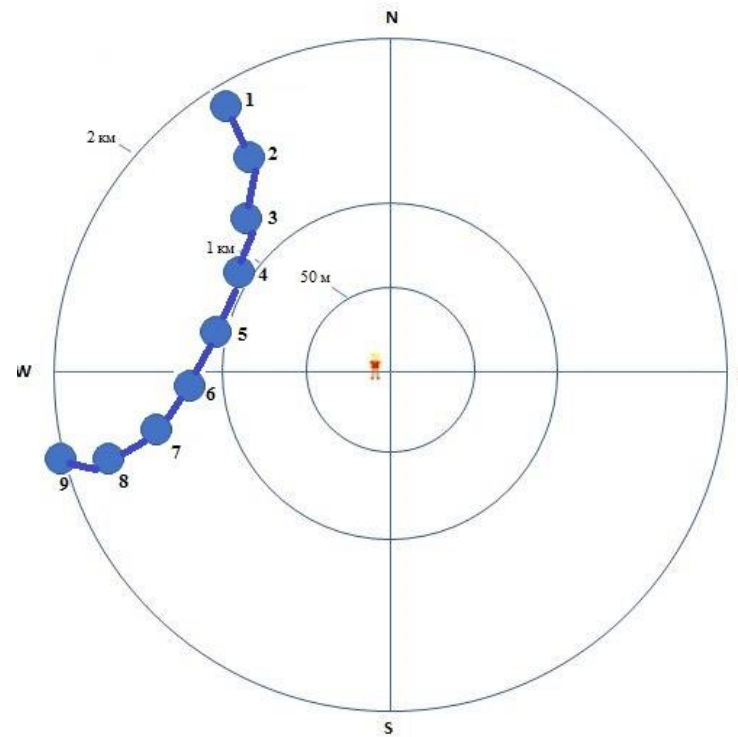


Fig. 12 Flight path (VP 8), 07.06.2020

Table 42 Target species log (VP 8), 07.06.2020


	<i>Aegyptius monachus</i>	1 90m	2 90m	3 90m	4 95m	5 95m	6 90m	7 95m	8 95m	9 90m
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Table 43 Secondary and other species 07.06.2020 VP 8

No.	Latin names	English names	Amount	Altitude (m)
1.	<i>Galerida cristata</i>	Crested Lark	3	2
2.	<i>Lanius pallidirostris</i>	Southern grey shrike	1	6
3.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	1	2
4.	<i>Merops supercilios</i>	Blue-cheeked Bee-eater	2	13
5.	<i>Coracias garrulus</i>	Eurasian Roller	2	3
6.	<i>Pterocles orientalis</i>	Black-bellied sandgrouse	2	12



**VP. 10**

Date: 12.06.2020 Start and end time: 8:16 – 11:16

**Weather:**

The air temperature: start 23°C end 28°C Clear

Wind speed approx. (3-5 m/s) No precipitation

**Primary species not found**

Table 44 Secondary and other species 12.06.2020 VP 10

No.	Latin names	English names	Amount	Altitude (m)
1.	<i>Galerida cristata</i>	Crested Lark	6	5
2.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	26	0-3
3.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	2	3
4.	<i>Falco tinnunculus</i>	Kestrel	2	12-20
5.	<i>Columba livia</i>	Rock Dove	5	18
6.	<i>Upupa epops</i>	Hoopoe	1	0-3
7.	<i>Merops supercilios</i>	Blue-cheeked Bee-eater	9	9-16
8.	<i>Hirundo rustica</i>	Barn swallow	6	3-10

**VP. 9**

Date: 12.06.2020 Start and end time: 11:56 – 15:56

**Weather:**

The air temperature: start 30°C end 34°C Clear

Wind speed approx. (3-4 m/s) No precipitation

**Primary species not found**

Table 45 Secondary and other species 12.06.2020 VP 9

No.	Latin names	English names	Amount	Altitude (m)
1.	<i>Galerida cristata</i>	Crested Lark	9	2-5
2.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	2	2
3.	<i>Coracias garrulus</i>	Eurasian Roller	2	5
4.	<i>Corvus ruficollis</i>	Brown-necked Raven	2	0
5.	<i>Falco naumanni</i>	Lesser Kestrel	1	16-18
6.	<i>Hirundo rustica</i>	Barn swallow	5	5-9
7.	<i>Acridotheres tristis</i>	Common myna	2	14

### VP. 3

Date: 13.06.2020 Start and end time: 7:56 – 10:56

**Weather:**

The air temperature: start 24°C end 30°C Clear

Wind speed approx. (5-6 m/s) No precipitation

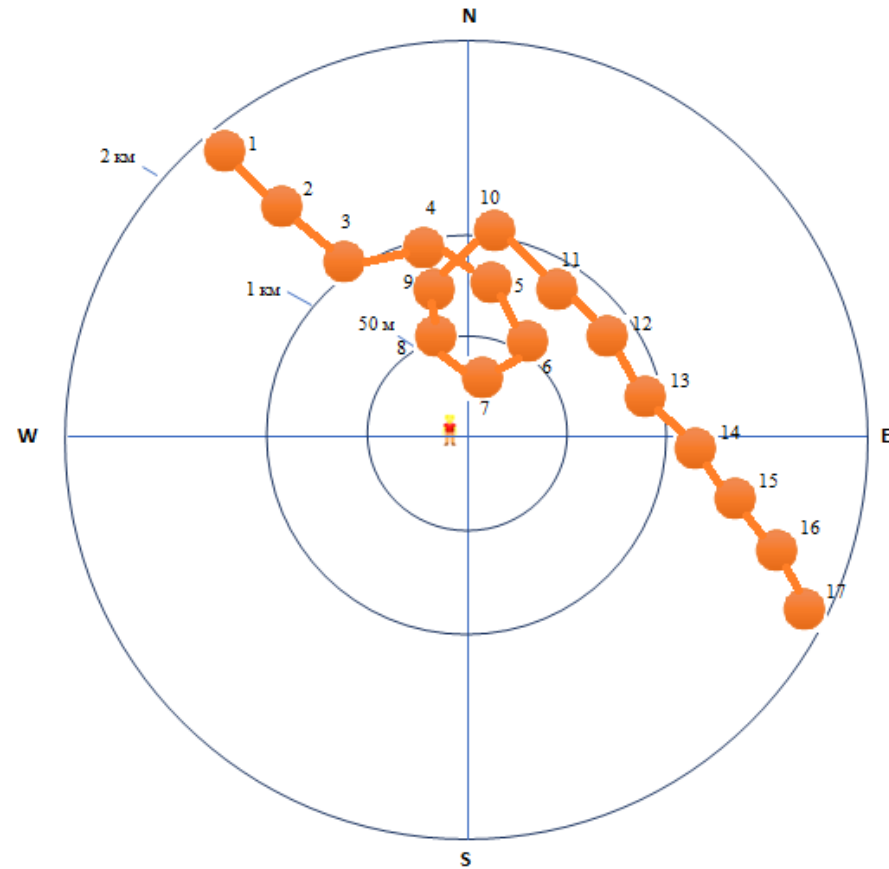


Fig. 13 Flight path (VP 3), 13.06.2020



Table 46 Target species log (VP 3), 13.06.2020


	<i>Neophron percnopterus</i>	1-60 m	2-60 m	3-65 m	4-60 m	5-65 m	6-65 m	7-65 m	8-60 m	9-60 m	10-65 m	11-60 m	12-60 m	13-60 m	14-60 m	15-65 m	16-60 m	17-65 m
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Table 47 Secondary and other species 13.06.2020 VP 3

No.	Latin names	English names	Amount	Altitude (m)
1.	<i>Galerida cristata</i>	Crested Lark	9	2-9
2.	<i>Buteo rufinus</i>	Long-legged Buzzard	1	7
3.	<i>Corvus corone</i>	Eurasian Carrion Crow	2	0-3
4.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	1	0-2
5.	<i>Falco naumanni</i>	Lesser Kestrel	1	16-20
6.	<i>Athene noctua</i>	Little Owl	1	0-10

**VP. 2**

Date: 13.06.2020 Start and end time: 11:26 – 14:26

**Weather:**

The air temperature: start 32°C end 33°C Clear

Wind speed approx. (6-8 m/s) No precipitation

**Primary species not found**

Table 48 Secondary and other species 13.06.2020 VP 2

No.	Latin names	English names	Amount	Altitude (m)
1.	<i>Galerida cristata</i>	Crested Lark	6	2
2.	<i>Lanius pallidirostris</i>	Southern grey shrike	1	6
3.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	3	2
4.	<i>Pterocles orientalis</i>	Black-bellied sandgrouse	8	12

**VP. 1**

Date: 13.06.2020 Start and end time: 15:49 – 18:49

**Weather:**

The air temperature: start 33°C end 29°C Clear

Wind speed approx. (3-5 m/s) No precipitation

**Primary species not found**

Table 49 Secondary and other species 13.06.2020 VP 1

<b>No.</b>	<b>Latin names</b>	<b>English names</b>	<b>Amount</b>	<b>Altitude (m)</b>
1.	<i>Galerida cristata</i>	Crested Lark	6	5
2.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	2	3
3.	<i>Columba livia</i>	Rock Dove	5	18
4.	<i>Upupa epops</i>	Hoopoe	1	0-3
5.	<i>Merops supercilios</i>	Blue-cheeked Bee-eater	9	9-16
6.	<i>Hirundo rustica</i>	Barn swallow	6	3-10



**VP. 6**

Date: 14.06.2020 Start and end time: 7:57 – 10:57

**Weather:**

The air temperature: start 23°C end 28°C Clear

Wind speed approx. (3-4 m/s) No precipitation

**Primary species not found**

Table 50 Secondary and other species 14.06.2020 VP 6

No.	Latin names	English names	Amount	Altitude (m)
1.	<i>Galerida cristata</i>	Crested Lark	9	2-5
2.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	2	2
3.	<i>Circus aeruginosus</i>	Marsh Harrier	1	6-25
4.	<i>Hirundo rustica</i>	Barn swallow	3	3-9
5.	<i>Coracias garrulus</i>	Eurasian Roller	2	4

### VP. 5

Date: 14.06.2020 Start and end time: 11:28 – 14:28

**Weather:**

The air temperature: start 31°C end 33°C Clear

Wind speed approx. (5-6 m/s) No precipitation

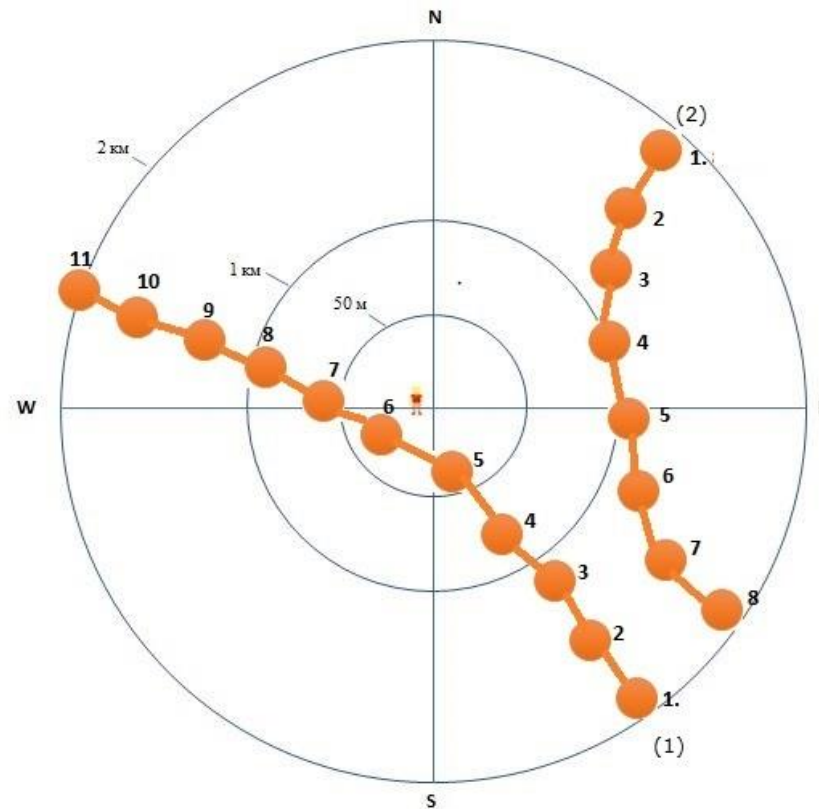


Fig. 14 Flight path (VP 5), 14.06.2020

Table 51 Target species log (VP 5), 14.06.2020



	<i>Neophron percnopterus(1)</i>	1-60 m	2-60 m	3-65 m	4-60 m	5-65 m	6-65 m	7-65 m	8-60 m	9-60 m	10-65 m	11-60 m
	<i>Neophron percnopterus(2)</i>	1-60 m	2-60 m	3-65 m	4-60 m	5-65 m	6-65 m	7-65 m	8-60 m			

Table 52 Secondary and other species 14.06.2020 VP 5

No.	Latin names	English names	Amount	Altitude (m)
1.	<i>Galerida cristata</i>	Crested Lark	6	2-6
2.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	3	0-4
3.	<i>Merops supercilios</i>	Blue-cheeked Bee-eater	4	6-9
4.	<i>Coracias garrulus</i>	Eurasian Roller	3	3
5.	<i>Lanius pallidirostris</i>	Southern grey shrike	1	6
6.	<i>Oenanthe pleschanka</i>	Pied Wheatear	2	0-5



**VP4**

Date: 14.06.2020 Start and end time: 15:12 – 18:12

**Weather:**

The air temperature: start 34°C end 30°C Clear

Wind speed approx. (6-7 m/s) No precipitation

**Primary species not found**

Table 53 Secondary and other species 14.06.2020 VP 4

No.	Latin names	English names	Amount	Altitude (m)
1.	<i>Circus aeruginosus</i>	Marsh Harrier	1	23
2.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	2	0-5
3.	<i>Galerida cristata</i>	Crested Lark	4	3-15
4.	<i>Oenanthe pleschanka</i>	Pied Wheatear	1	2-3
5.	<i>Columba livia</i>	Rock Dove	3	12

**VP. 7**

Date: 15.06.2020 Start and end time: 8:07 – 11:07

**Weather:**

The air temperature: start 23°C end 28°C Clear

Wind speed approx. (4-5 m/s) No precipitation

**Primary species not found**

Table 54 Secondary and other species 15.06.2020 VP 7

No.	Latin names	English names	Amount	Altitude (m)
1.	<i>Galerida cristata</i>	Crested Lark	3	2-10
2.	<i>Coracias garrulus</i>	Eurasian Roller	2	8
3.	<i>Merops supercilios</i>	Blue-cheeked Bee-eater	4	12
4.	<i>Athene noctua</i>	Little Owl	1	0-6
5.	<i>Columba livia</i>	Rock Dove	2	14
6.	<i>Lanius pallidirostris</i>	Southern grey shrike	1	5-8

### VP. 8

Date: 15.06.2020 Start and end time: 15:16 – 18:16

**Weather:**

The air temperature: start 34°C end 31°C Clear

Wind speed approx. (6-7 m/s) No precipitation

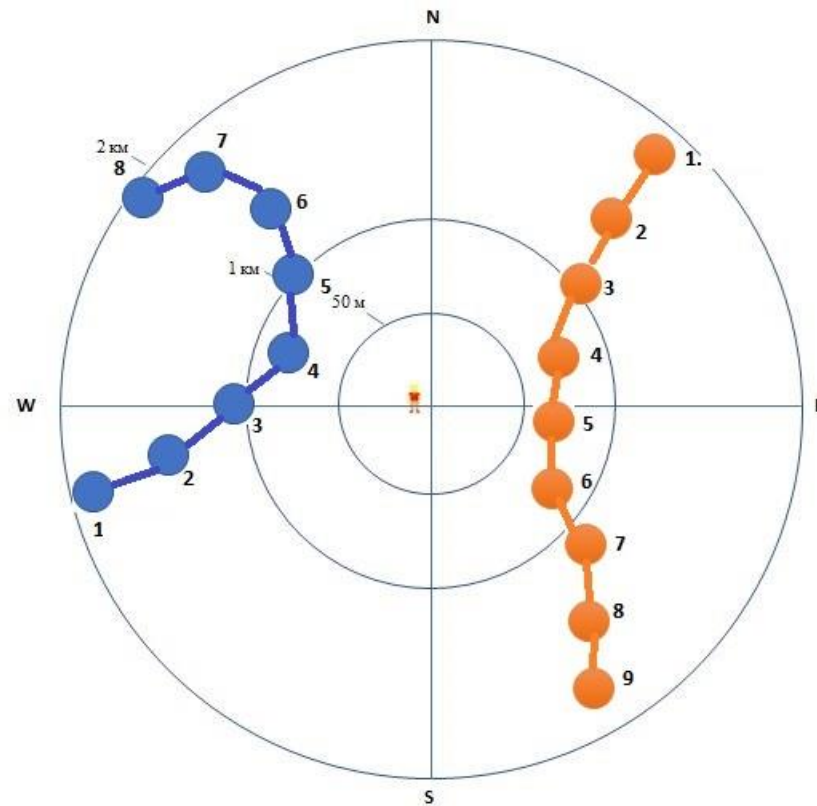


Fig. 15 Flight path (VP 8), 15.06.2020



Table 55 Target species log (VP 8), 15.06.2020



	<i>Neophron percnopterus</i>	1 65m	2 65m	3 70m	4 70m	5 75m	6 75m	7 70m	8 70m	9 65m
	<i>Aegypius monachus</i>	1 125m	2 125m	3 120m	4 120m	5 125m	6 125m	7 120m	8 120m	

Table 56 Secondary and other species 15.06.2020 VP 8

No.	Latin names	English names	Amount	Altitude (m)
1.	<i>Pterocles orientalis</i>	Black-bellied sandgrouse	2	5-12
2.	<i>Coracias garrulus</i>	Eurasian Roller	1	6
3.	<i>Galerida cristata</i>	Crested Lark	11	3-6
4.	<i>Corvus corone</i>	Eurasian Carrion Crow	1	0
5.	<i>Merops supercilios</i>	Blue-cheeked Bee-eater	5	10-15

**VP. 10**

Date: 16.06.2020 Start and end time: 7:36 – 10:36

**Weather:**

The air temperature: start 23°C end 28°C Clear

Wind speed approx. (2-4 m/s) No precipitation

**Primary species not found**

Table 57 Secondary and other species 16.06.2020 VP 10

No.	Latin names	English names	Amount	Altitude (m)
1.	<i>Galerida cristata</i>	Crested Lark	2	2-8
2.	<i>Upupa epops</i>	Hoopoe	1	0-3
3.	<i>Corvus ruficollis</i>	Brown-necked Raven	1	4
4.	<i>Muscicapa striata</i>	Spotted Flycatcher	1	1
5.	<i>Merops supercilios</i>	Blue-cheeked Bee-eater	5	6-12
6.	<i>Lanius pallidirostris</i>	Southern grey shrike	2	3-15

**VP. 9**

Date: 16.06.2020 Start and end time: 14:56 – 17:56

**Weather:**

The air temperature: start 30°C end 34 °C Clear

Wind speed approx. (3-6 m/s) No precipitation

**Primary species not found**

Table 58 Secondary and other species 16.06.2020 VP 9

<b>No.</b>	<b>Latin names</b>	<b>English names</b>	<b>Amount</b>	<b>Altitude (m)</b>
1.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	3	0-3
2.	<i>Galerida cristata</i>	Crested Lark	12	2-8
3.	<i>Muscicapa striata</i>	Spotted Flycatcher	2	2
4.	<i>Merops supercilios</i>	Blue-cheeked Bee-eater	3	6-11
5.	<i>Lanius pallidirostris</i>	Southern grey shrike	1	3-12



### VP 3

Date: 17.06.2020 Start and end time: 7:58 – 10:58

**Weather:**

The air temperature: start 24°C end 28 °C Clear

Wind speed approx. (4-6 m/s) No precipitation

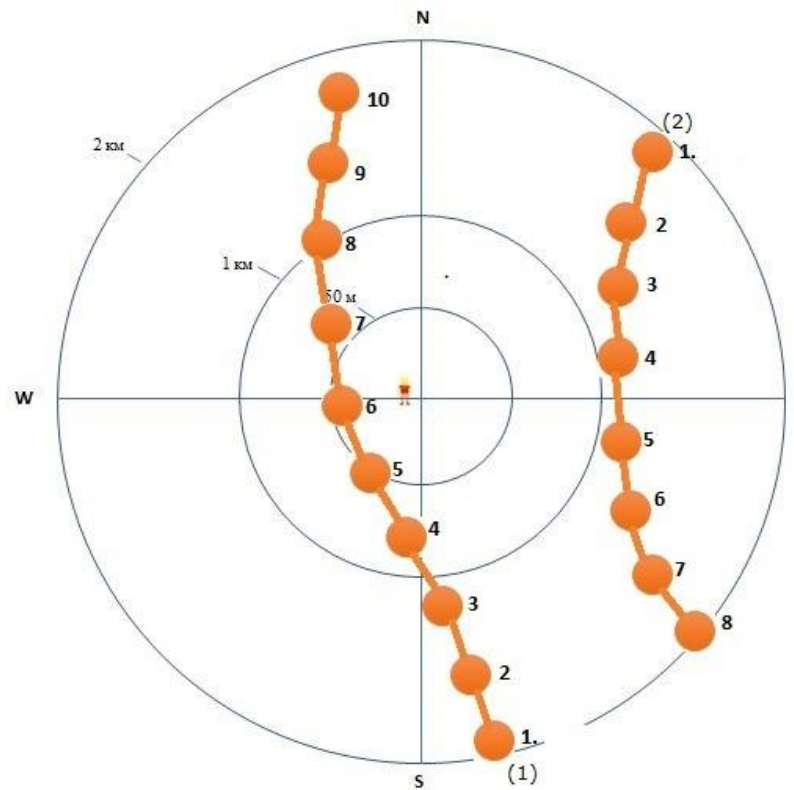


Fig. 16 Flight path (VP 3), 17.06.2020

Table 59 Target species log (VP 3), 17.06.2020



	<i>Neophron percnopterus</i> (1)	1 75 m	2 75 m	3 70 m	4 70 m	5 75 m	6 75 m	7 70 m	8 70 m	9 70 m	10 70 m
	<i>Neophron percnopterus</i> (2)	1 75 m	2 75 m	3 70 m	4 70 m	5 65 m	6 65 m	7 60 m	8 60 m		

Table 60 Secondary and other species 17.06.2020 VP 3

No.	Latin names	English names	Amount	Altitude (m)
1.	<i>Falco tinnunculus</i>	Kestrel	2	12-20
2.	<i>Buteo rufinus</i>	Long-legged Buzzard	1	10
3.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	3	3
4.	<i>Galerida cristata</i>	Crested Lark	7	2-12
5.	<i>Coracias garrulus</i>	Eurasian Roller	1	9
6.	<i>Merops supercilios</i>	Blue-cheeked Bee-eater	6	15

## VP. 2

Date: 17.06.2020 Start and end time: 11:29 – 14:29

### **Weather:**

The air temperature: start 31°C end 35°C Clear

Wind speed approx. (6-7 m/s) No precipitation

### **Primary species not found**

Table 61 Secondary and other species 17.06.2020 VP 2

No.	Latin names	English names	Amount	Altitude (m)
1	<i>Pterocles orientalis</i>	Black-bellied sandgrouse	2	3-8
2	<i>Acridotheres tristis</i>	Common myna	4	4-8
3	<i>Galerida cristata</i>	Crested Lark	7	3-6
4	<i>Merops supercilios</i>	Blue-cheeked Bee-eater	6	10-15
5	<i>Hirundo rustica</i>	Barn swallow	5	3-6



**VP. 1**

Date: 17.06.2020 Start and end time: 14:56 – 17:56

**Weather:**

The air temperature: start 33°C end 31°C Clear

Wind speed approx. (5-6 m/s) No precipitation

**Primary species not found**

Table 62 Secondary and other species 17.06.2020 VP 1

No.	Latin names	English names	Amount	Altitude (m)
1.	<i>Galerida cristata</i>	Crested Lark	4	2-8
2.	<i>Upupa epops</i>	Hoopoe	1	0-5
3.	<i>Muscicapa striata</i>	Spotted Flycatcher	1	1
4.	<i>Merops supercilios</i>	Blue-cheeked Bee-eater	5	6-12
5.	<i>Lanius pallidirostris</i>	Southern grey shrike	2	3-15
6.	<i>Circus aeruginosus</i>	EurasianMarsh-Harrier	2	6-25

**VP. 4**

Date: 18.06.2020 Start and end time: 7:52 – 10:52

**Weather:**

The air temperature: start 23°C end 29 °C Clear

Wind speed approx. (3-6 m/s) No precipitation

**Primary species not found**

Table 63 Secondary and other species 18.06.2020 VP 4

No.	Latin names	English names	Amount	Altitude (m)
1.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	2	0-3
2.	<i>Galerida cristata</i>	Crested Lark	8	2-8
3.	<i>Muscicapa striata</i>	Spotted Flycatcher	2	2
4.	<i>Merops supercilios</i>	Blue-cheeked Bee-eater	5	6-11
5.	<i>Lanius pallidirostris</i>	Southern grey shrike	2	3-12
6.	<i>Scotocerca inquieta</i>	Streaked Scrub Warbler	2	1-2
7.	<i>Coracias garrulus</i>	Eurasian Roller	3	12

### VP 5

Date: 18.06.2020 Start and end time: 11:23 – 14:23

**Weather:**

The air temperature: start 30°C end 33°C Clear

Wind speed approx. (4-6 m/s) No precipitation

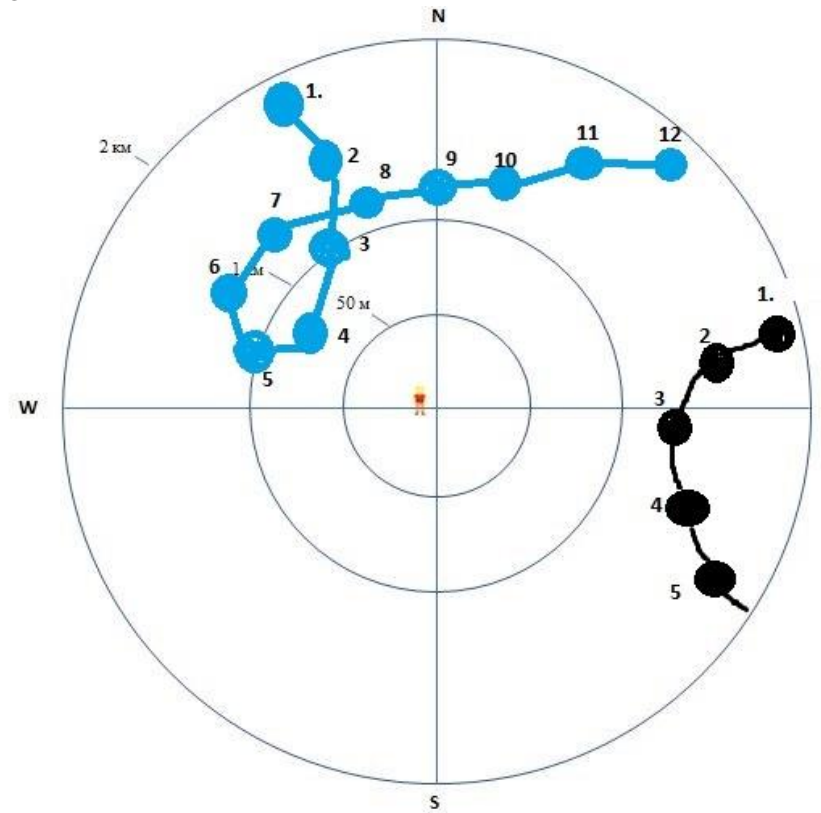


Fig. 17 Flight path (VP 5), 18.06.2020



Table 64 Target species log (VP 5), 18.06.2020



	<i>Aegypius monachus</i>	1 95 m	2 95 m	3 90 m	4 90 m	5 95 m	6 95 m	7 970 m	8 90 m	9 90 m	10 90 m	11 95 m	12 95 m
	<i>Aquila nipalensis</i>	1 75 m	2 75 m	3 70 m	4 70 m	5 65 m							

Table 65 Secondary and other species 18.06.2020 VP 5

No.	Latin names	English names	Amount	Altitude (m)
1.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	2	3
2.	<i>Rhodospiza obsoleta</i>	Black-billed Desert Finch	7	1
3.	<i>Galerida cristata</i>	Crested Lark	7	2-12
4.	<i>Coracias garrulus</i>	Eurasian Roller	2	11
5.	<i>Merops supercilios</i>	Blue-cheeked Bee-eater	8	15
6.	<i>Columba livia</i>	Rock Dove	3	12
7.	<i>Athene noctua</i>	Little Owl	1	0-12

**VP 6**

Date: 18.06.2020 Start and end time: 14:55 – 17:55

**Weather:**

The air temperature: start 34°C end 31 °C Clear

Wind speed approx. (4-6 m/s) No precipitation

**Primary species not found**

Table 66 Secondary and other species 18.06.2020 VP 5

No.	Latin names	English names	Amount	Altitude (m)
1.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	3	2
2.	<i>Buteo rufinus</i>	Long-legged Buzzard	1	12
3.	<i>Galerida cristata</i>	Crested Lark	6	2-6
4.	<i>Circus cyaneus</i>	Hen (Northern) Harrier	1	15
5.	<i>Rhodospiza obsoleta</i>	Black-billed Desert Finch	9	2
6.	<i>Merops supercilios</i>	Blue-cheeked Bee-eater	3	15
7.	<i>Corvus corone</i>	Eurasian Carrion Crow	2	3

### VP 7

Date: 19.06.2020 Start and end time: 8:23 – 11:23

**Weather:**

The air temperature: start 23°C end 27 °C Clear

Wind speed approx. (5-6 m/s) No precipitation

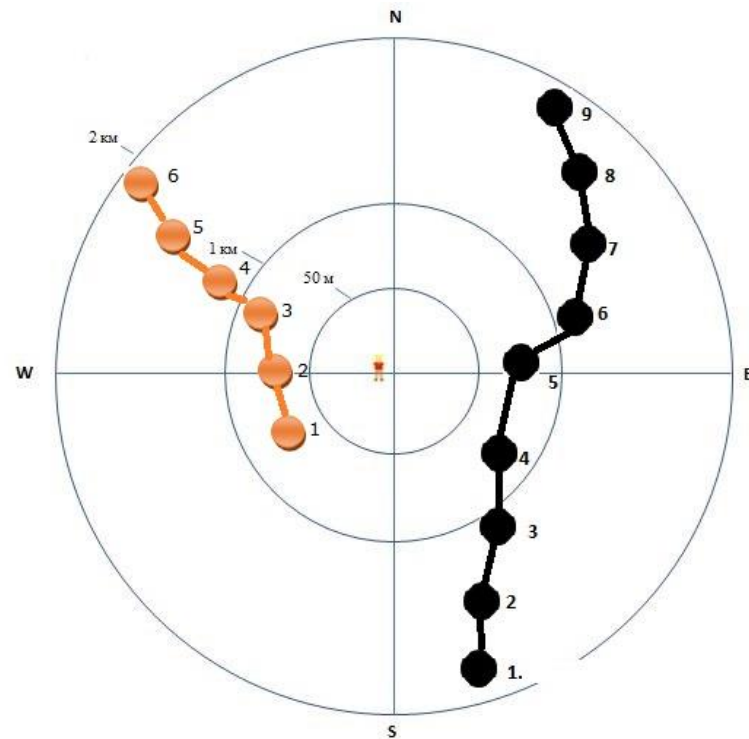


Fig. 18 Flight path (VP 7), 19.06.2020



Table 67 Target species log (VP 7), 19.06.2020



	<i>Aquila nipalensis</i>	1 95 m	2 95 m	3 90 m	4 90 m	5 95 m	6 95 m	7 970 m	8 90 m	9 90 m
	<i>Neophron percnopterus</i>	1 75 m	2 75 m	3 70 m	4 70 m	5 65 m				

Table 68 Secondary and other species 19.06.2020 VP 7

No.	Latin names	English names	Amount	Altitude (m)
1	<i>Oenanthe isabellina</i>	Isabelline Wheatear	1	2
2	<i>Galerida cristata</i>	Crested Lark	9	2-12
	<i>Rhodospiza obsoleta</i>	Black-billed Desert Finch	15	2
3	<i>Caprimulgus aegyptius</i>	Egyptian nightjar	1	6-13
4	<i>Merops supercilios</i>	Blue-cheeked Bee-eater	6	15
5	<i>Columba livia</i>	Rock Dove	2	12

**VP 8**

Date: 19.06.2020 Start and end time: 13:57 – 16:57

**Weather:**

The air temperature: start 32°C end 34 °C Clear

Wind speed approx. (5-6 m/s) No precipitation

**Primary species not found**

Table 69 Secondary and other species 19.06.2020 VP 8

No.	Latin names	English names	Amount	Altitude (m)
1.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	1	2
2.	<i>Galerida cristata</i>	Crested Lark	5	2-6
3.	<i>Merops supercilios</i>	Blue-cheeked Bee-eater	3	15
4.	<i>Pterocles orientalis</i>	Black-bellied sandgrouse	2	3-8
5.	<i>Circus cyaneus</i>	Hen (Northern) Harrier	1	6-26

**VP 10**

Date: 24.06.2020 Start and end time: 8:23 – 11:23

**Weather:**

The air temperature: start 24°C end 28 °C Clear

Wind speed approx. (2-4 m/s) No precipitation

**Primary species not found**

Table 70 Secondary and other species 24.06.2020 VP 10

No.	Latin names	English names	Amount	Altitude (m)
1.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	3	3
2.	<i>Caprimulgus aegyptius</i>	Egyptian nightjar	2	4-6
3.	<i>Galerida cristata</i>	Crested Lark	7	2-9
4.	<i>Rhodospiza obsoleta</i>	Black-billed Desert Finch	11	2-4
5.	<i>Caprimulgus aegyptius</i>	Egyptian nightjar	2	6-13
6.	<i>Merops supercilios</i>	Blue-cheeked Bee-eater	9	13



**VP 9**

Date: 24.06.2020 Start and end time: 14:05 – 17:05

**Weather:**

The air temperature: start 34°C end 31°C Clear

Wind speed approx. (4-6 m/s) No precipitation

**Primary species not found**

Table 71 Secondary and other species 24.06.2020 VP 9

No.	Latin names	English names	Amount	Altitude (m)
1.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	2	1
2.	<i>Galerida cristata</i>	Crested Lark	12	2-6
3.	<i>Caprimulgus aegyptius</i>	Egyptian nightjar	1	6-13
4.	<i>Pica pica</i>	Black-billed Magpie	2	5
5.	<i>Merops supercilios</i>	Blue-cheeked Bee-eater	9	15
6.	<i>Rhodospiza obsoleta</i>	Black-billed Desert Finch	8	2

**VP 1**

Date: 25.06.2020 Start and end time: 8:21 – 11:21

**Weather:**

The air temperature: start 25°C end 29 °C Clear

Wind speed approx. (4-6 m/s) No precipitation

**Primary species not found**

Table 72 Secondary and other species 25.06.2020 VP 1

No.	Latin names	English names	Amount	Altitude (m)
1.	<i>Lanius pallidirostris</i>	Southern grey shrike	2	5
2.	<i>Galerida cristata</i>	Crested Lark	7	2-12
3.	<i>Caprimulgus aegyptius</i>	Egyptian nightjar	2	6-13
4.	<i>Merops supercilios</i>	Blue-cheeked Bee-eater	8	15
5.	<i>Columba livia</i>	Rock Dove	3	12
6.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	3	2
7.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	13	0

## VP 2

Date: 25.06.2020 Start and end time: 11:53 – 14:53

### **Weather:**

The air temperature: start 32°C end 33 °C Clear

Wind speed approx. (5-6 m/s) No precipitation

**Primary species not found**

Table 73 Secondary and other species 25.06.2020 VP 2

No.	Latin names	English names	Amount	Altitude (m)
1.	<i>Galerida cristata</i>	Crested Lark	7	2-12
2.	<i>Buteo buteo</i>	Common Buzzard	1	1
3.	<i>Caprimulgus aegyptius</i>	Egyptian nightjar	2	6-13
4.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	22	0-2
5.	<i>Merops supercilios</i>	Blue-cheeked Bee-eater	8	15
6.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	3	2



**VP 3**

Date: 25.06.2020 Start and end time: 15:31 – 18:31

**Weather:**

The air temperature: start 30°C end 33 °C Clear

Wind speed approx. (4-6 m/s) No precipitation

**Primary species not found**

Table 74 Secondary and other species 25.06.2020 VP 3

No.	Latin names	English names	Amount	Altitude (m)
1.	<i>Lanius pallidirostris</i>	Southern grey shrike	1	9
2.	<i>Galerida cristata</i>	Crested Lark	15	2-10
3.	<i>Caprimulgus aegyptius</i>	Egyptian nightjar	1	6-13
4.	<i>Merops supercilios</i>	Blue-cheeked Bee-eater	6	16
5.	<i>Columba livia</i>	Rock Dove	3	13
6.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	1	2

**VP 5**

Date: 26.06.2020 Start and end time: 14:55 – 17:55

**Weather:**

The air temperature: start 34°C end 31 °C Clear

Wind speed approx. (4-6 m/s) No precipitation

**Primary species not found**

Table 75 Secondary and other species 18.06.2020 VP 5

No.	Latin names	English names	Amount	Altitude (m)
1.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	3	2
2.	<i>Buteo rufinus</i>	Long-legged Buzzard	1	
3.	<i>Galerida cristata</i>	Crested Lark	6	2-6
4.	<i>Caprimulgus aegyptius</i>	Egyptian nightjar	1	6-13
5.	<i>Merops supercilios</i>	Blue-cheeked Bee-eater	3	15

## VP survey results in July

### VP. 3

Date: 01.07.2020 Start and end time: 8:17 – 11:17

**Weather:**

The air temperature: start 24°C end 30°C Clear

Wind speed approx. (4-6 m/s) No precipitation

**Primary species not found**

Table 76 Secondary and other species 01.07.2020 VP 1

No.	Latin names	English names	Amount	Altitude (m)
1.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	14	0-3
2.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	3	0-4
3.	<i>Galerida cristata</i>	Crested Lark	6	3-12
4.	<i>Oenanthe pleschanka</i>	Pied Wheatear	1	2-4

## VP. 2

Date: 01.07.2020 Start and end time: 11:53 – 14:53

**Weather:**

The air temperature: start 30°C end 34°C Clear

Wind speed approx. (3-4 m/s) No precipitation

**Primary species not found**

Table 77 Secondary and other species 01.07.2020 VP 2

No.	Latin names	English names	Amount	Altitude (m)
	<i>Galerida cristata</i>	Crested Lark	4	0-10
2.	<i>Merops supercilios</i>	Blue-cheeked Bee-eater	6	16
3.	<i>Columba livia</i>	Rock Dove	12	16
4.	<i>Pterocles orientalis</i>	Black-bellied sandgrouse	4	3-13
5.	<i>Lanius pallidirostris</i>	Southern grey shrike	1	6
6.	<i>Scotocerca inquieta</i>	Streaked Scrub Warbler	2	1-2



### VP. 3

Date: 01.07.2020 Start and end time: 15:36 – 18:36

#### **Weather:**

The air temperature: start 34°C end 28°C Clear

Wind speed approx. (6-8 m/s) No precipitation

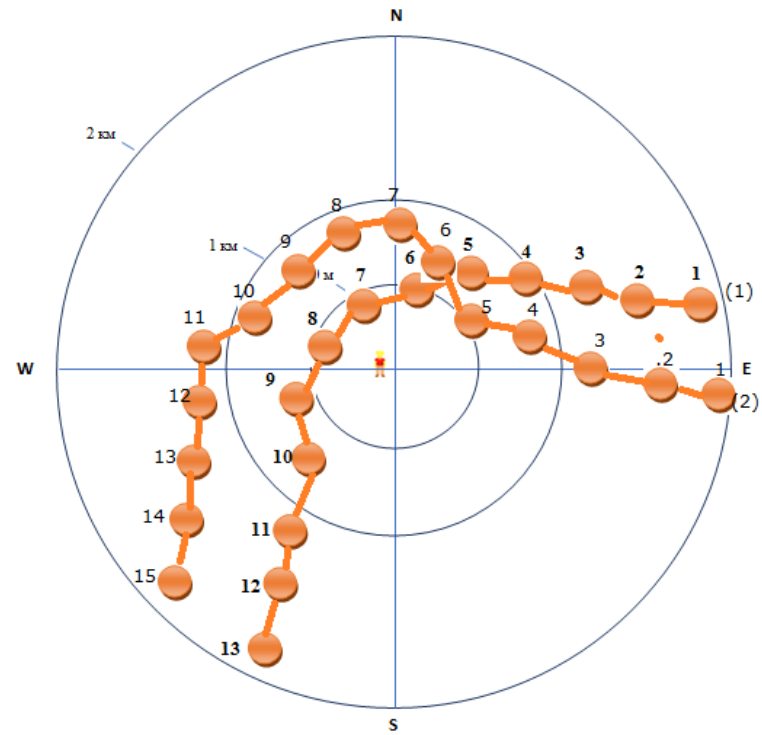


Fig. 19 . Flight path (VP 3), 01.07.2020

Table 78 Target species log (VP 3), 01.07.2020



	<i>Neophron percnopterus</i>	1 65m	2 65m	3 70m	4 70m	5 75m	6 75m	7 70m	8 70m	9 65m	10 60m	11 60m	12 65m	13 65m		
	<i>Neophron percnopterus</i>	1 65m	2 65m	3 70m	4 70m	5 75m	6 75m	7 70m	8 70m	9 65m	10 60m	11 60m	12 65m	13 65m	14 70m	15 70m

Table 79 Secondary and other species 01.07.2020 VP 3

No.	Latin names	English names	Amount	Altitude (m)
	<i>Pterocles orientalis</i>	Black-bellied sandgrouse	4	5-14
2.	<i>Coracias garrulus</i>	Eurasian Roller	2	9
3.	<i>Galerida cristata</i>	Crested Lark	6	3-6
4.	<i>Merops supercilios</i>	Blue-cheeked Bee-eater	14	15-25
5.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	15	0-5
6.	<i>Circus cyaneus</i>	Hen Harrier	1	8-19

**VP. 4**

Date: 02.07.2020 Start and end time: 7:43 – 10:43

**Weather:**

The air temperature: start 23°C end 28°C Clear

Wind speed approx. (3-5 m/s) No precipitation

**Primary species not found**

Table 80 Secondary and other species 02.07.2020 VP 4

No.	Latin names	English names	Amount	Altitude (m)
	<i>Galerida cristata</i>	Crested Lark	7	2-6
2.	<i>Upupa epops</i>	Hoopoe	2	0-4
3.	<i>Coracias garrulus</i>	Eurasian Roller	2	7
4.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	5	3-5
5.	<i>Muscicapa striata</i>	Spotted Flycatcher	1	1
6.	<i>Merops supercilios</i>	Blue-cheeked Bee-eater	5	6-12
7.	<i>Lanius pallidirostris</i>	Southern grey shrike	2	3-15

**VP. 6**

Date: 02.07.2020 Start and end time: 11:06 – 14:06

**Weather:**

The air temperature: start 32°C end 35 °C Clear

Wind speed approx. (2-4 m/s) No precipitation

**Primary species not found**

Table 81 Secondary and other species 02.07.2020 VP 6

No.	Latin names	English names	Amount	Altitude (m)
	<i>Oenanthe isabellina</i>	Isabelline Wheatear	2	0-4
2.	<i>Galerida cristata</i>	Crested Lark	6	2-6
3.	<i>Coracias garrulus</i>	Eurasian Roller	2	6
4.	<i>Merops supercilios</i>	Blue-cheeked Bee-eater	5	6-11
5.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	14	0



### VP 5

Date: 02.07.2020 Start and end time: 14:46 – 17:46

#### **Weather:**

The air temperature: start 36°C end 31 °C Clear

Wind speed approx. (5-6 m/s) No precipitation

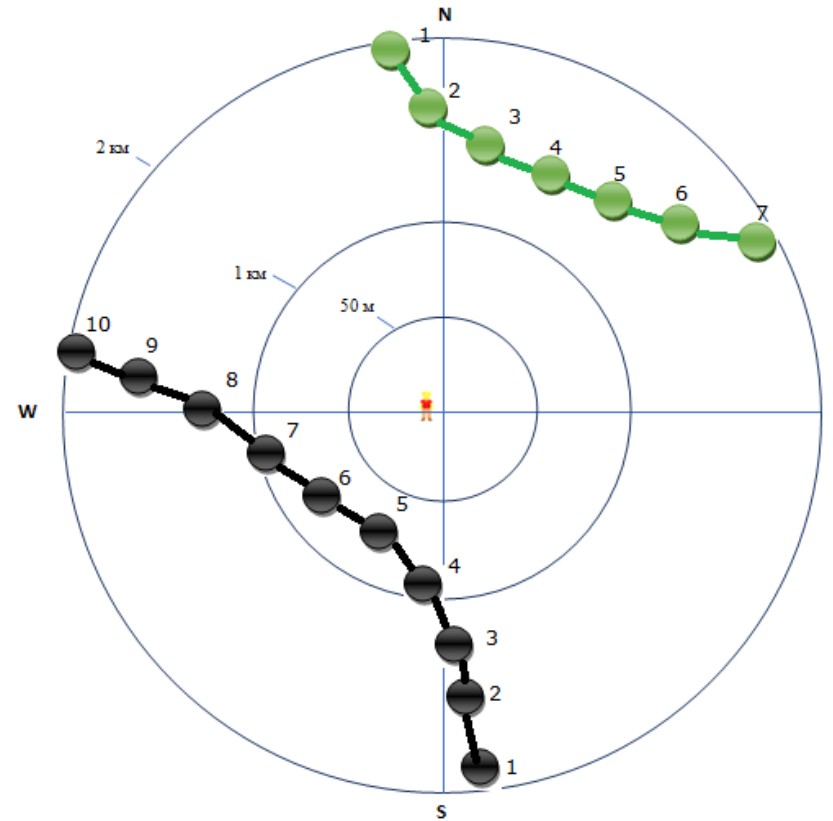


Fig. 20 Flight path (VP 6), 02.0.2020

Table 82 Target species log (VP 6), 02.07.2020



	<i>Aquila nipalensis</i>	1 75m	2 75m	3 70m	4 70m	5 75m	6 75m	7 70m	8 70m	9 70 m	10 70 m
	<i>Gyps fulvus</i>	1 135 m	2 135 m	3 130 m	4 130 m	5 135 m	6 135 m	7 130 m			

Table 83 Secondary and other species 02.07.2020 VP 6

No.	Latin names	English names	Amount	Altitude (m)
	<i>Falco tinnunculus</i>	Kestrel	2	13-20
2.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	1	3
3.	<i>Galerida cristata</i>	Crested Lark	6	0-6
4.	<i>Caprimulgus aegyptius</i>	Egyptian nightjar	2	6-13
5.	<i>Merops supercilios</i>	Blue-cheeked Bee-eater	9	13

**VP. 8**

Date: 03.07.2020 Start and end time: 07:52 – 10:52

**Weather:**

The air temperature: start 23°C end 28°C Clear

Wind speed approx. (4-5 m/s) No precipitation

**Primary species not found**

Table 84 Secondary and other species 03.07.2020 VP 8

No.	Latin names	English names	Amount	Altitude (m)
	<i>Oenanthe isabellina</i>	Isabelline Wheatear	2	1
2.	<i>Galerida cristata</i>	Crested Lark	3	3-9
3.	<i>Lanius pallidirostris</i>	Southern grey shrike	2	6
4.	<i>Pterocles orientalis</i>	Black-bellied sandgrouse	6	5-6
5.	<i>Falco tinnunculus</i>	Kestrel	1	10-23

**VP.7**

Date: 03.07.2020 Start and end time: 12:14 – 15:14

**Weather:**

The air temperature: start 31°C end 38°C Clear

Wind speed approx. (4-6 m/s) No precipitation

**Primary species not found**

Table 85 Secondary and other species 03.07.2020 VP 8

No.	Latin names	English names	Amount	Altitude (m)
	<i>Galerida cristata</i>	Crested Lark	3	2
2.	<i>Coracias garrulus</i>	Eurasian Roller	1	12
3.	<i>Buteo rufinus</i>	Long-legged Buzzard	1	12-35
4.	<i>Columba livia</i>	Rock Dove	15	12
5.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	16	6



**VP. 9**

Date: 04.07.2020 Start and end time: 07:58 – 10:58

**Weather:**

The air temperature: start 23°C end 30°C Clear

Wind speed approx. (2-5 m/s) No precipitation

**Primary species not found**

Table 86 Secondary and other species 04.07.2020 VP 9

No.	Latin names	English names	Amount	Altitude (m)
	<i>Oenanthe isabellina</i>	Isabelline Wheatear	2	3
2.	<i>Athene noctua</i>	Little Owl	1	2
3.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	6	3-5
4.	<i>Columba livia</i>	Rock Dove	3	16
5.	<i>Hirundo rustica</i>	Barn swallow	3	3-9
6.	<i>Coracias garrulus</i>	Eurasian Roller	1	6

### VP. 10

Date: 04.07.2020 Start and end time: 11:29 – 14:30

**Weather:**

The air temperature: start 29°C end 36°C Clear

Wind speed approx. (3-5 m/s) No precipitation

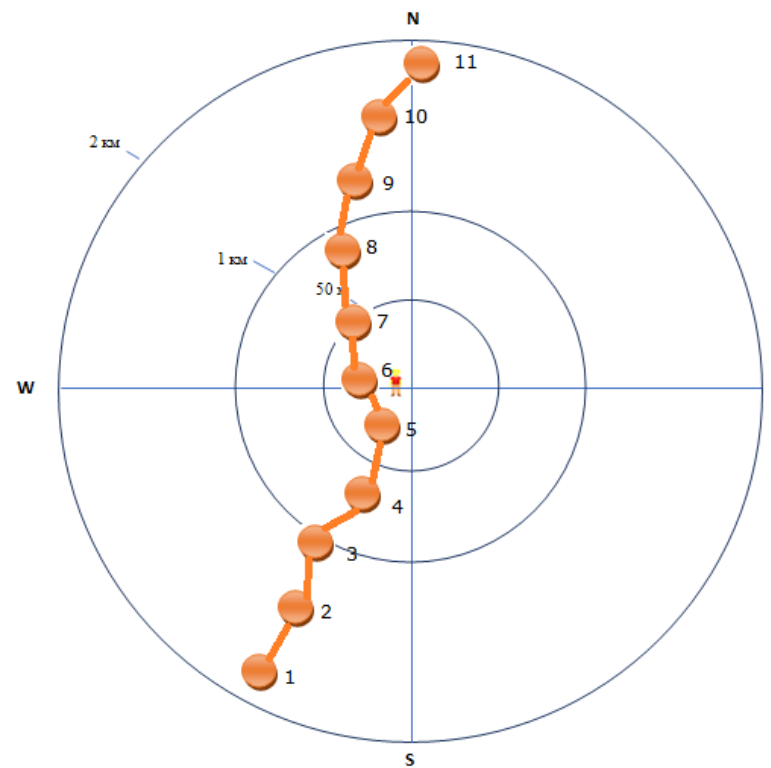


Fig. 21 Flight path (VP 10), 04.07.2020

Table 87 Target species log(VP 10), 04.07.2020


	<i>Neophron percnopterus</i>	1 80m	2 80m	3 80m	4 85m	5 85m	6 80m	7 85m	8 85m	9 80m	10 80m	11 80m
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Table 88 Secondary and other species 04.07.2020 VP 10

No.	Latin names	English names	Amount	Altitude (m)
	<i>Rhodospiza obsoleta</i>	Black-billed Desert Finch	12	2
2.	<i>Galerida cristata</i>	Crested Lark	4	0-6
3.	<i>Pterocles orientalis</i>	Black-bellied sandgrouse	4	3-12
4.	<i>Merops supercilios</i>	Blue-cheeked Bee-eater	4	8-16
5.	<i>Coracias garrulus</i>	Eurasian Roller	2	8

**VP. 3**

Date: 05.07.2020 Start and end time: 8:23 – 11:30

**Weather:**

The air temperature: start 24°C end 30°C Clear

Wind speed approx. (3-5 m/s) No precipitation

**Primary species not found**

Table 89 Secondary and other species 05.07.2020 VP 3

No.	Latin names	English names	Amount	Altitude (m)
	<i>Galerida cristata</i>	Crested Lark	6	0-9
2.	<i>Buteo rufinus</i>	Long-legged Buzzard	1	15
3.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	8	0-5
4.	<i>Lanius pallidirostris</i>	Southern grey shrike	2	3-5
5.	<i>Merops supercilios</i>	Blue-cheeked Bee-eater	2	15



**VP. 1**

Date: 05.07.2020 Start and end time: 12:06 – 15:06

**Weather:**

The air temperature: start 30°C end 34°C Clear

Wind speed approx. (2-4 m/s) No precipitation

**Primary species not found**

Table 90 Secondary and other species 05.07.2020 VP1

No.	Latin names	English names	Amount	Altitude (m)
	<i>Circus aeruginosus</i>	Marsh-Harrier	1	10
2.	<i>Pterocles orientalis</i>	Black-bellied sandgrouse	4	1
3.	<i>Rhodospiza obsoleta</i>	Black-billed Desert Finch	9	3
4.	<i>Coracias garrulus</i>	Eurasian Roller	2	10
5.	<i>Galerida cristata</i>	Crested Lark	5	4

## VP.2

Date: 05.07.2020 Start and end time: 15:36 – 18:36

### **Weather:**

The air temperature: start 38°C end 30°C Clear

Wind speed approx. (5-6 m/s) No precipitation

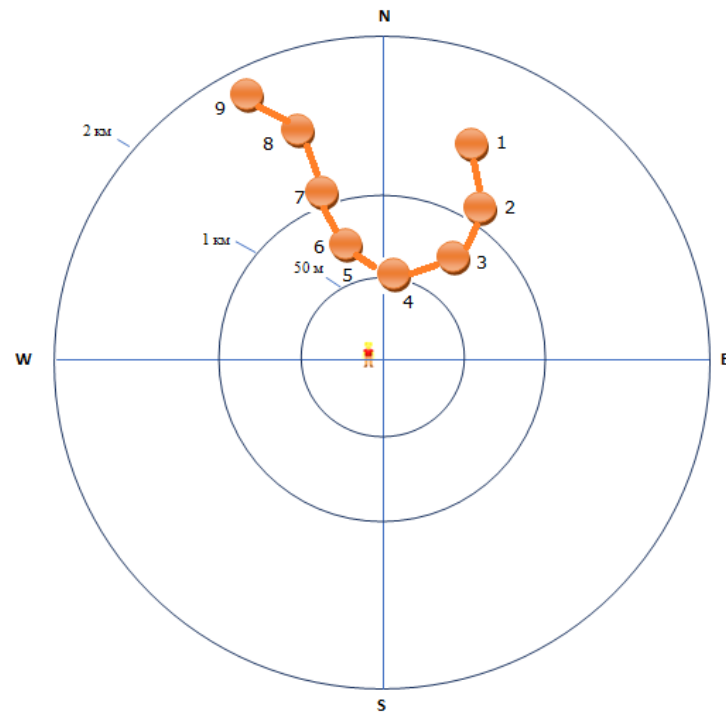


Fig. 22 Flight path (VP 2), 05.07.2020

Table 91 Target species log (VP 2), 05.07.2020


	<i>Neophron percnopterus</i>	1 20m	2 20m	3 30m	4 35m	5 35m	6 40m	7 45m	8 45m	9 50m
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Table 92 Secondary and other species 05.07.2020 VP 2

No.	Latin names	English names	Amount	Altitude (m)
	<i>Merops supercilios</i>	Blue-cheeked Bee-eater	4	10
2.	<i>Galerida cristata</i>	Crested Lark	8	0-5
3.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	1	0-2
4.	<i>Athene noctua</i>	Little Owl	1	0-12
5.	<i>Rhodospiza obsoleta</i>	Black-billed Desert Finch	2	0-2

#### VP 4

Date: 06.07.2020 Start and end time: 8:31 – 11:31

**Weather:**

The air temperature: start 24°C end 28°C Clear

Wind speed approx. (4-6 m/s) No precipitation

**Primary species not found**

Table 93 Secondary and other species 06.07.2020 VP4

No.	Latin names	English names	Amount	Altitude (m)
	<i>Merops supercilios</i>	Blue-cheeked Bee-eater	3	6-12
2.	<i>Galerida cristata</i>	Crested Lark	4	2-9
3.	<i>Lanius pallidirostris</i>	Southern grey shrike	1	6
4.	<i>Rhodospiza obsoleta</i>	Black-billed Desert Finch	8	2
5.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	2	1-3
6.	<i>Falco tinnunculus</i>	Kestrel	1	16-20



**VP. 5**

Date: 06.07.2020 Start and end time: 12:05 – 15:05

**Weather:**

The air temperature: start 31°C end 34°C Clear

Wind speed approx. (4-5 m/s) No precipitation

**Primary species not found**

Table 94 Secondary and other species 06.07.2020 VP5

No.	Latin names	English names	Amount	Altitude (m)
	<i>Galerida cristata</i>	Crested Lark	3	4
2.	<i>Buteo buteo</i>	Common Buzzard	1	9
3.	<i>Coracias garrulus</i>	Eurasian Roller	3	12
4.	<i>Upupa epops</i>	Hoopoe	1	0
5.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	1	1
6.	<i>Merops supercilios</i>	Blue-cheeked Bee-eater	3	6-9
7.	<i>Lanius pallidirostris</i>	Southern grey shrike	2	3-5

## VP 6

Date: 06.07.2020 Start and end time: 15:46 – 18:46

### **Weather:**

The air temperature: start 38°C end 31°C Clear

Wind speed approx. (5-6 m/s) No precipitation

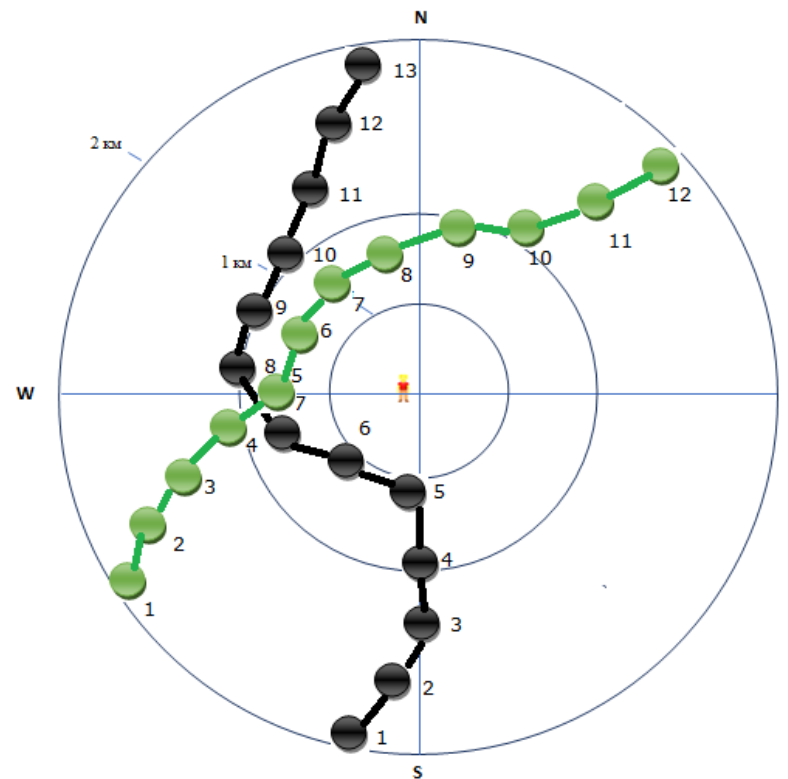


Fig. 23 Flight path (VP 6), 06.07.2020

Table 95 Target species log (VP 6), 06.07.2020



	<i>Aquila nipalensis</i>	1 120 m	2 120 m	3 120 m	4 125 m	5 125m	6 120m	7 125m	8 125m	9 120m	10 120m	11 120m	1 120 m	2 120 m
	<i>Gyps fulvus</i>	1 200 m	2 200 m	3 200 m	4 200 m	5 205 m	6 205 m	7 205 m	8 200 m	9 200 m	10 200 m	11 200 m	12 200 m	13 200 m

Table 96 Secondary and other species 06.07.2020 VP 6

No.	Latin names	English names	Amount	Altitude (m)
	<i>Galerida cristata</i>	Crested Lark	6	2-6
2.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	15	0
3.	<i>Rhodospiza obsoleta</i>	Black-billed Desert Finch	3	2
4.	<i>Pterocles orientalis</i>	Black-bellied sandgrouse	4	5-9
5.	<i>Lanius pallidirostris</i>	Southern grey shrike	1	5

**VP.7**

Date: 07.07.2020 Start and end time: 7:47 – 11:47

**Weather:**

The air temperature: start 24°C end 29°C Clear

Wind speed approx. (5-6 m/s) No precipitation

**Primary species not found**

Table 97 Secondary and other species 07.07.2020 VP 7

No.	Latin names	English names	Amount	Altitude (m)
	<i>Galerida cristata</i>	Crested Lark	4	0-2
2.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	8	0
3.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	2	2
4.	<i>Pterocles orientalis</i>	Black-bellied sandgrouse	3	12
5.	<i>Merops supercilios</i>	Blue-cheeked Bee-eater	2	18



### VP. 8

Date: 07.07.2020 Start and end time: 12:16 – 15:16

**Weather:**

The air temperature: start 32°C end 39°C Clear

Wind speed approx. (6-8 m/s) No precipitation

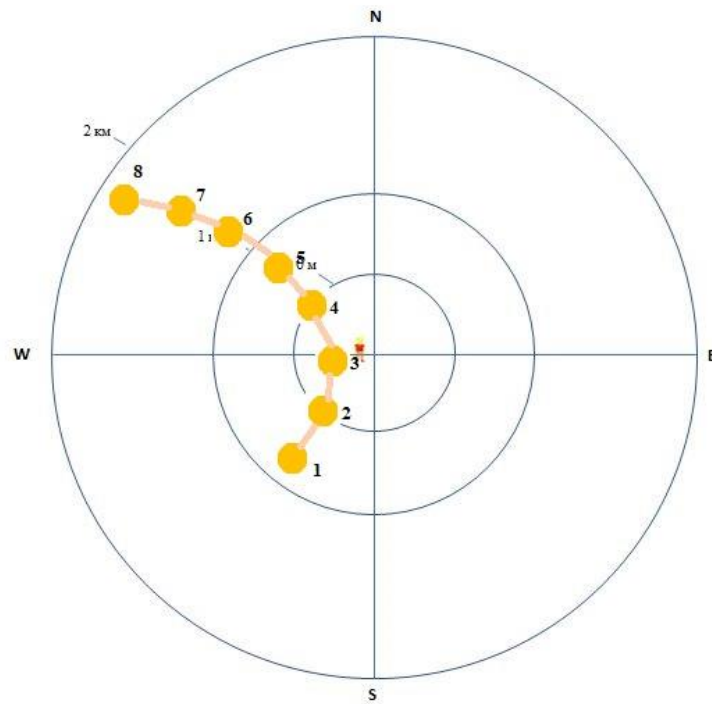


Fig. 24 Flight path (VP 8), 07.07.2020

Table 98 Target species log (VP 8), 07.07.2020


	<i>Neophron percnopterus</i>	1 90m	2 90m	3 90m	4 95m	5 95m	6 90m	7 95m	8 95m
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Table 99 Secondary and other species 07.07.2020 VP 8

No.	Latin names	English names	Amount	Altitude (m)
	<i>Galerida cristata</i>	Crested Lark	6	0-3
2.	<i>Lanius pallidirostris</i>	Southern grey shrike	2	6
3.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	1	2
4.	<i>Merops supercilios</i>	Blue-cheeked Bee-eater	5	6-12
5.	<i>Coracias garrulus</i>	Eurasian Roller	2	3
6.	<i>Pterocles orientalis</i>	Black-bellied sandgrouse	2	14

**VP. 10**

Date: 12.07.2020 Start and end time: 8:11 – 11:11

**Weather:**

The air temperature: start 23°C end 28°C Clear

Wind speed approx. (3-5 m/s) No precipitation

**Primary species not found**

Table 100 Secondary and other species 12.07.2020 VP 10

No.	Latin names	English names	Amount	Altitude (m)
	<i>Galerida cristata</i>	Crested Lark	6	5
2.	<i>Circus cyaneus</i>	Hen Harrier	1	12-20
3.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	26	0-3
4.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	3	3
5.	<i>Falco tinnunculus</i>	Kestrel	1	12-20
6.	<i>Columba livia</i>	Rock Dove	5	18
7.	<i>Merops supercilios</i>	Blue-cheeked Bee-eater	10	9-16

**VP. 9**

Date: 12.07.2020 Start and end time: 11:56 – 14:56

**Weather:**

The air temperature: start 30°C end 38°C Clear

Wind speed approx. (2-4 m/s) No precipitation

**Primary species not found**

Table 101 Secondary and other species 12.07.2020 VP 9

No.	Latin names	English names	Amount	Altitude (m)
	<i>Galerida cristata</i>	Crested Lark	6	2-4
2.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	2	2
3.	<i>Coracias garrulus</i>	Eurasian Roller	2	5
4.	<i>Corvus ruficollis</i>	Brown-necked Raven	2	0
5.	<i>Falco naumanni</i>	Lesser Kestrel	1	16-18
6.	<i>Hirundo rustica</i>	Barn swallow	5	5-9
7.	<i>Buteo rufinus</i>	Long-legged Buzzard	1	12-26



### VP. 3

Date: 13.07.2020 Start and end time: 8:13– 11:13

**Weather:**

The air temperature: start 25°C end 30°C Clear

Wind speed approx. (5-6 m/s) No precipitation

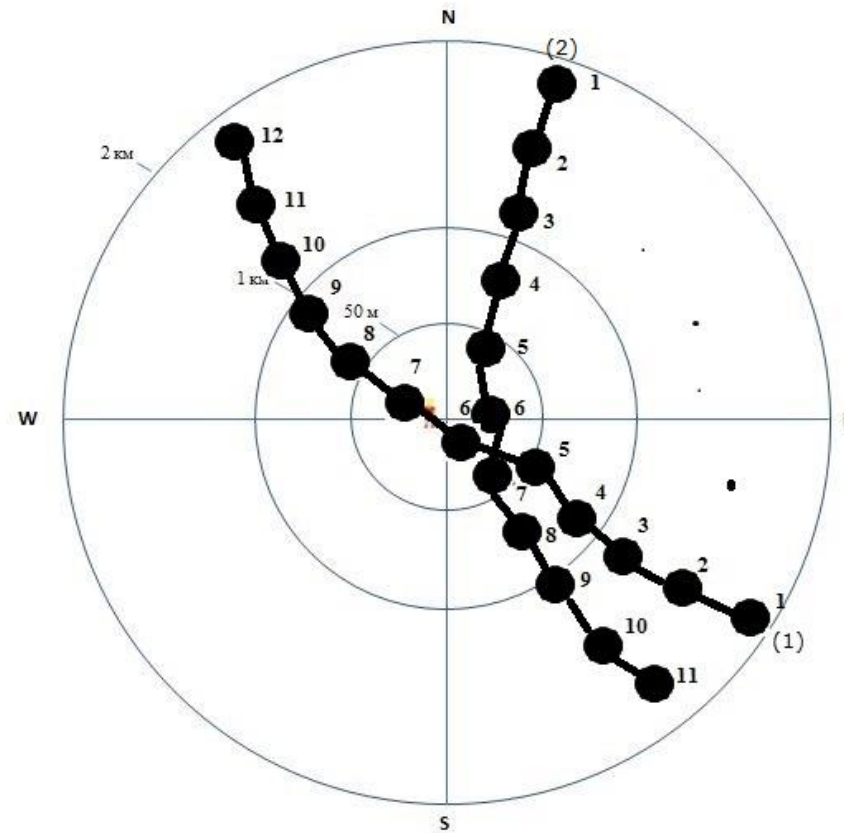


Fig. 25 Flight path (VP 3), 13.07.2020

Table 102 Target species log (VP 3), 13.07.2020



	<i>Aquila nipalensis(1)</i>	1- 60 m	2- 60 m	3- 65 m	4- 60 m	5- 55 m	6- 55 m	7- 55 m	8- 60 m	9- 60 m	10- 65 m	11- 60 m	12- 60 m
	<i>Aquila nipalensis(2)</i>	1- 90 m	2- 90 m	3- 95 m	4- 90 m	5- 95 m	6- 95 m	7- 95 m	8- 90 m	9- 90 m	10- 95 m	11- 90 m	

Table 103 Secondary and other species 13.07.2020 VP 3

No.	Latin names	English names	Amount	Altitude (m)
	<i>Galerida cristata</i>	Crested Lark	9	2-9
2.	<i>Corvus corone</i>	Eurasian Carrion Crow	2	0-3
3.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	2	0-2

**VP. 2**

Date: 13.07.2020 Start and end time: 11:26 – 14:26

**Weather:**

The air temperature: start 32°C end 34°C Clear

Wind speed approx. (2-3 m/s) No precipitation

**Primary species not found**

Table 104 Secondary and other species 13.07.2020 VP 2

No.	Latin names	English names	Amount	Altitude (m)
	<i>Galerida cristata</i>	Crested Lark	3	2-5
2.	<i>Lanius pallidirostris</i>	Southern grey shrike	1	5
3.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	2	2
4.	<i>Pterocles orientalis</i>	Black-bellied sandgrouse	2	6-9

**VP. 1**

Date: 13.07.2020 Start and end time: 15:49 – 18:49

**Weather:**

The air temperature: start 34°C end 29°C Clear

Wind speed approx. (3-5 m/s) No precipitation

**Primary species not found**

Table 105 Secondary and other species 13.07.2020 VP 1

No.	Latin names	English names	Amount	Altitude (m)
	<i>Galerida cristata</i>	Crested Lark	2	5
2.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	1	0-3
3.	<i>Columba livia</i>	Rock Dove	4	18
4.	<i>Merops supercilios</i>	Blue-cheeked Bee-eater	4	9-15
5.	<i>Hirundo rustica</i>	Barn swallow	5	3-10



**VP. 6**

Date: 14.07.2020 Start and end time: 7:57 – 10:57

**Weather:**

The air temperature: start 23°C end 28°C Clear

Wind speed approx. (3-4 m/s) No precipitation

**Primary species not found**

Table 106 Secondary and other species 14.07.2020 VP 6

No.	Latin names	English names	Amount	Altitude (m)
	<i>Galerida cristata</i>	Crested Lark	6	3-5
2.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	1	2
3.	<i>Circus aeruginosus</i>	Marsh Harrier	1	8-25
4.	<i>Hirundo rustica</i>	Barn swallow	3	3-9
5.	<i>Coracias garrulus</i>	Eurasian Roller	2	4
6.	<i>Lanius pallidirostris</i>	Southern grey shrike	1	3-6

### VP. 5

Date: 14.07.2020 Start and end time: 11:28 – 14:28

**Weather:**

The air temperature: start 31°C end 37°C Clear

Wind speed approx. (5-6 m/s) No precipitation

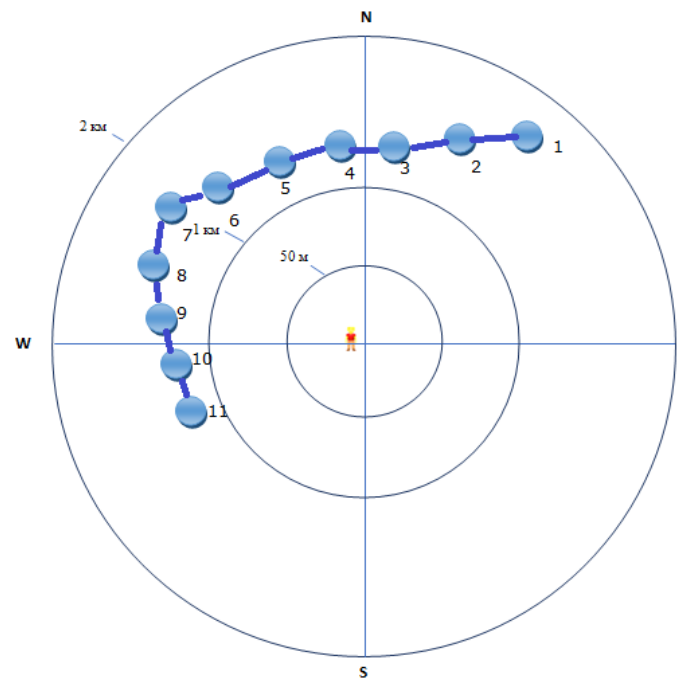


Fig. 26 Flight path (VP 5), 14.07.2020

Table 107 Target species log (VP 5), 14.07.2020


	<i>Aegypius monachus</i>	1- 80 m	2- 80 m	3- 85 m	4- 80 m	5- 85 m	6- 85 m	7- 85 m	8- 80 m	9- 80 m	10- 85 m	11- 80 m
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Table 108 Secondary and other species 14.07.2020 VP 5

No.	Latin names	English names	Amount	Altitude (m)
	<i>Galerida cristata</i>	Crested Lark	5	0-5
2.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	2	0-4
3.	<i>Merops supercilios</i>	Blue-cheeked Bee-eater	4	0-10
4.	<i>Coracias garrulus</i>	Eurasian Roller	3	3
5.	<i>Oenanthe pleschanka</i>	Pied Wheatear	1	0-5

**VP4**

Date: 14.07.2020 Start and end time: 15:12 – 18:12

**Weather:**

The air temperature: start 40°C end 32°C Clear

Wind speed approx. (6-7 m/s) No precipitation

**Primary species not found**

Table 109 Secondary and other species 14.07.2020 VP 4

No.	Latin names	English names	Amount	Altitude (m)
	<i>Circus aeruginosus</i>	Marsh Harrier	1	9-23
2.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	2	0-5
3.	<i>Galerida cristata</i>	Crested Lark	4	3-15
4.	<i>Oenanthe pleschanka</i>	Pied Wheatear	2	2-3
5.	<i>Columba livia</i>	Rock Dove	5	19



**VP. 7**

Date: 15.07.2020 Start and end time: 8:07 – 11:07

**Weather:**

The air temperature: start 23°C end 28°C Clear

Wind speed approx. (4-5 m/s) No precipitation

**Primary species not found**

Table 110 Secondary and other species 15.07.2020 VP 7

No.	Latin names	English names	Amount	Altitude (m)
	<i>Galerida cristata</i>	Crested Lark	3	2-10
2.	<i>Coracias garrulus</i>	Eurasian Roller	2	8
3.	<i>Merops supercilios</i>	Blue-cheeked Bee-eater	4	12
4.	<i>Athene noctua</i>	Little Owl	1	0
5.	<i>Lanius pallidirostris</i>	Southern grey shrike	1	5-8

### VP. 8

Date: 15.07.2020 Start and end time: 15:16 – 18:16

**Weather:**

The air temperature: start 37°C end 31°C Clear

Wind speed approx. (6-7 m/s) No precipitation

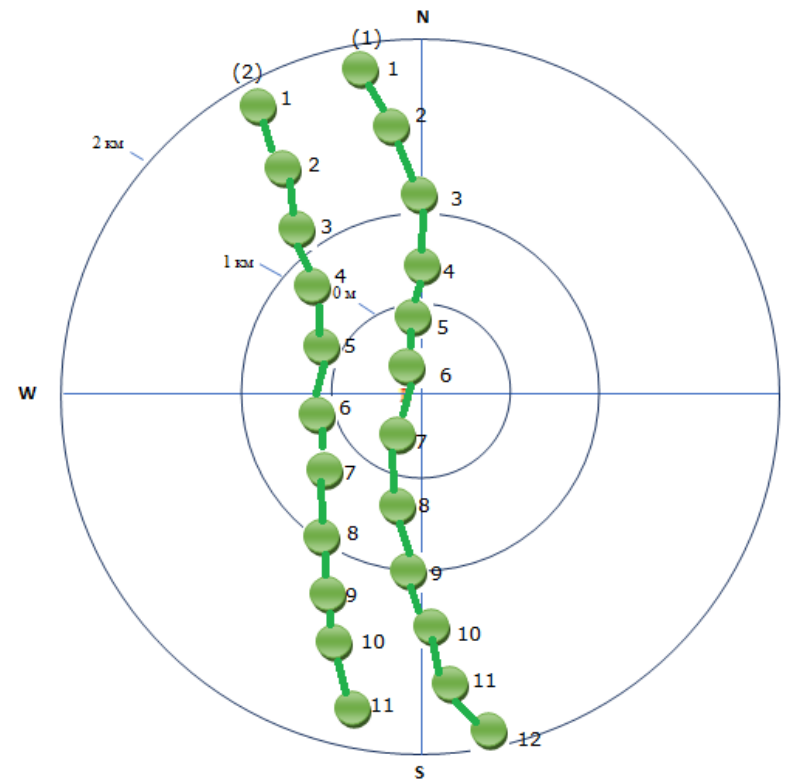


Fig. 27 Flight path (VP 8), 15.07.2020

Table 111 Target species log (VP 8), 15.07.2020



	<i>Gyps fulvus</i> (1)	1 125 m	2 125 m	3 120 m	4 120 m	5 125 m	6 125 m	7 120 m	8 120 m	9 125 m	10 125 m	11 120 m	12 120 m
	<i>Gyps fulvus</i> (2)	1 125 m	2 125 m	3 120 m	4 120 m	5 125 m	6 125 m	7 120 m	8 120 m	9 125 m	10 125 m	11 120 m	

Table 112 Secondary and other species 15.07.2020 VP 8

No.	Latin names	English names	Amount	Altitude (m)
	<i>Pterocles orientalis</i>	Black-bellied sandgrouse	2	5-12
2.	<i>Galerida cristata</i>	Crested Lark	6	3-6
3.	<i>Corvus corone</i>	Eurasian Carrion Crow	1	0
4.	<i>Merops supercilios</i>	Blue-cheeked Bee-eater	3	6-15

**VP. 10**

Date: 16.07.2020 Start and end time: 7:36 – 10:36

**Weather:**

The air temperature: start 23°C end 28°C Clear

Wind speed approx. (2-4 m/s) No precipitation

**Primary species not found**

Table 113 Secondary and other species 16.07.2020 VP 10

No.	Latin names	English names	Amount	Altitude (m)
	<i>Galerida cristata</i>	Crested Lark	9	2-8
2.	<i>Upupa epops</i>	Hoopoe	1	0-3
3.	<i>Corvus ruficollis</i>	Brown-necked Raven	1	6
4.	<i>Muscicapa striata</i>	Spotted Flycatcher	1	1
5.	<i>Merops supercilios</i>	Blue-cheeked Bee-eater	5	6-12



**VP. 9**

Date: 16.07.2020 Start and end time: 14:56 – 17:56

**Weather:**

The air temperature: start 30°C end 34 °C Clear

Wind speed approx. (3-6 m/s) No precipitation

**Primary species not found**

Table 114 Secondary and other species 16.07.2020 VP 9

No.	Latin names	English names	Amount	Altitude (m)
	<i>Oenanthe isabellina</i>	Isabelline Wheatear	2	0-3
2.	<i>Galerida cristata</i>	Crested Lark	6	2-8
3.	<i>Muscicapa striata</i>	Spotted Flycatcher	3	2
4.	<i>Merops supercilios</i>	Blue-cheeked Bee-eater	3	6-11

### VP 3

Date: 17.07.2020 Start and end time: 7:58 – 10:58

**Weather:**

The air temperature: start 24°C end 28 °C Clear

Wind speed approx. (4-6 m/s) No precipitation

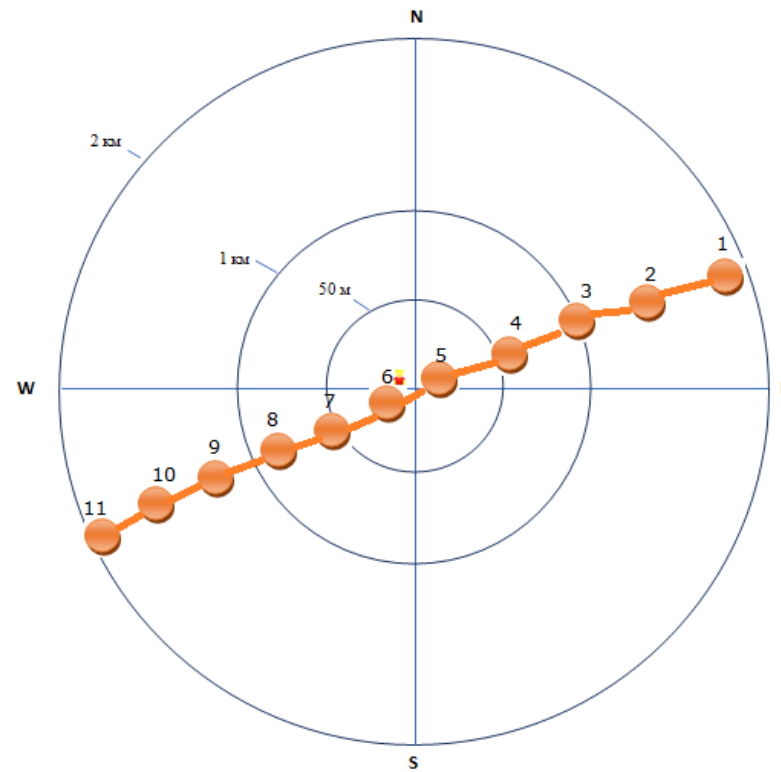


Fig. 28 Flight path (VP 3), 17 .07.2020

Table 115 Target species log (VP 3), 17.07.2020


	<i>Neophron percnopterus</i>	1 75 m	2 75 m	3 70 m	4 70 m	5 75 m	6 75 m	7 70 m	8 70 m	9 65 m	10 65 m	11 60 m
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Table 116 Secondary and other species 17.07.2020 VP 3

No.	Latin names	English names	Amount	Altitude (m)
	<i>Falco tinnunculus</i>	Kestrel	1	9-20
2.	<i>Buteo rufinus</i>	Long-legged Buzzard	1	10-20
3.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	2	1
4.	<i>Galerida cristata</i>	Crested Lark	7	2-8
5.	<i>Coracias garrulus</i>	Eurasian Roller	1	8
6.	<i>Merops supercilios</i>	Blue-cheeked Bee-eater	4	14

## VP. 2

Date: 17.07.2020 Start and end time: 11:29 – 14:29

### **Weather:**

The air temperature: start 31°C end 37°C Clear

Wind speed approx. (6-7 m/s) No precipitation

### **Primary species not found**

Table 117 Secondary and other species 17.07.2020 VP 2

No.	Latin names	English names	Amount	Altitude (m)
1	<i>Pterocles orientalis</i>	Black-bellied sandgrouse	1	3-6
2	<i>Acridotheres tristis</i>	Common myna	3	5-8
3	<i>Galerida cristata</i>	Crested Lark	7	3-4
4	<i>Merops supercilios</i>	Blue-cheeked Bee-eater	6	10-15
5	<i>Hirundo rustica</i>	Barn swallow	5	3-8



**VP. 1**

Date: 17.07.2020 Start and end time: 14:56 – 17:56

**Weather:**

The air temperature: start 38°C end 32°C Clear

Wind speed approx. (5-6 m/s) No precipitation

**Primary species not found**

Table 118 Secondary and other species 17.07.2020 VP 1

No.	Latin names	English names	Amount	Altitude (m)
	<i>Galerida cristata</i>	Crested Lark	3	0-5
2.	<i>Upupa epops</i>	Hoopoe	1	0
3.	<i>Merops supercilios</i>	Blue-cheeked Bee-eater	5	6-12
4.	<i>Lanius pallidirostris</i>	Southern grey shrike	3	3-15

#### VP. 4

Date: 18.07.2020 Start and end time: 7:52 – 10:52

**Weather:**

The air temperature: start 22°C end 29 °C Clear

Wind speed approx. (3-6 m/s) No precipitation

**Primary species not found**

Table 119 Secondary and other species 18.07.2020 VP 4

No.	Latin names	English names	Amount	Altitude (m)
	<i>Oenanthe isabellina</i>	Isabelline Wheatear	1	0-3
2.	<i>Galerida cristata</i>	Crested Lark	6	2-8
3.	<i>Muscicapa striata</i>	Spotted Flycatcher	2	2
4.	<i>Merops supercilios</i>	Blue-cheeked Bee-eater	4	0-6
5.	<i>Lanius pallidirostris</i>	Southern grey shrike	2	3-12
6.	<i>Scotocerca inquieta</i>	Streaked Scrub Warbler	2	1-2
7.	<i>Coracias garrulus</i>	Eurasian Roller	2	12

### VP 5

Date: 18.07.2020 Start and end time: 11:23 – 14:23

**Weather:**

The air temperature: start 30°C end 35°C Clear

Wind speed approx. (4-6 m/s) No precipitation

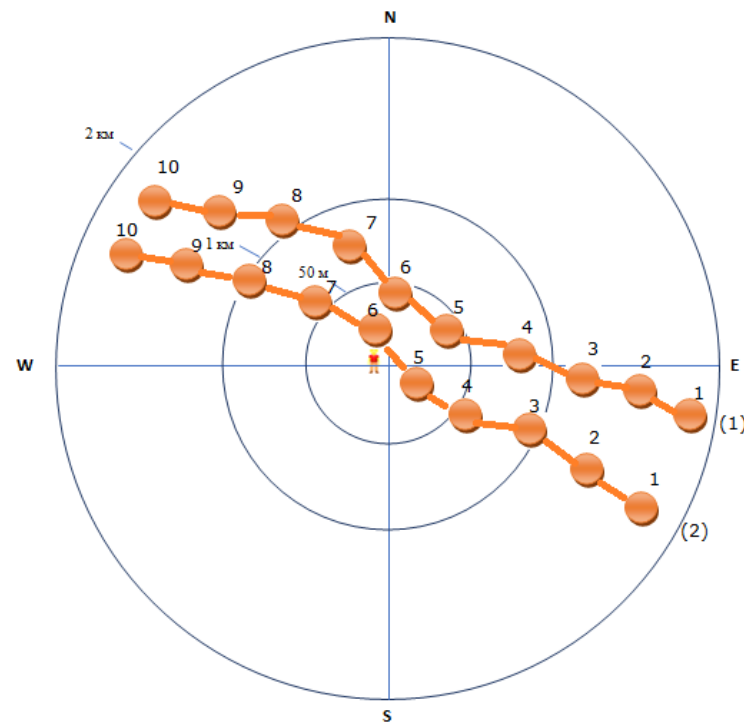


Fig. 29 Flight path (VP 5),18.07.2020

Table 120 Target species log (VP 5), 18.07.2020



	<i>Neophron percnopterus(1)</i>	1 95 m	2 95 m	3 90 m	4 90 m	5 95 m	6 95 m	7 970 m	8 90 m	9 90 m	10 90 m
	<i>Neophron percnopterus(2)</i>	1 95 m	2 95 m	3 90 m	4 90 m	5 95 m	6 95 m	7 970 m	8 90 m	9 90 m	10 90 m

Table 121 Secondary and other species 18.07.2020 VP 5

No.	Latin names	English names	Amount	Altitude (m)
	<i>Oenanthe isabellina</i>	Isabelline Wheatear	1	2
2.	<i>Rhodospiza obsoleta</i>	Black-billed Desert Finch	7	1
3.	<i>Galerida cristata</i>	Crested Lark	6	2-12
4.	<i>Coracias garrulus</i>	Eurasian Roller	2	11
5.	<i>Merops supercilios</i>	Blue-cheeked Bee-eater	6	15
6.	<i>Columba livia</i>	Rock Dove	5	14



**VP 6**

Date: 18.07.2020 Start and end time: 14:55 – 17:55

**Weather:**

The air temperature: start 38°C end 31 °C Clear

Wind speed approx. (4-6 m/s) No precipitation

**Primary species not found**

Table 122 Secondary and other species 18.07.2020 VP 6

No.	Latin names	English names	Amount	Altitude (m)
	<i>Oenanthe isabellina</i>	Isabelline Wheatear	3	2
2.	<i>Buteo rufinus</i>	Long-legged Buzzard	1	12
3.	<i>Galerida cristata</i>	Crested Lark	8	2-6
4.	<i>Circus cyaneus</i>	Hen (Northern) Harrier	1	15
5.	<i>Rhodospiza obsoleta</i>	Black-billed Desert Finch	9	2
6.	<i>Merops supercilios</i>	Blue-cheeked Bee-eater	4	15
7.	<i>Corvus corone</i>	Eurasian Carrion Crow	4	0-3

### VP 7

Date: 19.07.2020 Start and end time: 8:23 – 11:23

**Weather:**

The air temperature: start 23°C end 27 °C Clear

Wind speed approx. (5-6 m/s) No precipitation

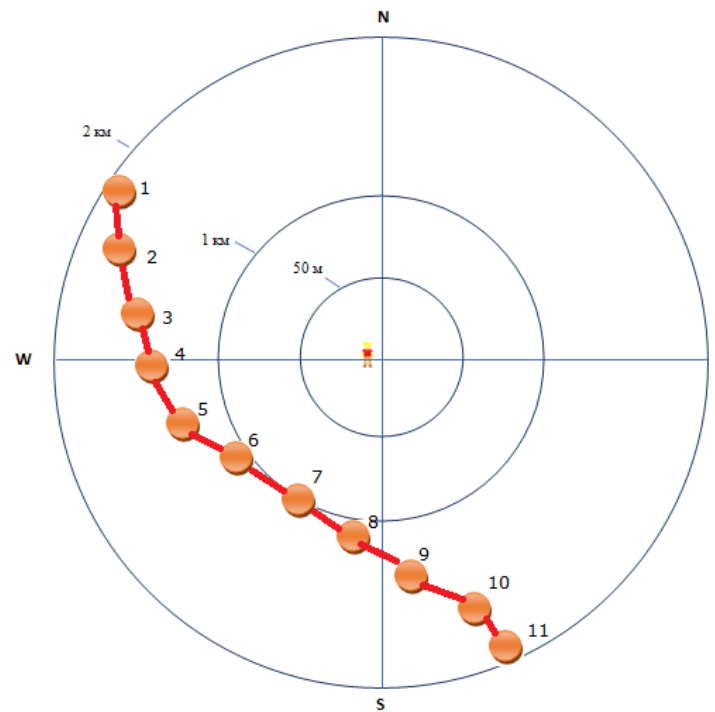


Fig. 30 Flight path (VP 7), 19.07.2020

Table 123 Target species log (VP 7), 19.07.2020


	<i>Neophron percnopterus</i>	1 95 m	2 95 m	3 90 m	4 90 m	5 95 m	6 95 m	7 970 m	8 90 m	9 90 m	10 95 m	11 95 m	12 90 m
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Table 124 Secondary and other species 19.07.2020 VP 7

No.	Latin names	English names	Amount	Altitude (m)
1	<i>Oenanthe isabellina</i>	Isabelline Wheatear	1	2
2	<i>Galerida cristata</i>	Crested Lark	5	2-12
3	<i>Merops supercilios</i>	Blue-cheeked Bee-eater	5	12

**VP 8**

Date: 19.07.2020 Start and end time: 13:57 – 16:57

**Weather:**

The air temperature: start 32°C end 34 °C Clear

Wind speed approx. (5-6 m/s) No precipitation

**Primary species not found**

Table 125 Secondary and other species 19.07.2020 VP 8

No.	Latin names	English names	Amount	Altitude (m)
	<i>Oenanthe isabellina</i>	Isabelline Wheatear	2	0-2
2.	<i>Galerida cristata</i>	Crested Lark	4	2-5
3.	<i>Pterocles orientalis</i>	Black-bellied sandgrouse	2	3-8
4.	<i>Circus cyaneus</i>	Hen (Northern) Harrier	1	14-26



**VP10**

Date: 24.07.2020 Start and end time: 8:23 – 11:23

**Weather:**

The air temperature: start 24°C end 28 °C Clear

Wind speed approx. (3-4 m/s) No precipitation

**Primary species not found**

Table 126 Secondary and other species 24.07.2020 VP 10

No.	Latin names	English names	Amount	Altitude (m)
	<i>Oenanthe isabellina</i>	Isabelline Wheatear	1	2
2.	<i>Caprimulgus aegyptius</i>	Egyptian nightjar	2	3-6
3.	<i>Galerida cristata</i>	Crested Lark	5	2-9
4.	<i>Rhodospiza obsoleta</i>	Black-billed Desert Finch	12	2-4
5.	<i>Merops supercilios</i>	Blue-cheeked Bee-eater	6	14

**VP9**

Date: 24.07.2020 Start and end time: 14:05 – 17:05

**Weather:**

The air temperature: start 34°C end 31°C Clear

Wind speed approx. (5-6 m/s) No precipitation

**Primary species not found**

Table 127 Secondary and other species 24.07.2020 VP 9

No.	Latin names	English names	Amount	Altitude (m)
	<i>Galerida cristata</i>	Crested Lark	9	2-6
2.	<i>Pica pica</i>	Black-billed Magpie	3	5
3.	<i>Rhodospiza obsoleta</i>	Black-billed Desert Finch	6	2
4.	<i>Galerida cristata</i>	Crested Lark	9	2-4

**VP1**

Date: 25.07.2020 Start and end time: 8:21 – 11:21

**Weather:**

The air temperature: start 25°C end 29 °C Clear

Wind speed approx. (5-6 m/s) No precipitation

**Primary species not found**

Table 128 Secondary and other species 25.07.2020 VP 1

No.	Latin names	English names	Amount	Altitude (m)
	<i>Lanius pallidirostris</i>	Southern grey shrike	1	5
2.	<i>Galerida cristata</i>	Crested Lark	11	2-12
3.	<i>Merops supercilios</i>	Blue-cheeked Bee-eater	4	15
4.	<i>Columba livia</i>	Rock Dove	5	12
5.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	2	2
6.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	15	0

## VP 2

Date: 25.07.2020 Start and end time: 11:53 – 14:53

### **Weather:**

The air temperature: start 32°C end 37 °C Clear

Wind speed approx. (5-6 m/s) No precipitation

**Primary species not found**

Table 129 Secondary and other species 25.07.2020 VP 2

No.	Latin names	English names	Amount	Altitude (m)
7.	<i>Galerida cristata</i>	Crested Lark	5	2-12
8.	<i>Buteo buteo</i>	Common Buzzard	1	1
9.	<i>Caprimulgus aegyptius</i>	Egyptian nightjar	2	6-13
10.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	18	0-2
11.	<i>Merops supercilios</i>	Blue-cheeked Bee-eater	6	15
12.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	1	2



**VP 3**

Date: 25.07.2020 Start and end time: 15:31 – 18:31

**Weather:**

The air temperature: start 30°C end 33 °C Clear

Wind speed approx. (4-6 m/s) No precipitation

**Primary species not found**

Table 130 Secondary and other species 25.07.2020 VP 3

No.	Latin names	English names	Amount	Altitude (m)
7.	<i>Lanius pallidirostris</i>	Southern grey shrike	1	9
8.	<i>Galerida cristata</i>	Crested Lark	8	2-10
9.	<i>Merops supercilios</i>	Blue-cheeked Bee-eater	2	16
10.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	2	2

## VP survey results in August

### VP. 1

Date: 01.08.2020 Start and end time: 8:12 – 11:12

**Weather:**

The air temperature: start 23°C end 28°C Clear

Wind speed approx. (5-6 m/s) No precipitation

**Primary species not found**

Table 131 Secondary and other species 01.08.2020 VP 1

No.	Latin names	English names	Amount	Altitude (m)
1.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	12	0-3
2.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	3	0-4
3.	<i>Galerida cristata</i>	Crested Lark	5	3-12
4.	<i>Oenanthe pleschanka</i>	Pied Wheatear	3	2-4

### VP. 3

Date: 01.08.2020 Start and end time: 11:48 – 14:48

#### **Weather:**

The air temperature: start 29°C end 33°C Clear

Wind speed approx. (6-8 m/s) No precipitation

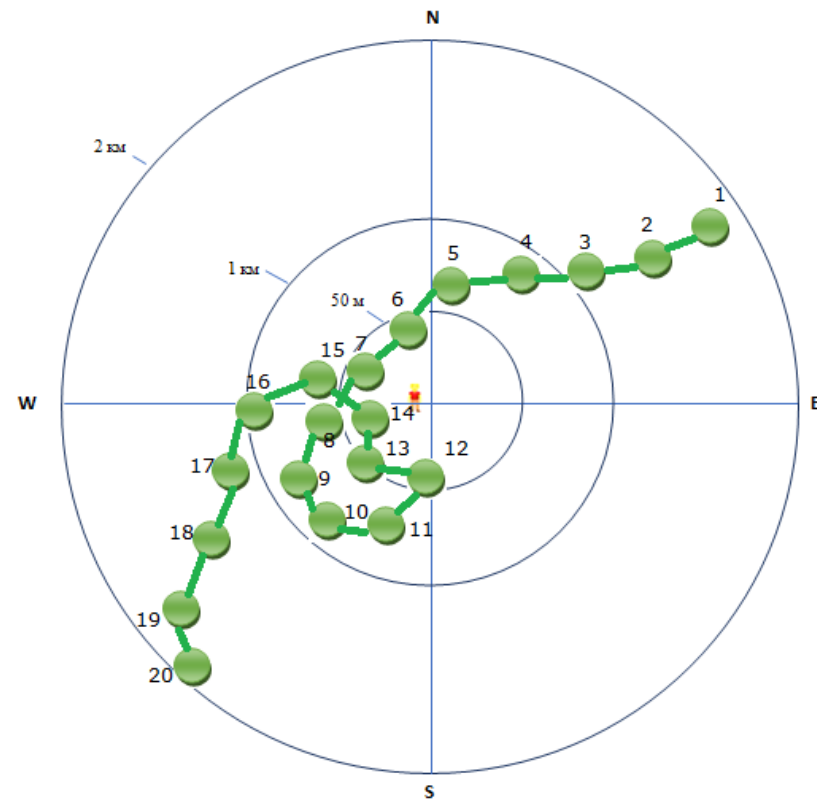


Fig. 31 Flight path (VP 3), 01.08.2020

Table 132 Target species log (VP 3), 01.08.2020


	Gyp s fulvu s	1 125 m	2 125 m	3 120 m	4 120 m	5 125 m	6 125 m	7 120 m	8 120 m	9 125 m	10 120 m	11 120 m	12 125 m	13 125 m	14 120 m	15 125 m	16 125 m	17 120 m	18 120 m	19 125 m	20 120 m
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Table 133 Secondary and other species 01.08.2020 VP 3

No.	Latin names	English names	Amount	Altitude (m)
	<i>Pterocles orientalis</i>	Black-bellied sandgrouse	6	5-12
2.	<i>Galerida cristata</i>	Crested Lark	5	3-7
3.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	9	0-5



## VP. 2

Date: 01.08.2020 Start and end time: 15:23 – 18:83

**Weather:**

The air temperature: start 32°C end 30°C Clear

Wind speed approx. (5-7 m/s) No precipitation

**Primary species not found**

Table 134 Secondary and other species 01.08.2020 VP 2

No.	Latin names	English names	Amount	Altitude (m)
	<i>Galerida cristata</i>	Crested Lark	3	0-9
2.	<i>Merops supercilios</i>	Blue-cheeked Bee-eater	4	16
3.	<i>Pterocles orientalis</i>	Black-bellied sandgrouse	4	0-9
4.	<i>Lanius pallidirostris</i>	Southern grey shrike	1	5
5.	<i>Scotocerca inquieta</i>	Streaked Scrub Warbler	2	1-2

**VP. 4**

Date: 02.08.2020 Start and end time: 7:46 – 10:46

**Weather:**

The air temperature: start 23°C end 28°C Clear

Wind speed approx. (3-5 m/s) No precipitation

**Primary species not found**

Table 135 Secondary and other species 02.08.2020 VP 4

No.	Latin names	English names	Amount	Altitude (m)
8.	<i>Galerida cristata</i>	Crested Lark	7	0-6
9.	<i>Coracias garrulus</i>	Eurasian Roller	2	7
10.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	5	3-5
11.	<i>Merops supercilios</i>	Blue-cheeked Bee-eater	3	5-12
12.	<i>Lanius pallidirostris</i>	Southern grey shrike	2	3-12

**VP. 6**

Date: 02.08.2020 Start and end time: 11:06 – 14:06

**Weather:**

The air temperature: start 32°C end 35 °C Clear

Wind speed approx. (3-4 m/s) No precipitation

**Primary species not found**

Table 136 Secondary and other species 02.08.2020 VP 6

No.	Latin names	English names	Amount	Altitude (m)
	<i>Oenanthe isabellina</i>	Isabelline Wheatear	1	0-2
2.	<i>Galerida cristata</i>	Crested Lark	4	2-56
3.	<i>Coracias garrulus</i>	Eurasian Roller	1	5
4.	<i>Merops supercilios</i>	Blue-cheeked Bee-eater	6	8-11
5.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	12	0

## VP 5

Date: 02.08.2020 Start and end time: 14:46 – 17:46

### Weather:

The air temperature: start 32°C end 30 °C Clear

Wind speed approx. (6-7 m/s) No precipitation

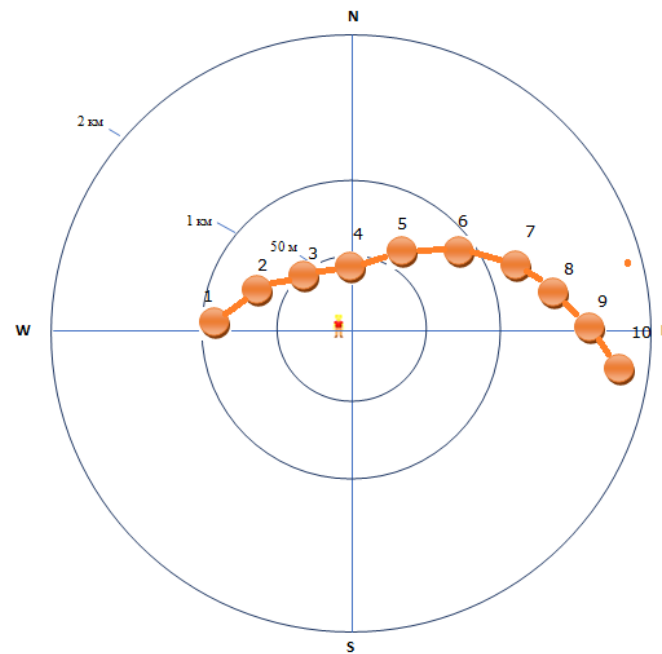


Fig. 32 Flight path (VP 6), 02.08.2020

Table 137 Target species log (VP 6), 02.08.2020


	<i>Neophron percnopterus</i>	1 75m	2 75m	3 70m	4 70m	5 75m	6 75m	7 70m	8 70m	9 70 m	10 70 m
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Table 138 Secondary and other species 02.08.2020 VP 6

No.	Latin names	English names	Amount	Altitude (m)
	<i>Falco tinnunculus</i>	Kestrel	1	20
2.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	2	0-2
3.	<i>Galerida cristata</i>	Crested Lark	4	0-7
4.	<i>Caprimulgus aegyptius</i>	Egyptian nightjar	2	6-13
5.	<i>Merops supercilios</i>	Blue-cheeked Bee-eater	4	14

**VP. 8**

Date: 03.08.2020 Start and end time: 07:53 – 10:53

**Weather:**

The air temperature: start 23°C end 28°C Clear

Wind speed approx. (2-3 m/s) No precipitation

**Primary species not found**

Table 139 Secondary and other species 03.08.2020 VP 8

<b>No.</b>	<b>Latin names</b>	<b>English names</b>	<b>Amount</b>	<b>Altitude (m)</b>
	<i>Oenanthe isabellina</i>	Isabelline Wheatear	1	1
2.	<i>Galerida cristata</i>	Crested Lark	3	0-9
3.	<i>Lanius pallidirostris</i>	Southern grey shrike	1	3-6
4.	<i>Pterocles orientalis</i>	Black-bellied sandgrouse	3	5-6
5.	<i>Falco tinnunculus</i>	Kestrel	1	23

**VP.7**

Date: 03.08.2020 Start and end time: 12:14 – 15:14

**Weather:**

The air temperature: start 30°C end 32°C Clear

Wind speed approx. (4-6 m/s) No precipitation

**Primary species not found**

Table 140 Secondary and other species 03.08.2020 VP 8

No.	Latin names	English names	Amount	Altitude (m)
	<i>Galerida cristata</i>	Crested Lark	4	0-5
2.	<i>Buteo rufinus</i>	Long-legged Buzzard	1	5-25
3.	<i>Columba livia</i>	Rock Dove	15	12
4.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	8	0

**VP. 9**

Date: 04.08.2020 Start and end time: 08:38 – 11:38

**Weather:**

The air temperature: start 23°C end 28°C Clear

Wind speed approx. (3-5 m/s) No precipitation

**Primary species not found**

Table 141 Secondary and other species 04.08.2020 VP 9

No.	Latin names	English names	Amount	Altitude (m)
	<i>Oenanthe isabellina</i>	Isabelline Wheatear	3	0-2
2.	<i>Athene noctua</i>	Little Owl	1	2
3.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	4	2-5
4.	<i>Columba livia</i>	Rock Dove	3	18
5.	<i>Coracias garrulus</i>	Eurasian Roller	1	7



**VP. 10**

Date: 04.08.2020 Start and end time: 14:29 – 17:30

**Weather:**

The air temperature: start 32°C end 30°C Clear

Wind speed approx. (3-5 m/s) No precipitation

**Primary species not found**

Table 142 Secondary and other species 04.08.2020 VP 10

No.	Latin names	English names	Amount	Altitude (m)
	<i>Galerida cristata</i>	Crested Lark	6	0-6
2.	<i>Pterocles orientalis</i>	Black-bellied sandgrouse	6	3-12
3.	<i>Merops supercilios</i>	Blue-cheeked Bee-eater	5	8-16
4.	<i>Coracias garrulus</i>	Eurasian Roller	1	8

**VP. 3**

Date: 05.08.2020 Start and end time: 8:24 – 11:24

**Weather:**

The air temperature: start 23°C end 27°C Clear

Wind speed approx. (2-5 m/s) No precipitation

**Primary species not found**

Table 143 Secondary and other species 05.08.2020 VP 3

No.	Latin names	English names	Amount	Altitude (m)
	<i>Galerida cristata</i>	Crested Lark	6	0-7
2.	<i>Buteo rufinus</i>	Long-legged Buzzard	1	16
3.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	6	0-5
4.	<i>Lanius pallidirostris</i>	Southern grey shrike	1	3-5
5.	<i>Merops supercilios</i>	Blue-cheeked Bee-eater	4	6-15

**VP. 1**

Date: 05.08.2020 Start and end time: 12:06 – 15:06

**Weather:**

The air temperature: start 28°C end 32°C Clear

Wind speed approx. (4-5 m/s) No precipitation

**Primary species not found**

Table 144 Secondary and other species 05.08.2020 VP1

No.	Latin names	English names	Amount	Altitude (m)
	<i>Pterocles orientalis</i>	Black-bellied sandgrouse	2	0-6
2.	<i>Rhodospiza obsoleta</i>	Black-billed Desert Finch	8	4
3.	<i>Coracias garrulus</i>	Eurasian Roller	2	10
4.	<i>Galerida cristata</i>	Crested Lark	5	4
5.	<i>Hirundo rustica</i>	Barn swallow	2	3-5

## VP.2

Date: 05.08.2020 Start and end time: 15:36 – 18:36

### **Weather:**

The air temperature: start 34°C end 31°C Clear

Wind speed approx. (5-6 m/s) No precipitation

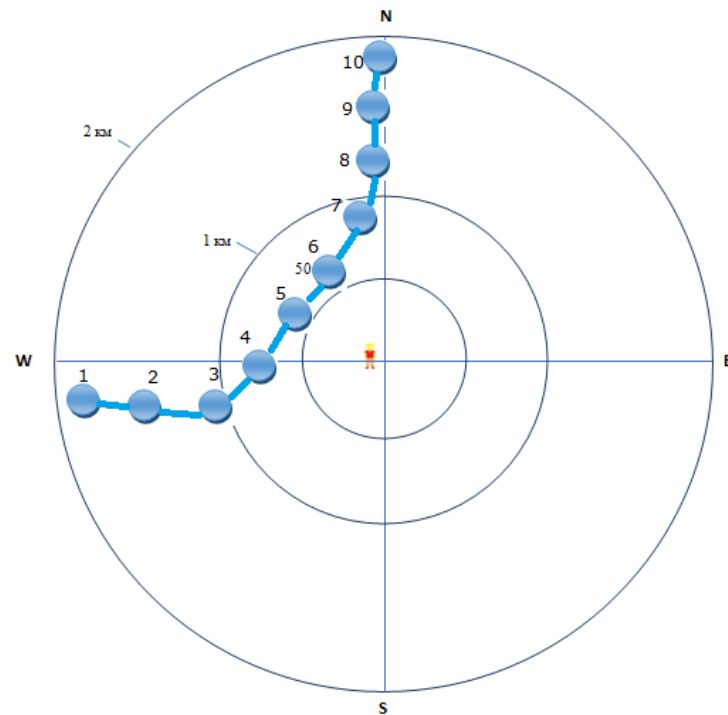


Fig. 33 Flight path (VP 2), 05.08.2020



Table 145 Target species log (VP 2), 05.08.2020


	<i>Aegypius monachus</i>	1 90 m	2 90 m	3 90 m	4 95 m	5 95 m	6 90 m	7 95 m	8 95 m	9 90 m	10 90 m
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Table 146 Secondary and other species 05.08.2020 VP 2

No.	Latin names	English names	Amount	Altitude (m)
6.	<i>Merops supercilios</i>	Blue-cheeked Bee-eater	5	0-12
7.	<i>Galerida cristata</i>	Crested Lark	6	0-3
8.	<i>Hirundo rustica</i>	Barn swallow	4	2-12
9.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	2	0-2
10.	<i>Athene noctua</i>	Little Owl	1	0-6

**VP 4**

Date: 06.08.2020 Start and end time: 8:32 – 11:32

**Weather:**

The air temperature: start 24°C end 28°C Clear

Wind speed approx. (4-6 m/s) No precipitation

**Primary species not found**

Table 147 Secondary and other species 06.08.2020 VP4

No.	Latin names	English names	Amount	Altitude (m)
	<i>Merops supercilios</i>	Blue-cheeked Bee-eater	5	6-12
2.	<i>Galerida cristata</i>	Crested Lark	6	2-6
3.	<i>Lanius pallidirostris</i>	Southern grey shrike	1	2-5
4.	<i>Hirundo rustica</i>	Barn swallow	5	3-9
5.	<i>Rhodospiza obsoleta</i>	Black-billed Desert Finch	7	2
6.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	3	1-3

**VP. 5**

Date: 06.08.2020 Start and end time: 12:05 – 15:05

**Weather:**

The air temperature: start 30°C end 32°C Clear

Wind speed approx. (4-5 m/s) No precipitation

**Primary species not found**

Table 148 Secondary and other species 06.08.2020 VP5

No.	Latin names	English names	Amount	Altitude (m)
	<i>Galerida cristata</i>	Crested Lark	5	3
2.	<i>Buteo buteo</i>	Common Buzzard	1	9-19
3.	<i>Coracias garrulus</i>	Eurasian Roller	1	11
4.	<i>Upupa epops</i>	Hoopoe	1	1-3
5.	<i>Merops supercilios</i>	Blue-cheeked Bee-eater	4	4-8
6.	<i>Lanius pallidirostris</i>	Southern grey shrike	1	3-5

## VP 6

Date: 06.08.2020 Start and end time: 15:46 – 18:46

### **Weather:**

The air temperature: start 32°C end 30°C Clear

Wind speed approx. (5-6 m/s) No precipitation

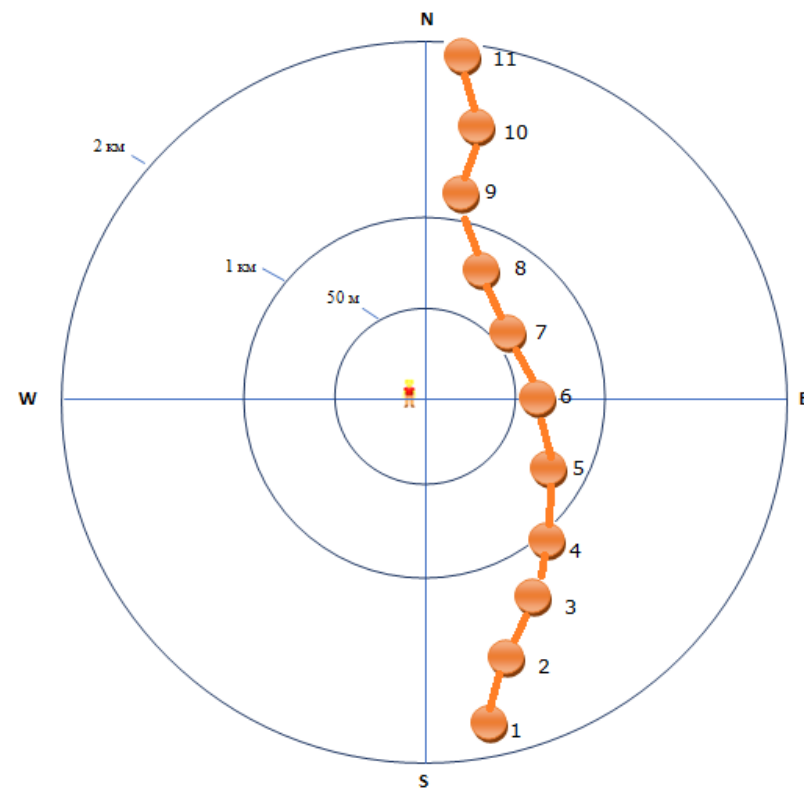


Fig. 34 Flight path (VP 6), 06.08.2020



Table 149 Target species log (VP 6), 06.07.2020


	<i>Neophron percnopterus</i>	1 120 m	2 120 m	3 120 m	4 125 m	5 125 m	6 120 m	7 125 m	8 125 m	9 120 m	10 120 m	11 120 m
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Table 150 Secondary and other species 06.08.2020 VP 6

No.	Latin names	English names	Amount	Altitude (m)
	<i>Galerida cristata</i>	Crested Lark	3	2-3
2.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	6	0
3.	<i>Rhodospiza obsoleta</i>	Black-billed Desert Finch	2	2
4.	<i>Pterocles orientalis</i>	Black-bellied sandgrouse	2	5-9
5.	<i>Lanius pallidirostris</i>	Southern grey shrike	1	5
6.	<i>Hirundo rustica</i>	Barn swallow	3	2-9

**VP.7**

Date: 07.08.2020 Start and end time: 7:47 – 11:47

**Weather:**

The air temperature: start 24°C end 29°C Clear

Wind speed approx. (5-6 m/s) No precipitation

**Primary species not found**

Table 151 Secondary and other species 07.08.2020 VP 7

No.	Latin names	English names	Amount	Altitude (m)
	<i>Galerida cristata</i>	Crested Lark	3	0-2
2.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	2	0-6
3.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	1	2
4.	<i>Merops supercilios</i>	Blue-cheeked Bee-eater	2	12

**VP. 8**

Date: 07.08.2020 Start and end time: 12:16 – 15:16

**Weather:**

The air temperature: start 32°C end 33°C Clear

Wind speed approx. (6-8 m/s) No precipitation

Table 152 Secondary and other species 07.08.2020 VP 8

No.	Latin names	English names	Amount	Altitude (m)
	<i>Galerida cristata</i>	Crested Lark	2	0-3
2.	<i>Merops supercilios</i>	Blue-cheeked Bee-eater	4	6-12
3.	<i>Coracias garrulus</i>	Eurasian Roller	2	3
4.	<i>Pterocles orientalis</i>	Black-bellied sandgrouse	4	1-6

**VP. 10**

Date: 12.08.2020 Start and end time: 8:11 – 11:11

**Weather:**

The air temperature: start 23°C end 28°C Clear

Wind speed approx. (3-5 m/s) No precipitation

**Primary species not found**

Table 153 Secondary and other species 12.08.2020 VP 10

No.	Latin names	English names	Amount	Altitude (m)
	<i>Galerida cristata</i>	Crested Lark	2	5
2.	<i>Circus cyaneus</i>	Hen Harrier	1	12-20
3.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	26	0-3
4.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	2	3
5.	<i>Falco tinnunculus</i>	Kestrel	2	12-18
6.	<i>Merops supercilios</i>	Blue-cheeked Bee-eater	4	9-16



**VP. 9**

Date: 12.08.2020 Start and end time: 13:56 – 15:56

**Weather:**

The air temperature: start 30°C end 32°C Clear

Wind speed approx. (5-6 m/s) No precipitation

**Primary species not found**

Table 154 Secondary and other species 12.08.2020 VP 9

<b>No.</b>	<b>Latin names</b>	<b>English names</b>	<b>Amount</b>	<b>Altitude (m)</b>
	<i>Galerida cristata</i>	Crested Lark	6	2-6
2.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	3	1
3.	<i>Coracias garrulus</i>	Eurasian Roller	2	5
4.	<i>Corvus ruficollis</i>	Brown-necked Raven	2	0
5.	<i>Hirundo rustica</i>	Barn swallow	4	5-9
6.	<i>Buteo rufinus</i>	Long-legged Buzzard	1	12-26

**VP. 6**

Date: 14.08.2020 Start and end time: 7:57 – 10:57

**Weather:**

The air temperature: start 23°C end 28°C Clear

Wind speed approx. (2-4 m/s) No precipitation

**Primary species not found**

Table 155 Secondary and other species 14.08.2020 VP 6

No.	Latin names	English names	Amount	Altitude (m)
	<i>Galerida cristata</i>	Crested Lark	4	2-3
2.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	2	2
3.	<i>Circus aeruginosus</i>	Marsh Harrier	1	6-22
4.	<i>Hirundo rustica</i>	Barn swallow	3	3-9
5.	<i>Sylvia atricapilla</i>	Blackcap	2	0-2
6.	<i>Coracias garrulus</i>	Eurasian Roller	2	4

**VP. 5**

Date: 14.08.2020 Start and end time: 11:28 – 14:28

**Weather:**

The air temperature: start 31°C end 33°C Clear

Wind speed approx. (5-6 m/s) No precipitation

Table 156 Secondary and other species 14.08.2020 VP 5

No.	Latin names	English names	Amount	Altitude (m)
	<i>Galerida cristata</i>	Crested Lark	3	0-5
2.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	1	0-2
3.	<i>Merops supercilios</i>	Blue-cheeked Bee-eater	2	0-10
4.	<i>Coracias garrulus</i>	Eurasian Roller	3	3
5.	<i>Oenanthe pleschanka</i>	Pied Wheatear	1	0-5

**VP4**

Date: 14.08.2020 Start and end time: 15:12 – 18:12

**Weather:**

The air temperature: start 34°C end 30°C Clear

Wind speed approx. (6-7 m/s) No precipitation

**Primary species not found**

Table 157 Secondary and other species 14.08.2020 VP 4

No.	Latin names	English names	Amount	Altitude (m)
	<i>Circus aeruginosus</i>	Marsh Harrier	1	9-20
2.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	2	0-5
3.	<i>Galerida cristata</i>	Crested Lark	5	3-15
4.	<i>Oenanthe pleschanka</i>	Pied Wheatear	1	1-3
5.	<i>Columba livia</i>	Rock Dove	4	19



**VP. 7**

Date: 15.08.2020 Start and end time: 8:07 – 11:07

**Weather:**

The air temperature: start 23°C end 28°C Clear

Wind speed approx. (4-5 m/s) No precipitation

**Primary species not found**

Table 158 Secondary and other species 15.08.2020 VP 7

No.	Latin names	English names	Amount	Altitude (m)
	<i>Galerida cristata</i>	Crested Lark	2	2-6
2.	<i>Merops supercilios</i>	Blue-cheeked Bee-eater	2	12
3.	<i>Athene noctua</i>	Little Owl	1	0-6
4.	<i>Lanius pallidirostris</i>	Southern grey shrike	1	5-6

### VP. 8

Date: 15.08.2020 Start and end time: 15:16 – 18:16

**Weather:**

The air temperature: start 34°C end 31°C Clear

Wind speed approx. (6-7 m/s) No precipitation

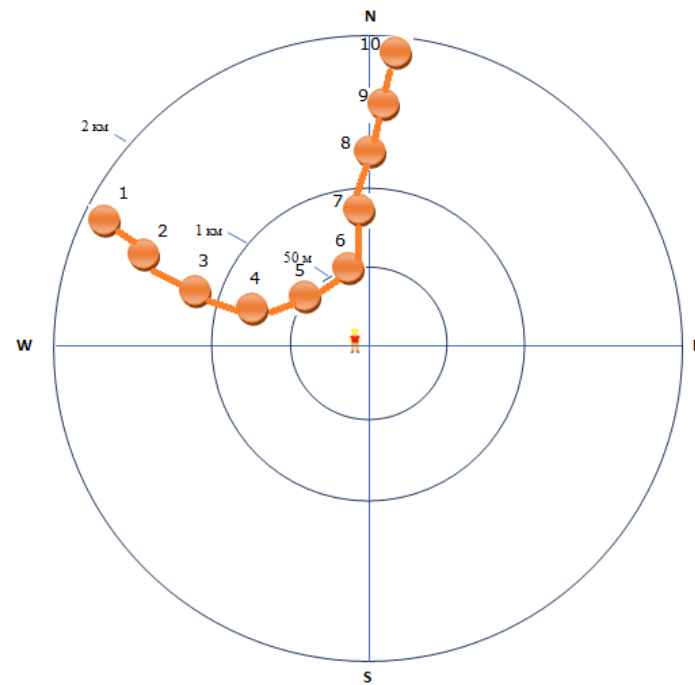


Fig. 35 Flight path (VP 8), 15.08.2020

Table 159 Target species log (VP 8), 15.08.2020


	<i>Neophron percnopterus</i>	1 75 m	2 75 m	3 70 m	4 70 m	5 85 m	6 85 m	7 90 m	8 90 m	9 95 m	10 95 m
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Table 160 Secondary and other species 15.08.2020 VP 8

No.	Latin names	English names	Amount	Altitude (m)
	<i>Pterocles orientalis</i>	Black-bellied sandgrouse	2	5-12
2.	<i>Galerida cristata</i>	Crested Lark	5	3-6
3.	<i>Corvus corone</i>	Eurasian Carrion Crow	1	0

**VP. 10**

Date: 16.08.2020 Start and end time: 7:36 – 10:36

**Weather:**

The air temperature: start 23°C end 28°C Clear

Wind speed approx. (2-4 m/s) No precipitation

**Primary species not found**

Table 161 Secondary and other species 16.08.2020 VP 10

No.	Latin names	English names	Amount	Altitude (m)
6.	<i>Galerida cristata</i>	Crested Lark	6	2-6
7.	<i>Corvus ruficollis</i>	Brown-necked Raven	1	6
8.	<i>Muscicapa striata</i>	Spotted Flycatcher	1	1



**VP. 9**

Date: 16.08.2020 Start and end time: 14:56 – 17:56

**Weather:**

The air temperature: start 30°C end 34 °C Clear

Wind speed approx. (3-6 m/s) No precipitation

**Primary species not found**

Table 162 Secondary and other species 16.08.2020 VP 9

No.	Latin names	English names	Amount	Altitude (m)
	<i>Oenanthe isabellina</i>	Isabelline Wheatear	1	0-3
2.	<i>Galerida cristata</i>	Crested Lark	3	0-2
3.	<i>Muscicapa striata</i>	Spotted Flycatcher	2	2

#### VP. 4

Date: 17.08.2020 Start and end time: 7:53 – 10:53

**Weather:**

The air temperature: start 23°C end 29 °C Clear

Wind speed approx. (3-4 m/s) No precipitation

**Primary species not found**

Table 163 Secondary and other species 17.08.2020 VP 4

No.	Latin names	English names	Amount	Altitude (m)
	<i>Oenanthe isabellina</i>	Isabelline Wheatear	1	0-3
2.	<i>Galerida cristata</i>	Crested Lark	2	2-5
3.	<i>Scotocerca inquieta</i>	Streaked Scrub Warbler	1	1-3
4.	<i>Coracias garrulus</i>	Eurasian Roller	2	10

**VP 5**

Date: 17.08.2020 Start and end time: 11:24 – 14:24

**Weather:**

The air temperature: start 29°C end 32°C Clear

Wind speed approx. (4-5 m/s) No precipitation

**Primary species not found**

Table 164 Secondary and other species 17.08.2020 VP 5

No.	Latin names	English names	Amount	Altitude (m)
	<i>Rhodospiza obsoleta</i>	Black-billed Desert Finch	5	1
2.	<i>Galerida cristata</i>	Crested Lark	4	2-4
3.	<i>Coracias garrulus</i>	Eurasian Roller	2	10
4.	<i>Merops supercilios</i>	Blue-cheeked Bee-eater	3	12
5.	<i>Columba livia</i>	Rock Dove	3	14

**VP 6**

Date: 17.08.2020 Start and end time: 14:58 – 17:55

**Weather:**

The air temperature: start 32°C end 30 °C Clear

Wind speed approx. (3-4 m/s) No precipitation

**Primary species not found**

Table 165 Secondary and other species 17.08.2020 VP 5

No.	Latin names	English names	Amount	Altitude (m)
	<i>Buteo rufinus</i>	Long-legged Buzzard	1	12-35
2.	<i>Galerida cristata</i>	Crested Lark	7	2-5
3.	<i>Rhodospiza obsoleta</i>	Black-billed Desert Finch	4	2
4.	<i>Merops supercilios</i>	Blue-cheeked Bee-eater	2	2-6
5.	<i>Corvus corone</i>	Eurasian Carrion Crow	1	3



**VP 7**

Date: 18.08.2020 Start and end time: 8:23 – 11:23

**Weather:**

The air temperature: start 23°C end 27 °C Clear

Wind speed approx. (5-6 m/s) No precipitation

**Primary species not found**

Table 166 Secondary and other species 18.08.2020 VP 7

No.	Latin names	English names	Amount	Altitude (m)
1.	<i>Galerida cristata</i>	Crested Lark	3	2-5
2.	<i>Caprimulgus aegyptius</i>	Egyptian nightjar	1	6-2
3.	<i>Merops supercilios</i>	Blue-cheeked Bee-eater	2	13
4.	<i>Buteo buteo</i>	Common Buzzard	1	19-32

**VP 8**

Date: 18.08.2020 Start and end time: 13:57 – 16:57

**Weather:**

The air temperature: start 31°C end 32 °C Clear

Wind speed approx. (5-7 m/s) No precipitation

**Primary species not found**

Table 167 Secondary and other species 18.08.2020 VP 8

No.	Latin names	English names	Amount	Altitude (m)
	<i>Oenanthe isabellina</i>	Isabelline Wheatear	1	0-2
2.	<i>Galerida cristata</i>	Crested Lark	2	0
3.	<i>Pterocles orientalis</i>	Black-bellied sandgrouse	2	3-8

**VP10**

Date: 19.08.2020 Start and end time: 8:25 – 11:25

**Weather:**

The air temperature: start 24°C end 28 °C Clear

Wind speed approx. (2-4 m/s) No precipitation

**Primary species not found**

Table 168 Secondary and other species 19.08.2020 VP 10

No.	Latin names	English names	Amount	Altitude (m)
	<i>Galerida cristata</i>	Crested Lark	3	2-6
2.	<i>Rhodospiza obsoleta</i>	Black-billed Desert Finch	8	2-4
3.	<i>Merops supercilios</i>	Blue-cheeked Bee-eater	3	3-12

VP9

Date: 19.08.2020 Start and end time: 14:05 – 17:05

**Weather:**

The air temperature: start 34°C end 31°C Clear

Wind speed approx. (5-6 m/s) No precipitation

**Primary species not found**

Table 169 Secondary and other species 19.08.2020 VP 9

No.	Latin names	English names	Amount	Altitude (m)
	<i>Galerida cristata</i>	Crested Lark	4	2-3
2.	<i>Pica pica</i>	Black-billed Magpie	2	4
3.	<i>Rhodospiza obsoleta</i>	Black-billed Desert Finch	5	2-3

## ATTACHMENTS

All the pictures are taken during VP surveys and specialized raptor nest survey on the Dzankeldy WF project territory.





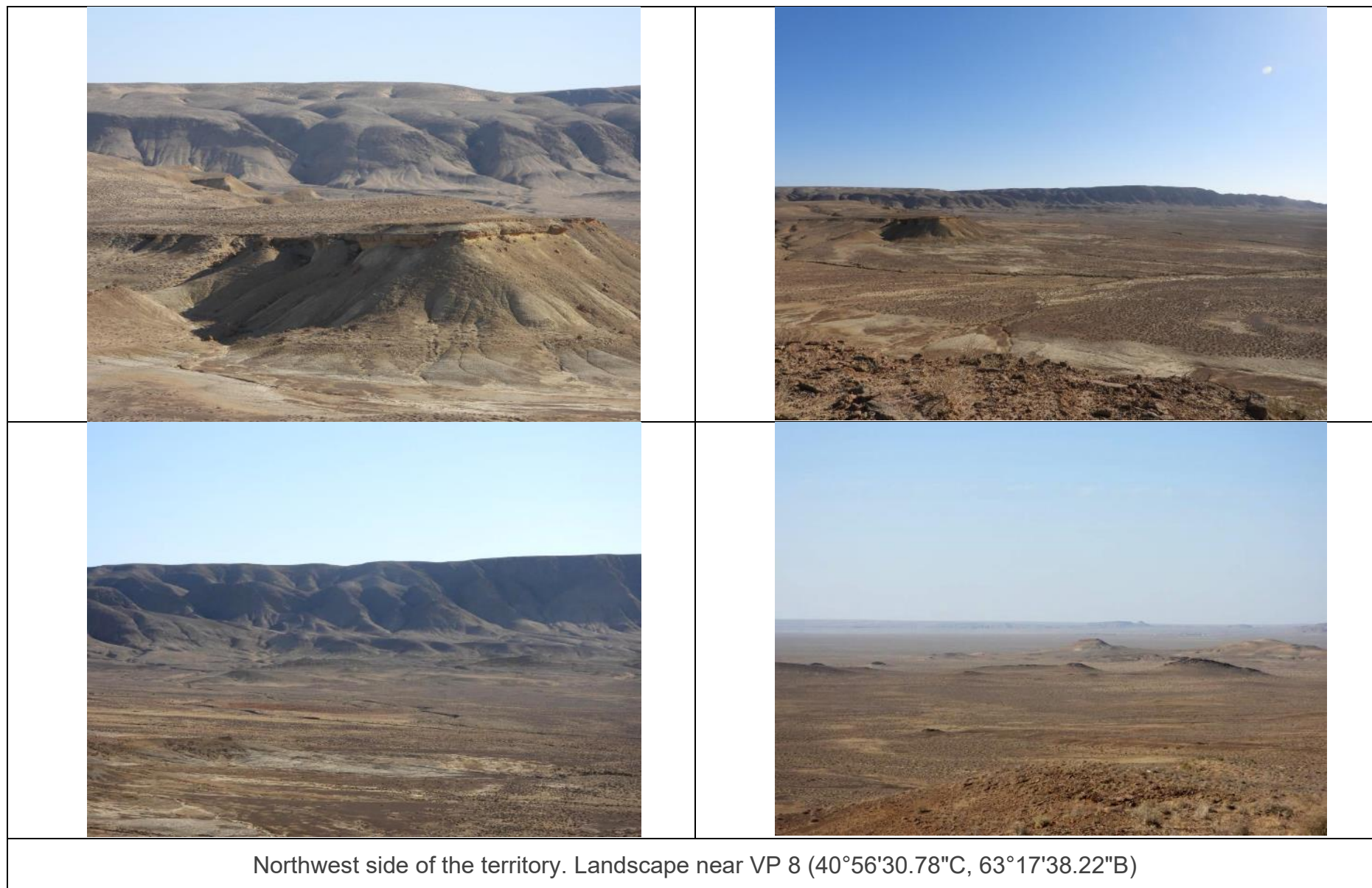




VP 4 (40°52'41.82"C, 63°25'36.69"B)











Grazing camels on the project territory



## AUTUMN QUARTERLY BIRD MONITORING REPORT

<b>Report Title</b>	AUTUMN QUARTERLY BIRD MONITORING REPORT
<b>Scope</b>	BIRDS VP
<b>Areas Covered</b>	DZHANKELDY WF
<b>Seasons Covered</b>	AUTUMN 2020
<b>Notes</b>	

# AUTUMN QUARTERLY BIRD MONITORING REPORT



Dzhankeldy Wind Farm Site

Client: 5 Capitals

This report is prepared by: Juru Energy

Date: \_\_\_\_\_

CHECKED BY \_\_\_\_\_

Date: \_\_\_\_\_

APPROVED BY \_\_\_\_\_

Date: \_\_\_\_\_

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## INTRODUCTION

In the framework of the Dzhankeldy Wind Farm Project, bird survey was conducted in the project area in Autumn 2020. The purpose of ornithological monitoring was to conduct systematic field studies at specific vantage points to assess bird species composition that occur within the project's area of influence, its abundance and territorial distribution, the nature of the stay, and daily activity of birds during spring migration and the beginning of nesting and also to identify birds that are of conservation interest under IUCN and Uzbekistan Redlist.

This report presents the primary materials of field studies in this territory from September 1 to November 15, 2020.

It is planned to conduct regular bird monitoring, which will allow us to take into account the risks from the wind farm for birds in the project area.

This report is a statement of work made by Juru Enery` local ornitologist Alisher Atakhodjaev and international expert Caleb Gordon. However, it should be noted that help in collecting survey material was also provided by the company's employees, and expedition members.

## SURVEY METHODS

The research methods were based on international best practice recommendations, in particular those set forth in the Scottish Natural Heritage: recommended bird survey methods to justify the assessment of the impact of surface wind farms. The range of detection and identification of large species as golden eagles was up to 2 km, and small passerines 50 m. Directions and flight altitude were taken into account.

The observations were carried out at 10 Vantage points (Table 2). The number and location of Vantage points for stationary observation in the project area have been agreed with the company employees and international expert. The points are located so as to cover the territory as completely as possible (Fig.1).

The duration of one bird count at each Vantage point (VP) was 3 hours. The total duration of all the observations in the territory was **363 hours** (Table 3).

During observations weather conditions such as wind speed and direction, and air temperature were recorded. Wind speed and air temperature were measured using an anemometer. Whenever possible, the number of species, approximate flight altitude, speed, and flight direction of each target species were recorded every 15 seconds.

During the observations, photographing and short video shooting of birds were carried out, which is used to confirm the correct determination of species and obtain additional data on the number of individuals. Following equipment was used: binoculars (Viking) with 10x zoom; cameras (Nikon P1000, Canon 550D) with 24x and 50x zoom, with focal length of 550 mm and 1200 mm, respectively; field telescope (Viking).

### Target and Secondary Species

Defining a project-specific subset of sensitive, or “target” species provides a basis for designing a project-specific set of biological monitoring and mitigation programs that is optimally suited for the key wildlife risk issues associated with a wind project. It is important to note that any bird or bat species, if impacted severely enough, can become a significant risk concern for a wind energy facility. For this reason, any potentially impacted species has a level of sensitivity,



warranting a taxonomically comprehensive approach to impact monitoring and adaptive management and mitigation during the operational phase.

Nonetheless, some species are more sensitive than others from a wind farm risk management standpoint. This is generally because they are classified as highly protected species by national and/or international authorities, because they are known or suspected to be highly susceptible to wind farm impacts (especially collision with rotors), or both. In addition, some species may be regarded as sensitive due to their cultural or iconic significance, or based on ecological/demographic factors (e.g. slow reproductive rate, naturally low population density).

In the present section, these different criteria have been integrated and considered together to produce a preliminary list of suggested target species for the DWEP, to be used to prioritize the Project's biological monitoring and mitigation programs, including the biological baseline studies. Table 1 below presents a suggested list of sensitive, or "target" bird species for the DWEP, subdivided into two tiers, reflecting different priority levels (tier 1 is higher sensitivity, higher priority than tier 2).

Table 1 Target and secondary species

Latin name	English name	IUCN status	Uzbek status	Notes on Likely Occurrence/Risk <sup>1</sup>
<b>Tier 1 Target Species (top priority)</b>				
<i>Aquila nipalensis</i>	Steppe Eagle	EN	VU	Likely present, though uncommon at site based on nearby, recent eBird records in similar habitat
<i>Neophron percnopterus</i>	Egyptian Vulture	EN	VU	Nested in region. Observed in 2018 in project area (Ten, Soldatov 2018), present at DWEP site, confirmed with four separate observations of single individuals during May 2020 VP surveys at three different VP

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<sup>1</sup> Patterns of regional and seasonal abundance determined from analysis of eBird data (ebird.org) accessed 10 June, 2020

<i>Falco cherrug</i>	Saker Falcon	EN	EN	Nested in project area, observed in 2018 (Ten, Soldatov 2018)
<i>Aquila chrysaetos</i>	Golden Eagle	LC	VU	Common resident and nests in project area (Ten, Soldatov 2018)
<i>Aquila heliaca</i>	Imperial Eagle	VU	VU	Migrant
<i>Chlamydotis macqueenii</i>	Asian Houbara	VU	VU	Common nesting and migrant species (Burnside)
<i>Vanellus gregarius</i>	Sociable Lapwing	CR	VU	possible rarity, recent eBird photo record in desert habitat ca 60km SE suggests possibility of occurrence. Extremely sensitive species with CR status
<b>Tier 2 Target Species (second priority)</b>				
<i>Aegypius monachus</i>	Cinereous Vulture	NT	VU	Resident in region
<i>Gyps fulvus</i>	Eurasian Griffon	NT	VU	Resident in region
<i>Circaetus gallicus</i>	Short-toed Snake-Eagle	LC	?	Likely present at site based on recent, nearby eBird records, though uncommon in region
<i>Hieraaetus pennatus</i>	Booted Eagle	LC	?	Very rare in region according to eBird records. Two individuals documented at DWEP during May 2020 during a VP Survey (VP 4)
<i>Circus aeruginosus</i>	Eurasian Marsh-Harrier	LC	?	Fairly common in region, several individuals documented at DWEP during May, 2020 VP surveys
<i>Circus cyaneus</i>	Hen Harrier	LC	?	Fairly common in region
<i>Circus macrourus</i>	Pallid Harrier	NT	?	Fairly common in region
<i>Circus pygargus</i>	Montagu's Harrier	LC	?	Uncommon in region
<i>Accipiter badius</i>	Shikra	LC	?	Uncommon in region
<i>Accipiter nisus</i>	Eurasian Sparrowhawk	LC	?	Uncommon in region

<i>Buteo rufinus</i>	Long-legged Buzzard	LC	?	Fairly common in region, documented at DWEP site in May, 2020
<i>Buteo buteo</i>	Common Buzzard	LC	?	Fairly common in region
<i>Milvus migrans</i>	Black Kite	LC	?	Uncommon in region
<i>Anthropoides virgo</i>	Demoiselle Crane	LC	?	Uncommon in region
<i>Grus grus</i>	Common Crane	LC	?	Uncommon in region
<i>Falco tinnunculus</i>	Common Kestrel	LC	?	Common in region, documented at DWEP site in May, 2020

## TERRITORY DESCRIPTION

The project territory is located in the Southwestern part of Uzbekistan in the Peshku district of Bukhara region. The landscape of the project area is steppe and arid. Accordingly, steppe and desert species of animals and plants are common here. But during the migration period, representatives of other biotopes can also be met there.

The village of Dzhankeldy is located near the project territory. About 90 families live in the village, there is one school and one preschool (kindergarten). The local population is mainly ethnic Kazakhs - they are engaged in breeding small cattle, camels and horse breeding. Due to lack of water, they practically do not engage in agriculture. In most cases, young people leave village to work in the cities of Bukhara and Navoi. Some houses are abandoned. Geological works are being carried out near the village.

The project area includes mountains of Beltau, which are considered as the spurs of the Kul'dzhuktau mountains, - a mountain island range in the Central part of the Kyzylkum desert (length about 100 km, width up to 15 km, height up to 785 m). The southern slopes of Kul'dzhuktau Mountains are slanting, dissected by dry canyons; the Northern slopes are rocky and steep. It is composed mainly of crystalline shales and limestones; along the margin — Jurassic, Cretaceous and Paleogene sedimentary strata, on the surface of which there are sometimes sifted sands.

## VANTAGE POINTS

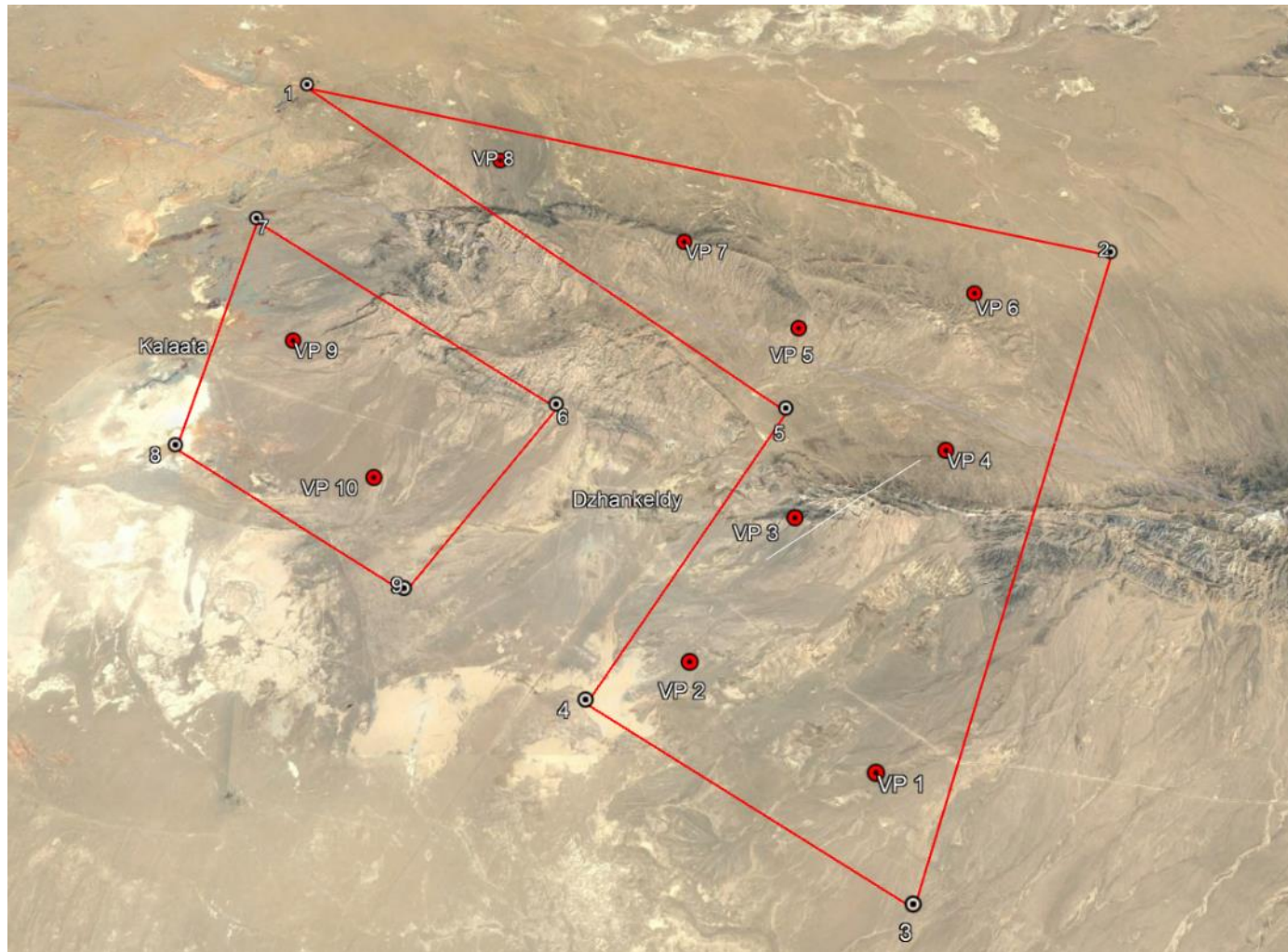


Fig. 1 Vantage Points locations



The number of Vantage Points was agreed with the Client. Points are located so as to cover the project territory as fully as possible. The coordinates of the Vantage Points of Dzhankeldy are shown in Table 2. The radius of a single observation point is 2 km. Time spent at one point is 3 hours' average.

Table 2 Coordinates of the VPs of Dzhankeldy project territory

<b>Vantage Points</b>	<b>Coordinates</b>	
VP 1	40.784300°	63.404295°
VP 2	40.811066°	63.347802°
VP 3	40.847481°	63.383422°
VP 4	40.865322°	63.434670°
VP 5	40.899852°	63.388194°
VP 6	40.909887°	63.449732°
VP 7	40.925033°	63.349676°
VP 8	40.951100°	63.284526°
VP 9	40.896820°	63.214673°
VP 10	40.858649°	63.244772°

Table 3 Total Number of VP survey hours

	<b>VP 1</b>	<b>VP 2</b>	<b>VP 3</b>	<b>VP 4</b>	<b>VP 5</b>	<b>VP 6</b>	<b>VP 7</b>	<b>VP 8</b>	<b>VP 9</b>	<b>VP 10</b>	
Total hours											
September hr	18	18	18	18	15	15	18	15	15	15	
October hr	12	12	12	12	9	12	12	9	15	15	
November hr	6	6	6	6	12	12	6	12	6	6	
accounts for Autumn	36	36	36	36	36	39	36	36	36	36	363

363 total hours of VP survey effort were conducted at the 10 VP survey points in the project area during the reporting period (Table 3), which corresponds to the autumn season. Each of the 10 points received at least 36 hours of VP survey effort during the autumn season. This is a strong level of effort, and will provide a strong source of data for a robust seasonal collision risk modelling effort, and overall interpretation of autumn season collision risk for target bird species.

## BIRD OBSERVATIONS RESULTS

Among birds registered during bird survey in from September 1 to November 15, 2020 (Tables 4-6), following bird species belonging to top priority target species were found in the project area: Steppe Eagle (*Aquila nipalensis*), Egyptian Vulture (*Neophron percnopterus*), Imperial Eagle (*Aquila heliaca*).

Among the secondary species, following bird species were found in the project area: Eurasian Marsh-Harrier (*Circus aeruginosus*), Cinereous Vulture (*Aegypius monachus*), Hen Harrier (*Circus cyaneus*), Long-legged Buzzard (*Buteo rufinus*), Common Buzzard (*Buteo buteo*), Common Kestrel (*Falco tinnunculus*), Short-toed Snake- Eagle (*Circaetus gallicus*), Black Kite (*Milvus migrans*).

Table 4 Results of bird observations in September

SPECIES			VANTAGE POINTS										IUCN statu s	Uzb Red Book status	Nature of stay
No	Latin	English	VP 1	VP 2	VP 3	VP 4	VP 5	VP 6	VP 7	VP 8	VP 9	VP 10			
TARGET SPECIES															
1.	<i>Aquila chrysaetos</i>	Golden Eagle											LC	2 (VU:D)	NMW
2.	<i>Aquila heliaca</i>	Imperial Eagle				1, 1			1				VU	2 (VU:D)	NM
3.	<i>Aquila nipalensis</i>	Steppe Eagle		1, 1	2	1, 2	2			2	2, 1, 1		EN	2 (VU:D)	NMW
4.	<i>Chlamydotis macqueenii</i>	Asian Houbara											VU	2 (VU:R)	M
5.	<i>Falco cherrug</i>	Saker Falcon											EN	2 (VU:D)	NMS

6.	<i>Neophron percnopterus</i>	Egyptian Vulture									1		EN	listed 2 (VU:R)	<b>R</b>
7.	<i>Vanellus gregarius</i>	Sociable Lapwing											CR	2 (VU:R)	<b>M</b>
<b>SECONDARY SPECIES</b>															
1.	<i>Accipiter badius</i>	Shikra											LC	not listed	<b>NM</b>
2.	<i>Accipiter nisus</i>	Eurasian Sparrowhawk											LC	not listed	<b>NMW</b>
3.	<i>Aegypius monachus</i>	Cinereous Vulture				1	1, 1						NT	3 (NT)	<b>R</b>
4.	<i>Anthropoides virgo</i>	Demoiselle Crane											LC	not listed	<b>M</b>
5.	<i>Buteo buteo</i>	Common Buzzard			1	2, 5		1	2				LC	not listed	<b>MW</b>
6.	<i>Buteo rufinus</i>	Long-legged Buzzard		1		1, 1, 39 (migrating), 1						1	LC	not listed	<b>NMW</b>
7.	<i>Circaetus gallicus</i>	Short-toed Snake-Eagle										1	LC	2 (VU:D)	<b>NM</b>
8.	<i>Circus aeruginosus</i>	Eurasian Marsh-Harrier			1		1, 1	1	1		2	2	LC	not listed	<b>NMW</b>
9.	<i>Circus cyaneus</i>	Hen Harrier	2	1, 1	1	1, 1		1	1		1		LC	not listed	<b>MW</b>
10.	<i>Circus macrourus</i>	Pallid Harrier											NT	3 (NT)	<b>MS</b>

11.	<i>Circus pygargus</i>	Montagu's Harrier											LC	not listed	<b>NM</b>
12.	<i>Falco tinnunculus</i>	Common Kestrel	1	1, 1, 1			1, 2	2, 2, 2	1				LC	not listed	<b>NMW</b>
13.	<i>Grus grus</i>	Common Crane											LC	not listed	<b>MW</b>
14.	<i>Gyps fulvus</i>	Eurasian Griffon											NT	2 (VU:D)	<b>R</b>
15.	<i>Hieraaetus pennatus</i>	Booted Eagle											LC	2 (VU:D)	<b>NM</b>
16.	<i>Milvus migrans</i>	Black Kite				4							LC	not listed	<b>NMW</b>
<b>OTHER SPECIES OF BIRDS</b>															
1.	<i>Acridotheres tristis</i>	Common mayna					3				7, 4		LC	not listed	<b>R</b>
2.	<i>Alectoris chukar</i>	Chukkar partridge					2						LC	not listed	<b>R</b>
3.	<i>Ardea cinerea</i>	Grey Heron	1										LC	not listed	<b>NMW</b>
4.	<i>Athene noctua</i>	Little Owl	1	1	1, 1, 1	1	1	1, 2	1	1	1, 1		LC	not listed	<b>R</b>
5.	<i>Bubo bubo</i>	Northern Eagle Owl			1								LC	not listed	<b>R</b>
6.	<i>Calandrella brachydactyla</i>	Short-toed lark	18										LC	not listed	<b>NM</b>
7.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	21, 14	23, 31, 24	21, 12, 16	12, 12, 19, 21	25, 29	23, 12	12, 32, 10	15, 13	35, 27, 31, 14	36, 9, 10	LC	not listed	<b>NMW</b>
8.	<i>Caprimulgus aegyptius</i>	Egyptian nightjar		1	1							1	LC	not listed	<b>NM</b>



9.	<i>Columba livia</i>	Rock Dove	5, 14, 26		9	12, 23	12, 26, 12	23, 21	9, 14	6		27, 23, 12	LC	not listed	<b>R</b>
10.	<i>Coracias garrulus</i>	Eurasian Roller	10, 3	3	3, 2	5, 6, 2, 2	3	11, 3, 3	3, 2	5	2	8	LC	not listed	<b>NM</b>
11.	<i>Corvus corax</i>	Northern Raven	15, 12, 12				12	3	35, 15	12, 14	23	24, 7	LC	not listed	<b>R</b>
12.	<i>Corvus cornix</i>	Eurasian Hooded Crow										3	LC	not listed	<b>MW</b>
13.	<i>Corvus corone</i>	Eurasian Carrion Crow											LC	not listed	<b>R</b>
14.	<i>Corvus monedula</i>	Jackdaw		5, 1				3			2	4	LC	not listed	<b>RMW</b>
15.	<i>Corvus ruficollis</i>	Brown-necked Raven		1									LC	not listed	<b>R</b>
16.	<i>Falco naumanni</i>	Lesser kestrel										1	LC	3 (NT)	<b>NM</b>
17.	<i>Galerida cristata</i>	Crested Lark	9, 9, 6, 9, 13, 6	12, 16, 10, 9, 16, 6	12, 10, 10, 12, 6, 18	9, 13, 6, 3, 12, 6	11, 9, 19, 4, 9	9, 15, 12, 12, 6	6, 6, 5, 9, 10, 6	7, 5, 11, 6, 5	6, 5, 5, 16, 12	18, 12, 6, 9, 5	LC	not listed	<b>R</b>
18.	<i>Hirundo daurica</i>	Red-rumped Swallow			1								LC	not listed	<b>NM</b>
19.	<i>Hirundo rustica</i>	Barn swallow	60, 5	48, 5	1, 6	5		26	30, 5		5	5	LC	not listed	<b>NM</b>
20.	<i>Lanius excubitor</i>	Great (Gray) Shrike							1	2, 2, 1			LC	not listed	<b>MW</b>
21.	<i>Lanius pallidirostris</i>	Southern grey shrike			2								LC	not listed	<b>NM</b>

22.	<i>Melanocorypha bimaculata</i>	Bimaculated lark		16									LC	not listed	NM
23.	<i>Merops supercilios</i>	Blue-cheeked Bee-eater	3				5			6			LC	not listed	NM
24.	<i>Muscicapa striata</i>	Spotted Flycatcher	2, 2		2, 2								LC	not listed	NM
25.	<i>Nycticorax nycticorax</i>	Black-crowned night-heron			1, 1, 1			1					LC	not listed	NM
26.	<i>Oenanthe finschii</i>	Black-necked Wheatear				1, 2							LC	not listed	RMW
27.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	3, 3, 1, 2, 3	3, 3, 3, 3, 2, 2	3, 4, 2, 2, 3	3, 3, 3, 3, 1	1, 2, 1, 2	3, 3, 3, 3, 1	1, 3, 2, 2, 4, 2	3, 3, 2, 2, 2	3, 2, 2, 2	7, 3, 4, 2, 2	LC	not listed	NM
28.	<i>Passer indicus</i>	Indian House Sparrow					13	3					LC	not listed	NM
29.	<i>Phalacrocorax pygmaeus</i>	Pygmy cormorant	5						5				LC	3 (NT)	R
30.	<i>Phoenicurus phoenicurus</i>	Eurasian Redstart								1			LC	not listed	NM
31.	<i>Phylloscopus collybita</i>	Chiffchaff				1							LC	not listed	MW
32.	<i>Pica pica</i>	Black-billed Magpie										2	LC	not listed	R
33.	<i>Pterocles orientalis</i>	Black-bellied sandgrouse	2, 2, 6, 3, 6	4	5	5	4, 6	5, 5	5	3, 3	3, 3	6, 5	LC	not listed	NMW
34.	<i>Rhodospiza obsoleta</i>	Black-billed Desert Finch		6, 3	3, 4	5	3, 2, 5	5			3, 3	3	LC	not listed	R

35.	<i>Scotocerca inquieta</i>	Streaked Scrub Warbler	3	2, 3	3					1	3	3	LC	not listed	<b>R</b>
36.	<i>Sitta tephronota</i>	Greater Rock Nuthatch						1	1, 1, 1	2, 2			LC	not listed	<b>R</b>
37.	<i>Streptopelia decaocto</i>	Collared Turtle Dove			2						2, 8		LC	not listed	<b>R</b>
38.	<i>Sylvia curruca</i>	Lesser Whitethroat				1							LC	not listed	<b>NM</b>
39.	<i>Tadorna ferruginea</i>	Roadyshield duck										4	LC	not listed	<b>NMW</b>
40.	<i>Turdus atrogularis</i>	Black-throated Thrush			9	4	12, 5	6	3, 10				LC	not listed	<b>MW</b>
41.	<i>Upupa epops</i>	Hoopoe						1					LC	not listed	<b>NMW</b>

Table 5 Results of bird observations in October

SPECIES			VANTAGE POINTS										IUCN statu s	Uzb Red Book status	Nature of stay
No	Latin	English	VP 1	VP 2	VP 3	VP 4	VP 5	VP 6	VP 7	VP 8	VP 9	VP 10			
TARGET SPECIES															
1.	<i>Aquila chrysaetos</i>	Golden Eagle											LC	2 (VU:D)	NMW
2.	<i>Aquila heliaca</i>	Imperial Eagle				2, 1		1					VU	2 (VU:D)	NM
3.	<i>Aquila nipalensis</i>	Steppe Eagle		1, 2, 1		1		1	1	1, 2			EN	2 (VU:D)	NMW
4.	<i>Chlamydotis macqueenii</i>	Asian Houbara											VU	2 (VU:R)	M
5.	<i>Falco cherrug</i>	Saker Falcon											EN	2 (VU:D)	NMS
6.	<i>Neophron percnopterus</i>	Egyptian Vulture											EN	listed 2 (VU:R)	R
7.	<i>Vanellus gregarius</i>	Sociable Lapwing											CR	2 (VU:R)	M
SECONDARY SPECIES															
1.	<i>Accipiter badius</i>	Shikra											LC	not listed	NM
2.	<i>Accipiter nisus</i>	Eurasian Sparrowhawk											LC	not listed	NMW
3.	<i>Aegypius monachus</i>	Cinereous Vulture			1		1			1, 2			NT	3 (NT)	R

[illegible]



1.	<i>Acridotheres tristis</i>	Common mayna		6	12	3, 12, 4			5	7	6		LC	not listed	R
2.	<i>Alectoris chukar</i>	Chuckar partridge	7, 4								2		LC	not listed	R
3.	<i>Ammomanes deserti</i>	Desert Lark									1		LC	not listed	R
4.	<i>Anas crecca</i>	Green-winged teal	6						1				LC	not listed	MWS
5.	<i>Anas platyrhynchos</i>	Mallard		110									LC	not listed	NMW
6.	<i>Anas strepera</i>	Gadwall	12		19								LC	not listed	NMW
7.	<i>Ardea cinerea</i>	Grey Heron		1			1			1			LC	not listed	NMW
8.	<i>Athene noctua</i>	Little Owl	1		1		1, 1	1, 1	1, 1			1, 1, 2, 1	LC	not listed	R
9.	<i>Bubo bubo</i>	Northern Eagle Owl			2								LC	not listed	R
10.	<i>Calandrella brachydactyla</i>	Short-toed lark							26			23, 26	LC	not listed	NM
11.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	32	32, 38, 17	21, 19	23		26	15	32, 23	19, 27	32, 35, 29	LC	not listed	NMW
12.	<i>Casmerodius albus</i>	Great egret		1							1			not listed	NMW
13.	<i>Columba livia</i>	Rock Dove			11, 6		60, 24	10	13, 29, 20	14, 12	9, 32, 23, 6, 12		LC	not listed	R
14.	<i>Coracias garrulus</i>	Eurasian Roller			1								LC	not listed	NM

15.	<i>Corvus corax</i>	Northern Raven		12			12			26	26, 35, 15	15	LC	not listed	<b>R</b>
16.	<i>Corvus cornix</i>	Eurasian Hooded Crow				3				1			LC	not listed	<b>MW</b>
17.	<i>Corvus frugilegus</i>	Eurasian Rook			11	4		6					LC	not listed	<b>RMW</b>
18.	<i>Corvus monedula</i>	Jackdaw	3					4	2		1	3	LC	not listed	<b>RMW</b>
19.	<i>Galerida cristata</i>	Crested Lark	9, 10, 15, 12	23, 12, 10, 12	12, 10, 6, 12	8, 9, 10, 10	6, 12, 9	6, 7, 10, 7	9, 17, 12, 9	14, 12, 10	12, 6, 19, 12, 12	13, 6, 6, 10, 12	LC	not listed	<b>R</b>
20.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	1, 3, 4, 2	2, 1, 2, 1	4, 2, 3, 2	1, 1, 3, 2	2, 4, 2	2, 3, 2	4, 3, 3, 2	5, 4, 2	3, 2, 1, 2, 2	1, 3, 3, 2, 3	LC	not listed	<b>NM</b>
21.	<i>Hirundo rustica</i>	Barn swallow		4		8		3	12			4	LC	not listed	<b>NM</b>
22.	<i>Lanius excubitor</i>	Great (Gray) Shrike			1	1	2		2			1	LC	not listed	<b>MW</b>
23.	<i>Larus ridibundus</i>	Black-Headed Gull	7		13								LC	not listed	<b>NMW</b>
24.	<i>Melanocorypha bimaculata</i>	Bimaculate d lark										25	LC	not listed	<b>NM</b>
25.	<i>Merops supercilios</i>	Blue-cheeked Bee-eater				4							LC	not listed	<b>NM</b>
26.	<i>Passer indicus</i>	Indian House Sparrow				12						5	LC	not listed	<b>NM</b>

27.	<i>Pelecanus onocrotalus</i>	Great White Pelican									16		LC	2 (VU:D)	NMW
28.	<i>Phalacrocorax carbo</i>	Great Cormorant				24							LC	not listed	NMW
29.	<i>Phalacrocorax pygmaeus</i>	Pygmy cormorant	3	5	4								LC	3 (NT)	R
30.	<i>Pica pica</i>	Black-billed Magpie				2							LC	not listed	R
31.	<i>Pterocles orientalis</i>	Black-bellied sandgrouse		3	3	5	3	5, 5, 2			5	2, 3, 3	LC	not listed	NMW
32.	<i>Rhodospiza obsoleta</i>	Black-billed Desert Finch		5, 5		3	3	3, 5	2, 6				LC	not listed	R
33.	<i>Scotocerca inquieta</i>	Streaked Scrub Warbler	2, 2	2, 1					1	2	2	2	LC	not listed	R
34.	<i>Sitta tephronota</i>	Greater Rock Nuthatch		2	1	2							LC	not listed	R
35.	<i>Streptopelia decaocto</i>	Collared Turtle Dove	2									3	LC	not listed	R
36.	<i>Streptopelia senegalensis</i>	Laughing dove						2	2				LC	not listed	R
37.	<i>Tadorna ferruginea</i>	Roadyshield duck	1, 3					7			9, 3		LC	not listed	NMW
38.	<i>Tringa totanus</i>	Common Redshank	3										LC	not listed	MWS
39.	<i>Turdus atrogularis</i>	Black-throated Thrush						7	5				LC	not listed	MW

Table 6 Results of bird observations in November

SPECIES			VANTAGE POINTS										IUCN statu s	Uzb Red Book status	Nature of stay
No	Latin	English	VP 1	VP 2	VP 3	VP 4	VP 5	VP 6	VP 7	VP 8	VP 9	VP 10			
TARGET SPECIES															
1.	<i>Aquila chrysaetos</i>	Golden Eagle	1										LC	2 (VU:D)	NMW
2.	<i>Aquila heliaca</i>	Imperial Eagle											VU	2 (VU:D)	NM
3.	<i>Aquila nipalensis</i>	Steppe Eagle	1	1			1		1	2, 1			EN	2 (VU:D)	NMW
4.	<i>Chlamydotis macqueenii</i>	Asian Houbara											VU	2 (VU:R)	M
5.	<i>Falco cherrug</i>	Saker Falcon											EN	2 (VU:D)	NMS
6.	<i>Neophron percnopterus</i>	Egyptian Vulture											EN	listed 2 (VU:R)	R
7.	<i>Vanellus gregarius</i>	Sociable Lapwing											CR	2 (VU:R)	M
SECONDARY SPECIES															
1.	<i>Accipiter badius</i>	Shikra											LC	not listed	NM
2.	<i>Accipiter nisus</i>	Eurasian Sparrowhawk											LC	not listed	NMW
3.	<i>Aegypius monachus</i>	Cinereous Vulture		2			2	2					NT	3 (NT)	R

4.	<i>Anthropoides virgo</i>	Demoiselle Crane											LC	not listed	<b>M</b>
5.	<i>Buteo buteo</i>	Common Buzzard		1	1		1, 1	1			1		LC	not listed	<b>MW</b>
6.	<i>Buteo rufinus</i>	Long-legged Buzzard								2, 2			LC	not listed	<b>NMW</b>
7.	<i>Circaetus gallicus</i>	Short-toed Snake - Eagle											LC	2 (VU:D)	<b>NM</b>
8.	<i>Circus aeruginosus</i>	Eurasian Marsh-Harrier		2			1		1				LC	not listed	<b>NMW</b>
9.	<i>Circus cyaneus</i>	Hen Harrier		1									LC	not listed	<b>MW</b>
10.	<i>Circus macrourus</i>	Pallid Harrier											NT	3 (NT)	<b>MS</b>
11.	<i>Circus pygargus</i>	Montagu's Harrier											LC	not listed	<b>NM</b>
12.	<i>Falco tinnunculus</i>	Common Kestrel		2	2, 2	2	2, 2	2, 2, 2	2, 2		2	2	LC	not listed	<b>NMW</b>
13.	<i>Grus grus</i>	Common Crane											LC	not listed	<b>MW</b>
14.	<i>Gyps fulvus</i>	Eurasian Griffon											NT	2 (VU:D)	<b>R</b>
15.	<i>Hieraaetus pennatus</i>	Booted Eagle											LC	2 (VU:D)	<b>NM</b>
16.	<i>Milvus migrans</i>	Black Kite											LC	not listed	<b>NMW</b>
<b>OTHER SPECIES OF BIRDS</b>															
1.	<i>Acridotheres tristis</i>	Common mayna	7, 6		6	6	5, 6	6	4	12, 2	5, 6		LC	not listed	<b>R</b>



2.	<i>Alectoris chukar</i>	Chuckar partridge					6	6					LC	not listed	<b>R</b>
3.	<i>Ardea cinerea</i>	Grey Heron									1		LC	not listed	<b>NMW</b>
4.	<i>Athene noctua</i>	Little Owl	1	1	1	2		1	1			1	LC	not listed	<b>R</b>
5.	<i>Bubo bubo</i>	Northern Eagle Owl					1						LC	not listed	<b>R</b>
6.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	23	32	23	21, 27	18, 19, 23	32, 19, 13, 13	23	23, 23	19	32, 21	LC	not listed	<b>NMW</b>
7.	<i>Columba livia</i>	Rock Dove	32	12	5, 14			18, 18	18	5	16	12	LC	not listed	<b>R</b>
8.	<i>Corvus corax</i>	Northern Raven			25		12				32		LC	not listed	<b>R</b>
9.	<i>Corvus cornix</i>	Eurasian Hooded Crow		6			16, 10	6, 6, 6	5, 6	19, 10	8	7, 5	LC	not listed	<b>MW</b>
10.	<i>Corvus corone</i>	Eurasian Carrion Crow								2			LC	not listed	<b>R</b>
11.	<i>Corvus frugilegus</i>	Eurasian Rook	16			34	15, 9	8, 9	24, 21	12, 12		8, 23	LC	not listed	<b>RMW</b>
12.	<i>Corvus monedula</i>	Jackdaw	2				16	16	11		6		LC	not listed	<b>RMW</b>
13.	<i>Corvus ruficollis</i>	Brown-necked Raven	2										LC	not listed	<b>R</b>
14.	<i>Galerida cristata</i>	Crested Lark	10, 21	9, 17	10, 12	12, 12	6, 15, 10, 3	7, 10, 6, 6	9, 13	12, 12, 3, 12	9, 10	9, 9	LC	not listed	<b>R</b>
15.	<i>Hirundo rustica</i>	Barn swallow		2									LC	not listed	<b>NM</b>
16.	<i>Lanius excubitor</i>	Great (Gray) Shrike						2					LC	not listed	<b>MW</b>

17.	<i>Larus ridibundus</i>	Black-Headed Gull										3	LC	not listed	NMW
18.	<i>Nycticorax nycticorax</i>	Black-crowned night-heron						1				1	LC	not listed	NM
19.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	1, 3	3, 2	2, 2	2, 2	2, 1, 2	2, 2, 1, 1	1, 1	2, 2, 2	2, 2	21, 2	LC	not listed	NM
20.	<i>Pterocles orientalis</i>	Black-bellied sandgrouse	5	3	5, 3	12			4				LC	not listed	NMW
21.	<i>Scotocerca inquieta</i>	Streaked Scrub Warbler	2							3			LC	not listed	R
22.	<i>Sitta tephronota</i>	Greater Rock Nuthatch				2							LC	not listed	R
23.	<i>Streptopelia decaocto</i>	Collared Turtle Dove	2							2		2	LC	not listed	R
24.	<i>Tadorna ferruginea</i>	Roodysheld duck					3						LC	not listed	NMW
25.	<i>Turdus atrogularis</i>	Black-throated Thrush	16			5, 15							LC	not listed	MW

## CONCLUSIONS

The project territory of the planned Dzhankeldy wind farm is located on the Western part of the lowlands of Kul'dzhuktau Mountains surrounded by the desert. The majority of animals and plants belong to desert species, but during migration species of different ecological groups could be found there. The territory of the planned Dzhankeldy wind farm is deserted, waterless and arid. There are two settlements on the project territory: Dzhankeldy and Kal'ata. Due to the lack of water, the local population is engaged in breeding small cattle and camels. There is a camel farm in the village of Kal'ata.

By the beginning of Autumn survey, the vegetation of plants and the activity of rodents were over. In connection with the early cold snap and frost this year, the activity of reptiles in October has fallen sharply, and most of them went into hibernation earlier than usual. The absence of the reptiles affected the occurrence of birds of prey, which usually hunt on them.

On the territory of the planned Dzhankeldy wind farm bird observations were conducted at 10 vantage points.

From observations, it became clear that in September the activity of birds is higher in comparison with other months. At each observation point, predatory bird species were found: *Aquila nipalensis*, *Falco tinnunculus*, *Aegypius monachus*, *Aquila chrysaetos*, *Aquila heliaca*, *Buteo rufinus*, *Buteo buteo*, *Circus cyaneus*, and *Circus aeruginosus*. From waterfowl we observed: *Tadorna ferruginea*, *Casmerodius albus*, *Ardea cinerea*, various species of ducks and gulls *LARIDAE*.

Closer to the inhabited localities, representatives of the *COLUMBIFORMES* order were found - *Columba livia*, *Streptopelia decaocto*, *Streptopelia senegalensis* and *Pterocles orientalis*. From the *STRIGIFORMES* order, we met *Athene noctua* and *Bubo bubo*, which rarely rose above 15 meters above the ground. Of the *PASSERIFORMES* order, the representatives of the *Alaudidae* family were often met: *Galerida cristata*, *Calandrella rufescens*, *Alauda arvensis*, and transient species: *Hirundo rustica*, *Lanius exubitor*, *Acridotheres tristis*, *Corvus monedula*, *Corvus frugilegus*, *Corvus cornix*, *Corvus corax*.

The rare bird species (*Aquila nipalensis*, *Aquila chrysaetos*, *Aegypius monachus*, *Aquila heliaca*) observed on the project territory during Autumn survey are widely distributed both in the adjacent territories and in all the mountainous regions of Uzbekistan, and the Dzhankeldy project territory is not a key area for them.

## Appendix 1. Weather conditions during VP Autumn surveys

Table 7 Weather conditions and visibility in September

	VP 1	VP 2	VP 3	VP 4	VP 5	VP 6	VP 7	VP 8	VP 9	VP 10
1 September	half cloudy, 6-7 m/s	half cloudy, 6-7 m/s	half cloudy, 5-6 m/s							
2 September				partly cloudy, 6-8 m/s	sunny, 4-5 m/s	sunny, 3-4 m/s				
3 September							half cloudy, 5-7 m/s	sunny, 2-5 m/s		
4 September									sunny, 3-5 m/s	cloudy, 6-7 m/s
5 September	sunny, 5-7 m/s	sunny, 4-5 m/s	cloudy, 3-5 m/s							
6 September				half cloudy, 5-6 m/s	cloudy, 3-6 m/s	half cloudy, 4-6 m/s				
7 September							cloudy, 4-5 m/s	cloudy, 3-4 m/s		
10 September									sunny, 4-5 m/s	cloudy, 4-6 m/s
11 September	partly cloudy, 5-6 m/s	cloudy, 4-6 m/s	cloudy, 4-6 m/s							
12 September				sunny, 6-8 m/s	partly cloudy, 5-6 m/s	sunny, 4-6 m/s				

13 September							half cloudy 6-7 m/s	cloudy, 6-7 m/s		
14 September									sunny, 4-5 m/s	half cloudy 5-7 m/s
15 September	half cloudy 6-7 m/s	sunny, 5-6 m/s	partly cloudy, 6-7 m/s							
16 September				cloudy, 7-8 m/s	half cloudy 3-5 m/s	half cloudy 6-8 m/s				
20 September							half cloudy 3-6 m/s	cloudy 7-8 m/s		
21 September									half cloudy 6-8 m/s	half cloudy 5-6 m/s
22 September	cloudy, 7-8 m/s	half cloudy 6-8 m/s	partly cloudy, 6-7 m/s							
23 September				cloudy, 4-5 m/s	partly cloudy, 5-7 m/s					
24 September						half cloudy 6-7 m/s	half cloudy 6-7 m/s			
25 September									cloudy, 4-5 m/s	half cloudy 6-7 m/s
26 September	cloudy, 6-7 m/s	partly cloudy, 5-7 m/s								
27 September			half cloudy 4-5 m/s	half cloudy 6-8 m/s						



28 September							cloudy, 6-8 m/s	half cloudy 5-7 m/s		
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Table 8 Weather conditions and visibility in October

	VP 1	VP 2	VP 3	VP 4	VP 5	VP 6	VP 7	VP 8	VP 9	VP 10
2 Oktober									half cloudy, 8-10 m/s	half cloudy, 6-7 m/s
3 Oktober	half cloudy, 3-5 m/s	partly cloudy, 6-8 m/s								
4 Oktober			sunny, 3-4 m/s	sunny, 4-5 m/s						
5 Oktober					half cloudy, 5-7 m/s	cloudy, 2-5 m/s				
6 Oktober							sunny, 3-5 m/s	cloudy, 6-7 m/s		
7 Oktober									half cloudy, 7-8 m/s	sunny, 5-7 m/s
8 Oktober	cloudy, 3-5 m/s	sunny, 4-6 m/s								
11 Oktober			cloudy, 6-8 m/s	half cloudy, 4-6 m/s						
12 Oktober						cloudy, 3-6 m/s	half cloudy, 5-6 m/s			
13 Oktober									cloudy, 4-6 m/s	cloudy, 6-8 m/s
14 Oktober	cloudy, 6-8 m/s	sunny, 5-7 m/s								
15 Oktober			partly cloudy, 5-6 m/s	cloudy, 5-8 m/s						

16 Oktober					partly cloudy, 5-6 m/s	cloudy, 6-8 m/s				
17 Oktober							sunny, 4-6 m/s	sunny, 6-8 m/s		
20 Oktober									partly cloudy, 5-7 m/s	half cloudy, 6-7 m/s
22 Oktober	half cloudy, 3-6 m/s	cloudy, 6-7 m/s								
23 Oktober			partly cloudy, 5-7 m/s	sunny, 4-5 m/s						
24 Oktober					half cloudy, 6-7 m/s	half cloudy, 5-6 m/s				
25 Oktober							partly cloudy, 6-7 m/s	sunny, 7-8 m/s		
26 Oktober									half cloudy, 6-8 m/s	half cloudy, 6-8 m/

Table 9 Weather conditions and visibility in November

	VP 1	VP 2	VP 3	VP 4	VP 5	VP 6	VP 7	VP 8	VP 9	VP 10
1 November									half cloudy, 6-7 m/s	half cloudy, 6-7 m/s
2 November	half cloudy, 5-6 m/s	partly cloudy, 6-8 m/s								
3 November			cloudy, 5-6 m/s	cloudy, 4-6 m/s						
4 November					half cloudy, 6-7 m/s	half cloudy, 6-7 m/s				
5 November							half cloudy, 5-6 m/s	partly cloudy, 6-8 m/s		
6 November									cloudy, 5-6 m/s	cloudy, 5-6 m/s
7 November	sunny, 4-5 m/s	cloudy, 4-6 m/s								
10 November			half cloudy, 4-6 m/s	half cloudy, 5-6 m/s						
11 November					partly cloudy, 6-8 m/s	cloudy, 5-6 m/s				
12 November							cloudy, 5-6 m/s	sunny, 4-5 m/s		
13 November					cloudy, 5-6 m/s	cloudy, 5-6 m/s				
14 November						cloudy, 5-6 m/s		cloudy, 6-7 m/s		
15 November					cloudy, 5-6 m/s			partly cloudy, 5-6 m/s		

## Appendix 2. Vantage Point Data Logs

### VP survey results in September

#### VP. 1

Date: 01.09.2020. Start and end time: 8:12 – 11:13

**Weather:**

The air temperature around 12-14°C sky half cloudy.

Wind speed approx. (6-7 m/s) No precipitation

***Primary species not found***

Table 10. Secondary and other species (VP 1), 01.09.2020

No	Latin names	English names	Amount	Flight altitude
<b>OTHER SPECIES</b>				
1.	<i>Columba livia</i>	Rock Dove	5	40
2.	<i>Galerida cristata</i>	Crested lark	9	0-15
3.	<i>Merops supercilios</i>	Blue-cheeked Bee-eater	3	5-35
4.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	3	0-4
5.	<i>Hirundo rustica</i>	Barn Swallow	60	3-15
6.	<i>Pterocles orientalis</i>	Black-bellied sandgrouse	2	0-8
7.	<i>Corvus corax</i>	Northern Raven	15	15-25



**VP. 2**

Date: 01.09.2020. Start and end time: 11:41 – 14:41

**Weather:**

The air temperature around 16-18°C sky half cloudy.

Wind speed approx. (6-7 m/s) No precipitation

***Primary species not found***

Table 11. Secondary and other species (VP 2), 01.09.2020

No	Latin names	English names	Amount	Flight altitude
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	12	0-10
2.	<i>Coracias garrulus</i>	Eurasian Roller	10	6
3.	<i>Muscicapa striata</i>	Spotted Flycatcher	2	1
4.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	3	0-4
5.	<i>Melanocorypha bimaculata</i>	Bimaculated lark	16	0-8
6.	<i>Hirundo rustica</i>	Barn Swallow	48	3-15
7.	<i>Athene noctua</i>	Little owl	1	0-5
8.	<i>Caprimulgus aegyptius</i>	Egyptian Nightjar	1	0-6

### VP. 3

Date: 01.09.2020. Start and end time: 15:27 – 18:37

**Weather:**

The air temperature around 19-16°C sky half cloudy.

Wind speed approx. (5-6 m/s) No precipitation

***Primary species not found***

Table 12. Secondary and other species (VP 3), 01.09.2020.

No	Latin names	English names	Amount	Flight altitude
<b>OTHER SPECIES</b>				
1.	<i>Athene noctua</i>	Little owl	1	0-5
2.	<i>Galerida cristata</i>	Crested lark	12	0-15
3.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	21	0-6
4.	<i>Oenanthe isabellina</i>	Isabelline wheatear	3	0-10
5.	<i>Rhodospiza obsoleta</i>	Black-billed Desert Finch	3	3
6.	<i>Muscicapa striata</i>	Spotted Flycatcher	2	1
7.	<i>Nycticorax nycticorax</i>	Black-crowned night-heron	1	65

#### VP. 4

Date: 02.09.2020. Start and end time: 07:23 – 10:23

#### **Weather:**

The air temperature around 9-12°C partly cloudy.

Wind speed approx. (6-8 m/s) No precipitation

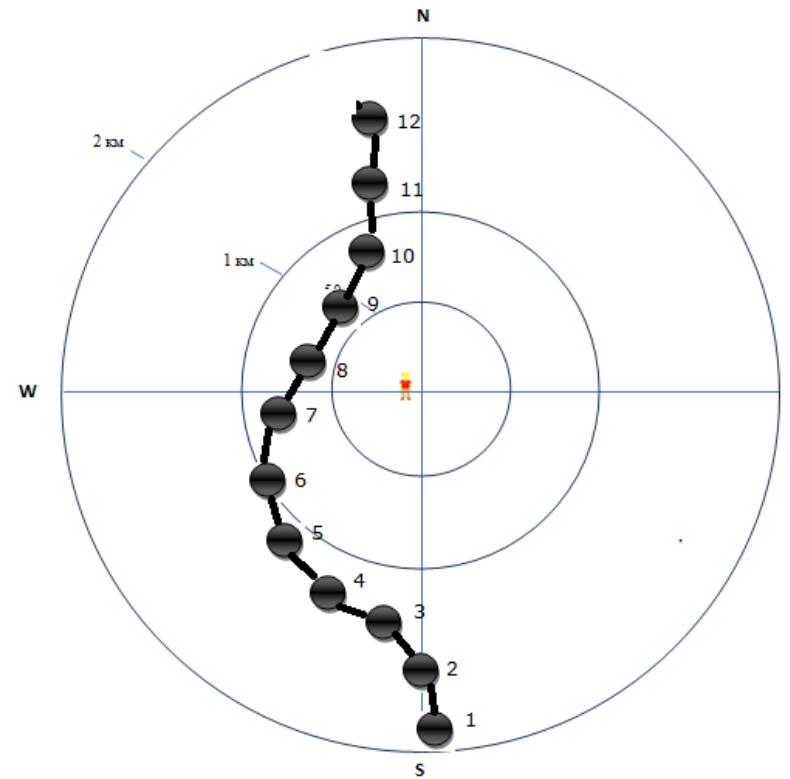


Fig.2 Flight path (VP 4), 02.09.2020

Table 13. Target species log (VP 4), 02.09.2020.

●	<i>Aquila nipalensis</i>	1	2	3	4	5	6	7	8	9	10	11	12
		120 m	120 m	125 m	120 m	125 m	125 m	125 m	120 m	125 m	125 m	120 m	120 m

Table 14. Secondary and other species (VP 4), 02.09.2020

No	Latin names	English names	Amount	Flight altitude
<b>SECONDARY SPECIES</b>				
1.	<i>Buteo rufinus</i>	Long-legged Buzzard	1	20-35
2.	<i>Buteo buteo</i>	Common Buzzard	2	55-60
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	9	0-9
2.	<i>Phylloscopus collybita</i>	Chiffchaff	1	1
3.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	12	0-5
4.	<i>Oenanthe isabellina</i>	Isabelline wheatear	3	0-10
5.	<i>Coracias garrulus</i>	Eurasian Roller	5	3-15

### VP. 5

Date: 02.09.2020. Start and end time: 11:03 – 14:03

#### **Weather:**

The air temperature around 14-18°C is clear.

Wind speed approx. (4-5 m/s) No precipitation

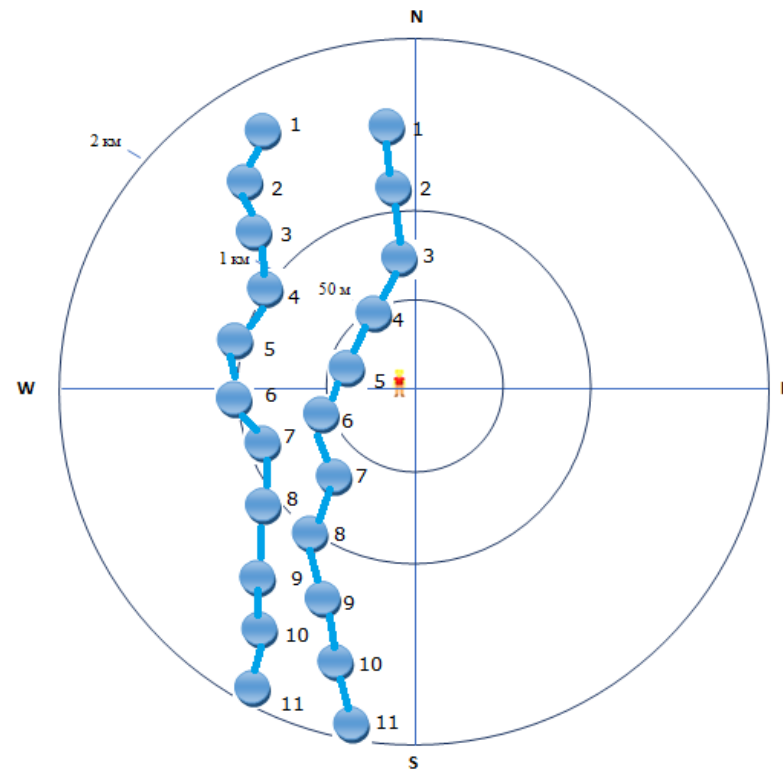


Fig. 3 Flight path (VP 5), 02.09.2020



Table 15 Target species log (VP 5), 02.09.2020.

●	<i>Aquila nipalensis</i> (1)	1 150 m	2 150 m	3 155 m	4 150 m	5 155 m	6 155 m	7 150 m	8 150 m	9 150 m	10 150 m	11 155 m
●	<i>Aquila nipalensis</i> (2)	1 150 m	2 150 m	3 155 m	4 150 m	5 155 m	6 155 m	7 150 m	8 150 m	9 150 m	10 150 m	11 155 m

Table 16. Secondary and other species (VP 5), 02.09.2020.

No	Latin names	English names	Amount	Flight altitude
<b>SECONDARY SPECIES</b>				
1.	<i>Circus aeruginosus</i>	Marsh Harrier	1	8-25
<b>OTHER SPECIES</b>				
1.	<i>Passer indicus</i>	Indian House Sparrow	13	0-4
2.	<i>Merops supercilios</i>	Blue-cheeked Bee-eate	5	8-12
3.	<i>Galerida cristata</i>	Crested lark	11	0-15
4.	<i>Oenanthe isabellina</i>	Isabelline wheatear	1	0-10
5.	<i>Acridotheres tristis</i>	Indian Myna	3	2-7
6.	<i>Coracias garrulus</i>	Eurasian Roller	3	3-15
7.	<i>Corvus corax</i>	Northern Raven	12	25-35

**VP.6**

Date: 02.09.2020. Start and end time: 14:52 – 17:55

**Weather:**

The air temperature around 18-16°C is clear.

Wind speed approx. (3-4 m/s) No precipitation

***Primary species not found***

Table 17. Secondary and other species (VP 6), 02.09.2020.

<b>No</b>	<b>Latin names</b>	<b>English names</b>	<b>Amount</b>	<b>Flight altitude</b>
<b>SECONDARY SPECIES</b>				
1.	<i>Falco tinnunculus</i>	Common Kestrel	2	10-30
2.	<i>Circus aeruginosus</i>	Marsh Harrier	1	10-25
<b>OTHER SPECIES</b>				
3.	<i>Upupa epops</i>	Hoopoe	1	0-2
4.	<i>Hirundo rustica</i>	Barn Swallow	26	10-15
5.	<i>Galerida cristata</i>	Crested lark	9	0-15
6.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	23	0-5
7.	<i>Oenanthe isabellina</i>	Isabelline wheatear	3	0-10
8.	<i>Columba livia</i>	Rock Dove	23	30
9.	<i>Coracias garrulus</i>	Eurasian Roller	11	3-15

**VP. 7**

Date: 03.09.2020. Start and end time: 8:17 – 11:17

**Weather:**

The air temperature around 9-15°C sky half cloudy

Wind speed approx. (5-7 ms) No precipitation

***Primary species not found***

Table 18. Secondary and other species (VP 7), 03.09.2020

<b>№</b>	<b>Latin names</b>	<b>English names</b>	<b>Amount</b>	<b>Flight altitude</b>
<b>SECONDARY SPECIES</b>				
1.	<i>Circus aeruginosus</i>	Marsh Harrier	1	14-20
2.	<i>Circus cyaneus</i>	Hen Harrier	1	20-30
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	6	0-15
2.	<i>Oenanthe isabellina</i>	Isabelline wheatear	1	0-10
3.	<i>Hirundo rustica</i>	Barn swallow	30	5-10

**VP. 8**

Date: 03.09.2020. Start and end time: 11:42 – 14:42

Weather:

The air temperature around 16-18°C is clear.

Wind speed approx. (2-5 m/s) No precipitation

***Primary species not found***

Table 19. Secondary and other species (VP 8), 03.09.2020

<b>№</b>	<b>Latin names</b>	<b>English names</b>	<b>Amount</b>	<b>Flight altitude</b>
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	7	0-15
2.	<i>Columba livia</i>	Rock Dove	6	23
3.	<i>Oenanthe isabellina</i>	Isabelline wheatear	3	0-10
4.	<i>Lanius excubitor</i>	Great (Gray) Shrike	2	3-9
5.	<i>Pterocles orientalis</i>	Black-bellied sandgrouse	3	0-10

# VP.9

Date: 04.09.2020. Start and end time: 9:12 – 12:15

## **Weather:**

The air temperature around 10-16°C is clear.

Wind speed approx. (3-5 m/s) No precipitation

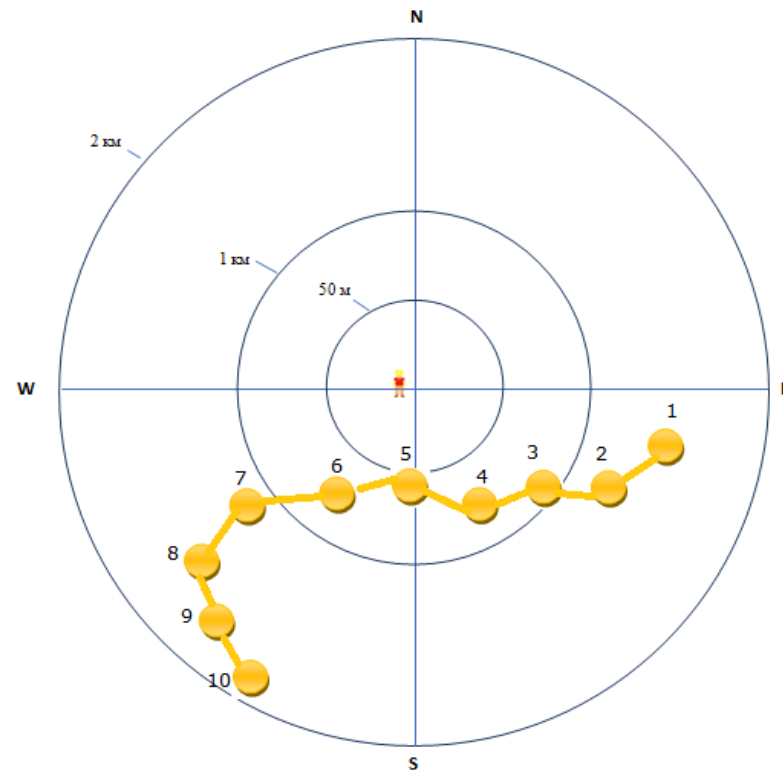


Fig. 4 Flight path (VP 9), 04.09.2020

Table 20 Target species log (VP 9), 04.09.2020.


	<i>Neophron percnopterus</i>	1	2	3	4	5	6	7	8	9	10
		120 m	120 m	125 m	120 m	125 m	125 m	120 m	120 m	125 m	120 m



Table 21. Secondary and other species (VP 9), 04.09.2020.

<b>№</b>	<b>Latin names</b>	<b>English names</b>	<b>Amount</b>	<b>Flight altitude</b>
<b>OTHER SPECIES</b>				
1.	<i>Rhodospiza obsoleta</i>	Black-billed Desert Finch	3	3
2.	<i>Galerida cristata</i>	Crested lark	6	0-15
3.	<i>Hirundo rustica</i>	Barn Swallow	5	5-20
4.	<i>Oenanthe isabellina</i>	Isabelline wheatear	3	0-10
5.	<i>Corvus monedula</i>	Jackdaw	2	0-2
6.	<i>Scotocerca inquieta</i>	Streaked Scrub Warbler	3	2
7.	<i>Corvus corax</i>	Northern Raven	23	50

**VP. 10**

Date: 04.09.2020. Start and end time: 13:34 – 15:34

Weather:

The air temperature around 18-13°C is cloudy.

Wind speed approx. (6-7 m/s) No precipitation

***Primary species not found***

Table 22. Secondary and other species (VP 10), 04.09.2020.

<b>№</b>	<b>Latin names</b>	<b>English names</b>	<b>Amount</b>	<b>Flight altitude</b>
<b>SECONDARY SPECIES</b>				
1.	<i>Buteo rufinus</i>	Long-legged Buzzard	1	20-45
2.	<i>Falco naumanni</i>	Lesser kestrel	1	12-25
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	18	0-15
2.	<i>Oenanthe isabellina</i>	Isabelline wheatear	7	0-10
3.	<i>Columba livia</i>	Rock Dove	27	35
4.	<i>Coracias garrulus</i>	Eurasian Roller	8	3-15
5.	<i>Pica pica</i>	Magpie	2	4

**VP. 1**

Date: 05.09.2020. Start and end time: 8:06 – 11:06

**Weather:**

The air temperature around 8-12°C is clear.

Wind speed approx. (5-7 m/s) No precipitation

***Primary species not found***

Table 23. Secondary and other species (VP 1), 05.09.2020.

<b>No</b>	<b>Latin names</b>	<b>English names</b>	<b>Amount</b>	<b>Flight altitude</b>
<b>OTHER SPECIES</b>				
1.	<i>Pterocles orientalis</i>	Black-bellied sandgrouse	2	5
2.	<i>Galerida cristata</i>	Crested lark	9	0-15
3.	<i>Oenanthe isabellina</i>	Isabelline wheatear	3	0-10
4.	<i>Scotocerca inquieta</i>	Streaked Scrub Warbler	3	0-2
5.	<i>Athene noctua</i>	Little Owl	1	0-5
6.	<i>Calandrella brachydactyla</i>	Short-toed lark	18	0-6

**VP. 3**

Date: 05.09.2020. Start and end time: 8:19 – 11:19

**Weather:**

The air temperature around 16-18°C cloudy.

Wind speed approx. (3-5 m/s) No precipitation

***Primary species not found***

Table 24. Secondary and other species (VP 3), 05.09.2020.

<b>№</b>	<b>Latin names</b>	<b>English names</b>	<b>Amount</b>	<b>Flight altitude</b>
<b>OTHER SPECIES</b>				
1.	<i>Coracias garrulus</i>	Eurasian Roller	3	5
2.	<i>Streptopelia decaocto</i>	Collared Turtle Dove	2	4
3.	<i>Galerida cristata</i>	Crested lark	10	0-15
4.	<i>Hirundo rustica</i>	Barn Swallow	1	2-5
5.	<i>Oenanthe isabellina</i>	Isabelline wheatear	4	0-10
6.	<i>Scotocerca inquieta</i>	Streaked Scrub Warbler	4	2

## VP. 2

Date: 05.09.2020. Start and end time: 11:56 – 14:56

### Weather:

The air temperature around 16-18°C is clear.

Wind speed approx. (4-5 m/s) No precipitation

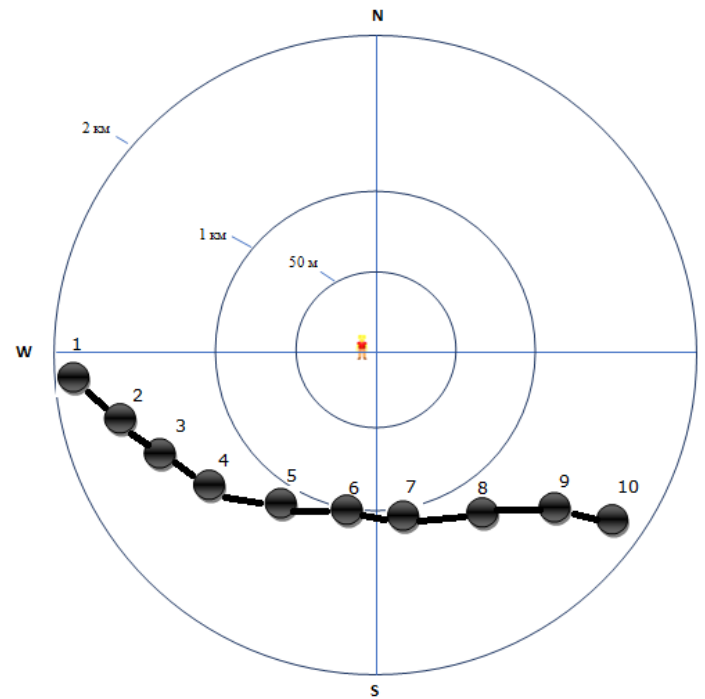


Fig. 5. Flight path (VP 2), 05.09.2020

Table 25. Target species log (VP 2), 05.09.2020


	<i>Aquila nipalensis</i>	1	2	3	4	5	6	7	8	9	10
		110 m	110 m	115 m	110 m	115 m	115 m	115 m	110 m	110 m	110 m



Table 26. Secondary and other species (VP 2), 05.09.2020

<b>№</b>	<b>Latin names</b>	<b>English names</b>	<b>Amount</b>	<b>Flight altitude</b>
<b>OTHER SPECIES</b>				
1.	<i>Coracias garrulus</i>	Eurasian Roller	3	3
2.	<i>Galerida cristata</i>	Crested lark	16	0-13
3.	<i>Oenanthe isabellina</i>	Isabelline wheatear	3	0-10
4.	<i>Scotocerca inquieta</i>	Streaked Scrub Warbler	2	2

**VP 6**

Date: 06.09.2020. Start and end time: 7:53 – 10:53

**Weather:**

The air temperature around 8-12°C sky half cloudy

Wind speed approx. (4-6 m/s) No precipitation

***Primary species not found***

Table 27. Secondary and other species (VP 6), 06.09.2020

<b>№</b>	<b>Latin names</b>	<b>English names</b>	<b>Amount</b>	<b>Flight altitude</b>
<b>SECONDARY SPECIES</b>				
1.	<i>Circus cyaneus</i>	Hen (Northern) Harrier	1	5-30
2.	<i>Falco tinnunculus</i>	Common Kestrel	2	15-25
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	15	0-5
2.	<i>Oenanthe isabellina</i>	Isabelline wheatear	3	0-5
3.	<i>Pterocles orientalis</i>	Black-bellied sandgrouse	5	0-15
4.	<i>Athene noctua</i>	Little Owl	1	0-5

**VP 5**

Date: 06.09.2020. Start and end time: 11:18 – 14:18

**Weather:**

The air temperature around 12-14°C cloudy.

Wind speed approx. (3-6 m/s) No precipitation

***Primary species not found***

Table 28. Secondary and other species (VP 5), 06.09.2020

<b>№</b>	<b>Latin names</b>	<b>English names</b>	<b>Amount</b>	<b>Flight altitude</b>
<b>SECONDARY SPECIES</b>				
1.	<i>Falco tinnunculus</i>	Common Kestrel	1	6-32
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	9	0-15
2.	<i>Columba livia</i>	Rock Dove	12	35
3.	<i>Rhodospiza obsoleta</i>	Black-billed Desert Finch	3	2
4.	<i>Pterocles orientalis</i>	Black-bellied sandgrouse	4	35

#### VP. 4

Date: 06.09.2020. Start and end time: 14:56 – 17:56

**Weather:**

The air temperature around 14-12°C sky half cloudy.

Wind speed approx. (5-6 m/s) No precipitation

***Primary species not found***

Table 29. Secondary and other species (VP 4), 06.09.2020.

No	Latin names	English names	Amount	Flight altitude
<b>SECONDARY SPECIES</b>				
1.	<i>Buteo rufinus</i>	Long-legged Buzzard	1	45
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	13	0-15
2.	<i>Oenanthe isabellina</i>	Isabelline wheatear	3	0-4
3.	<i>Oenanthe finschii</i>	Black-necked Wheatear	1	1-3
4.	<i>Columba livia</i>	Rock Dove	12	35
5.	<i>Coracias garrulus</i>	Eurasian Roller	6	3-15

**VP. 7**

Date: 07.09.2020. Start and end time: 8:15 – 11:15

**Weather:**

The air temperature around 8-12°C cloudy.

Wind speed approx. (4-5 m/s) No precipitation

***Primary species not found***

Table 30. Secondary and other species (VP 7), 07.09.2020.

No	Latin names	English names	Amount	Flight altitude
<b>SECONDARY SPECIES</b>				
1.	<i>Buteo buteo</i>	Common Buzzard	2	15-45
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	6	0-15
2.	<i>Oenanthe isabellina</i>	Isabelline wheatear	3	0-10
3.	<i>Sitta tephronota</i>	Greater Rock Nuthatch	1	0-4
4.	<i>Columba livia</i>	Rock Dove	9	35
5.	<i>Coracias garrulus</i>	Eurasian Roller	3	3-15
6.	<i>Corvus corax</i>	Northern Raven	35	23
7.	<i>Phalacrocorax pygmaeus</i>	Pygmy cormorant	5	0-10



**VP. 8**

Date: 07.09.2020. Start and end time: 12:43 – 15:43

**Weather:**

The air temperature around 14-13°C cloudy.

Wind speed approx. (3-4 m/s) No precipitation

***Primary species not found***

Table 31. Secondary and other species (VP 8), 07.09.2020.

<b>№</b>	<b>Latin names</b>	<b>English names</b>	<b>Amount</b>	<b>Flight altitude</b>
<b>OTHER SPECIES</b>				
1.	<i>Coracias garrulus</i>	Eurasian Roller	5	6
2.	<i>Galerida cristata</i>	Crested lark	5	0-15
3.	<i>Oenanthe isabellina</i>	Isabelline wheatear	3	0-10
4.	<i>Merops supercilios</i>	Blue-cheeked Bee-eater	6	15
5.	<i>Sitta tephronota</i>	Greater Rock Nuthatch	2	0-5
6.	<i>Lanius exubitor</i>	Great (Gray) Shrike	2	3-6

### VP.9

Date: 10.09.2020. Start and end time: 9:12 – 12:12

#### **Weather:**

The air temperature around 9-14°C is clear.

Wind speed approx. (4-5 m/s) No precipitation

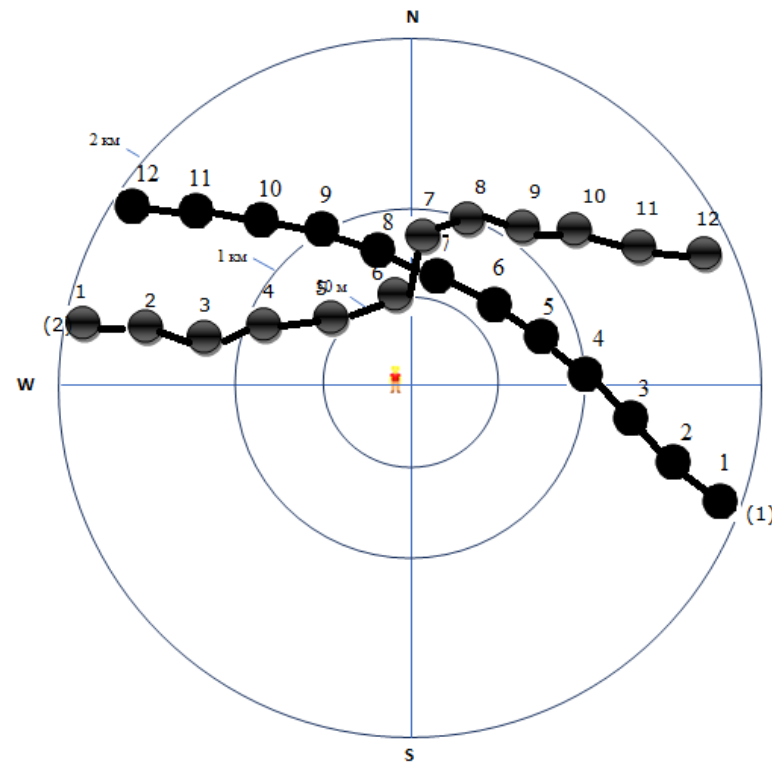


Fig. 6. Flight path (VP 9), 10.09.2020

Table 32. Target species (VP 9), 10.09.2020



	<i>Aquila nipalensis(1)</i>	1- 90 m	2- 90 m	3- 95 m	4- 90 m	5- 95 m	6- 95 m	7- 95 m	8- 90 m	9- 90 m	10- 90 m	11- 90 m	12- 90 m
	<i>Aquila nipalensis(2)</i>	1- 90 m	2- 90 m	3- 95 m	4- 90 m	5- 95 m	6- 95 m	7- 95 m	8- 90 m	9- 90 m	10- 90 m	11- 90 m	12- 90 m

Table 33. Secondary and other species (VP 9), 10.09.2020

No	Latin names	English names	Amount	Flight altitude
<b>OTHER SPECIES</b>				
1.	<i>Rhodospiza obsoleta</i>	Black-billed Desert Finch	3	3
2.	<i>Galerida cristata</i>	Crested lark	5	0-15
3.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	35	0-4
4.	<i>Oenanthe isabellina</i>	Isabelline wheatear	2	0-10
5.	<i>Pterocles orientalis</i>	Black-bellied sandgrouse	3	6-8

**VP. 10**

Date: 10.09.2020. Start and end time:13:40 – 15:40

**Weather:**

The air temperature around 16-12°C cloudy.

Wind speed approx. (4-6 m/s) No precipitation

***Primary species not found***

Table 34. Secondary and other species (VP 10), 10.09.2020

<b>№</b>	<b>Latin names</b>	<b>English names</b>	<b>Amount</b>	<b>Flight altitude</b>
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	12	0-15
2.	<i>Oenanthe isabellina</i>	Isabelline wheatear	3	0-10
3.	<i>Corvus monedula</i>	Jackdaw	4	0-4
4.	<i>Scotocerca inquieta</i>	Streaked Scrub Warbler	3	2
5.	<i>Tadorna ferruginea</i>	Roodysheld duck	4	45
6.	<i>Caprimulgus aegyptius</i>	Egyptian nightjar	1	0-15

**VP. 1**

Date: 11.09.2020. Start and end time: 8:13 – 11:13

**Weather:**

The air temperature around 9-13°C partly cloudy

Wind speed approx. (5-6 m/s) No precipitation

***Primary species not found***

Table 35. Secondary and other species (VP 1), 11.09.2020.

<b>Nº</b>	<b>Latin names</b>	<b>English names</b>	<b>Amount</b>	<b>Flight altitude</b>
<b>SECONDARY SPECIES</b>				
1.	<i>Circus cyaneus</i>	Hen (Northern) Harrier	2	15-45
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	6	0-15
2.	<i>Oenanthe isabellina</i>	Isabelline wheatear	1	0-10
3.	<i>Coracias garrulus</i>	Eurasian Roller	3	3-15
4.	<i>Muscicapa striata</i>	Spotted Flycatcher	2	3
5.	<i>Hirundo rustica</i>	Barn swallow	5	3-10
6.	<i>Columba livia</i>	Rock Dove	14	25
7.	<i>Phalacrocorax pygmaeus</i>	Pygmy cormorant	5	0-10



**VP. 3**

Date: 11.09.2020. Start and end time: 11:46 – 14:46

**Weather:**

The air temperature around 13-15°C cloudy.

Wind speed approx. (4-6 m/s) No precipitation

**Primary species not found**

Table 36. Secondary and other species (VP 3), 11.09.2020.

<b>№</b>	<b>Latin names</b>	<b>English names</b>	<b>Amount</b>	<b>Flight altitude</b>
<b>SECONDARY SPECIES</b>				
1.	<i>Falco tinnunculus</i>	Common Kestrel	1	8-20
2.	<i>Circus aeruginosus</i>	Marsh Harrier	1	20-35
3.	<i>Circus cyaneus</i>	Hen (Northern) Harrier	1	15-25
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	10	0-15
2.	<i>Oenanthe isabellina</i>	Isabelline wheatear	2	0-10
3.	<i>Nycticorax nycticorax</i>	Black-crowned night-heron	1	50
4.	<i>Coracias garrulus</i>	Eurasian Roller	2	3-15
5.	<i>Rhodospiza obsoleta</i>	Black-billed Desert Finch	4	2
6.	<i>Muscicapa striata</i>	Spotted Flycatcher	2	3

## VP. 2

Date: 11.09.2020. Start and end time: 15:16 – 18:16

### Weather:

The air temperature around 16-10°C cloudy.

Wind speed approx. (4-6 ms) No precipitation

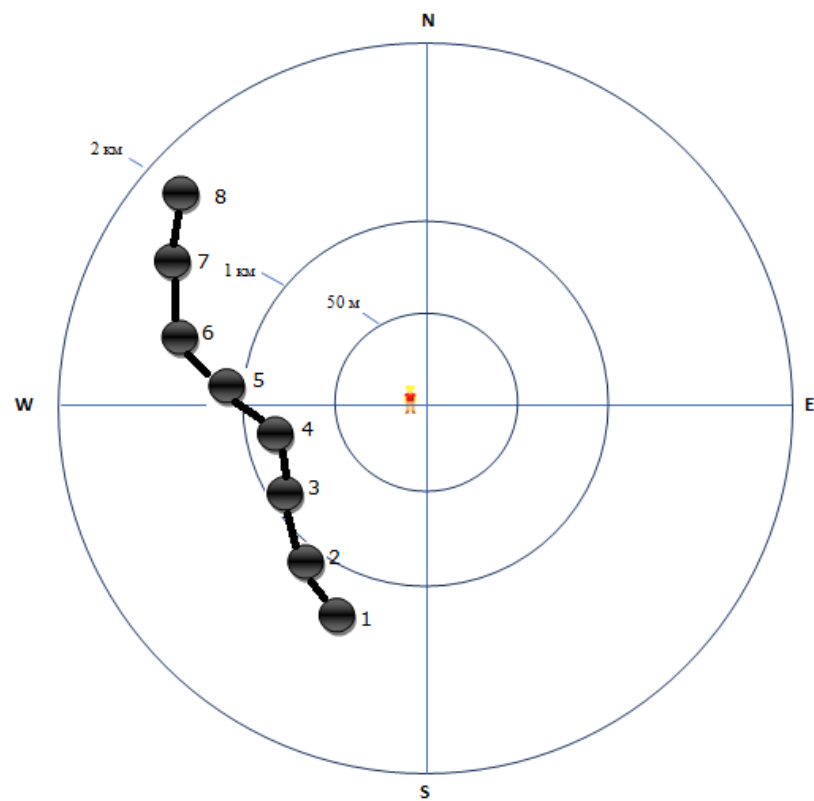


Fig. 7. Flight path (VP 2), 11.09.2020

Table 37. Target species log (VP 2), 11.09.2020

●	<i>Aquila nipalensis</i>	1- 120 m	2- 120 m	3- 125 m	4- 120 m	5- 125 m	6- 125 m	7- 125 m	8- 110 m
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Table 38. Secondary and other species (VP 2), 11.09.2020

№	Latin names	English names	Amount	Flight altitude
<b>OTHER SPECIES</b>				
1.	<i>Rhodospiza obsoleta</i>	Black-billed Desert Finch	6	3
2.	<i>Galerida cristata</i>	Crested lark	10	0-15
3.	<i>Oenanthe isabellina</i>	Isabelline wheatear	3	0-10
4.	<i>Pterocles orientalis</i>	Black-bellied sandgrouse	4	0-15
5.	<i>Corvus monedula</i>	Jackdaw	5	0-12
6.	<i>Scotocerca inquieta</i>	Streaked Scrub Warbler	3	2

## VP. 5

Date: 12.09.2020. Start and end time: 7:48 – 10:48

### **Weather:**

The air temperature around 7-10°C partly cloudy.

Wind speed approx. (6-7 m/s) No precipitation

### ***Primary species not found***

Table 39. Secondary and other species (VP 5), 12.09.2020

<b>№</b>	<b>Latin names</b>	<b>English names</b>	<b>Amount</b>	<b>Flight altitude</b>
<b>SECONDARY SPECIES</b>				
1.	<i>Falco tinnunculus</i>	Common Kestrel	2	15-25
2.	<i>Aegypius monachus</i>	Cinereous Vulture	1	125
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	19	0-15
2.	<i>Oenanthe isabellina</i>	Isabelline wheatear	2	0-10
3.	<i>Columba livia</i>	Rock Dove	26	35
4.	<i>Coracias garrulus</i>	Eurasian Roller	3	3-15
5.	<i>Rhodospiza obsoleta</i>	Black-billed Desert Finch	2	2
6.	<i>Athene noctua</i>	Little Owl	1	0-5

**VP. 6**

Date: 12.09.2020. Start and end time: 11:09 – 14:09

**Weather:**

The air temperature around 12-16°C is clear.

Wind speed approx. (4-6 m/s) No precipitation

**Primary species not found**

Table 40. Secondary and other species (VP 6), 12.09.2020.

<b>№</b>	<b>Latin names</b>	<b>English names</b>	<b>Amount</b>	<b>Flight altitude</b>
<b>SECONDARY SPECIES</b>				
1.	<i>Falco tinnunculus</i>	Common Kestrel	2	15-25
2.	<i>Buteo buteo</i>	Common Buzzard	1	12-35
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	12	0-15
2.	<i>Oenanthe isabellina</i>	Isabelline wheatear	3	0-10
3.	<i>Columba livia</i>	Rock Dove	21	35
4.	<i>Coracias garrulus</i>	Eurasian Roller	3	3-15
5.	<i>Rhodospiza obsoleta</i>	Black-billed Desert Finch	5	2
6.	<i>Athene noctua</i>	Little Owl	2	0-3



#### VP. 4

Date: 12.09.2020. Start and end time: 14:36 – 17:36

**Weather:**

The air temperature around 16-12°C is clear.

Wind speed approx. (6-8 m/s) No precipitation

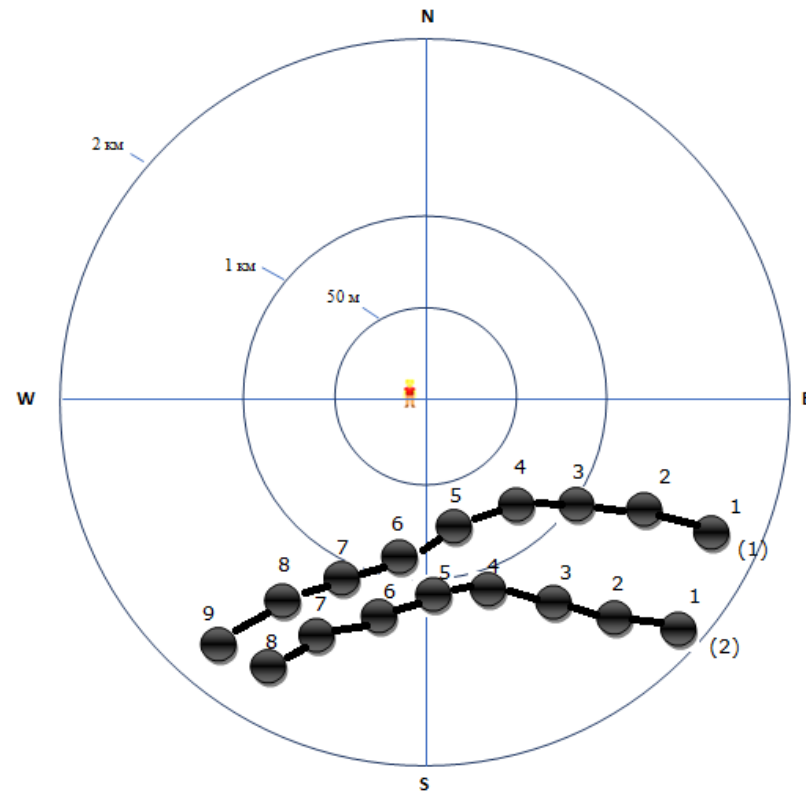


Fig. 8. Flight path (VP 4), 12.09.2020.

Table 41. Target species log (VP 4), 12.09.2020.

●	<i>Aquila nipalensis(1)</i>	1- 120 m	2- 120 m	3- 125 m	4- 120 m	5- 125 m	6- 125 m	7- 125 m	8- 130 m	9- 140 m
●	<i>Aquila nipalensis(2)</i>	1- 120 m	2- 120 m	3- 125 m	4- 120 m	5- 125 m	6- 125 m	7- 125 m	8- 110 m	

Table 42. Secondary and other species (VP 4), 12.09.2020

No	Latin names	English names	Amount	Flight altitude
<b>SECONDARY SPECIES</b>				
1.	<i>Buteo rufinus</i>	Long-legged Buzzard	39	15-45
2.	<i>Buteo buteo</i>	Common Buzzard	5	12-35
3.	<i>Milvus migrans</i>	Black Kite	4	30-35
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	6	0-15
2.	<i>Oenanthe isabellina</i>	Isabelline wheatear	3	0-10
3.	<i>Rhodospiza obsoleta</i>	Black-billed Desert Finch	5	2
4.	<i>Sylvia curruca</i>	Lesser Whitethroat	1	0-1

**VP. 8**

Date: 13.09.2020. Start and end time: 8:58 – 11:58

**Weather:**

The air temperature around 8-12°C cloudy.

Wind speed approx. (6-7 m/s) No precipitation

***Primary species not found***

Table 43. Secondary and other species (VP 8), 13.09.2020.

<b>№</b>	<b>Latin names</b>	<b>English names</b>	<b>Amount</b>	<b>Flight altitude</b>
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	11	0-15
2.	<i>Phoenicurus phoenicurus</i>	Eurasian Redstart	1	2
3.	<i>Oenanthe isabellina</i>	Isabelline wheatear	2	0-10
4.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	15	0-3
5.	<i>Scotocerca inquieta</i>	Streaked Scrub Warbler	1	2
6.	<i>Corvus corax</i>	Northern Raven	12	50
7.	<i>Sitta tephronota</i>	Greater Rock Nuthatch	2	0-3

## VP. 7

Date: 13.09.2020. Start and end time: 12:27 – 15:29

### **Weather:**

The air temperature around 14-16°C sky half cloudy

Wind speed approx. (3-6 m/s) rainy

### ***Primary species not found***

Table 44. Secondary and other species (VP 7), 13.09.2020.

No	Latin names	English names	Amount	Flight altitude
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	5	0-15
2.	<i>Oenanthe isabellina</i>	Isabelline wheatear	2	0-10
3.	<i>Pterocles orientalis</i>	Black-bellied sandgrouse	5	20
4.	<i>Sitta tephronota</i>	Greater Rock Nuthatch	1	0-3
5.	<i>Turdus atrogularis</i>	Black-throated Thrush	3	0-5
6.	<i>Hirundo rustica</i>	Barn swallow	5	5-10

# VP. 9

Date: 14.09.2020. Start and end time: 9:52 – 12:53

## **Weather:**

The air temperature around 10-15°C is clear.

Wind speed approx. (4-5 m/s) No precipitation

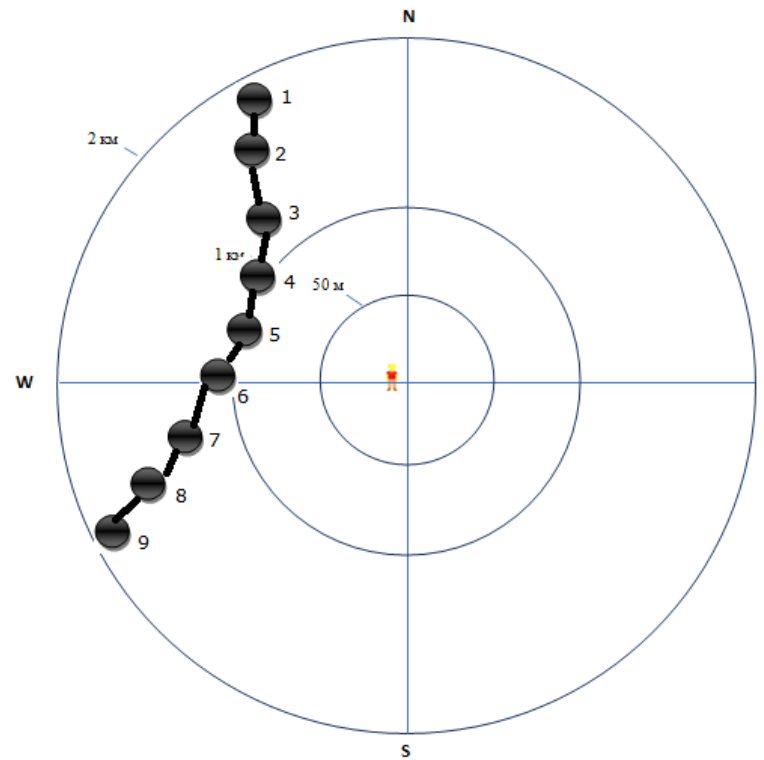


Fig. 9. Flight path (VP 9), 14.09.2020.

Table 45. Target species log (VP 9), 14.09.2020

●	<i>Aquila nipalensis</i>	1- 70 m	2- 80 m	3- 95 m	4- 120 m	5- 125 m	6- 125 m	7- 125 m	8- 130 m	9- 140 m
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Table 46. Secondary and other species (VP 9), 14.09.2020.

<b>№</b>	<b>Latin names</b>	<b>English names</b>	<b>Amount</b>	<b>Flight altitude</b>
<b>OTHER SPECIES</b>				
1.	<i>Athene noctua</i>	Little owl	1	0-6
2.	<i>Streptopelia decaocto</i>	Collared Turtle Dove	2	12
3.	<i>Galerida cristata</i>	Crested lark	5	0-15
4.	<i>Oenanthe isabellina</i>	Isabelline wheatear	2	0-10
5.	<i>Coracias garrulus</i>	Eurasian Roller	2	4
6.	<i>Acridotheres tristis</i>	Indian Myna	7	2-7
7.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	27	0-3

**VP. 10**

Date: 14.09.2020. Start and end time: 13:48 – 16:48

**Weather:**

The air temperature around 16-10°C partly cloudy.

Wind speed approx. (5-7 m/s) No precipitation

***Primary species not found***

Table 47. Secondary and other species (VP 10), 14.09.2020

<b>Nº</b>	<b>Latin names</b>	<b>English names</b>	<b>Amount</b>	<b>Flight altitude</b>
<b>SECONDARY SPECIES</b>				
1.	<i>Circus aeruginosus</i>	Marsh Harrier	2	15-25
2.	<i>Circaetus gallicus</i>	Short-toed Snake-Eagle	1	90
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	6	0-15
2.	<i>Oenanthe isabellina</i>	Isabelline wheatear	4	0-10
3.	<i>Columba livia</i>	Rock Dove	23	40
4.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	36	2-6
5.	<i>Rhodospiza obsoleta</i>	Black-billed Desert Finch	3	2
6.	<i>Pterocles orientalis</i>	Black-bellied sandgrouse	6	15

**VP. 1**

Date: 15.09.2020. Start and end time: 7:43 – 10:43

**Weather:**

The air temperature around 7-10°C sky half cloudy.

Wind speed approx. (6-7 m/s) No precipitation

***Primary species not found***

Table 48. Secondary and other species (VP 1), 15.09.2020.

<b>№</b>	<b>Latin names</b>	<b>English names</b>	<b>Amount</b>	<b>Flight altitude</b>
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	9	0-15
2.	<i>Oenanthe isabellina</i>	Isabelline wheatear	2	0-10
3.	<i>Pterocles orientalis</i>	Black-bellied sandgrouse	6	25
4.	<i>Corvus corax</i>	Northern Raven	12	35
5.	<i>Ardea cinerea</i>	Grey Heron	1	40

**VP. 2**

Date: 15.09.2020. Start and end time: 11:08 – 14:08

**Weather:**

The air temperature around 14-16°C is clear.

Wind speed approx. (5-6 m/s) No precipitation

***Primary species not found***

Table 49. Secondary and other species (VP 2), 15.09.2020

<b>№</b>	<b>Latin names</b>	<b>English names</b>	<b>Amount</b>	<b>Flight altitude</b>
<b>SECONDARY SPECIES</b>				
1.	<i>Falco tinnunculus</i>	Common Kestrel	1	23
2.	<i>Buteo rufinus</i>	Long-legged Buzzard	1	25
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	9	0-15
2.	<i>Oenanthe isabellina</i>	Isabelline wheatear	3	0-10
3.	<i>Corvus ruficollis</i>	Brown-necked Raven	1	4
4.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	23	2-9

**VP. 3**

Date: 15.09.2020. Start and end time: 14:36 – 17:37

**Weather:**

The air temperature around 16-12°C partly cloudy.

Wind speed approx. (6-7 m/s) No precipitation

***Primary species not found***

Table 50. Secondary and other species (VP 3), 15.09.2020.

No	Latin names	English names	Amount	Flight altitude
<b>OTHER SPECIES</b>				
1.	<i>Lanius pallidirostris</i>	Southern grey shrike	2	2
2.	<i>Galerida cristata</i>	Crested lark	12	0-15
3.	<i>Oenanthe isabellina</i>	Isabelline wheatear	2	0-10
4.	<i>Athene noctua</i>	Little Owl	1	0-6
5.	<i>Caprimulgus aegyptius</i>	Egyptian nightjar	1	0-5
6.	<i>Nycticorax nycticorax</i>	Black-crowned night-heron	1	20
7.	<i>Bubo bubo</i>	Northern Eagle Owl	1	0-23



#### VP. 4

Date:16.09.2020. Start and end time: 7:52 – 10:53

**Weather:**

The air temperature around 8-12°C cloudy.

Wind speed approx. (7-8 m/s) No precipitation

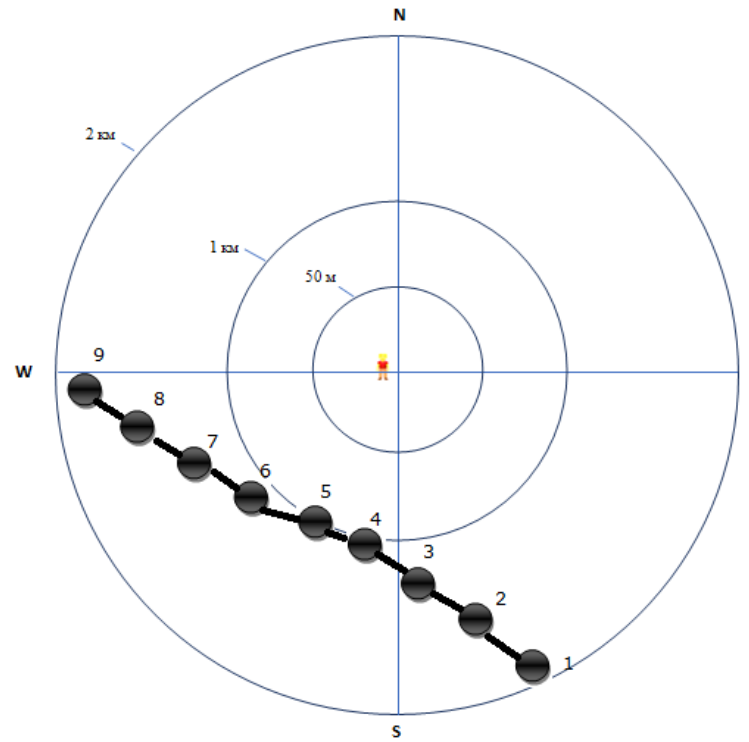


Fig. 10. Flight path (VP 4), 16.09.2020

Table 51. Target species log (VP 4), 16.09.2020


	<i>Aquila heliaca</i>	1- 90 m	2- 90 m	3- 95 m	4- 90 m	5- 95 m	6- 95 m	7- 95 m	8- 90 m	9- 90 m
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Table 52. Secondary and other species (VP 4), 16.09.2020

No	Latin names	English names	Amount	Flight altitude
<b>SECONDARY SPECIES</b>				
1.	<i>Circus cyaneus</i>	Hen (Northern) Harrier	1	11-30
2.	<i>Buteo rufinus</i>	Long-legged Buzzard	1	25-30
3.	<i>Aegypius monachus</i>	Cinereous Vulture	1	120
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	3	0-15
2.	<i>Oenanthe isabellina</i>	Isabelline wheatear	1	0-10
3.	<i>Oenanthe finschii</i>	Black-necked Wheatear	2	1-3
4.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	12	0-6

**VP. 5**

Date: 16.09.2020. Start and end time: 11:26 – 14:26

**Weather:**

The air temperature around 12-14°C sky half cloudy

Wind speed approx. (3-5 m/s) No precipitation

***Primary species not found***

Table 53. Secondary and other species (VP 5), 16.09.2020.

<b>Nº</b>	<b>Latin names</b>	<b>English names</b>	<b>Amount</b>	<b>Flight altitude</b>
<b>OTHER SPECIES</b>				
1.	<i>Alectoris chukar</i>	Chuckar partridge	2	0
2.	<i>Columba livia</i>	Rock Dove	12	15
3.	<i>Galerida cristata</i>	Crested lark	4	0-15
4.	<i>Oenanthe isabellina</i>	Isabelline wheatear	1	0-10
5.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	25	0-12
6.	<i>Pterocles orientalis</i>	Black-bellied sandgrouse	6	15
7.	<i>Turdus atrogularis</i>	Black-throated Thrush	12	0-20

**VP. 6**

Date:16.09.2020. Start and end time: 14:25 – 17:25

**Weather:**

The air temperature around 12-9°C sky half cloudy

Wind speed approx. (6-8 m/s) No precipitation

***Primary species not found***

Table 54. Secondary and other species (VP 6), 16.09.2020

<b>Nº</b>	<b>Latin names</b>	<b>English names</b>	<b>Amount</b>	<b>Flight altitude</b>
<b>OTHER SPECIES</b>				
1.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	12	0-2
2.	<i>Corvus monedula</i>	Jackdaw	3	0-3
3.	<i>Galerida cristata</i>	Crested lark	12	0-15
4.	<i>Oenanthe isabellina</i>	Isabelline wheatear	3	0-10
5.	<i>Passer indicus</i>	Indian House Sparrow	3	2
6.	<i>Pterocles orientalis</i>	Black-bellied sandgrouse	5	0-5

**VP. 7**

Date: 20.09.2020. Start and end time: 8:56 – 11:56

**Weather:**

The air temperature around 8-12°C sky half cloudy

Wind speed approx. (3-6 m/s) No precipitation

***Primary species not found***

Table 55. Secondary and other species (VP 7), 20.09.2020

No	Latin names	English names	Amount	Flight altitude
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	9	0-15
2.	<i>Oenanthe isabellina</i>	Isabelline wheatear	2	0-10
3.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	12	0-12
4.	<i>Lanius exubitor</i>	Great (Gray) Shrike	1	2-10
5.	<i>Sitta tephronota</i>	Greater Rock Nuthatch	1	0-3



## VP. 8

Date:20.09.2020. Start and end time: 12:23 – 15:23

**Weather:**

The air temperature around 12-16°C cloudy.

Wind speed approx. (7-8 m/s) No precipitation

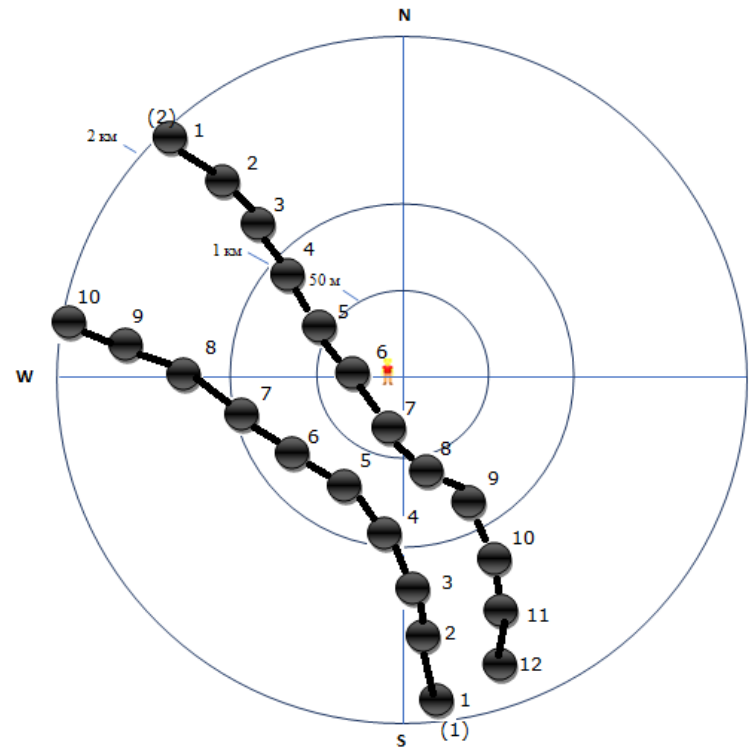


Fig. 11. Flight path (VP 8), 20.09.2020

Table 56. Target species log (VP 8), 20.09.2020.



	<i>Aquila nipalensis</i> (1)	1- 120 m	2- 120 m	3- 125 m	4- 120 m	5- 125 m	6- 115 m	7- 115 m	8- 110 m	9- 110 m	10- 100 m	11- 110 m	12- 110 m
	<i>Aquila nipalensis</i> (2)	1- 90 m	2- 90 m	3- 95 m	4- 90 m	5- 95 m	6- 95 m	7- 95 m	8- 90 m	9- 90 m	10- 90 m		

Table 57. Secondary and other species (VP 8), 20.09.2020.

No	Latin names	English names	Amount	Flight altitude
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	6	0-15
2.	<i>Oenanthe isabellina</i>	Isabelline wheatear	2	0-10
3.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	13	0-6

**VP. 9**

Date: 21.09.2020. Start and end time: 8:32 – 11:32

**Weather:**

The air temperature around 8-10°C sky half cloudy

Wind speed approx. (6-8 m/s) No precipitation

***Primary species not found***

Table 58. Secondary and other species (VP 9), 21.09.2020

No	Latin names	English names	Amount	Flight altitude
<b>SECONDARY SPECIES</b>				
1.	<i>Circus aeruginosus</i>	Marsh Harrier	2	15-32
2.	<i>Circus cyaneus</i>	Hen (Northern) Harrier	1	6-35
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	16	0-15
2.	<i>Streptopelia decaocto</i>	Collared Turtle Dove	8	5
3.	<i>Acridotheres tristis</i>	Indian Myna	4	1-8
4.	<i>Oenanthe isabellina</i>	Isabelline wheatear	2	0-10
5.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	31	0-6
6.	<i>Pterocles orientalis</i>	Black-bellied sandgrouse	3	0

**VP. 10**

Date:21.09.2020. Start and end time: 12:54 – 15:56

**Weather:**

The air temperature around 12-11°C sky half cloudy

Wind speed approx. (5-6 m/s) No precipitation

***Primary species not found***

Table 59. Secondary and other species (VP 10 ), 21.09.2020.

No	Latin names	English names	Amount	Flight altitude
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	9	0-15
2.	<i>Oenanthe isabellina</i>	Isabelline wheatear	2	0-10
3.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	9	0-12
4.	<i>Pterocles orientalis</i>	Black-bellied sandgrouse	5	15
5.	<i>Corvus corax</i>	Northern Raven	24	25
6.	<i>Corvus cornix</i>	Eurasian Hooded Crow	3	25

**VP. 1**

Date: 22.09.2020. Start and end time: 7:23–10:23

**Weather:**

The air temperature around 8-10°C cloudy.

Wind speed approx. (7-8 m/s) No precipitation

***Primary species not found***

Table 60. Secondary and other species (VP 1), 22.09.2020.

<b>№</b>	<b>Latin names</b>	<b>English names</b>	<b>Amount</b>	<b>Flight altitude</b>
<b>SECONDARY SPECIES</b>				
1.	<i>Falco tinnunculus</i>	Common Kestrel	1	25
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	13	0-15
2.	<i>Oenanthe isabellina</i>	Isabelline wheatear	3	0-10
3.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	21	0-5
4.	<i>Pterocles orientalis</i>	Black-bellied sandgrouse	3	0-6



**VP. 2**

Date: 22.09.2020. Start and end time: 10:58 – 13:58

**Weather:**

The air temperature around 10-15°C sky half cloudy

Wind speed approx. (6-8 m/s) No precipitation

***Primary species not found***

Table 61. Secondary and other species (VP 2), 22.09.2020.

<b>№</b>	<b>Latin names</b>	<b>English names</b>	<b>Amount</b>	<b>Flight altitude</b>
<b>SECONDARY SPECIES</b>				
1.	<i>Circus cyaneus</i>	Hen (Northern) Harrier	1	6-35
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	16	0-15
2.	<i>Oenanthe isabellina</i>	Isabelline wheatear	2	0-10
3.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	31	0-6
4.	<i>Hirundo rustica</i>	Barn swallow	5	3-12
5.	<i>Corvus monedula</i>	Jackdaw	1	25

**VP. 3**

Date: 22.09.2020. Start and end time: 14:28 – 17:28

**Weather:**

The air temperature around 14-9°C partly cloudy.

Wind speed approx. (6-7 m/s) No precipitation

***Primary species not found***

Table 62. Secondary and other species (VP 3), 22.09.2020

<b>№</b>	<b>Latin names</b>	<b>English names</b>	<b>Amount</b>	<b>Flight altitude</b>
<b>SECONDARY SPECIES</b>				
1.	<i>Buteo buteo</i>	Common Buzzard	1	15-25
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	6	0-8
2.	<i>Oenanthe isabellina</i>	Isabelline wheatear	3	0-10
3.	<i>Columba livia</i>	Rock Dove	9	25
4.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	12	2-6
5.	<i>Athene noctua</i>	Little Owl	1	0-5

#### VP. 4

Date: 23.09.2020. Start and end time: 9:22 – 12:23

**Weather:**

The air temperature around 8-12°C is cloudy.

Wind speed approx. (4-5 m/s) No precipitation

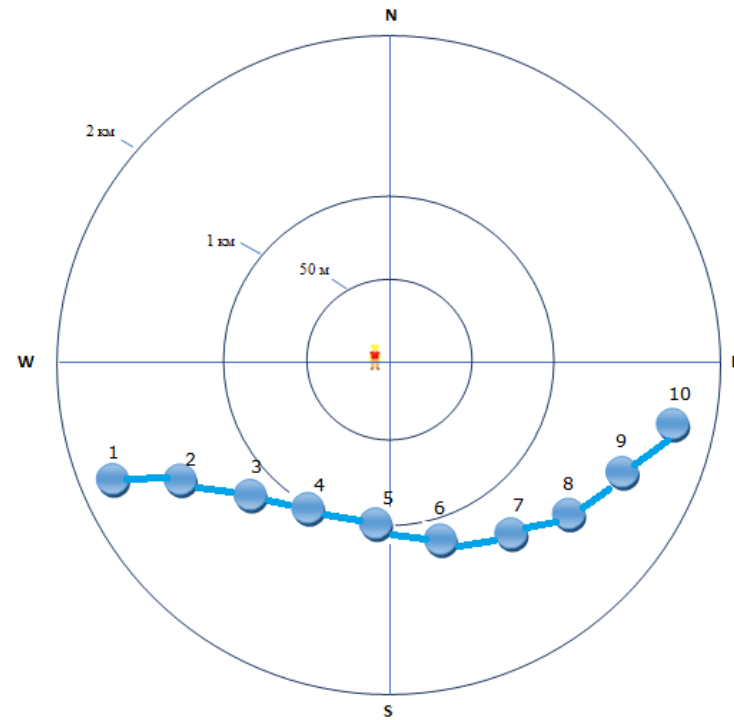


Fig. 12. Flight path (VP 4), 23.09.2020

Table 63. Target species log (VP 4), 23.09.2020.


	<i>Aquila heliaca</i>	1- 120 m	2- 120 m	3- 125 m	4- 120 m	5- 125 m	6- 125 m	7- 125 m	8- 110 m	9- 110 m	10- 110 m
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Table 64. Secondary and other species (VP 4), 23.09.2020

<b>№</b>	<b>Latin names</b>	<b>English names</b>	<b>Amount</b>	<b>Flight altitude</b>
<b>OTHER SPECIES</b>				
1.	<i>Athene noctua</i>	Little owl	1	0-6
2.	<i>Galerida cristata</i>	Crested lark	12	0-15
3.	<i>Coracias garrulus</i>	Eurasian Roller	2	4
4.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	19	0-3
5.	<i>Hirundo rustica</i>	Barn swallow	5	3-5

## VP. 5

Date: 23.09.2020. Start and end time: 13:27 – 15:29

### **Weather:**

The air temperature around 14-16°C partly cloudy.

Wind speed approx. (5-7 m/s) No precipitation

### ***Primary species not found***

Table 65. Secondary and other species (VP 5), 23.09.2020.

No	Latin names	English names	Amount	Flight altitude
<b>SECONDARY SPECIES</b>				
1.	<i>Circus aeruginosus</i>	Marsh Harrier	1	15-30
2.	<i>Aegypius monachus</i>	Cinereous Vulture	1	125
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	9	0-15
2.	<i>Oenanthe isabellina</i>	Isabelline wheatear	2	0-10
3.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	29	2-6
4.	<i>Rhodospiza obsoleta</i>	Black-billed Desert Finch	5	2
5.	<i>Turdus atrogularis</i>	Black-throated Thrush	5	0-5



**VP. 6**

Date: 24.09.2020. Start and end time:10:23 – 13:23

**Weather:**

The air temperature around 9-16°C sky half cloudy.

Wind speed approx. (6-7 m/s) No precipitation

***Primary species not found***

Table 66. Secondary and other species (VP 6), 24.09.2020.

<b>№</b>	<b>Latin names</b>	<b>English names</b>	<b>Amount</b>	<b>Flight altitude</b>
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	6	0-15
2.	<i>Oenanthe isabellina</i>	Isabelline wheatear	1	0-10
3.	<i>Corvus corax</i>	Northern Raven	3	35
4.	<i>Nycticorax nycticorax</i>	Black-crowned night-heron	1	50
5.	<i>Turdus atrogularis</i>	Black-throated Thrush	6	0-6
6.	<i>Sitta tephronota</i>	Greater Rock Nuthatch	1	0-3

**VP. 7**

Date: 24.09.2020. Start and end time: 13:55 – 16:57

**Weather:**

The air temperature around 16-12°C sky half cloudy

Wind speed approx. (6-7 m/s) No precipitation

***Primary species not found***

Table 67. Secondary and other species (VP 7), 24.09.2020.

No	Latin names	English names	Amount	Flight altitude
<b>SECONDARY SPECIES</b>				
1.	<i>Falco tinnunculus</i>	Common Kestrel	1	5-25
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	10	0-15
2.	<i>Oenanthe isabellina</i>	Isabelline wheatear	4	0-10
3.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	32	2-6
4.	<i>Athene noctua</i>	Little Owl	1	0-3
5.	<i>Coracias garrulus</i>	Eurasian Roller	2	6

### VP. 9

Date: 25.09.2020. Start and end time: 9:22 – 12:24

#### Weather:

The air temperature around 9-12°C is cloudy.

Wind speed approx. (4-5 m/s) No precipitation

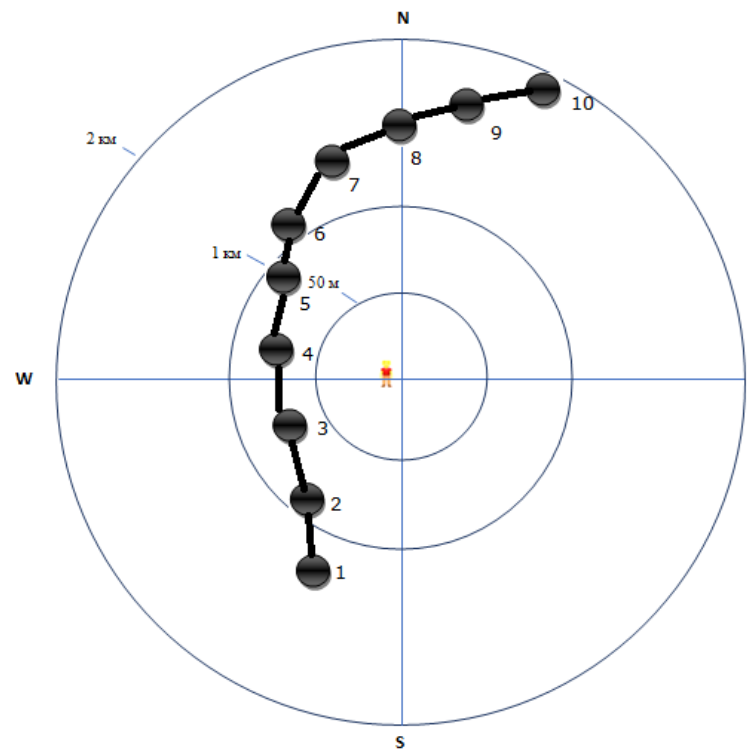


Fig. 13. Flight path (VP 9), 25.09.2020

Table 68. Target species log (VP 9), 25.09.2020.


	<i>Aquila nipalensis</i>	1- 120 m	2- 120 m	3- 125 m	4- 120 m	5- 125 m	6- 125 m	7- 125 m	8- 110 m	9- 110 m	10- 110 m
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Table 69. Secondary and other species (VP 9), 25.09.2020.

No	Latin names	English names	Amount	Flight altitude
<b>OTHER SPECIES</b>				
1.	<i>Athene noctua</i>	Little owl	1	0-6
2.	<i>Galerida cristata</i>	Crested lark	12	0-15
3.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	14	0-3

**VP. 10**

Date: 25.09.2020. Start and end time: 12:54 – 15:56

**Weather:**

The air temperature around 14-12°C sky half cloudy

Wind speed approx. (6-7 m/s) No precipitation

***Primary species not found***

Table 70. Secondary and other species (VP 10), 25.09.2020

No	Latin names	English names	Amount	Flight altitude
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	5	0-15
2.	<i>Oenanthe isabellina</i>	Isabelline wheatear	2	0-10
3.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	10	2-6
4.	<i>Hirundo rustica</i>	Barn swallow	5	10
5.	<i>Columba livia</i>	Rock Dove	12	25
6.	<i>Corvus corax</i>	Northern Raven	7	30

**VP. 1**

Date: 26.09.2020. Start and end time: 9:46 – 12:52

**Weather:**

The air temperature around 8-12°C is cloudy.

Wind speed approx. (6-7 m/s) No precipitation

***Primary species not found***

Table 71. Secondary and other species (VP 1), 26.09.2020.

<b>№</b>	<b>Latin names</b>	<b>English names</b>	<b>Amount</b>	<b>Flight altitude</b>
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	6	0-15
2.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	14	0-3
3.	<i>Pterocles orientalis</i>	Black-bellied sandgrouse	6	12
4.	<i>Corvus corax</i>	Northern Raven	12	20-30
5.	<i>Columba livia</i>	Rock Dove	26	30



**VP. 2**

Date: 26.09.2020. Start and end time: 13:27 – 15:29

**Weather:**

The air temperature around 14-13°C partly cloudy.

Wind speed approx. (5-7 m/s) No precipitation

***Primary species not found***

Table 72. Secondary and other species (VP 2), 26.09.2020.

No	Latin names	English names	Amount	Flight altitude
<b>SECONDARY SPECIES</b>				
1.	<i>Circus cyaneus</i>	Hen (Northern) Harrier	1	15-30
2.	<i>Falco tinnunculus</i>	Common Kestrel	1	12-25
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	6	0-15
2.	<i>Oenanthe isabellina</i>	Isabelline wheatear	2	0-10
3.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	24	2-6
4.	<i>Rhodospiza obsoleta</i>	Black-billed Desert Finch	3	2

### VP. 3

Date: 27.09.2020. Start and end time: 10:24 – 13:28

#### **Weather:**

The air temperature around 9-16°C sky half cloudy

Wind speed approx. (4-5 m/s) No precipitation

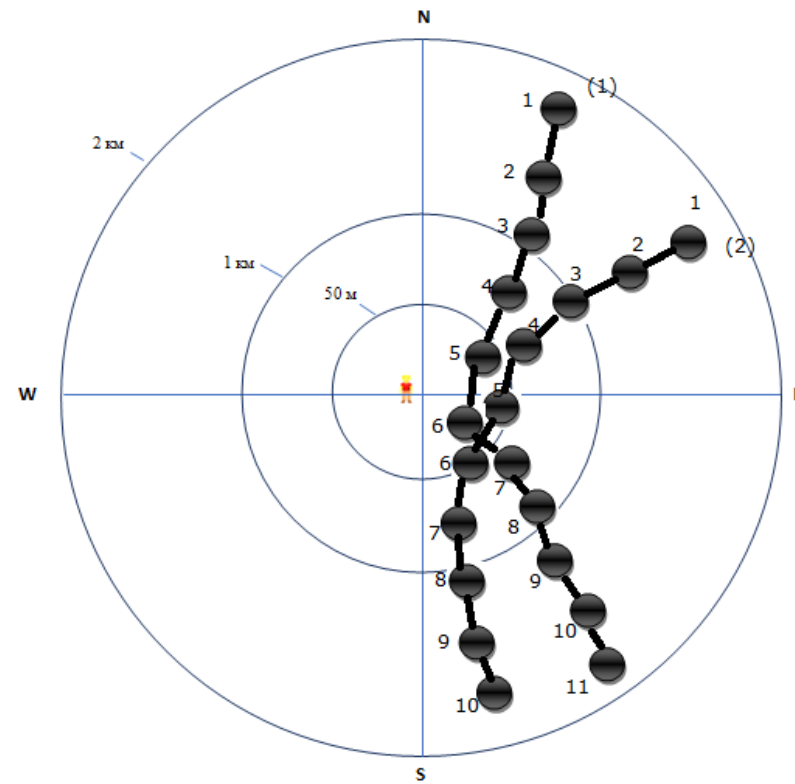


Fig. 14. Flight path (VP 3), 27.09.2020

Table 73. Target species log (VP 3), 27.09.2020

●	<i>Aquila nipalensis(1)</i>	1- 120 m	2- 90 m	3- 85 m	4- 80 m	5- 65 m	6- 65 m	7- 55 m	8- 50 m	9- 50 m	10- 60 m	11- 70 m
●	<i>Aquila nipalensis(2)</i>	1- 120 m	2- 90 m	3- 85 m	4- 80 m	5- 65 m	6- 65 m	7- 55 m	8- 50 m	9- 50 m	10- 60 m	

Table 74. Secondary and other species (VP 3), 27.09.2020

№	Latin names	English names	Amount	Flight altitude
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	18	0-15
2.	<i>Pterocles orientalis</i>	Black-bellied sandgrouse	5	0-9
3.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	16	0-3
4.	<i>Hirundo rustica</i>	Barn swallow	6	12
5.	<i>Hirundo daurica</i>	Red-rumped Swallow	1	42
6.	<i>Turdus atrogularis</i>	Black-throated Thrush	9	25

**VP. 4**

Date: 27.09.2020. Start and end time: 14:12 – 17:12

**Weather:**

The air temperature around 14-11°C sky half cloudy

Wind speed approx. (6-8 m/s) No precipitation

***Primary species not found***

Table 75. Secondary and other species (VP 4), 27.09.2020

No	Latin names	English names	Amount	Flight altitude
<b>SECONDARY SPECIES</b>				
1.	<i>Circus cyaneus</i>	Hen (Northern) Harrier	1	6-35
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	6	0-6
2.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	21	0-9
3.	<i>Pterocles orientalis</i>	Black-bellied sandgrouse	5	0-3
4.	<i>Turdus atrogularis</i>	Black-throated Thrush	4	25
5.	<i>Coracias garrulus</i>	Eurasian Roller	2	3-9
6.	<i>Columba livia</i>	Rock Dove	23	25

### VP. 7

Date:28.09.2020. Start and end time: 10:13 – 12:13

#### Weather:

The air temperature around 9-12°C cloudy.

Wind speed approx. (6-8 m/s) No precipitation

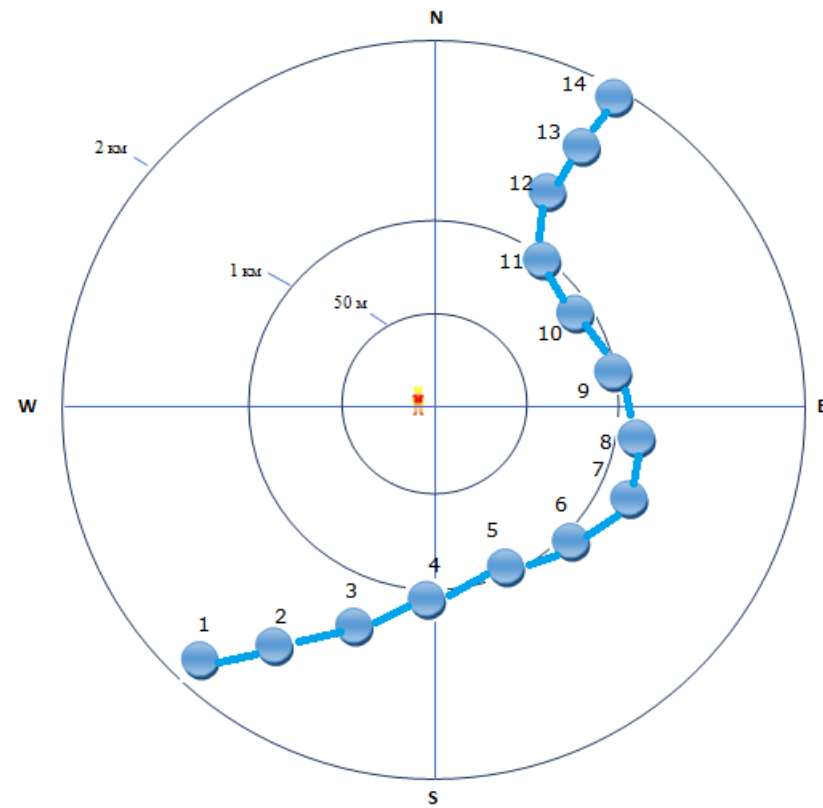


Fig. 15. Flight path (VP 7), 28.09.2020

Table 76. Target species log (VP 7), 28.09.2020.


	<i>Aquila heliaca</i>	1- 150 m	2- 150 m	3- 155 m	4- 150 m	5- 155 m	6- 155 m	7- 155 m	8- 150 m	9- 150 m	10- 150 m	11- 150 m	12- 150 m	13- 155 m	14- 150 m
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Table 77. Secondary and other species (VP 7), 28.09.2020.

No	Latin names	English names	Amount	Flight altitude
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	6	0-15
2.	<i>Oenanthe isabellina</i>	Isabelline wheatear	2	0-10
3.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	10	0-6
4.	<i>Corvus corax</i>	Northern Raven	15	35
5.	<i>Columba livia</i>	Rock Dove	14	40
6.	<i>Turdus atrogularis</i>	Black-throated Thrush	10	0-12



**VP. 8**

Date: 28.09.2020. Start and end time: 12:58 – 15:59

**Weather:**

The air temperature around 14-12°C sky half cloudy.

Wind speed approx. (5-7 m/s) No precipitation

***Primary species not found***

Table 78. Secondary and other species (VP 8), 28.09.2020

No	Latin names	English names	Amount	Flight altitude
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	5	0-15
2.	<i>Oenanthe isabellina</i>	Isabelline wheatear	2	0-10
3.	<i>Pterocles orientalis</i>	Black-bellied sandgrouse	3	0-5
4.	<i>Corvus corax</i>	Northern Raven	14	35
5.	<i>Athene noctua</i>	Little Owl	1	0-3
6.	<i>Lanius exubitor</i>	Great (Gray) Shrike	1	4-10

## VP survey results in October

### VP. 9

Date: 02.10.2020. Start and end time: 9:20 – 12:20

**Weather:**

The air temperature around 8-10°C sky half cloudy.

Wind speed approx. (6-7 m/s) No precipitation

***Primary species not found***

Table 79. Secondary and other species (VP 9), 02.10.2020

No	Latin names	English names	Amount	Flight altitude
<b>OTHER SPECIES</b>				
1.	<i>Columba livia</i>	Rock Dove	9	40
2.	<i>Galerida cristata</i>	Crested lark	12	0-15
3.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	3	0-4
4.	<i>Pterocles orientalis</i>	Black-bellied sandgrouse	5	0-8
5.	<i>Corvus corax</i>	Northern Raven	26	15-25
6.	<i>Casmerodius albus</i>	Great egret	1	25
7.	<i>Ammomanes deserti</i>	Desert Lark	1	0-1

**VP. 10**

Date: 02.10.2020. Start and end time: 13:23 – 15:23

**Weather:**

The air temperature around 12-10°C sky half cloudy.

Wind speed approx. (6-7 m/s) No precipitation

***Primary species not found***

Table 80. Secondary and other species (VP 10), 02.10.2020

No	Latin names	English names	Amount	Flight altitude
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	13	0-10
2.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	1	0-4
3.	<i>Melanocorypha bimaculata</i>	Bimaculated lark	25	0-8
4.	<i>Athene noctua</i>	Little owl	1	0-2
5.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	32	0-9

**VP. 1**

Date: 03.10.2020 Start and end time: 9:27 – 12:37

**Weather:**

The air temperature around 8-12°C sky half cloudy.

Wind speed approx. (3-5 m/s) No precipitation

***Primary species not found***

Table 81. Secondary and other species (VP 1), 03.10.2020.

No	Latin names	English names	Amount	Flight altitude
<b>OTHER SPECIES</b>				
1.	<i>Athene noctua</i>	Little owl	1	0-5
2.	<i>Galerida cristata</i>	Crested lark	9	0-15
3.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	32	0-6
4.	<i>Oenanthe isabellina</i>	Isabelline wheatear	1	0-6
5.	<i>Larus ridibundus</i>	Black-Headed Gull	7	14

## VP. 2

Date: 03.10.2020. Start and end time: 13:23 – 15:23

### Weather:

The air temperature around 13-10°C partly cloudy.

Wind speed approx. (6-8 m/s) No precipitation

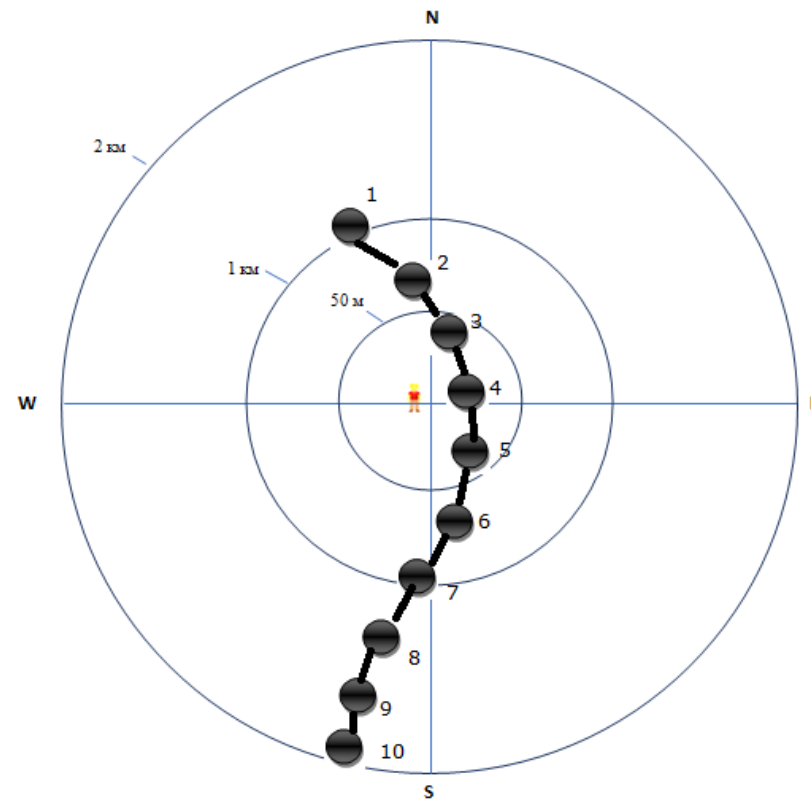


Fig.16 Flight path (VP 2), 03.10.2020

Table 82. Target species log (VP 2), 03.10.2020.


	<i>Aquila nipalensis</i>	1	2	3	4	5	6	7	8	9	10
		90 m	90 m	95 m	90 m	95 m	95 m	95 m	90 m	85 m	85 m

Table 83. Secondary and other species (VP 2), 03.10.2020.

No	Latin names	English names	Amount	Flight altitude
<b>SECONDARY SPECIES</b>				
1.	<i>Circus aeruginosus</i>	Eurasian Marsh-Harrier	1	10-30
2.	<i>Buteo buteo</i>	Common Buzzard	2	45
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	23	0-15
2.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	32	0-5
3.	<i>Oenanthe isabellina</i>	Isabelline wheatear	2	0-3
4.	<i>Rhodospiza obsoleta</i>	Black-billed Desert Finch	5	1-3



#### VP. 4

Date: 04.10.2020. Start and end time: 9:03 – 12:03

#### **Weather:**

The air temperature around 10-14°C is clear.

Wind speed approx. (4-5 m/s) No precipitation

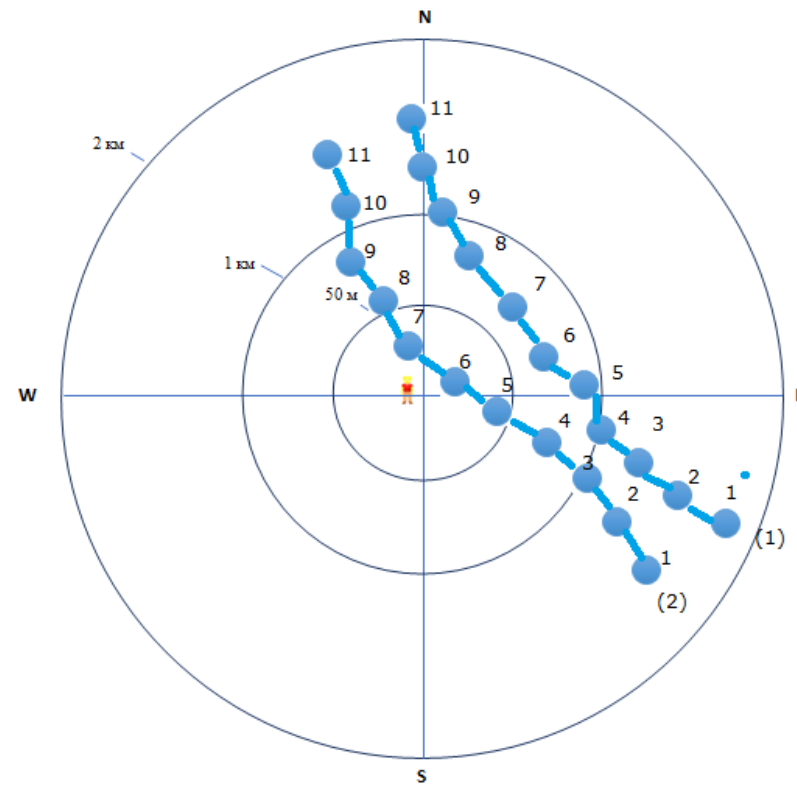


Fig. 17 Flight path (VP 4), 04.10.2020

Table 84 Target species log (VP 4), 04.10.2020.



	<i>Aquila heliaca</i> (1)	1 150 m	2 150 m	3 155 m	4 150 m	5 155 m	6 150m	7 150 m	8 150 m	9 150 m	10 150 m	11 155 m
	<i>Aquila heliaca</i> (2)	1 150 m	2 150 m	3 155 m	4 150 m	5 155 m	6 150m	7 150 m	8 150 m	9 105 m	10 150 m	11 155 m

Table 85. Secondary and other species (VP 4), 04.10.2020.

No	Latin names	English names	Amount	Flight altitude
<b>SECONDARY SPECIES</b>				
1.	<i>Falco tinnunculus</i>	Common Kestrel	1	8-25
<b>OTHER SPECIES</b>				
1.	<i>Passer indicus</i>	Indian House Sparrow	12	0-4
2.	<i>Merops supercilios</i>	Blue-cheeked Bee-eate	4	8-12
3.	<i>Galerida cristata</i>	Crested lark	8	0-15
4.	<i>Oenanthe isabellina</i>	Isabelline wheatear	1	0-10
5.	<i>Acridotheres tristis</i>	Indian Myna	3	2-8

**VP. 3**

Date: 04.10.2020. Start and end time: 12:52 – 15:55

**Weather:**

The air temperature around 15-12°C is clear.

Wind speed approx. (3-4 m/s) No precipitation

***Primary species not found***

Table 86. Secondary and other species (VP 3), 04.10.2020.

No	Latin names	English names	Amount	Flight altitude
<b>SECONDARY SPECIES</b>				
1.	<i>Falco tinnunculus</i>	Kestrel	1	15-30
2.	<i>Buteo buteo</i>	Common Buzzard	4	10-25
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	12	0-15
2.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	21	0-5
3.	<i>Oenanthe isabellina</i>	Isabelline wheatear	4	0-10
4.	<i>Acridotheres tristis</i>	Indian Myna	12	2-9
5.	<i>Anas strepera</i>	Gadwall	19	45
6.	<i>Columba livia</i>	Rock Dove	11	30

**VP. 5**

Date: 05.10.2020. Start and end time: 9:17 – 12:17

**Weather:**

The air temperature around 7-12°C sky half cloudy

Wind speed approx. (5-7 ms) No precipitation

***Primary species not found***

Table 87. Secondary and other species (VP 5), 05.10.2020

<b>Nº</b>	<b>Latin names</b>	<b>English names</b>	<b>Amount</b>	<b>Flight altitude</b>
<b>SECONDARY SPECIES</b>				
1.	<i>Circus aeruginosus</i>	Marsh Harrier	1	5-20
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	6	0-15
2.	<i>Columba livia</i>	Rock Dove	60	25
3.	<i>Oenanthe isabellina</i>	Isabelline wheatear	2	0-10

**VP. 6**

Date: 05.10.2020. Start and end time: 13:02 – 15:16

Weather:

The air temperature around 12-10°C cloudy.

Wind speed approx. (2-5 m/s) No precipitation

***Primary species not found***

Table 88. Secondary and other species (VP 6), 05.10.2020

<b>№</b>	<b>Latin names</b>	<b>English names</b>	<b>Amount</b>	<b>Flight altitude</b>
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	6	0-9
2.	<i>Oenanthe isabellina</i>	Isabelline wheatear	2	0-10
3.	<i>Pterocles orientalis</i>	Black-bellied sandgrouse	5	15
4.	<i>Hirundo rustica</i>	Barn Swallow	3	4-30
5.	<i>Athene noctua</i>	Little Owl	1	0-12

### VP.7

Date: 06.10.2020. Start and end time: 11:12 – 13:12

#### **Weather:**

The air temperature around 10-13°C is clear.

Wind speed approx. (3-5 m/s) No precipitation

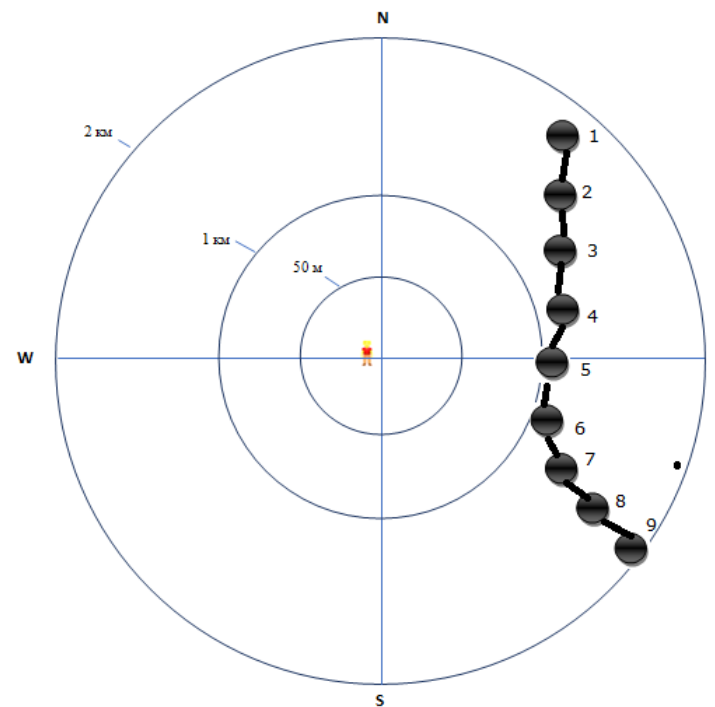


Fig. 18 Flight path (VP 7), 06.10.2020

Table 89 Target species log (VP 7), 06.10.2020

●	<i>Aquila nipalensis</i>	1	2	3	4	5	6	7	8	9
		120 m	120 m	125 m	120 m	125 m	125 m	120 m	120 m	120 m



Table 90. Secondary and other species (VP 7), 06.10.2020.

<b>№</b>	<b>Latin names</b>	<b>English names</b>	<b>Amount</b>	<b>Flight altitude</b>
<b>OTHER SPECIES</b>				
1.	<i>Rhodospiza obsoleta</i>	Black-billed Desert Finch	2	3
2.	<i>Anas crecca</i>	Green-winged teal	1	50
3.	<i>Galerida cristata</i>	Crested lark	9	0-15
4.	<i>Oenanthe isabellina</i>	Isabelline wheatear	4	0-10
5.	<i>Corvus monedula</i>	Jackdaw	2	0-2
6.	<i>Scotocerca inquieta</i>	Streaked Scrub Warbler	1	2

**VP. 8**

Date: 06.10.2020. Start and end time: 13:54 – 16:58

Weather:

The air temperature around 10-7°C is cloudy.

Wind speed approx. (6-7 m/s) No precipitation

***Primary species not found***

Table 91. Secondary and other species (VP 8), 06.10.2020.

<b>№</b>	<b>Latin names</b>	<b>English names</b>	<b>Amount</b>	<b>Flight altitude</b>
<b>SECONDARY SPECIES</b>				
1.	<i>Buteo rufinus</i>	Long-legged Buzzard	1	15-45
2.	<i>Aegypius monachus</i>	Cinereous Vulture	1	160
3.	<i>Falco tinnunculus</i>	Kestrel	1	10-25
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	14	0-15
2.	<i>Oenanthe isabellina</i>	Isabelline wheatear	5	0-10
3.	<i>Columba livia</i>	Rock Dove	14	35
4.	<i>Acridotheres tristis</i>	Indian Myna	7	2-7
5.	<i>Corvus corax</i>	Northern Raven	26	25-35

**VP. 10**

Date: 07.10.2020. Start and end time: 10:06 – 13:09

**Weather:**

The air temperature around 9-15°C is clear.

Wind speed approx. (5-7 m/s) No precipitation

***Primary species not found***

Table 92. Secondary and other species (VP 10), 07.10.2020.

No	Latin names	English names	Amount	Flight altitude
<b>OTHER SPECIES</b>				
1.	<i>Pterocles orientalis</i>	Black-bellied sandgrouse	2	0-5
2.	<i>Galerida cristata</i>	Crested lark	6	0-9
3.	<i>Streptopelia decaocto</i>	Collared Turtle Dove	3	0-12
4.	<i>Oenanthe isabellina</i>	Isabelline wheatear	3	0-10
5.	<i>Scotocerca inquieta</i>	Streaked Scrub Warbler	2	0-2
6.	<i>Athene noctua</i>	Little Owl	1	0-5
7.	<i>Calandrella brachydactyla</i>	Short-toed lark	23	0-6

**VP. 9**

Date: 07.10.2020. Start and end time: 13:48 – 16:48

**Weather:**

The air temperature around 11-7°C sky half cloudy

Wind speed approx. (7-8 m/s) No precipitation

***Primary species not found***

Table 93. Secondary and other species (VP 9), 07.10.2020.

<b>№</b>	<b>Latin names</b>	<b>English names</b>	<b>Amount</b>	<b>Flight altitude</b>
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	6	0-15
2.	<i>Oenanthe isabellina</i>	Isabelline wheatear	2	0-10
3.	<i>Scotocerca inquieta</i>	Streaked Scrub Warbler	2	2
4.	<i>Corvus corax</i>	Northern Raven	35	50-65
5.	<i>Columba livia</i>	Rock Dove	32	40
6.	<i>Pelecanus onocrotalus</i>	Great White Pelican	16	20

**VP. 1**

Date: 08.10.2020. Start and end time: 8:19 – 11:19

**Weather:**

The air temperature around 6-12°C cloudy.

Wind speed approx. (3-5 m/s) No precipitation

***Primary species not found***

Table 94. Secondary and other species (VP 1), 08.10.2020.

<b>Nº</b>	<b>Latin names</b>	<b>English names</b>	<b>Amount</b>	<b>Flight altitude</b>
<b>OTHER SPECIES</b>				
1.	<i>Streptopelia decaocto</i>	Collared Turtle Dove	2	4
2.	<i>Galerida cristata</i>	Crested lark	10	0-15
3.	<i>Oenanthe isabellina</i>	Isabelline wheatear	3	0-10
4.	<i>Scotocerca inquieta</i>	Streaked Scrub Warbler	2	2
5.	<i>Tringa totanus</i>	Common Redshank	3	5
6.	<i>Alectoris chukar</i>	Chuckar partridge	7	0

## VP. 2

Date: 08.10.2020. Start and end time: 12:16 – 15:18

### Weather:

The air temperature around 13-10°C is clear.

Wind speed approx. (4-6 m/s) No precipitation

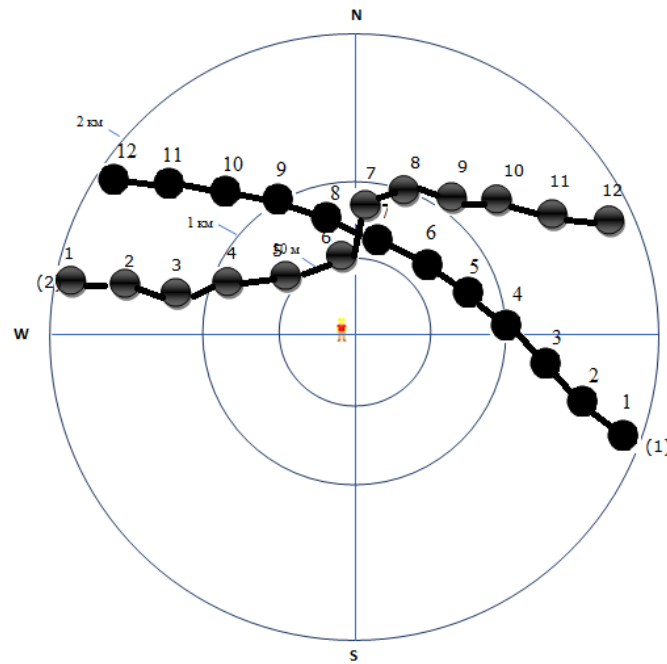


Fig. 19. Flight path (VP 2), 08.10.2020

Table 95. Target species log (VP 2), 08.10.2020

●	<i>Aquila nipalensis</i> (1)	1 110 m	2 110 m	3 115 m	4 110 m	5 115 m	6 115 m	7 115 m	8 110 m	9 110 m	10 110 m	11 110 m	12 110 m
●	<i>Aquila nipalensis</i> (2)	1 120 m	2 120 m	3 125 m	4 120 m	5 125 m	6 125 m	7 125 m	8 120 m	9 120 m	10 120 m	11 120 m	12 120 m



Table 96. Secondary and other species (VP 2), 08.10.2020

<b>№</b>	<b>Latin names</b>	<b>English names</b>	<b>Amount</b>	<b>Flight altitude</b>
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	12	0-13
2.	<i>Hirundo rustica</i>	Barn Swallow	4	3-15
3.	<i>Oenanthe isabellina</i>	Isabelline wheatear	1	0-10
4.	<i>Scotocerca inquieta</i>	Streaked Scrub Warbler	2	2
5.	<i>Acridotheres tristis</i>	Common myna	6	18
6.	<i>Sitta tephronota</i>	Greater Rock Nuthatch	2	0-5

**VP 3**

Date: 11.10.2020 Start and end time: 9:22 – 12:25

**Weather:**

The air temperature around 6-12°C is cloudy.

Wind speed approx. (6-8 m/s) No precipitation

***Primary species not found***

Table 97. Secondary and other species (VP 3), 11.10.2020

<b>No</b>	<b>Latin names</b>	<b>English names</b>	<b>Amount</b>	<b>Flight altitude</b>
<b>SECONDARY SPECIES</b>				
1.	<i>Circus cyaneus</i>	Hen (Northern) Harrier	2	5-25
2.	<i>Falco tinnunculus</i>	Kestrel	2	12-25
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	10	0-5
2.	<i>Oenanthe isabellina</i>	Isabelline wheatear	2	0-5
3.	<i>Bubo bubo</i>	Northern Eagle Owl	2	0-25
4.	<i>Pterocles orientalis</i>	Black-bellied sandgrouse	3	0-15
5.	<i>Athene noctua</i>	Little Owl	1	0-3
6.	<i>Lanius exubitor</i>	Great (Gray) Shrike	1	3-10

**VP 4**

Date: 11.10.2020 Start and end time: 13:43 – 14:43

**Weather:**

The air temperature around 12-7°C sky half cloudy

Wind speed approx. (4-6 m/s) No precipitation

***Primary species not found***

Table 98. Secondary and other species (VP 4), 11.10.2020

<b>№</b>	<b>Latin names</b>	<b>English names</b>	<b>Amount</b>	<b>Flight altitude</b>
<b>SECONDARY SPECIES</b>				
1.	<i>Circus cyaneus</i>	Hen (Northern) Harrier	1	5-35
2.	<i>Falco tinnunculus</i>	Kestrel	1	15-25
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	9	0-5
2.	<i>Oenanthe isabellina</i>	Isabelline wheatear	1	0-5
3.	<i>Hirundo rustica</i>	Barn Swallow	8	10-35
4.	<i>Lanius exubitor</i>	Great (Gray) Shrike	1	4-8

**VP 6**

Date: 12.10.2020 Start and end time: 9:18 – 11:18

**Weather:**

The air temperature around 8-11°C cloudy.

Wind speed approx. (3-6 m/s) No precipitation

***Primary species not found***

Table 99. Secondary and other species (VP 6), 12.10.2020

<b>№</b>	<b>Latin names</b>	<b>English names</b>	<b>Amount</b>	<b>Flight altitude</b>
<b>SECONDARY SPECIES</b>				
1.	<i>Falco tinnunculus</i>	Kestrel	1	6-25
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	7	0-6
2.	<i>Columba livia</i>	Rock Dove	10	20
3.	<i>Rhodospiza obsoleta</i>	Black-billed Desert Finch	3	0-3
4.	<i>Pterocles orientalis</i>	Black-bellied sandgrouse	5	35
5.	<i>Tadorna ferruginea</i>	Ruddy Shelduck	7	75

**VP. 7**

Date: 12.10.2020. Start and end time: 12:14 – 15:16

**Weather:**

The air temperature around 12-9°C sky half cloudy.

Wind speed approx. (5-6 m/s) No precipitation

***Primary species not found***

Table 100. Secondary and other species (VP 7), 12.10.2020.

No	Latin names	English names	Amount	Flight altitude
<b>SECONDARY SPECIES</b>				
1.	<i>Buteo rufinus</i>	Long-legged Buzzard	1	20-45
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	17	0-15
2.	<i>Oenanthe isabellina</i>	Isabelline wheatear	3	0-10
3.	<i>Columba livia</i>	Rock Dove	13	35
4.	<i>Calandrella brachydactyla</i>	Short-toed lark	26	0-6
5.	<i>Hirundo rustica</i>	Barn Swallow	12	40
6.	<i>Athene noctua</i>	Little Owl	1	0-6

**VP. 9**

Date: 13.10.2020. Start and end time: 8:15 – 11:15

**Weather:**

The air temperature around 8-12°C cloudy.

Wind speed approx. (4-6 m/s) No precipitation

***Primary species not found***

Table 101. Secondary and other species (VP 9), 13.10.2020.

No	Latin names	English names	Amount	Flight altitude
<b>SECONDARY SPECIES</b>				
1.	<i>Buteo buteo</i>	Common Buzzard	2	25-45
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	19	0-15
2.	<i>Oenanthe isabellina</i>	Isabelline wheatear	1	0-10
3.	<i>Columba livia</i>	Rock Dove	23	0-35
4.	<i>Corvus corax</i>	Northern Raven	15	23
5.	<i>Tadorna ferruginea</i>	Ruddy Shelduck	9	35



**VP. 10**

Date: 13.10.2020. Start and end time: 12:43 – 15:45

**Weather:**

The air temperature around 12-9°C cloudy.

Wind speed approx. (6-8 m/s) No precipitation

***Primary species not found***

Table 102. Secondary and other species (VP 10), 13.10.2020.

<b>№</b>	<b>Latin names</b>	<b>English names</b>	<b>Amount</b>	<b>Flight altitude</b>
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	6	0-15
2.	<i>Oenanthe isabellina</i>	Isabelline wheatear	3	0-10
3.	<i>Athene noctua</i>	Little Owl	2	0-3
4.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	35	0-15
5.	<i>Calandrella brachydactyla</i>	Short-toed lark	26	0-12
6.	<i>Hirundo rustica</i>	Barn Swallow	4	15

## VP.2

Date: 14.10.2020. Start and end time: 9:12 – 12:12

### **Weather:**

The air temperature around 8-12°C is clear.

Wind speed approx. (5-7 m/s) No precipitation

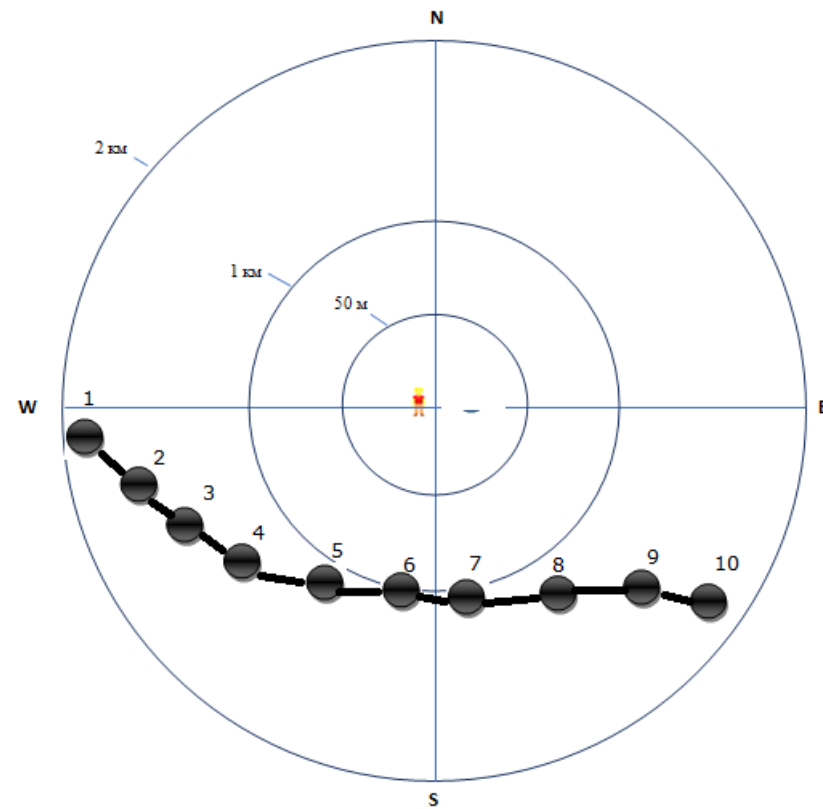


Fig. 20. Flight path (VP 2), 14.10.2020

Table 103. Target species (VP 2), 14.10.2020


	<i>Aquila nipalensis</i>	1- 90 m	2- 90 m	3- 95 m	4- 90 m	5- 95 m	6- 95 m	7- 95 m	8- 90 m	9- 90 m	10- 90 m
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Table 104. Secondary and other species (VP 2), 14.10.2020

No	Latin names	English names	Amount	Flight altitude
<b>OTHER SPECIES</b>				
1.	<i>Rhodospiza obsoleta</i>	Black-billed Desert Finch	5	15
2.	<i>Galerida cristata</i>	Crested lark	10	0-15
3.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	38	0-4
4.	<i>Oenanthe isabellina</i>	Isabelline wheatear	2	0-10
5.	<i>Pterocles orientalis</i>	Black-bellied sandgrouse	3	6-8
6.	<i>Ardea cinerea</i>	Gray heron	1	40
7.	<i>Phalacrocorax pygmaeus</i>	Pygmy cormorant	5	45

**VP. 1**

Date: 14.10.2020. Start and end time:13:10 – 15:16

**Weather:**

The air temperature around 12-8°C cloudy.

Wind speed approx. (6-8 m/s) No precipitation

***Primary species not found***

Table 105. Secondary and other species (VP 1), 14.10.2020

<b>№</b>	<b>Latin names</b>	<b>English names</b>	<b>Amount</b>	<b>Flight altitude</b>
<b>OTHER SPECIES</b>				
1.	<i>Alectoris chukar</i>	Chuckar partridge	4	0-3
2.	<i>Galerida cristata</i>	Crested lark	15	0-15
3.	<i>Oenanthe isabellina</i>	Isabelline wheatear	4	0-10
4.	<i>Corvus monedula</i>	Jackdaw	3	0-4
5.	<i>Scotocerca inquieta</i>	Streaked Scrub Warbler	2	2
6.	<i>Tadorna ferruginea</i>	Ruddy Shelduck	1	45
7.	<i>Anas strepera</i>	Gadwall	12	35

**VP.3**

Date: 15.10.2020. Start and end time: 10:13 – 13:13

**Weather:**

The air temperature around 8-13°C partly cloudy

Wind speed approx. (5-6 m/s) No precipitation

***Primary species not found***

Table 106. Secondary and other species (VP 3), 15.10.2020.

<b>№</b>	<b>Latin names</b>	<b>English names</b>	<b>Amount</b>	<b>Flight altitude</b>
<b>SECONDARY SPECIES</b>				
1.	<i>Circus cyaneus</i>	Hen (Northern) Harrier	1	10-45
2.	<i>Falco tinnunculus</i>	Kestrel	2	12-25
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	6	0-15
2.	<i>Oenanthe isabellina</i>	Isabelline wheatear	3	0-10
3.	<i>Coracias garrulus</i>	Eurasian Roller	1	3-15
4.	<i>Larus ridibundus</i>	Black-Headed Gull	13	12
5.	<i>Phalacrocorax pygmaeus</i>	Pygmy cormorant	4	0-10
6.	<i>Sitta tephronota</i>	Greater Rock Nuthatch	1	9

**VP. 4**

Date: 15.10.2020. Start and end time: 13:56 – 16:56

**Weather:**

The air temperature around 12-8°C cloudy.

Wind speed approx. (5-8 m/s) No precipitation

***Primary species not found***

Table 107. Secondary and other species (VP 4), 15.10.2020.

<b>№</b>	<b>Latin names</b>	<b>English names</b>	<b>Amount</b>	<b>Flight altitude</b>
<b>SECONDARY SPECIES</b>				
1.	<i>Falco tinnunculus</i>	Kestrel	1	15
2.	<i>Circus aeruginosus</i>	Marsh Harrier	1	20-35
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	10	0-15
2.	<i>Oenanthe isabellina</i>	Isabelline wheatear	3	0-10
3.	<i>Phalacrocorax carbo</i>	Great Cormorant	24	50
4.	<i>Rhodospiza obsoleta</i>	Black-billed Desert Finch	3	2
5.	<i>Acridotheres tristis</i>	Indian Myna	12	25
6.	<i>Pica pica</i>	Magpie	2	12



### VP. 6

Date: 16.10.2020. Start and end time: 10:06 – 13:16

**Weather:**

The air temperature around 8-12°C cloudy.

Wind speed approx. (6-8 ms) No precipitation

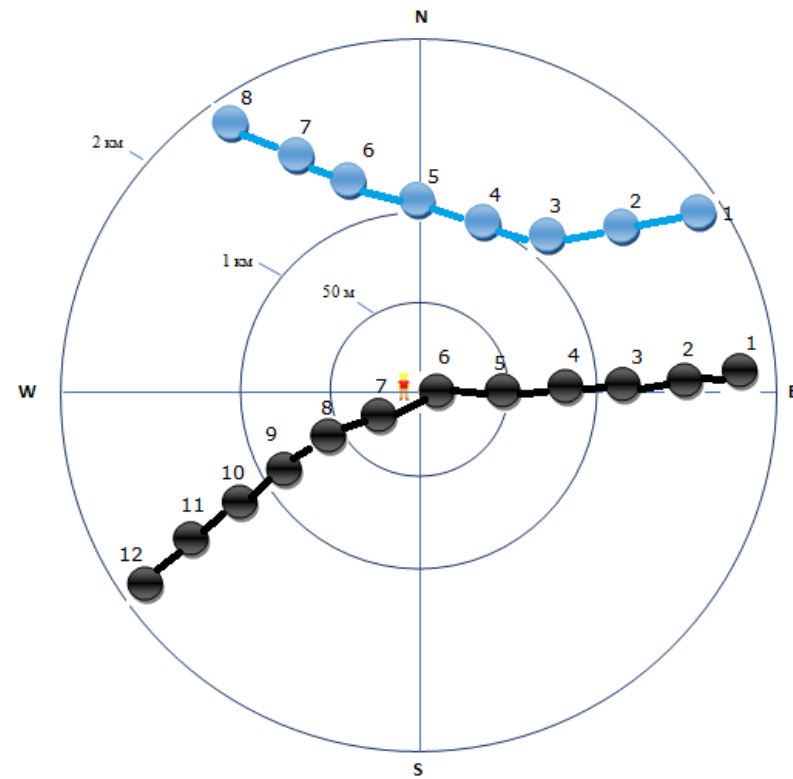


Fig. 21. Flight path (VP 6), 16.10.2020

Table 108. Target species log (VP 6), 16.10.2020



	<i>Aquila heliaca</i>	1- 140 m	2- 140 m	3- 145 m	4- 140 m	5- 145 m	6- 145 m	7- 145 m	8- 140 m				
	<i>Aquila nipalensis</i>	1- 120 m	2- 120 m	3- 125 m	4- 120 m	5- 125 m	6- 125 m	7- 125 m	8- 110 m	9- 110 m	10- 110 m	11- 100 m	12- 100 m

Table 109. Secondary and other species (VP 6), 16.10.2020

No	Latin names	English names	Amount	Flight altitude
<b>OTHER SPECIES</b>				
	<i>Rhodospiza obsoleta</i>	Black-billed Desert Finch	5	3
2.	<i>Galerida cristata</i>	Crested lark	10	0-15
3.	<i>Oenanthe isabellina</i>	Isabelline wheatear	3	0-10
4.	<i>Pterocles orientalis</i>	Black-bellied sandgrouse	2	0-15
5.	<i>Corvus monedula</i>	Jackdaw	4	0-12
6.	<i>Streptopelia senegalensis</i>	Laughing dove	2	5-6

**VP. 5**

Date: 16.10.2020. Start and end time: 13:48 – 15:52

**Weather:**

The air temperature around 12-8°C partly cloudy.

Wind speed approx. (5-6 m/s) No precipitation

***Primary species not found***

Table 110. Secondary and other species (VP 5), 16.10.2020

<b>Nº</b>	<b>Latin names</b>	<b>English names</b>	<b>Amount</b>	<b>Flight altitude</b>
<b>SECONDARY SPECIES</b>				
1.	<i>Falco tinnunculus</i>	Kestrel	2	10-25
2.	<i>Aegypius monachus</i>	<i>Aegypius monachus</i>	1	120
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	12	0-15
2.	<i>Oenanthe isabellina</i>	Isabelline wheatear	4	0-10
3.	<i>Columba livia</i>	Rock Dove	24	35
4.	<i>Rhodospiza obsoleta</i>	Black-billed Desert Finch	3	2
5.	<i>Athene noctua</i>	Little Owl	1	0-5

**VP. 7**

Date: 17.10.2020. Start and end time: 9:09 – 11:13

**Weather:**

The air temperature around 8-12°C is clear.

Wind speed approx. (4-6 m/s) No precipitation

**Primary species not found**

Table 111. Secondary and other species (VP 7), 17.10.2020.

<b>№</b>	<b>Latin names</b>	<b>English names</b>	<b>Amount</b>	<b>Flight altitude</b>
<b>SECONDARY SPECIES</b>				
1.	<i>Buteo buteo</i>	Common Buzzard	2	12-35
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	12	0-15
2.	<i>Oenanthe isabellina</i>	Isabelline wheatear	3	0-5
3.	<i>Streptopelia senegalensis</i>	Laughing dove	2	20
4.	<i>Columba livia</i>	Rock Dove	29	35
5.	<i>Acridotheres tristis</i>	Common myna	5	15
6.	<i>Rhodospiza obsoleta</i>	Black-billed Desert Finch	6	0-2

### VP. 8

Date: 17.10.2020. Start and end time: 11:52 – 14:52

**Weather:**

The air temperature around 12-14°C is clear.

Wind speed approx. (6-8 m/s) No precipitation

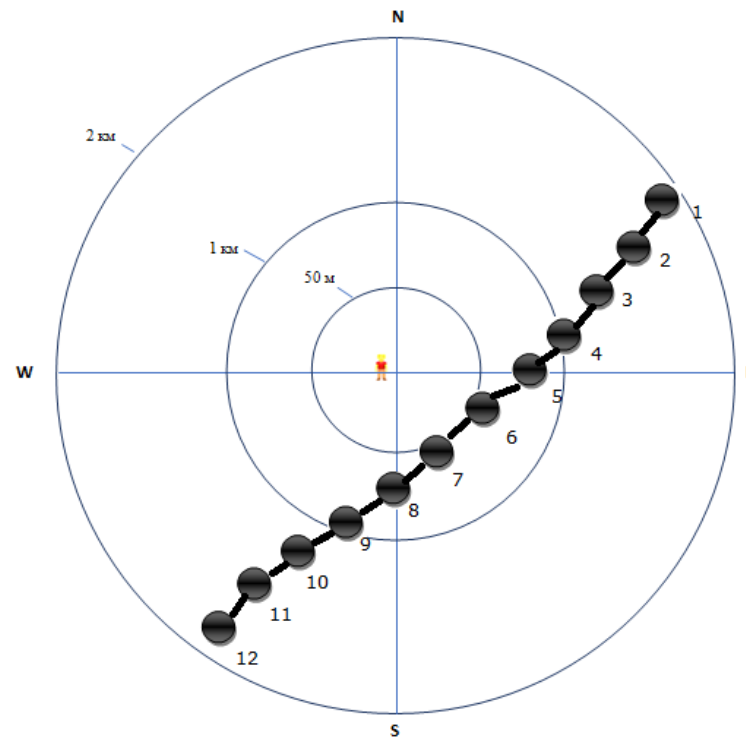


Fig. 22. Flight path (VP 8), 17.10.2020.

Table 112. Target species log (VP 8), 17.10.2020.


	<i>Aquila nipalensis</i>	1- 120 m	2- 120 m	3- 125 m	4- 120 m	5- 125 m	6- 125 m	7- 125 m	8- 130 m	9- 140 m	10- 150 m	11- 160 m	12- 160 m
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Table 113. Secondary and other species (VP 8), 17.10.2020

<b>№</b>	<b>Latin names</b>	<b>English names</b>	<b>Amount</b>	<b>Flight altitude</b>
<b>OTHER SPECIES</b>				
1.	<i>Corvus cornix</i>	Hooded Crow	1	8
2.	<i>Galerida cristata</i>	Crested lark	12	0-15
3.	<i>Oenanthe isabellina</i>	Isabelline wheatear	4	0-10
4.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	32	0-3
5.	<i>Scotocerca inquieta</i>	Streaked Scrub Warbler	2	0-2
6.	<i>Ardea cinerea</i>	Grey Heron	1	40
7.	<i>Columba livia</i>	Rock Dove	12	30



**VP. 9**

Date: 20.10.2020. Start and end time: 9:28 – 12:28

**Weather:**

The air temperature around 7-10°C partly cloudy.

Wind speed approx. (5-7 m/s) No precipitation

***Primary species not found***

Table 114. Secondary and other species (VP 9), 20.10.2020

<b>Nº</b>	<b>Latin names</b>	<b>English names</b>	<b>Amount</b>	<b>Flight altitude</b>
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	12	0-15
2.	<i>Oenanthe isabellina</i>	Isabelline wheatear	2	0-10
3.	<i>Columba livia</i>	Rock Dove	6	35
4.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	19	2-6

**VP. 10**

Date: 20.10.2020. Start and end time: 13:23 – 15:23

**Weather:**

The air temperature around 5-8°C sky half cloudy.

Wind speed approx. (6-7 m/s) No precipitation

***Primary species not found***

Table 115. Secondary and other species (VP 10), 20.10.2020.

<b>№</b>	<b>Latin names</b>	<b>English names</b>	<b>Amount</b>	<b>Flight altitude</b>
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	10	0-15
2.	<i>Oenanthe isabellina</i>	Isabelline wheatear	2	0-10
3.	<i>Pterocles orientalis</i>	Black-bellied sandgrouse	3	0
4.	<i>Athene noctua</i>	Little Owl	1	0-5
5.	<i>Corvus corax</i>	Northern Raven	15	35
6.	<i>Lanius exubitor</i>	Great (Gray) Shrike	1	3-10

**VP. 2**

Date: 22.10.2020. Start and end time: 9:58 – 12:59

**Weather:**

The air temperature around 7-10°C cloudy.

Wind speed approx. (6-7 m/s) No precipitation

***Primary species not found***

Table 116. Secondary and other species (VP 2), 22.10.2020.

<b>№</b>	<b>Latin names</b>	<b>English names</b>	<b>Amount</b>	<b>Flight altitude</b>
<b>OTHER SPECIES</b>				
1.	<i>Anas platyrhynchos</i>	Mallard	110	70
2.	<i>Galerida cristata</i>	Crested lark	12	0-15
3.	<i>Oenanthe isabellina</i>	Isabelline wheatear	1	0-10
4.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	17	0-3
5.	<i>Casmerodius albus</i>	Great egret	1	35
6.	<i>Scotocerca inquieta</i>	Streaked Scrub Warbler	1	2
7.	<i>Corvus corax</i>	Northern Raven	12	50

### VP. 1

Date: 22.10.2020. Start and end time: 13:47 – 15:49

**Weather:**

The air temperature around 10-6°C sky half cloudy

Wind speed approx. (3-6 m/s) No precipitation

***Primary species not found***

Table 117. Secondary and other species (VP 1), 22.10.2020.

No	Latin names	English names	Amount	Flight altitude
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	12	0-15
2.	<i>Oenanthe isabellina</i>	Isabelline wheatear	2	0-10
3.	<i>Tadorna ferruginea</i>	Ruddy Shelduck	3	25
4.	<i>Phalacrocorax pygmaeus</i>	Pygmy cormorant	3	35
5.	<i>Anas crecca</i>	Green-winged teal	6	40

#### VP. 4

Date: 23.10.2020. Start and end time: 19:52 – 12:53

**Weather:**

The air temperature around 8-12°C is clear.

Wind speed approx. (4-5 m/s) No precipitation

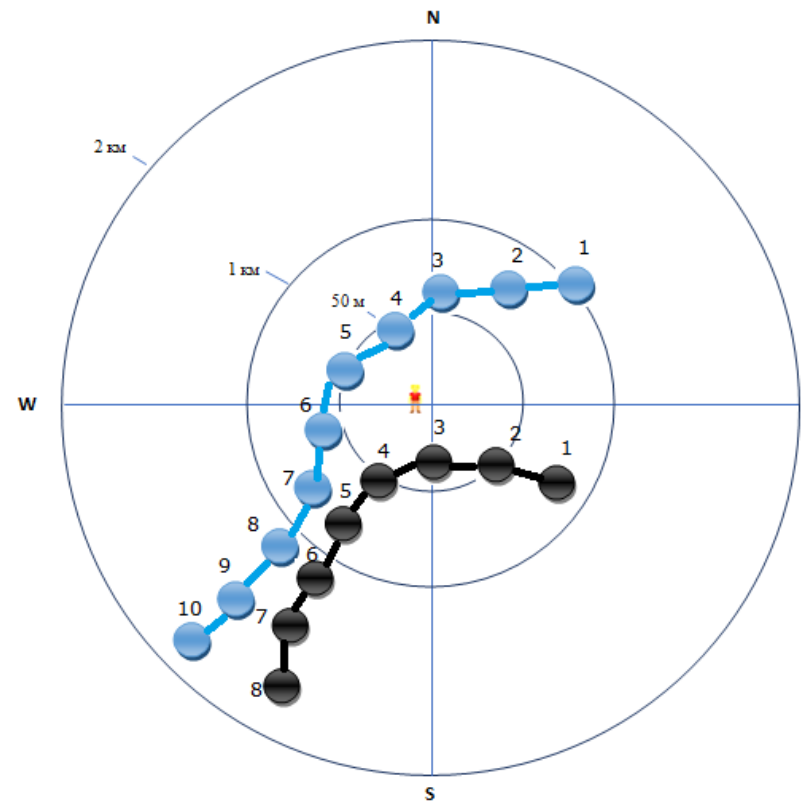


Fig. 23. Flight path (VP 4), 23.10.2020.

Table 118. Target species log (VP 4), 23.10.2020.



	<i>Aquila nipalensis</i>	1- 70 m	2- 80 m	3- 95 m	4- 120 m	5- 125 m	6- 125 m	7- 125 m	8- 130 m		
	<i>Aquila heliaca</i>	1- 120 m	2- 120 m	3- 125 m	4- 120 m	5- 125 m	6- 125 m	7- 125 m	8- 110 m	9- 110 m	10- 110 m

Table 119. Secondary and other species (VP 4), 23.10.2020.

No	Latin names	English names	Amount	Flight altitude
<b>OTHER SPECIES</b>				
1.	<i>Corvus cornix</i>	Hooded Crow	3	10
2.	<i>Corvus frugilegus</i>	Eurasian Rook	4	12
3.	<i>Galerida cristata</i>	Crested lark	10	0-15
4.	<i>Oenanthe isabellina</i>	Isabelline wheatear	2	0-10
5.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	23	0-3
6.	<i>Pterocles orientalis</i>	Black-bellied sandgrouse	5	12
7.	<i>Acridotheres tristis</i>	Indian Myna	4	15
8.	<i>Sitta tephronota</i>	Greater Rock Nuthatch	2	0-6



**VP. 3**

Date: 23.10.2020. Start and end time: 13:28 – 15:28

**Weather:**

The air temperature around 12-7°C partly cloudy.

Wind speed approx. (5-7 m/s) No precipitation

***Primary species not found***

Table 120. Secondary and other species (VP 3), 23.10.2020

<b>№</b>	<b>Latin names</b>	<b>English names</b>	<b>Amount</b>	<b>Flight altitude</b>
<b>SECONDARY SPECIES</b>				
1.	<i>Circus aeruginosus</i>	Marsh Harrier	1	15-25
2.	<i>Aegypius monachus</i>	Cinereous Vulture	1	180
3.	<i>Falco tinnunculus</i>	Kestrel	1	16-25
<b>OTHER SPECIES</b>				
1.	<i>Corvus frugilegus</i>	Eurasian Rook	11	10
2.	<i>Galerida cristata</i>	Crested lark	12	0-15
3.	<i>Oenanthe isabellina</i>	Isabelline wheatear	2	0-10
4.	<i>Columba livia</i>	Rock Dove	6	35
5.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	19	2-6

**VP. 5**

Date: 24.10.2020. Start and end time: 9:23 – 12:23

**Weather:**

The air temperature around 5-8°C sky half cloudy.

Wind speed approx. (6-7 m/s) No precipitation

***Primary species not found***

Table 121. Secondary and other species (VP 5), 24.10.2020.

<b>№</b>	<b>Latin names</b>	<b>English names</b>	<b>Amount</b>	<b>Flight altitude</b>
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	9	0-15
2.	<i>Oenanthe isabellina</i>	Isabelline wheatear	2	0-10
3.	<i>Pterocles orientalis</i>	Black-bellied sandgrouse	3	0
4.	<i>Athene noctua</i>	Little Owl	1	0-5
5.	<i>Corvus corax</i>	Northern Raven	12	35
6.	<i>Ardea cinerea</i>	Gray heron	1	0-25
7.	<i>Lanius exubitor</i>	Great (Gray) Shrike	2	3-10

**VP. 6**

Date: 24.10.2020. Start and end time: 13:18 – 16:21

**Weather:**

The air temperature around 8-9°C sky half cloudy.

Wind speed approx. (5-6 m/s) No precipitation

***Primary species not found***

Table 122. Secondary and other species (VP 6), 24.10.2020

<b>№</b>	<b>Latin names</b>	<b>English names</b>	<b>Amount</b>	<b>Flight altitude</b>
<b>SECONDARY SPECIES</b>				
1.	<i>Falco tinnunculus</i>	Kestrel	1	12-25
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	7	0-15
2.	<i>Corvus frugilegus</i>	Eurasian Rook	6	12
3.	<i>Oenanthe isabellina</i>	Isabelline wheatear	2	0-10
4.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	26	2-9
5.	<i>Turdus atrogularis</i>	Black-throated Thrush	7	20
6.	<i>Athene noctua</i>	Little Owl	1	0-15

**VP. 7**

Date: 25.10.2020. Start and end time: 10:12 – 13:15

**Weather:**

The air temperature around 8-11°C partly cloudy.

Wind speed approx. (6-7 m/s) No precipitation

***Primary species not found***

Table 123. Secondary and other species (VP 7), 25.10.2020.

<b>№</b>	<b>Latin names</b>	<b>English names</b>	<b>Amount</b>	<b>Flight altitude</b>
<b>OTHER SPECIES</b>				
1.	<i>Columba livia</i>	Rock Dove	20	20
2.	<i>Galerida cristata</i>	Crested lark	9	0-15
3.	<i>Oenanthe isabellina</i>	Isabelline wheatear	2	0-10
4.	<i>Athene noctua</i>	Little Owl	1	0-3
5.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	15	0-10
6.	<i>Lanius exubitor</i>	Great (Gray) Shrike	2	8-9
7.	<i>Turdus atrogularis</i>	Black-throated Thrush	5	12

**VP. 8**

Date: 25.10.2020. Start and end time: 14:13 – 17:13

**Weather:**

The air temperature around 12-6°C cloudy.

Wind speed approx. (7-8 m/s) No precipitation

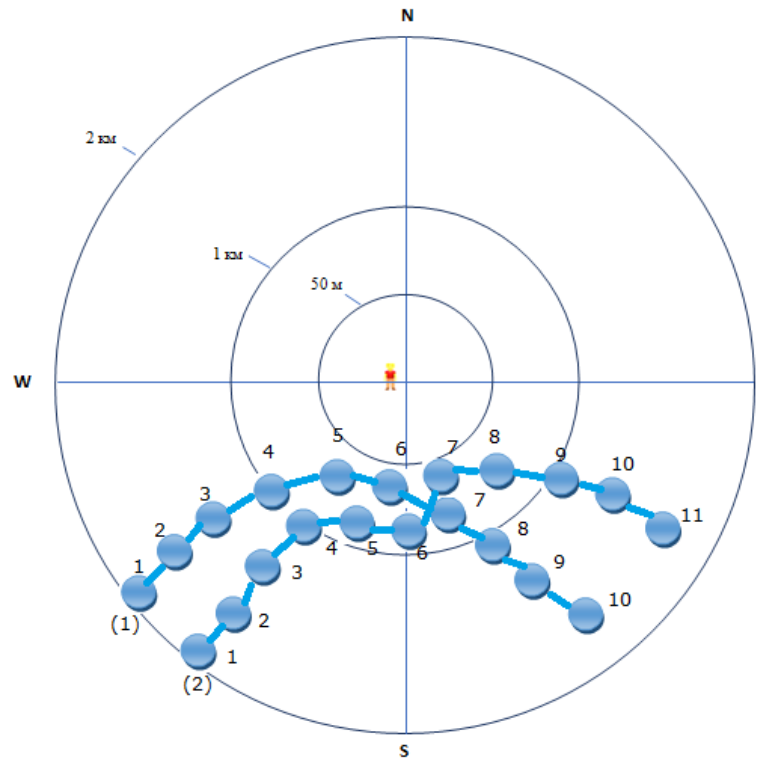


Fig. 24. Flight path (VP 8), 25.10.2020

Table 124. Target species log (VP 8), 25.10.2020



	<i>Aquila nipalensis</i> (1)	1- 160 m	2- 160 m	3- 165 m	4- 160 m	5- 165 m	6- 165 m	7- 165 m	8- 160 m	9- 160 m	10- 160 m	
	<i>Aquila nipalensis</i> (2)	1- 160 m	2- 160 m	3- 165 m	4- 160 m	5- 165 m	6- 165 m	7- 165 m	8- 160 m	9- 160 m	10- 160 m	11- 160 m

Table 125. Secondary and other species (VP 8), 25.10.2020

No	Latin names	English names	Amount	Flight altitude
<b>SECONDARY SPECIES</b>				
1.	<i>Circus cyaneus</i>	Hen (Northern) Harrier	1	11-20
2.	<i>Aegypius monachus</i>	Cinereous Vulture	2	160
3.	<i>Buteo rufinus</i>	Long-legged Buzzard	1	25-30
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	10	0-15
2.	<i>Oenanthe isabellina</i>	Isabelline wheatear	2	0-10
3.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	23	0-6



**VP. 9**

Date: 26.10.2020. Start and end time: 9:56 – 12:56

**Weather:**

The air temperature around 6-11°C sky half cloudy

Wind speed approx. (6-8 m/s) No precipitation

***Primary species not found***

Table 126. Secondary and other species (VP 9), 26.10.2020.

No	Latin names	English names	Amount	Flight altitude
<b>OTHER SPECIES</b>				
1.	<i>Alectoris chukar</i>	Chuckar partridge	2	0-3
2.	<i>Columba livia</i>	Rock Dove	12	15
3.	<i>Galerida cristata</i>	Crested lark	12	0-15
4.	<i>Tadorna ferruginea</i>	Ruddy Shelduck	3	35
5.	<i>Oenanthe isabellina</i>	Isabelline wheatear	2	0-10
6.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	27	0-12
7.	<i>Corvus monedula</i>	Jackdaw	1	12
8.	<i>Acridotheres tristis</i>	Indian Myna	6	12

**VP. 10**

Date: 26.10.2020. Start and end time: 13:35 – 15:35

**Weather:**

The air temperature around 11-8°C sky half cloudy

Wind speed approx. (6-8 m/s) No precipitation

***Primary species not found***

Table 127. Secondary and other species (VP 10), 26.10.2020

No	Latin names	English names	Amount	Flight altitude
<b>OTHER SPECIES</b>				
1.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	29	0-9
2.	<i>Corvus monedula</i>	Jackdaw	3	0-3
3.	<i>Galerida cristata</i>	Crested lark	12	0-15
4.	<i>Oenanthe isabellina</i>	Isabelline wheatear	3	0-10
5.	<i>Passer indicus</i>	Indian House Sparrow	5	2
6.	<i>Pterocles orientalis</i>	Black-bellied sandgrouse	3	0-5

## VP survey results in November

### VP.9

Date: 01.11.2020. Start and end time: 9:23 – 12:23

**Weather:**

The air temperature around 6-10°C sky half cloudy.

Wind speed approx. (6-7 m/s) No precipitation

***Primary species not found***

Table 128. Secondary and other species (VP 9), 01.11.2020

No	Latin names	English names	Amount	Flight altitude
OTHER SPECIES				
8.	<i>Galerida cristata</i>	Crested lark	9	0-8
9.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	2	0-4
10.	<i>Acridotheres tristis</i>	Common myna	5	6-10
11.	<i>Corvus corax</i>	Northern Raven	32	15-25
12.	<i>Columba livia</i>	Rock Dove	16	40
13.	<i>Corvus cornix</i>	Eurasian Hooded Crow	8	10

**VP. 10**

Date: 01.11.2020. Start and end time: 13:33 – 15:36

**Weather:**

The air temperature around 12-10°C sky half cloudy.

Wind speed approx. (6-7 m/s) No precipitation

***Primary species not found***

Table 129. Secondary and other species (VP 10), 01.11.2020

No	Latin names	English names	Amount	Flight altitude
<b>OTHER SPECIES</b>				
6.	<i>Nycticorax nycticorax</i>	Black-crowned night-heron	1	30
7.	<i>Athene noctua</i>	Little owl	1	0-2
8.	<i>Galerida cristata</i>	Crested lark	9	0-10
9.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	21	0-4
10.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	32	0-9
11.	<i>Corvus cornix</i>	Hooded Crow	7	8
12.	<i>Corvus frugilegus</i>	Eurasian Rook	8	7
13.	<i>Streptopelia decaocto</i>	Collared Turtle Dove	2	5-10

**VP. 1**

Date: 02.11.2020 Start and end time: 9:27 – 12:37

**Weather:**

The air temperature around 8-12°C sky half cloudy.

Wind speed approx. (5-6 m/s) No precipitation

***Primary species not found***

Table 130. Secondary and other species (VP 1), 02.11.2020.

No	Latin names	English names	Amount	Flight altitude
<b>OTHER SPECIES</b>				
6.	<i>Athene noctua</i>	Little owl	1	0-5
7.	<i>Galerida cristata</i>	Crested lark	10	0-9
8.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	23	0-6
9.	<i>Oenanthe isabellina</i>	Isabelline wheatear	1	0-6
10.	<i>Corvus monedula</i>	Jackdaw	2	30
11.	<i>Acridotheres tristis</i>	Indian Myna	7	12
12.	<i>Pterocles orientalis</i>	Black-bellied sandgrouse	5	25
13.	<i>Streptopelia decaocto</i>	Collared Turtle Dove	2	12

## VP. 2

Date: 02.11.2020. Start and end time: 13:23 – 15:23

### **Weather:**

The air temperature around 13-10°C partly cloudy.

Wind speed approx. (6-8 m/s) No precipitation

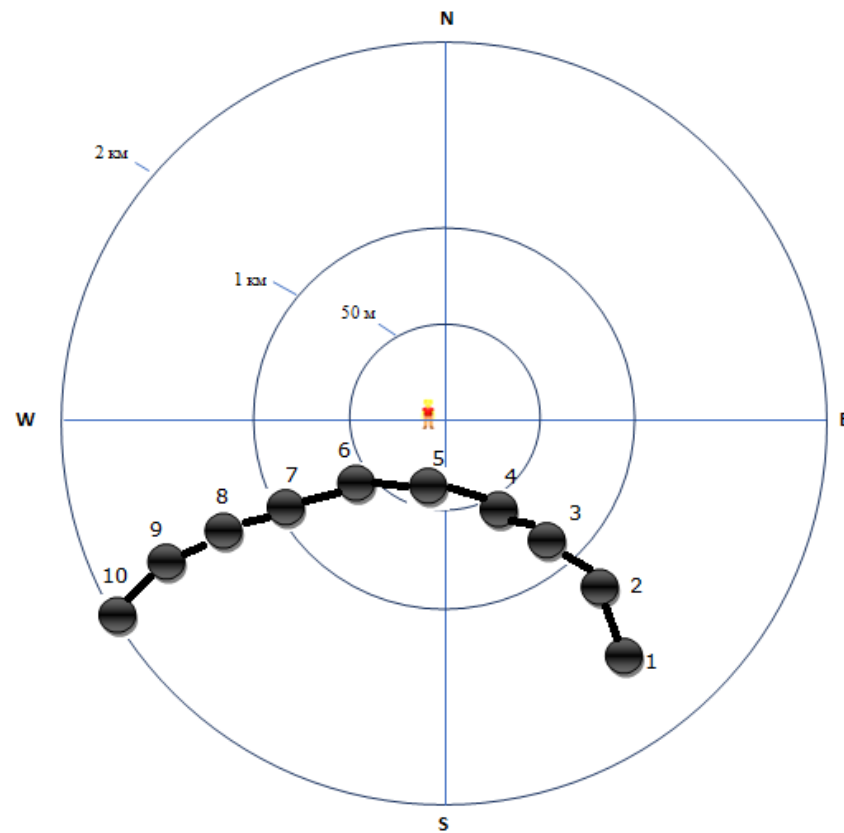


Fig.25 Flight path (VP 2), 02.11.2020



Table 131. Target species log (VP 2), 02.11.2020.


	<i>Aquila nipalensis</i>	1 150 m	2 150 m	3 155 m	4 150 m	5 155 m	6 155 m	7 155 m	8 150 m	9 155 m	10 155 m
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Table 132. Secondary and other species (VP 2), 02.11.2020.

No	Latin names	English names	Amount	Flight altitude
<b>SECONDARY SPECIES</b>				
3.	<i>Circus aeruginosus</i>	Eurasian Marsh-Harrier	1	12-30
4.	<i>Aegypius monachus</i>	Cinereous Vulture	2	150
5.	<i>Buteo buteo</i>	Common Buzzard	1	20-30
<b>OTHER SPECIES</b>				
5.	<i>Galerida cristata</i>	Crested lark	9	0-15
6.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	32	0-5
7.	<i>Oenanthe isabellina</i>	Isabelline wheatear	3	0-3
8.	<i>Corvus cornix</i>	Hooded Crow	6	12
9.	<i>Columba livia</i>	Rock Dove	12	30

**VP. 3**

Date: 03.11.2020. Start and end time: 9:52 – 12:55

**Weather:**

The air temperature around 9-13°C cloudy.

Wind speed approx. (5-6 m/s) No precipitation

***Primary species not found***

Table 133. Secondary and other species (VP 3), 03.11.2020.

No	Latin names	English names	Amount	Flight altitude
<b>SECONDARY SPECIES</b>				
3.	<i>Falco tinnunculus</i>	Kestrel	2	15-30
4.	<i>Buteo buteo</i>	Common Buzzard	1	10-25
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	10	0-15
2.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	23	0-5
3.	<i>Columba livia</i>	Rock Dove	5	30
4.	<i>Oenanthe isabellina</i>	Isabelline wheatear	2	0-10
5.	<i>Pterocles orientalis</i>	Black-bellied sandgrouse	5	35
6.	<i>Acridotheres tristis</i>	Indian Myna	6	2-9

**VP. 4**

Date: 03.11.2020. Start and end time: 13:32 – 15:35

**Weather:**

The air temperature around 13-12°C cloudy.

Wind speed approx. (4-6 m/s) No precipitation

***Primary species not found***

Table 134. Secondary and other species (VP 4), 03.11.2020.

<b>№</b>	<b>Latin names</b>	<b>English names</b>	<b>Amount</b>	<b>Flight altitude</b>
<b>SECONDARY SPECIES</b>				
1.	<i>Falco tinnunculus</i>	Kestrel	2	10-30
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	12	0-15
2.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	21	0-5
3.	<i>Oenanthe isabellina</i>	Isabelline wheatear	2	0-10
4.	<i>Corvus frugilegus</i>	Eurasian Rook	34	10-12
5.	<i>Turdus atrogularis</i>	Black-throated Thrush	5	0-12
6.	<i>Sitta tephronota</i>	Greater Rock Nuthatch	2	6

**VP.5**

Date: 04.11.2020. Start and end time: 9:16 – 12:16

**Weather:**

The air temperature around 6-11°C sky half cloudy.

Wind speed approx. (6-7 m/s) No precipitation

***Primary species not found***

Table 135. Secondary and other species (VP 5), 04.11.2020

<b>№</b>	<b>Latin names</b>	<b>English names</b>	<b>Amount</b>	<b>Flight altitude</b>
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	6	0-8
2.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	2	0-4
3.	<i>Acridotheres tristis</i>	Common myna	5	6-10
4.	<i>Corvus corax</i>	Northern Raven	12	15-25
5.	<i>Corvus cornix</i>	Hooded Crow	16	10
6.	<i>Corvus frugilegus</i>	Eurasian Rook	15	8

**VP. 6**

Date: 04.11.2020. Start and end time: 13:33 – 15:36

**Weather:**

The air temperature around 12-10°C sky half cloudy.

Wind speed approx. (6-7 m/s) No precipitation

***Primary species not found***

Table 136. Secondary and other species (VP 6), 04.11.2020

<b>№</b>	<b>Latin names</b>	<b>English names</b>	<b>Amount</b>	<b>Flight altitude</b>
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	7	0-10
2.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	2	0-4
3.	<i>Athene noctua</i>	Little owl	1	0-5
4.	<i>Nycticorax nycticorax</i>	Black-crowned night-heron	1	30
5.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	32	0-9
6.	<i>Corvus cornix</i>	Hooded Crow	6	8
7.	<i>Corvus frugilegus</i>	Eurasian Rook	8	7

## VP. 7

Date: 05.11.2020 Start and end time: 9:27 – 12:37

**Weather:**

The air temperature around 9-12°C sky half cloudy.

Wind speed approx. (5-6 m/s) No precipitation

***Primary species not found***

Table 137. Secondary and other species (VP 7), 05.11.2020.

<b>№</b>	<b>Latin names</b>	<b>English names</b>	<b>Amount</b>	<b>Flight altitude</b>
<b>OTHER SPECIES</b>				
1.	<i>Athene noctua</i>	Little owl	1	0-5
2.	<i>Corvus monedula</i>	Jackdaw	11	8
3.	<i>Corvus frugilegus</i>	Eurasian Rook	24	10
4.	<i>Corvus cornix</i>	Eurasian Hooded Crow	5	10
5.	<i>Galerida cristata</i>	Crested lark	9	0-9
6.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	23	0-6
7.	<i>Oenanthe isabellina</i>	Isabelline wheatear	1	0-6
8.	<i>Acridotheres tristis</i>	Indian Myna	4	12
9.	<i>Pterocles orientalis</i>	Black-bellied sandgrouse	4	25



### VP. 8

Date: 05.11.2020. Start and end time: 13:23 – 15:23

#### **Weather:**

The air temperature around 13-10°C partly cloudy.

Wind speed approx. (6-8 m/s) No precipitation

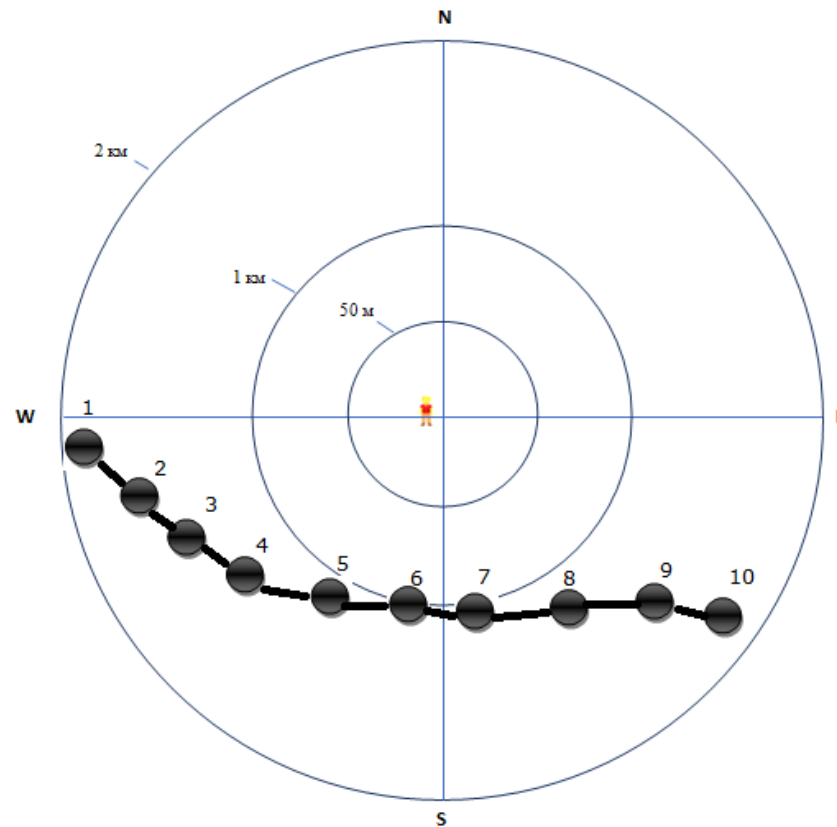


Fig.26 Flight path (VP 8), 05.11.2020

Table 138. Target species log (VP 8), 05.11.2020.

●	<i>Aquila nipalensis</i>	1 150 m	2 150 m	3 155 m	4 150 m	5 155 m	6 155 m	7 155 m	8 150 m	9 155 m	10 155 m
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Table 139. Secondary and other species (VP 8), 05.11.2020.

No	Latin names	English names	Amount	Flight altitude
<b>SECONDARY SPECIES</b>				
1.	<i>Circus aeruginosus</i>	Eurasian Marsh-Harrier	1	12-30
2.	<i>Falco tinnunculus</i>	Common Kestrel	2	12-35
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	12	0-15
2.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	23	0-5
3.	<i>Oenanthe isabellina</i>	Isabelline wheatear	2	0-3
4.	<i>Corvus cornix</i>	Hooded Crow	19	12
5.	<i>Streptopelia decaocto</i>	Collared Turtle Dove	2	12-30

**VP. 9**

Date: 06.11.2020. Start and end time: 9:51 – 12:55

**Weather:**

The air temperature around 9-13°C cloudy.

Wind speed approx. (5-6 m/s) No precipitation

***Primary species not found***

Table 140. Secondary and other species (VP 9), 06.11.2020.

No	Latin names	English names	Amount	Flight altitude
<b>SECONDARY SPECIES</b>				
1.	<i>Falco tinnunculus</i>	Kestrel	2	15-30
2.	<i>Buteo buteo</i>	Common Buzzard	1	10-25
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	10	0-15
2.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	19	0-5
3.	<i>Oenanthe isabellina</i>	Isabelline wheatear	2	0-10
4.	<i>Ardea cinerea</i>	Gray heron	1	30
5.	<i>Acridotheres tristis</i>	Indian Myna	6	2-9
6.	<i>Corvus monedula</i>	Jackdaw	6	30-40

**VP. 10**

Date: 06.11.2020. Start and end time: 13:32 – 15:35

**Weather:**

The air temperature around 13-12°C cloudy.

Wind speed approx. (5-6 m/s) No precipitation

***Primary species not found***

Table 141. Secondary and other species (VP 10), 06.11.2020.

<b>№</b>	<b>Latin names</b>	<b>English names</b>	<b>Amount</b>	<b>Flight altitude</b>
<b>SECONDARY SPECIES</b>				
1.	<i>Falco tinnunculus</i>	Common Kestrel	2	12-30
<b>OTHER SPECIES</b>				
1.	<i>Larus ridibundus</i>	Black-Headed Gull	3	7
2.	<i>Galerida cristata</i>	Crested lark	9	0-15
3.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	21	0-5
4.	<i>Oenanthe isabellina</i>	Isabelline wheatear	2	0-10
5.	<i>Corvus cornix</i>	Hooded Crow	5	10-15
6.	<i>Columba livia</i>	Rock Dove	12	32
7.	<i>Corvus frugilegus</i>	Eurasian Rook	23	10-12

### VP. 1

Date: 07.11.2020. Start and end time: 10:56 – 13:56

#### **Weather:**

The air temperature around 9-15°C is clear.

Wind speed approx. (4-5 m/s) No precipitation

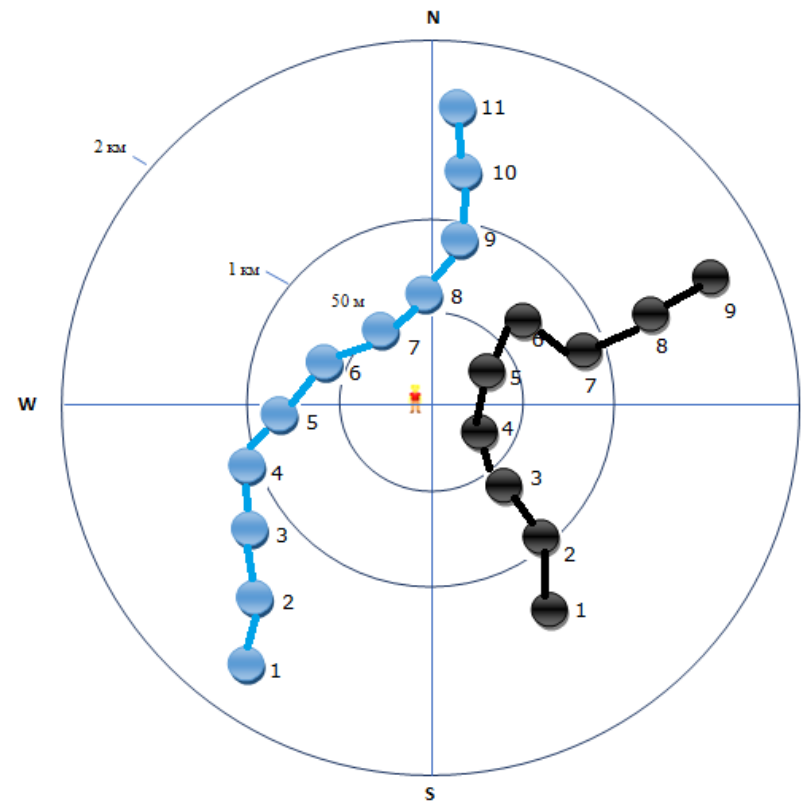


Fig. 27. Flight path (VP 1), 07.11.2020

Table 142. Target species log (VP 1), 07.11.2020



	<i>Aquila nipalensis</i>	1 110 m	2 110 m	3 115 m	4 110 m	5 115 m	6 115 m	7 115 m	8 110 m	9 110 m		
	<i>Aquila chrysaetos</i>	1 120 m	2 120 m	3 125 m	4 120 m	5 125 m	6 125 m	7 125 m	8 120 m	9 120 m	10 120 m	11 120 m

Table 143. Secondary and other species (VP 1), 07.11.2020

No	Latin names	English names	Amount	Flight altitude
<b>OTHER SPECIES</b>				
7.	<i>Corvus ruficollis</i>	Brown-necked Raven	2	0-3
8.	<i>Corvus frugilegus</i>	Eurasian Rook	16	30
9.	<i>Galerida cristata</i>	Crested lark	21	0-13
10.	<i>Columba livia</i>	Pigeon	32	15
11.	<i>Oenanthe isabellina</i>	Isabelline wheatear	3	0-10
12.	<i>Scotocerca inquieta</i>	Streaked Scrub Warbler	2	2
13.	<i>Acridotheres tristis</i>	Indian Myna	6	18
14.	<i>Turdus atrogularis</i>	Black-throated Thrush	16	15



**VP 2**

Date: 07.11.2020 Start and end time: 13:42 – 16:42

**Weather:**

The air temperature around 18-14°C is cloudy.

Wind speed approx. (4-6 m/s) No precipitation

***Primary species not found***

Table 144. Secondary and other species (VP 2), 07.11.2020

<b>№</b>	<b>Latin names</b>	<b>English names</b>	<b>Amount</b>	<b>Flight altitude</b>
<b>SECONDARY SPECIES</b>				
3.	<i>Circus cyaneus</i>	Hen (Northern) Harrier	1	10-35
4.	<i>Falco tinnunculus</i>	Common Kestrel	2	15-25
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	17	0-5
2.	<i>Oenanthe isabellina</i>	Isabelline wheatear	2	0-5
3.	<i>Hirundo rustica</i>	Barn swallow	2	5-15
4.	<i>Pterocles orientalis</i>	Black-bellied sandgrouse	3	0-15
5.	<i>Athene noctua</i>	Little Owl	1	0-5

**VP 3**

Date: 10.11.2020 Start and end time: 8:53 – 11:53

**Weather:**

The air temperature around 6-9°C sky half cloudy

Wind speed approx. (4-6 m/s) No precipitation

***Primary species not found***

Table 145. Secondary and other species (VP 3), 10.11.2020

<b>№</b>	<b>Latin names</b>	<b>English names</b>	<b>Amount</b>	<b>Flight altitude</b>
<b>SECONDARY SPECIES</b>				
3.	<i>Falco tinnunculus</i>	Common Kestrel	2	15-25
<b>OTHER SPECIES</b>				
5.	<i>Galerida cristata</i>	Crested lark	12	0-5
6.	<i>Oenanthe isabellina</i>	Isabelline wheatear	2	0-5
7.	<i>Pterocles orientalis</i>	Black-bellied sandgrouse	3	5-15
8.	<i>Athene noctua</i>	Little Owl	1	0-2
9.	<i>Corvus corax</i>	Northern Raven	25	40
10.	<i>Columba livia</i>	Rock Dove	14	35

#### VP. 4

Date: 10.11.2020 Start and end time: 12:27 – 14:27

**Weather:**

The air temperature around 10-14°C sky half cloudy.

Wind speed approx. (5-6 m/s) No precipitation

***Primary species not found***

Table 146. Secondary and other species (VP 4), 10.11.2020.

No	Latin names	English names	Amount	Flight altitude
<b>OTHER SPECIES</b>				
1.	<i>Athene noctua</i>	Little owl	2	0-10
2.	<i>Galerida cristata</i>	Crested lark	12	0-9
3.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	27	0-6
4.	<i>Oenanthe isabellina</i>	Isabelline wheatear	2	0-6
5.	<i>Acridotheres tristis</i>	Indian Myna	6	12
6.	<i>Pterocles orientalis</i>	Black-bellied sandgrouse	12	25
7.	<i>Turdus atrogularis</i>	Black-throated Thrush	15	15

### VP. 5

Date: 11.11.2020. Start and end time: 10:23 – 13:23

#### **Weather:**

The air temperature around 9-12°C partly cloudy.

Wind speed approx. (6-8 m/s) No precipitation

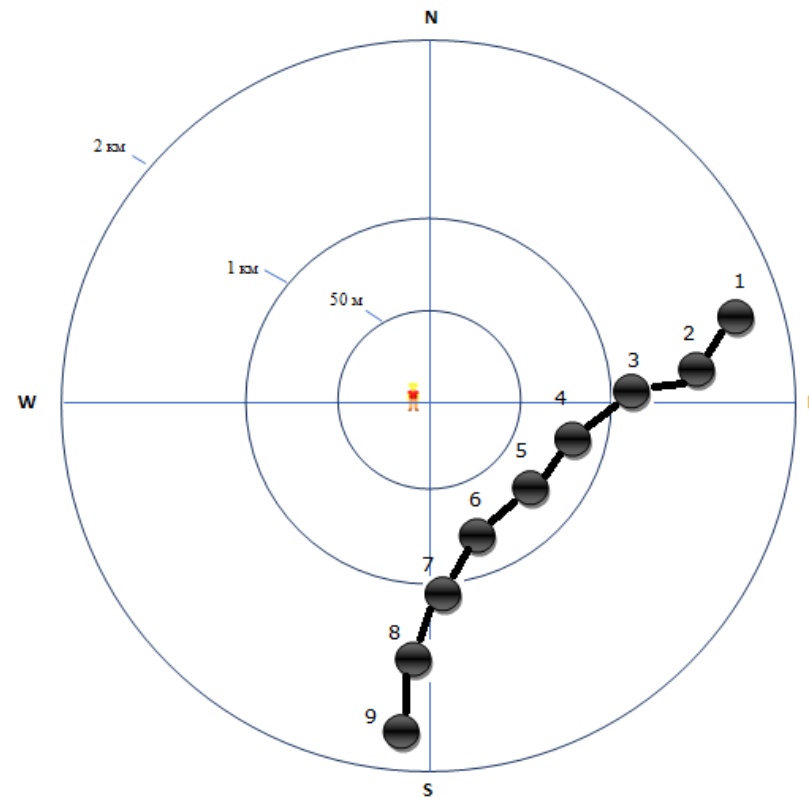


Fig.28 Flight path (VP 5), 11.11.2020

Table 147. Target species log (VP 5), 11.11.2020.

●	<i>Aquila nipalensis</i>	1 120 m	2 120 m	3 125 m	4 120 m	5 125 m	6 125 m	7 125 m	8 120 m	9 120 m
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Table 148. Secondary and other species (VP 5), 11.11.2020.

No	Latin names	English names	Amount	Flight altitude
<b>SECONDARY SPECIES</b>				
1.	<i>Circus aeruginosus</i>	Eurasian Marsh-Harrier	1	12-30
2.	<i>Buteo buteo</i>	Common Buzzard	1	20-30
3.	<i>Falco tinnunculus</i>	Common Kestrel	2	12-35
<b>OTHER SPECIES</b>				
1.	<i>Tadorna ferruginea</i>	Ruddy Shelduck	3	35
2.	<i>Galerida cristata</i>	Crested lark	15	0-15
3.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	18	0-5
4.	<i>Oenanthe isabellina</i>	Isabelline wheatear	1	0-3
5.	<i>Bubo bubo</i>	Northern Eagle Owl	1	2-4

**VP. 6**

Date: 11.11.2020. Start and end time: 13:51 – 15:55

**Weather:**

The air temperature around 13-10°C cloudy.

Wind speed approx. (5-6 m/s) No precipitation

**Primary species not found**

Table 149. Secondary and other species (VP 6), 11.11.2020.

No	Latin names	English names	Amount	Flight altitude
<b>SECONDARY SPECIES</b>				
1.	<i>Falco tinnunculus</i>	Common Kestrel	2	15-30
2.	<i>Buteo buteo</i>	Common Buzzard	1	10-25
3.	<i>Aegypius monachus</i>	Cinereous Vulture	2	120-150
<b>OTHER SPECIES</b>				
1.	<i>Alectoris chukar</i>	Chukar Partridge	6	0-3
2.	<i>Corvus monedula</i>	Jackdaw	16	8
3.	<i>Corvus frugilegus</i>	Eurasian Rook	9	10
4.	<i>Galerida cristata</i>	Crested lark	10	0-15
5.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	19	0-5
6.	<i>Oenanthe isabellina</i>	Isabelline wheatear	2	0-10
7.	<i>Acridotheres tristis</i>	Indian Myna	6	12



**VP. 7**

Date: 12.11.2020. Start and end time: 9:32 – 12:35

**Weather:**

The air temperature around 8-12°C cloudy.

Wind speed approx. (5-6 m/s) No precipitation

***Primary species not found***

Table 150. Secondary and other species (VP 7), 12.11.2020.

<b>№</b>	<b>Latin names</b>	<b>English names</b>	<b>Amount</b>	<b>Flight altitude</b>
<b>SECONDARY SPECIES</b>				
1.	<i>Falco tinnunculus</i>	Common Kestrel	2	5-30
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	6	0-15
2.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	13	0-5
3.	<i>Corvus cornix</i>	Eurasian Hooded Crow	6	20-30
4.	<i>Oenanthe isabellina</i>	Isabelline wheatear	1	0-10
5.	<i>Columba livia</i>	Rock Dove	18	35
6.	<i>Corvus frugilegus</i>	Eurasian Rook	21	10-12

**VP. 8**

Date: 12.11.2020. Start and end time: 13:26 – 15:26

**Weather:**

The air temperature around 12-11°C is clear.

Wind speed approx. (4-5 m/s) No precipitation

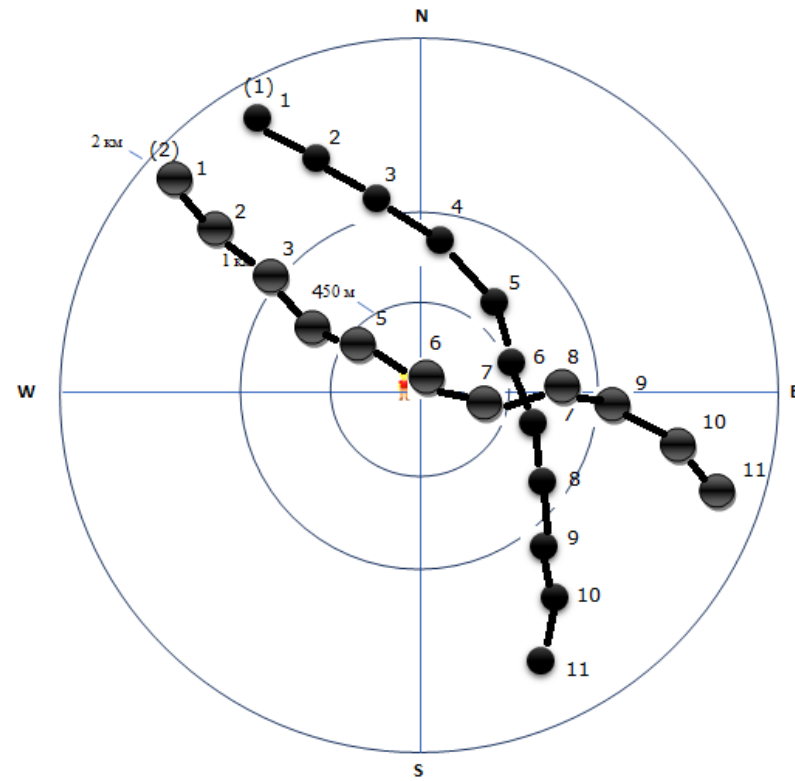


Fig. 29. Flight path (VP 8), 12.11.2020

Table 151. Target species log (VP 8), 12.11.2020



	<i>Aquila nipalensis(1)</i>	1 110 m	2 110 m	3 115 m	4 110 m	5 115 m	6 115 m	7 115 m	8 110 m	9 110 m	10 100 m	11 100 m
	<i>Aquila nipalensis(2)</i>	1 110 m	2 110 m	3 115 m	4 110 m	5 115 m	6 115 m	7 115 m	8 110 m	9 110 m	10 100 m	11 100 m

Table 152. Secondary and other species (VP 8), 12.11.2020

No	Latin names	English names	Amount	Flight altitude
<b>SECONDARY SPECIES</b>				
1.	<i>Buteo rufinus</i>	Long-legged Buzzard	2	40
<b>OTHER SPECIES</b>				
1.	<i>Corvus corone</i>	Eurasian Carrion Crow	2	0-2
2.	<i>Corvus frugilegus</i>	Eurasian Rook	12	2-6
3.	<i>Galerida cristata</i>	Crested lark	12	0-13
4.	<i>Oenanthe isabellina</i>	Isabelline wheatear	2	0-10
5.	<i>Scotocerca inquieta</i>	Streaked Scrub Warbler	3	2
6.	<i>Acridotheres tristis</i>	Indian Myna	12	18

**VP. 5**

Date: 13.11.2020. Start and end time: 9:51 – 12:55

**Weather:**

The air temperature around 5-9°C cloudy.

Wind speed approx. (5-6 m/s) No precipitation

**Primary species not found**

Table 153. Secondary and other species (VP 5), 13.11.2020.

No	Latin names	English names	Amount	Flight altitude
<b>SECONDARY SPECIES</b>				
1.	<i>Falco tinnunculus</i>	Common Kestrel	2	15-30
2.	<i>Buteo buteo</i>	Common Buzzard	1	10-25
3.	<i>Aegypius monachus</i>	Cinereous Vulture	2	120-150
<b>OTHER SPECIES</b>				
1.	<i>Alectoris chukar</i>	Chukar Partridge	6	0-3
2.	<i>Corvus monedula</i>	Jackdaw	16	8
3.	<i>Corvus frugilegus</i>	Eurasian Rook	9	10
4.	<i>Galerida cristata</i>	Crested lark	10	0-15
5.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	19	0-5
6.	<i>Oenanthe isabellina</i>	Isabelline wheatear	2	0-10
7.	<i>Acridotheres tristis</i>	Indian Myna	6	12

**VP. 6**

Date: 13.11.2020. Start and end time: 13:32 – 15:35

**Weather:**

The air temperature around 12-10°C cloudy.

Wind speed approx. (5-6 m/s) No precipitation

***Primary species not found***

Table 154. Secondary and other species (VP 6), 13.11.2020.

<b>№</b>	<b>Latin names</b>	<b>English names</b>	<b>Amount</b>	<b>Flight altitude</b>
<b>SECONDARY SPECIES</b>				
1.	<i>Falco tinnunculus</i>	Common Kestrel	2	5-30
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	6	0-15
2.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	13	0-5
3.	<i>Corvus cornix</i>	Eurasian Hooded Crow	6	20-30
4.	<i>Oenanthe isabellina</i>	Isabelline wheatear	1	0-10
5.	<i>Lanius exubitor</i>	Great (Gray) Shrike	2	3-10
6.	<i>Columba livia</i>	Rock Dove	18	35

**VP. 6**

Date: 14.11.2020. Start and end time: 9:35 – 12:45

**Weather:**

The air temperature around 2-9°C cloudy.

Wind speed approx. (5-6 m/s) No precipitation

***Primary species not found***

Table 155. Secondary and other species (VP 6), 14.11.2020.

<b>№</b>	<b>Latin names</b>	<b>English names</b>	<b>Amount</b>	<b>Flight altitude</b>
<b>SECONDARY SPECIES</b>				
1.	<i>Falco tinnunculus</i>	Common Kestrel	2	5-30
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	6	0-15
2.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	13	0-5
3.	<i>Corvus cornix</i>	Eurasian Hooded Crow	6	20-30
4.	<i>Oenanthe isabellina</i>	Isabelline wheatear	1	0-10
5.	<i>Columba livia</i>	Rock Dove	18	35



**VP. 8**

Date: 14.11.2020. Start and end time: 13:32 – 15:35

**Weather:**

The air temperature around 9-5°C cloudy.

Wind speed approx. (6-7 m/s) No precipitation

***Primary species not found***

Table 156. Secondary and other species (VP 8), 14.11.2020.

<b>№</b>	<b>Latin names</b>	<b>English names</b>	<b>Amount</b>	<b>Flight altitude</b>
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	3	0-15
2.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	23	0-5
3.	<i>Corvus cornix</i>	Eurasian Hooded Crow	10	20-30
4.	<i>Columba livia</i>	Rock Dove	5	35

**VP. 5**

Date: 15.11.2020. Start and end time: 9:32 – 12:35

**Weather:**

The air temperature around 3-5°C cloudy.

Wind speed approx. (5-6 m/s) No precipitation

***Primary species not found***

Table 157. Secondary and other species (VP 5), 15.11.2020.

<b>№</b>	<b>Latin names</b>	<b>English names</b>	<b>Amount</b>	<b>Flight altitude</b>
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	3	0-15
2.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	23	0-5
3.	<i>Corvus cornix</i>	Eurasian Hooded Crow	10	20-30

### VP. 8

Date: 15.11.2020. Start and end time: 13:26 – 15:26

#### **Weather:**

The air temperature around 5-4°C partly cloudy,

Wind speed approx. (4-5 m/s) No precipitation

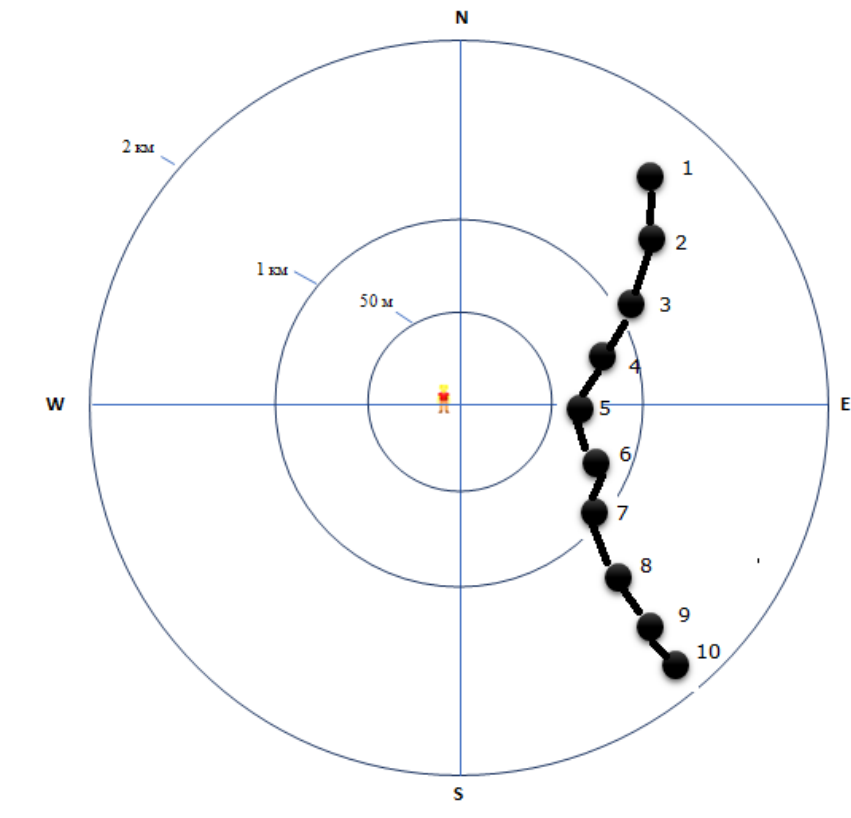


Fig. 30. Flight path (VP 8), 15.11.2020

Table 158. Target species log (VP 8), 15.11.2020



	<i>Aquila nipalensis</i>	1 110 m	2 110 m	3 115 m	4 110 m	5 115 m	6 115 m	7 115 m	8 110 m	9 110 m	10 100 m
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Table 159. Secondary and other species (VP 8), 15.11.2020

No	Latin names	English names	Amount	Flight altitude
<b>SECONDARY SPECIES</b>				
1	<i>Buteo rufinus</i>	Long-legged Buzzard	2	40
<b>OTHER SPECIES</b>				
1.	<i>Corvus frugilegus</i>	Eurasian Rook	12	2-6
2.	<i>Galerida cristata</i>	Crested lark	12	0-13
3.	<i>Oenanthe isabellina</i>	Isabelline wheatear	2	0-10
4.	<i>Acridotheres tristis</i>	Indian Myna	2	18

ATTACHMENTS

All the pictures are taken during VP surveys on the Dzhankeldy WF project territory.

	
Kestrel ( <i>Falco tinnunculus</i> )	Long-legged Buzzard ( <i>Buteo rufinus</i> )

	
<p>Common Buzzard (<i>Buteo buteo</i>)</p>	<p>Black Kite and Long-legged Buzzard (<i>Buteo rufinus</i>) VP 4, 12.09.2020</p>
	
<p>Migrating raptors: Common Buzzard (<i>Buteo buteo</i>), Black Kite (<i>Milvus migrans</i>) and Long-legged Buzzard (<i>Buteo rufinus</i>)</p>	





The old nest of a large bird of prey (40°51'17.00"C, 63°24'24.59"B)





A hollow in a rock, suitable for a nest of a large bird of prey. Possibly was used for this purpose



Lesser Whitethroat (*Sylvia curruca*)





Trapelus sanguinolentus



Trapelus sanguinolentus (female)



Trapelus sanguinolentus (male)



Trapelus sanguinolentus (male)



Argiope lobata



Domestic camel



Chukar Partridge (*Alectoris chukar*)



Pinacate beetle





Kestrel (*Falco tinnunculus*)



Long-legged Buzzard (*Buteo rufinus*)



Long-legged Buzzard (*Buteo rufinus*)



Cinereous Vulture (*Aegypius monachus*)



Desert Lark (*Ammomanes deserti*)



## WINTER QUARTERLY BIRD MONITORING REPORT

<b>Report Title</b>	WINTER QUARTERLY BIRD MONITORING REPORT
<b>Scope</b>	BIRDS VP
<b>Areas Covered</b>	DZHANKELDY WF
<b>Seasons Covered</b>	WINTER 2021
<b>Notes</b>	

# WINTER QUARTERLY BIRD MONITORING REPORT

Dzankeldy Wind Farm Site

Client: 5 Capitals

This report is prepared by: Juru Energy

Date: \_\_\_\_\_

CHECKED BY \_\_\_\_\_

Date: \_\_\_\_\_

APPROVED BY \_\_\_\_\_

Date: \_\_\_\_\_

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## INTRODUCTION

In the framework of the Dzankeldy Wind Farm Project, bird survey was conducted in the project area in Winter 2020/2021. The purpose of ornithological monitoring was to conduct systematic field studies at specific vantage points to assess bird species composition that occur within the project's area of influence, its abundance and territorial distribution, the nature of the stay, and daily activity of birds during spring migration and the beginning of nesting and also to identify birds that are of conservation interest under IUCN and Uzbekistan Redlist.

This report presents the primary materials of field studies in this territory from November 16, 2020 to March 7, 2021.

It was planned to conduct regular bird monitoring to evaluate the risks from the wind farm for birds in the project area.

This report is a statement of work made by Juru Enery` local senior ornitologists Alisher Atakhodjaev and Yakub Ametov, and ornitologists Ramzjon Sohibnazarov and Asilbek Sokhibnazarov. This report was reviewed by the international expert Caleb Gordon.

## SURVEY METHODS

The research methods were based on international best practice recommendations, in particular those set forth in the Scottish Natural Heritage: recommended bird survey methods to justify the assessment of the impact of surface wind farms<sup>1</sup>. The range of detection and identification of large species as golden eagles was up to 2 km, and small passerines 50 m. Directions and flight altitude were taken into account.

The observations were carried out at 10 Vantage points (Table 2). The number and location of Vantage points for stationary observation in the project area have been agreed with the company employees and international expert. The points are located so as to cover the territory as completely as possible (Fig.1).

The duration of one bird count at each Vantage point (VP) was 3 hours. The total duration of all the observations in the territory was **360 hours** (Table 3).

During observations weather conditions such as wind speed and direction, and air temperature were recorded. Wind speed and air temperature were measured using an anemometer. Whenever possible, the number of species, approximate flight altitude, speed, and flight direction of each target species were recorded every 15 seconds.

During the observations, photographing and short video shooting of birds were carried out, which is used to confirm the correct determination of species and obtain additional data on the number of individuals. Following equipment was used: binoculars (Viking) with 10x zoom; cameras (Nikon P1000, Canon 550D) with 24x and 50x zoom, with focal length of 550 mm and 1200 mm, respectively; field telescope (Viking).

### Target and Secondary Species

Defining a project-specific subset of sensitive, or “target” species provides a basis for designing a project-specific set of biological monitoring and mitigation programs that is optimally suited for the key wildlife risk issues associated with

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<sup>1</sup> Scottish Natural Heritage (SNH) 2017, Recommended bird survey methods to inform impact assessment of onshore wind farms. March 2017 version 2, Scotland, UK.

a wind project. It is important to note that any bird or bat species, if impacted severely enough, can become a significant risk concern for a wind energy facility. For this reason, any potentially impacted species has a level of sensitivity, warranting a taxonomically comprehensive approach to impact monitoring and adaptive management and mitigation during the operational phase.

Nonetheless, some species are more sensitive than others from a wind farm risk management standpoint. This is generally because they are classified as highly protected species by national and/or international authorities, because they are known or suspected to be highly susceptible to wind farm impacts (especially collision with rotors), or both. In addition, some species may be regarded as sensitive due to their cultural or iconic significance, or based on ecological/demographic factors (e.g. slow reproductive rate, naturally low population density).

In the present section, these different criteria have been integrated and considered together to produce a preliminary list of suggested target species for the DWEP, to be used to prioritize the Project's biological monitoring and mitigation programs, including the biological baseline studies. Table 1 below presents a suggested list of sensitive, or "target" bird species for the DWEP, subdivided into two tiers, reflecting different priority levels (tier 1 is higher sensitivity, higher priority than tier 2).

#### Selection and classification of target/priority species

The objective of identifying a list of Project-specific target/priority species is to focus the Project's biodiversity monitoring and management programs on key, potentially-affected species, as such represent the most important biodiversity risk issues for the Project.

Characteristics, and specific elements of the list include the following:

- includes all raptor species that are either known to occur, or likely to occur within the Project area
- includes all nationally- or internationally-listed species that are either known to occur, or likely to occur within the Project area



- includes selected additional species, especially other large-bodied birds, that could represent significant risk issues if significant impact occurs
- the list is intended to be comprehensive of all potentially affected species that could represent significant risk issues for the Project, potentially requiring management actions, if serious impacts are detected. Regarding this point, we note that any bird or bat species could become a risk issue for the project requiring management actions if serious enough impacts are detected during Project operations. For this reason, the monitoring efforts are inclusive of all bird and bat species observed, and such is expected to be the case for operations-phase impact monitoring and management programs.
- the list is intended to be adaptable, and subject to revision in the future under the auspice of adaptive management, for example if a species that was not initially expected to occur with the Project area is detected on-site, or if impacts to specific species differ substantially from initial predictions (the latter could, in principle, result in an upgrade or downgrade in the Project priority level of a species, for example, under the auspice of adaptive management)

The process for generating the list was as follows:

- An initial draft list was generated by the international wind-wildlife specialist on the basis of the criteria described below, based on information from the following sources: IUCN distribution maps, eBird data on bird distributions, species- and country-specific information in the BirdLife International Data Zone, initial bird monitoring results from the Project area, technical literature and prior experience with studying and managing wildlife impacts at wind energy facilities, IFC policy, guidelines, and typical practice for the management of biodiversity impacts at development projects, and specifically the management of wildlife impacts at wind energy facilities.
- The list was revised with input from regional expert ornithologists
- The list is periodically updated based on ongoing monitoring data being conducted at the facility (e.g. inclusion of newly documented species)

The criteria for classifying species initially as tier 1(primary) or tier 2 (secondary) target species are multiple and varied, and initial classification was based on synthesizing and balancing all of the factors listed below. Note that these classifications are subject to revision on an ongoing basis under the auspice of adaptive management, in light of ongoing monitoring results:

- IUCN listed status
- Uzbek redlist status
- Other potential conservation sensitivity factors (i.e. societal values)
- known susceptibility of the species, or similar species, to wind turbine collisions
- where specific susceptibility of species, or very closely related species is not known, predicted collision susceptibility as a function of flight morphology, ecology, and behaviour
- demographic and ecological factors that contribute to relatively high sensitivity to anthropogenic mortality (e.g. slow reproduction rate, late age of first reproduction, low population density)
- expected or known abundance of the species within the Project site (i.e. species expected to occur very rarely at the Project site are considered lower risk than are species expected to have higher abundance at the site, all other factors being equal)

Table 1 below presents a suggested list of sensitive, or “target” bird species for the Dzankeldy project, subdivided into two tiers, reflecting different priority levels (tier 1 is higher sensitivity, higher priority than tier 2).

Table 1 Target and secondary species

Latin name	English name	IUCN status	Uzbek status	Notes on Likely Occurrence/Risk <sup>2</sup>
<b>Tier 1 Target Species (top priority)</b>				
<i>Aquila nipalensis</i>	Steppe Eagle	EN	VU	Likely present, though uncommon at site based on nearby, recent eBird records in similar habitat
<i>Neophron percnopterus</i>	Egyptian Vulture	EN	VU	Nested in region. Observed in 2018 in project area (Ten, Soldatov 2018), present at DWEP site, confirmed with four separate observations of single individuals during May 2020 VP surveys at three different VP
<i>Falco cherrug</i>	Saker Falcon	EN	NT	Nested in project area, observed in 2018 (Ten, Soldatov 2018)
<i>Aquila chrysaetos</i>	Golden Eagle	LC	VU	Common resident and nests in project area (Ten, Soldatov 2018)
<i>Aquila heliaca</i>	Imperial Eagle	VU	VU	Migrant
<i>Chlamydotis macqueenii</i>	Asian Houbara	VU	VU	Common nesting and migrant species (Burnside)
<i>Vanellus gregarius</i>	Sociable Lapwing	CR	VU	possible rarity, recent eBird photo record in desert habitat ca 60km SE suggests possibility of occurrence. Extremely sensitive species with CR status
<b>Tier 2 Target Species (second priority)</b>				
<i>Aegypius monachus</i>	Cinereous Vulture	NT	VU	Resident in region
<i>Gyps fulvus</i>	Eurasian Griffon	NT	VU	Resident in region

<sup>2</sup> Patterns of regional and seasonal abundance determined from analysis of eBird data (ebird.org) accessed 10 June, 2020

<i>Circaetus gallicus</i>	Short-toed Snake-Eagle	LC	VU	Likely present at site based on recent, nearby eBird records, though uncommon in region
<i>Hieraaetus pennatus</i>	Booted Eagle	LC	VU	Very rare in region according to eBird records. Two individuals documented at DWEP during May 2020 during a VP Survey (VP 4)
<i>Circus aeruginosus</i>	Eurasian Marsh-Harrier	LC	NA	Fairly common in region, several individuals documented at DWEP during May, 2020 VP surveys
<i>Circus cyaneus</i>	Hen Harrier	LC	NA	Fairly common in region
<i>Circus macrourus</i>	Pallid Harrier	NT	NT	Fairly common in region
<i>Circus pygargus</i>	Montagu's Harrier	LC	NA	Uncommon in region
<i>Accipiter badius</i>	Shikra	LC	NA	Uncommon in region
<i>Accipiter nisus</i>	Eurasian Sparrowhawk	LC	NA	Uncommon in region
<i>Buteo rufinus</i>	Long-legged Buzzard	LC	NA	Fairly common in region, documented at DWEP site in May, 2020
<i>Buteo buteo</i>	Common Buzzard	LC	NA	Fairly common in region
<i>Milvus migrans</i>	Black Kite	LC	NA	Uncommon in region
<i>Anthropoides virgo</i>	Demoiselle Crane	LC	NA	Uncommon in region
<i>Grus grus</i>	Common Crane	LC	NA	Uncommon in region
<i>Falco tinnunculus</i>	Common Kestrel	LC	NA	Common in region, documented at DWEP site in May, 2020

## **TERRITORY DESCRIPTION**

The project territory is located in the Southwestern part of Uzbekistan in the Peshku district of Bukhara region. The landscape of the project area is steppe and arid. Accordingly, steppe and desert species of animals and plants are common here. But during the migration period, representatives of other biotopes can also be met there.

The village of Dzhankeldy is located near the project territory. About 90 families live in the village, there is one school and one preschool (kindergarten). The local population is mainly ethnic Kazakhs - they are engaged in breeding small cattle, camels and horse breeding. Due to lack of water, they practically do not engage in agriculture. In most cases, young people leave village to work in the cities of Bukhara and Navoi. Some houses are abandoned. Geological works are being carried out near the village.

The project area includes mountains of Beltau, which are considered as the spurs of the Kul'dzhuktau mountains, - a mountain island range in the Central part of the Kyzylkum desert (length about 100 km, width up to 15 km, height up to 785 m). The southern slopes of Kul'dzhuktau Mountains are slanting, dissected by dry canyons; the Northern slopes are rocky and steep. It is composed mainly of crystalline shales and limestones; along the margin — Jurassic, Cretaceous and Paleogene sedimentary strata, on the surface of which there are sometimes sifted sands.

## VANTAGE POINTS

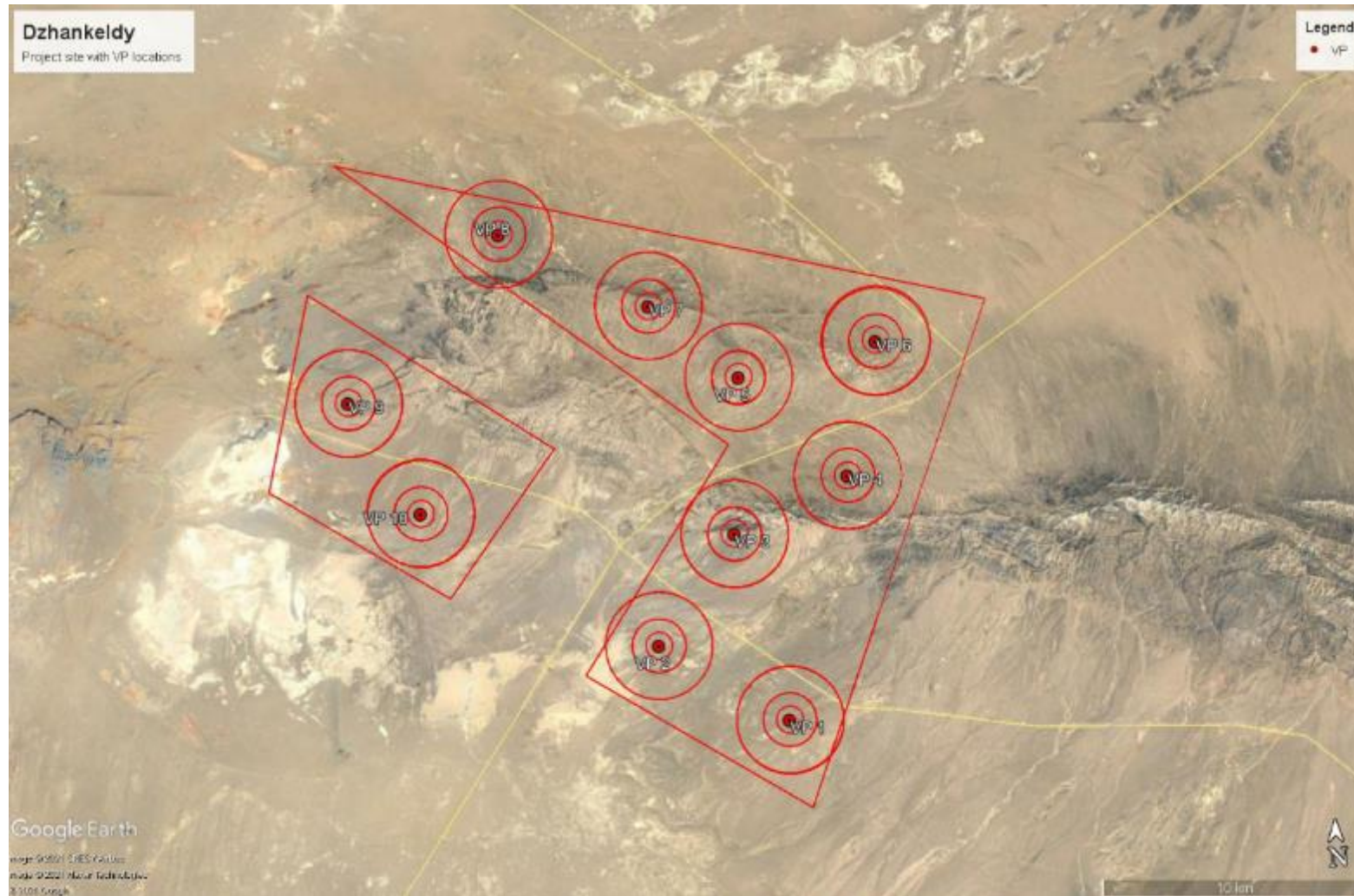


Fig. 1 Vantage Points locations



The number of Vantage Points was agreed with the Client. Points are located so as to cover the project territory as fully as possible. The coordinates of the Vantage Points of Dzankeldy are shown in Table 2. The radius of a single observation point is 2 km. Time spent at one point is 3 hours' average.

Table 2 Coordinates of the VPs of Dzankeldy project territory

<b>Vantage Points</b>	<b>Coordinates</b>	
VP 1	40.784300°	63.404295°
VP 2	40.811066°	63.347802°
VP 3	40.847481°	63.383422°
VP 4	40.865322°	63.434670°
VP 5	40.899852°	63.388194°
VP 6	40.909887°	63.449732°
VP 7	40.925033°	63.349676°
VP 8	40.951100°	63.284526°
VP 9	40.896820°	63.214673°
VP 10	40.858649°	63.244772°

Table 3 Total Number of VP survey hours

	<b>VP 1</b>	<b>VP 2</b>	<b>VP 3</b>	<b>VP 4</b>	<b>VP 5</b>	<b>VP 6</b>	<b>VP 7</b>	<b>VP 8</b>	<b>VP 9</b>	<b>VP 10</b>	
<b><i>November hr</i></b>	3	3	3	3	3	3	3	3	3	3	
<b><i>December hr</i></b>	9	9	9	9	9	9	9	9	9	9	
<b><i>January hr</i></b>	9	9	9	12	9	6	9	9	9	9	
<b><i>February hr</i></b>	12	12	12	12	9	9	9	9	12	12	
<b><i>March hr</i></b>	3	3	3	3	6	6	6	6	3	3	
<b><i>accounts for Winter</i></b>	36	36	36	39	36	33	36	36	36	36	<b>360</b>

360 total hours of VP survey effort were conducted at the 10 VP survey points in the project area during the reporting period (Table 3), which corresponds to the Winter season. Each of the 10 points received at least 36 hours of VP survey effort during the Winter season. This is a strong level of effort, and will provide a strong source of data for a robust seasonal collision risk modelling effort, and overall interpretation of winter season collision risk for target bird species.

## BIRD OBSERVATIONS RESULTS

Among birds registered during bird survey in from November 15, 2020 – March 7, 2021 (Tables 4-8), following bird species belonging to top priority target species were found in the project area: Steppe Eagle (*Aquila nipalensis*), Imperial Eagle (*Aquila heliaca*), Golden Eagle (*Aquila chrysaetos*).

Among the secondary species, following bird species were found in the project area: Cinereous Vulture (*Aegypius monachus*), Hen Harrier (*Circus cyaneus*), Long-legged Buzzard (*Buteo rufinus*), Common Buzzard (*Buteo buteo*), Common Kestrel (*Falco tinnunculus*).

Table 4 Results of bird observations in November, 2020

SPECIES			VANTAGE POINTS NUMBER OF INDIVIDUALS											IUCN status	Uzb Red Book status	Natur e of stay
№	Latin	English	VP 1	V P 2	VP 3	VP 4	VP 5	VP 6	VP 7	VP 8	VP 9	VP 10	Total			
TARGET SPECIES																
1.	<i>Aquila nipalensis</i>	Steppe Eagle							1	1			2	EN	2 (VU:D)	NMW
2.	<i>Neophron percnopterus</i>	Egyptian Vulture												EN	2 (VU:R)	R
3.	<i>Falco cherrug</i>	Saker Falcon												EN	2 (VU:D)	NMS
4.	<i>Aquila chrysaetos</i>	Golden Eagle												LC	2 (VU:D)	NMW
5.	<i>Aquila heliaca</i>	Imperial Eagle												VU	2 (VU:D)	NM
6.	<i>Chlamydotis macqueenii</i>	Asian Houbara												VU	2 (VU:R)	M
7.	<i>Vanellus gregarius</i>	Sociable Lapwing												CR	2 (VU:R)	M
Total number of individuals of target species in November													2			
SECONDARY SPECIES																
1.	<i>Accipiter badius</i>	Shikra												LC	not listed	NM
2.	<i>Accipiter nisus</i>	Eurasian												LC	not listed	NMW

		Sparrowhawk														
3.	<i>Aegypius monachus</i>	Cinereous Vulture												NT	3 (NT)	R
4.	<i>Anthropoides virgo</i>	Demoiselle Crane												LC	not listed	M
5.	<i>Buteo buteo</i>	Common Buzzard			1								1	LC	not listed	MW
6.	<i>Buteo rufinus</i>	Long-legged Buzzard												LC	not listed	NMW
7.	<i>Circaetus gallicus</i>	Short-toed Snake- Eagle												LC	2 (VU:D)	NM
8.	<i>Circus aeruginosus</i>	Eurasian Marsh-Harrier												LC	not listed	NMW
9.	<i>Circus cyaneus</i>	Hen Harrier												LC	not listed	MW
10.	<i>Circus macrourus</i>	Pallid Harrier												NT	3 (NT)	MS
11.	<i>Circus pygargus</i>	Montagu's Harrier												LC	not listed	NM
12.	<i>Falco tinnunculus</i>	Common Kestrel		1	2	2				1			6	LC	not listed	NMW
13.	<i>Grus grus</i>	Common Crane												LC	not listed	MW
14.	<i>Gyps fulvus</i>	Eurasian Griffon												NT	2 (VU:D)	R
15.	<i>Hieraaetus pennatus</i>	Booted Eagle												LC	2 (VU:D)	NM
16.	<i>Milvus migrans</i>	Black Kite												LC	not listed	NMW
Total number of individuals of secondary species in November													7			
OTHER SPECIES OF BIRDS																
	<i>Athene noctua</i>	Little Owl						1					1	LC	not listed	R
2.	<i>Galerida cristata</i>	Crested lark	6	9	5	9	4	3	3	4	9	1	53	LC	not listed	R
3.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	12	6	15	12		32	13	12		2	104	LC	not listed	NMW
4.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	1		1		1	2		1	2	3	11	LC	not listed	NM
5.	<i>Oenanthe finschii</i>	Black-necked Wheatear												LC	not listed	RMW
6.	<i>Corvus cornix</i>	Hooded Crow		6			12	6	6	20	2	3	55	LC	not listed	MW
7.	<i>Corvus corax</i>	Northern Raven					1				12		13	LC	not listed	R
8.	<i>Corvus frugilegus</i>	Eurasian Rook						3	12				15	LC	not listed	RMW

9.	<i>Columba livia</i>	Rock Dove		5	6					5		16	LC	not listed	<b>R</b>
10.	<i>Pterocles orientalis</i>	Black-bellied sandgrouse			5							5	LC	not listed	<b>NMW</b>
11.	<i>Sitta tephronota</i>	Greater Rock Nuthatch				2						2	LC	not listed	<b>R</b>
12.	<i>Acridotheres tristis</i>	Indian Myna			3		3					6	LC	not listed	<b>NMW</b>
13.	<i>Turdus atrogularis</i>	Black-throated Thrush				3						3	LC	not listed	<b>MW</b>
14.	<i>Melanocorypha leucoptera</i>	White-winged Lark	18			15						33	LC	not listed	<b>?</b>
Total number of individuals of other species in November												<b>317</b>			
Total number of individuals in November												<b>326</b>			

\*R - (residens) settled, W - (wintering) wintering, M - (migrant) migratory, N - nesting species, S – summering

Table 5 Results of bird observations in December, 2020

SPECIES			VANTAGE POINTS NUMBER OF INDIVIDUALS											IUCN status	Uzb Red Book status	Natur e of stay
№	Latin	English	VP 1	VP 2	VP 3	VP 4	VP 5	VP 6	VP 7	VP 8	VP 9	VP 10	Total			
TARGET SPECIES																
	<i>Aquila nipalensis</i>	Steppe Eagle	1				1	1	1				4	EN	2 (VU:D)	NMW
2.	<i>Neophron percnopterus</i>	Egyptian Vulture												EN	2 (VU:R)	R
3.	<i>Falco cherrug</i>	Saker Falcon												EN	2 (VU:D)	NMS
4.	<i>Aquila chrysaetos</i>	Golden Eagle												LC	2 (VU:D)	NMW
5.	<i>Aquila heliaca</i>	Imperial Eagle			1								1	VU	2 (VU:D)	NM
6.	<i>Chlamydotis macqueenii</i>	Asian Houbara												VU	2 (VU:R)	M
7.	<i>Vanellus gregarius</i>	Sociable Lapwing												CR	2 (VU:R)	M
Total number of individuals of target species in December													5			
SECONDARY SPECIES																
	<i>Accipiter badius</i>	Shikra												LC	not listed	NM
2.	<i>Accipiter nisus</i>	Eurasian Sparrowhawk												LC	not listed	NMW
3.	<i>Aegypius monachus</i>	Cinereous Vulture		1		1							2	NT	3 (NT)	R
4.	<i>Anthropoides virgo</i>	Demoiselle Crane												LC	not listed	M
5.	<i>Buteo buteo</i>	Common Buzzard												LC	not listed	MW
6.	<i>Buteo rufinus</i>	Long-legged Buzzard												LC	not listed	NMW
7.	<i>Circaetus gallicus</i>	Short-toed Snake- Eagle												LC	2 (VU:D)	NM
8.	<i>Circus aeruginosus</i>	Eurasian Marsh-Harrier												LC	not listed	NMW
9.	<i>Circus cyaneus</i>	Hen Harrier		2		1			1	1			5	LC	not listed	MW
10.	<i>Circus macrourus</i>	Pallid Harrier												NT	3 (NT)	MS



11.	<i>Circus pygargus</i>	Montagu's Harrier												LC	not listed	NM
12.	<i>Falco tinnunculus</i>	Common Kestrel	1	1	2				1	1	1		7	LC	<i>not listed</i>	NMW
13.	<i>Grus grus</i>	Common Crane												LC	<i>not listed</i>	MW
14.	<i>Gyps fulvus</i>	Eurasian Griffon												NT	2 (VU:D)	R
15.	<i>Hieraaetus pennatus</i>	Booted Eagle												LC	2 (VU:D)	NM
16.	<i>Milvus migrans</i>	Black Kite												LC	<i>not listed</i>	NMW
Total number of individuals of secondary species in December													14			
OTHER SPECIES OF BIRDS																
	<i>Athene noctua</i>	Little Owl	1				1						2	LC	not listed	R
2.	<i>Galerida cristata</i>	Crested lark	15	10	19	14	15	21	18	16	16	11	155	LC	not listed	R
3.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	21	12	25	12	6	8	23	16	16	8	147	LC	not listed	NMW
4.	<i>Melanocorypha leucoptera</i>	White-winged Lark			16		80	18			376	33	523	LC	not listed	MW
5.	<i>Oenanthe isabellina</i>	Isabelline Wheatear		1	2	2	2	3	2	1	24	2	39	LC	not listed	NM
6.	<i>Corvus cornix</i>	Hooded Crow	6	5	20	30	14	5	19	21	6	6	132	LC	not listed	MW
7.	<i>Corvus corax</i>	Northern Raven	12	9	9	1		12		9	1	1	54	LC	not listed	R
8.	<i>Corvus frugilegus</i>	Eurasian Rook	3	6			11	6					26	LC	not listed	RMW
9.	<i>Columba livia</i>	Rock Dove	8	8	5			5	4	5			35	LC	not listed	R
10.	<i>Pterocles orientalis</i>	Black-bellied sandgrouse		3						4			7	LC	not listed	NMW
11.	<i>Sitta tephronota</i>	Greater Rock Nuthatch			4									LC	not listed	R
12.	<i>Acridotheres tristis</i>	Indian Myna		2						2	3		7	LC	not listed	NMW
13.	<i>Lanius excubitor</i>	Great (Gray) Shrik												LC	not listed	MW
14.	<i>Turdus atrogularis</i>	Black-throated Thrush			2						2		4	LC	not listed	MW
Total number of individuals of other species in December													1131			
Total number of individuals in December													1150			

\*R - (residents) settled, W - (wintering) wintering, M - (migrant) migratory, N - nesting species, S – summering

Table 6 Results of bird observations in January, 2021

SPECIES			VANTAGE POINTS NUMBER OF INDIVIDUALS											IUCN status	Uzb Red Book status	Nature of stay
№	Latin	English	VP 1	VP 2	VP 3	VP 4	VP 5	VP 6	VP 7	VP 8	VP 9	VP 10	Total			
TARGET SPECIES																
	<i>Aquila nipalensis</i>	Steppe Eagle		1					2	1			4	EN	2 (VU:D)	NMW
2.	<i>Neophron percnopterus</i>	Egyptian Vulture												EN	2 (VU:R)	R
3.	<i>Falco cherrug</i>	Saker Falcon												EN	2 (VU:D)	NMS
4.	<i>Aquila chrysaetos</i>	Golden Eagle			1								1	LC	2 (VU:D)	NMW
5.	<i>Aquila heliaca</i>	Imperial Eagle												VU	2 (VU:D)	NM
6.	<i>Chlamydotis macqueenii</i>	Asian Houbara												VU	2 (VU:R)	M
7.	<i>Vanellus gregarius</i>	Sociable Lapwing												CR	2 (VU:R)	M
Total number of individuals of target species in January													5			
SECONDARY SPECIES																
	<i>Accipiter badius</i>	Shikra												LC	not listed	NM
2.	<i>Accipiter nisus</i>	Eurasian Sparrowhawk												LC	not listed	NMW
3.	<i>Aegypius monachus</i>	Cinereous Vulture						1					1	NT	3 (NT)	R
4.	<i>Anthropoides virgo</i>	Demoiselle Crane												LC	not listed	M

5.	<i>Buteo buteo</i>	Common Buzzard												LC	<i>not listed</i>	<b>MW</b>
6.	<i>Buteo rufinus</i>	Long-legged Buzzard			1					1			2	LC	<i>not listed</i>	<b>NMW</b>
7.	<i>Circaetus gallicus</i>	Short-toed Snake- Eagle												LC	2 (VU:D)	<b>NM</b>
8.	<i>Circus aeruginosus</i>	Eurasian Marsh- Harrier												LC	<i>not listed</i>	<b>NMW</b>
9.	<i>Circus cyaneus</i>	Hen Harrier			1					1		1	3	LC	<i>not listed</i>	<b>MW</b>
10	<i>Circus macrourus</i>	Pallid Harrier												NT	3 (NT)	<b>MS</b>
11	<i>Circus pygargus</i>	Montagu's Harrier												LC	not listed	<b>NM</b>
12	<i>Falco tinnunculus</i>	Common Kestrel		1	2		1	1	1	2	1		9	LC	<i>not listed</i>	<b>NMW</b>
13	<i>Grus grus</i>	Common Crane												LC	<i>not listed</i>	<b>MW</b>
14	<i>Gyps fulvus</i>	Eurasian Griffon												NT	2 (VU:D)	<b>R</b>
15	<i>Hieraaetus pennatus</i>	Booted Eagle												LC	2 (VU:D)	<b>NM</b>
16	<i>Milvus migrans</i>	Black Kite												LC	<i>not listed</i>	<b>NMW</b>
Total number of individuals of secondary species in January													17			
OTHER SPECIES OF BIRDS																
	<i>Haliaeetus albicilla</i>	White-tailed Sea-eagle				1			1				2	LC	2 (VU:R)	<b>NMW</b>
2.	<i>Athene noctua</i>	Little Owl	1		1				1	1	1	1	6	LC	not listed	<b>R</b>
3.	<i>Alectoris chukar</i>	Chukkar partridge			6							5	11	LC	not listed	<b>R</b>
4.	<i>Galerida cristata</i>	Crested lark	11	9	16	16	10	7	14	18	15	13	129	LC	not listed	<b>R</b>

5.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	12	24	9	14	3	10	13	17		6	108	LC	not listed	<b>NMW</b>
6.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	2	2	3	1	2	4	3	6	5	3	31	LC	not listed	<b>NM</b>
7.	<i>Melanocorypha leucoptera</i>	White-winged Lark	12	15				25			28	5	85	LC	not listed	<b>MW</b>
8.	<i>Oenanthe finschii</i>	Black-necked Wheatear	1			1	2	2	2		2		10	LC	not listed	<b>RMW</b>
9.	<i>Corvus cornix</i>	Hooded Crow	4	10	26	18	11		14	7	6	19	115	LC	not listed	<b>MW</b>
10.	<i>Corvus corax</i>	Northern Raven	6			9	1			12	9	1	38	LC	not listed	<b>R</b>
11.	<i>Corvus frugilegus</i>	Eurasian Rook		4					11				15	LC	not listed	<b>RMW</b>
12.	<i>Columba livia</i>	Rock Dove	5		3	8				5			21	LC	not listed	<b>R</b>
13.	<i>Sitta tephronota</i>	Greater Rock Nuthatch			1								1	LC	not listed	<b>R</b>
14.	<i>Acridotheres tristis</i>	Indian Myna				2						5	7	LC	not listed	<b>NMW</b>
Total number of individuals of other species in January													579			
Total number of individuals in January													601			

\*R - (residens) settled, W - (wintering) wintering, M - (migrant) migratory, N - nesting species, S - summering

Table 7 Results of bird observations in February, 2021

SPECIES			VANTAGE POINTS NUMBER OF INDIVIDUALS											IUCN status	Uzb Red Book status	Nature of stay
№	Latin	English	VP 1	VP 2	VP 3	VP 4	VP 5	VP 6	VP 7	VP 8	VP 9	VP 10	Total			
TARGET SPECIES																
	<i>Aquila nipalensis</i>	Steppe Eagle							1				1	EN	2 (VU:D)	NMW
2.	<i>Neophron percnopterus</i>	Egyptian Vulture												EN	2 (VU:R)	R
3.	<i>Falco cherrug</i>	Saker Falcon												EN	2 (VU:D)	NMS
4.	<i>Aquila chrysaetos</i>	Golden Eagle		1	1	1				1			4	LC	2 (VU:D)	NMW
5.	<i>Aquila heliaca</i>	Imperial Eagle												VU	2 (VU:D)	NM
6.	<i>Chlamydotis macqueenii</i>	Asian Houbara												VU	2 (VU:R)	M
7.	<i>Vanellus gregarius</i>	Sociable Lapwing												CR	2 (VU:R)	M
Total number of individuals of target species in February													5			
SECONDARY SPECIES																
	<i>Accipiter badius</i>	Shikra												LC	not listed	NM
2.	<i>Accipiter nisus</i>	Eurasian Sparrowhawk												LC	not listed	NMW
3.	<i>Aegypius monachus</i>	Cinereous Vulture					1	1					2	NT	3 (NT)	R
4.	<i>Anthropoides virgo</i>	Demoiselle Crane												LC	not listed	M
5.	<i>Buteo buteo</i>	Common Buzzard									1	1	2	LC	<i>not listed</i>	MW

6.	<i>Buteo rufinus</i>	Long-legged Buzzard			2	1				1		2	6	LC	<i>not listed</i>	<b>NMW</b>
7.	<i>Circaetus gallicus</i>	Short-toed Snake- Eagle												LC	2 (VU:D)	<b>NM</b>
8.	<i>Circus aeruginosus</i>	Eurasian Marsh- Harrier												LC	<i>not listed</i>	<b>NMW</b>
9.	<i>Circus cyaneus</i>	Hen Harrier			2	1				1		2	6	LC	<i>not listed</i>	<b>MW</b>
10.	<i>Circus macrourus</i>	Pallid Harrier												NT	3 (NT)	<b>MS</b>
11.	<i>Circus pygargus</i>	Montagu's Harrier												LC	not listed	<b>NM</b>
12.	<i>Falco tinnunculus</i>	Common Kestrel	1		3		1	1	1	3	2	1	13	LC	<i>not listed</i>	<b>NMW</b>
13.	<i>Grus grus</i>	Common Crane												LC	<i>not listed</i>	<b>MW</b>
14.	<i>Gyps fulvus</i>	Eurasian Griffon												NT	2 (VU:D)	<b>R</b>
15.	<i>Hieraaetus pennatus</i>	Booted Eagle												LC	2 (VU:D)	<b>NM</b>
16.	<i>Milvus migrans</i>	Black Kite												LC	<i>not listed</i>	<b>NMW</b>
Total number of individuals of secondary species in February													<b>29</b>			
<b>OTHER SPECIES OF BIRDS</b>																
	<i>Athene noctua</i>	Little Owl	1	1	1			1	1	1		2	8	LC	not listed	<b>R</b>
2.	<i>Ardea cinerea</i>	Gray heron	1	1									2	LC	not listed	<b>NMW</b>
3.	<i>Alectoris chukar</i>	Chukar partridge			5								5	LC	not listed	<b>R</b>
4.	<i>Upupa epops</i>	Hoopoe			1								1	LC	not listed	<b>NMW</b>
5.	<i>Galerida cristata</i>	Crested lark	19	14	20	10	10	11	16	18	17	20	155	LC	not listed	<b>R</b>
6.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	25	25	13	13	10	17	11	14	6	3	137	LC	not listed	<b>NMW</b>



7.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	5	4	4	4	4	11	4	6	12	4	58	LC	not listed	<b>NM</b>
8.	<i>Oenanthe finschii</i>	Black-necked Wheatear		1		1	1	4	2		4	1	14	LC	not listed	<b>RMW</b>
9.	<i>Melanocorypha leucoptera</i>	White-winged Lark	12				10					28	50	LC	not listed	<b>MW</b>
10.	<i>Corvus cornix</i>	Hooded Crow	8	9	9	10	6	4	12	6	9	13	86	LC	not listed	<b>MW</b>
11.	<i>Corvus corax</i>	Northern Raven	1	2		2	1				1		7	LC	not listed	<b>R</b>
12.	<i>Corvus frugilegus</i>	Eurasian Rook		9					9				18	LC	not listed	<b>RMW</b>
13.	<i>Pica pica</i>	Black-billed Magpie					2						2	LC	not listed	<b>R</b>
14.	<i>Columba livia</i>	Rock Dove		12	3	8				5		7	35	LC	not listed	<b>R</b>
15.	<i>Sitta tephronota</i>	Greater Rock Nuthatch			1								1	LC	not listed	<b>R</b>
16.	<i>Acridotheres tristis</i>	Indian Myna				2						7	9	LC	not listed	<b>NMW</b>
17.	<i>Lanius excubitor</i>	Great (Gray) Shrik	1	1									2	LC	not listed	<b>MW</b>
18.	<i>Rhodospiza obsoleta</i>	Black-billed Desert Finch		5							11		16	LC	not listed	<b>R</b>
19.	<i>Scotocerca inquieta</i>	Streaked Scrub Warbler					1				2		3	LC	not listed	<b>R</b>
20.	<i>Motacilla personata</i>	Pied Wagtail										1	1			
21.	<i>Haliaeetus albicilla</i>	White-tailed Sea-eagle	1			1			1				3			
Total number of individuals of other species in February													<b>613</b>			
Total number of individuals in January													<b>647</b>			

\*R - (residents) settled, W - (wintering) wintering, M - (migrant) migratory, N - nesting species, S - summering

Table 8 Results of bird observations in March, 2021

SPECIES			VANTAGE POINTS NUMBER OF INDIVIDUALS											IUCN status	Uzb Red Book status	Nature of stay
No	Latin	English	VP 1	VP 2	VP 3	VP 4	VP 5	VP 6	VP 7	VP 8	VP 9	VP 10	Total			
TARGET SPECIES																
	<i>Aquila nipalensis</i>	Steppe Eagle												EN	2 (VU:D)	NMW
2.	<i>Neophron percnopterus</i>	Egyptian Vulture												EN	2 (VU:R)	R
3.	<i>Falco cherrug</i>	Saker Falcon												EN	2 (VU:D)	NMS
4.	<i>Aquila chrysaetos</i>	Golden Eagle							1				1	LC	2 (VU:D)	NMW
5.	<i>Aquila heliaca</i>	Imperial Eagle												VU	2 (VU:D)	NM
6.	<i>Chlamydotis macqueenii</i>	Asian Houbara												VU	2 (VU:R)	M
7.	<i>Vanellus gregarius</i>	Sociable Lapwing												CR	2 (VU:R)	M
Total number of individuals of target species in March													1			
SECONDARY SPECIES																
	<i>Accipiter badius</i>	Shikra												LC	not listed	NM
2.	<i>Accipiter nisus</i>	Eurasian Sparrowhawk												LC	not listed	NMW
3.	<i>Aegypius monachus</i>	Cinereous Vulture					1						1	NT	3 (NT)	R
4.	<i>Anthropoides virgo</i>	Demoiselle Crane												LC	not listed	M
5.	<i>Buteo buteo</i>	Common Buzzard												LC	not listed	MW
6.	<i>Buteo rufinus</i>	Long-legged Buzzard												LC	not listed	NMW
7.	<i>Circaetus gallicus</i>	Short-toed Snake- Eagle												LC	2 (VU:D)	NM

8.	<i>Circus aeruginosus</i>	Eurasian Marsh-Harrier												LC	<i>not listed</i>	<b>NMW</b>
9.	<i>Circus cyaneus</i>	Hen Harrier	1							2		2	5	LC	<i>not listed</i>	<b>MW</b>
10.	<i>Circus macrourus</i>	Pallid Harrier												NT	3 (NT)	<b>MS</b>
11.	<i>Circus pygargus</i>	Montagu's Harrier												LC	not listed	<b>NM</b>
12.	<i>Falco tinnunculus</i>	Common Kestrel					2			2	2	1	7	LC	<i>not listed</i>	<b>NMW</b>
13.	<i>Grus grus</i>	Common Crane												LC	<i>not listed</i>	<b>MW</b>
14.	<i>Gyps fulvus</i>	Eurasian Griffon												NT	2 (VU:D)	<b>R</b>
15.	<i>Hieraaetus pennatus</i>	Booted Eagle												LC	2 (VU:D)	<b>NM</b>
16.	<i>Milvus migrans</i>	Black Kite												LC	<i>not listed</i>	<b>NMW</b>
Total number of individuals of secondary species in March													<b>13</b>			
<b>OTHER SPECIES OF BIRDS</b>																
	<i>Athene noctua</i>	Little Owl	1			1				1		1	4	LC	not listed	<b>R</b>
2.	<i>Ardea cinerea</i>	Gray heron	1									1	2	LC	not listed	<b>NMW</b>
3.	<i>Alectoris chukar</i>	Chukar partridge				6			7				13	LC	not listed	<b>R</b>
4.	<i>Upupa epops</i>	Hoopoe					2		1				3	LC	not listed	<b>NMW</b>
5.	<i>Galerida cristata</i>	Crested lark	5	4	4	6	13	9	11	12	5	3	72	LC	not listed	<b>R</b>
6.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark			4		14	5		4	5	9	41	LC	not listed	<b>NMW</b>
7.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	3	3	2	4	3	2	3	6	2	3	53	LC	not listed	<b>NM</b>
8.	<i>Oenanthe finschii</i>	Black-necked Wheatear			3			5	2				10	LC	not listed	<b>RMW</b>
9.	<i>Melanocorypha leucoptera</i>	White-winged Lark												LC	not listed	<b>MW</b>
10.	<i>Corvus cornix</i>	Hooded Crow		3				2	2				7	LC	not listed	<b>MW</b>

11	<i>Corvus corax</i>	Northern Raven		2				2					4	LC	not listed	<b>R</b>
12	<i>Corvus frugilegus</i>	Eurasian Rook							4				4	LC	not listed	<b>RMW</b>
13	<i>Corvus monedula</i>	Jackdaw									4		4	LC	not listed	<b>RMW</b>
14	<i>Pica pica</i>	Black-billed Magpie					2						2	LC	not listed	<b>R</b>
15	<i>Columba livia</i>	Rock Dove						12					12	LC	not listed	<b>R</b>
16	<i>Sitta tephronota</i>	Greater Rock Nuthatch			2								2	LC	not listed	<b>R</b>
17	<i>Acridotheres tristis</i>	Indian Myna		3									3	LC	not listed	<b>NMW</b>
18	<i>Lanius excubitor</i>	Great (Gray) Shrik						1					1	LC	not listed	<b>MW</b>
19	<i>Rhodospiza obsoleta</i>	Black-billed Desert Finch							3				3	LC	not listed	<b>R</b>
20	<i>Scotocerca inquieta</i>	Streaked Scrub Warbler					1						1	LC	not listed	<b>R</b>
21	<i>Motacilla personata</i>	Pied Wagtail		2									2	LC	not listed	<b>RMW</b>
22	<i>Apus apus</i>	Northern Swift						2					2	LC	not listed	<b>NM</b>
23	<i>Haliaeetus albicilla</i>	White-tailed Sea-eagle							1				1			
Total number of individuals of other species in March													<b>246</b>			
Total number of individuals in March													<b>260</b>			

\*R - (residens) settled, W - (wintering) wintering, M - (migrant) migratory, N - nesting species, S - summering

## TARGET SPECIES ECOLOGY

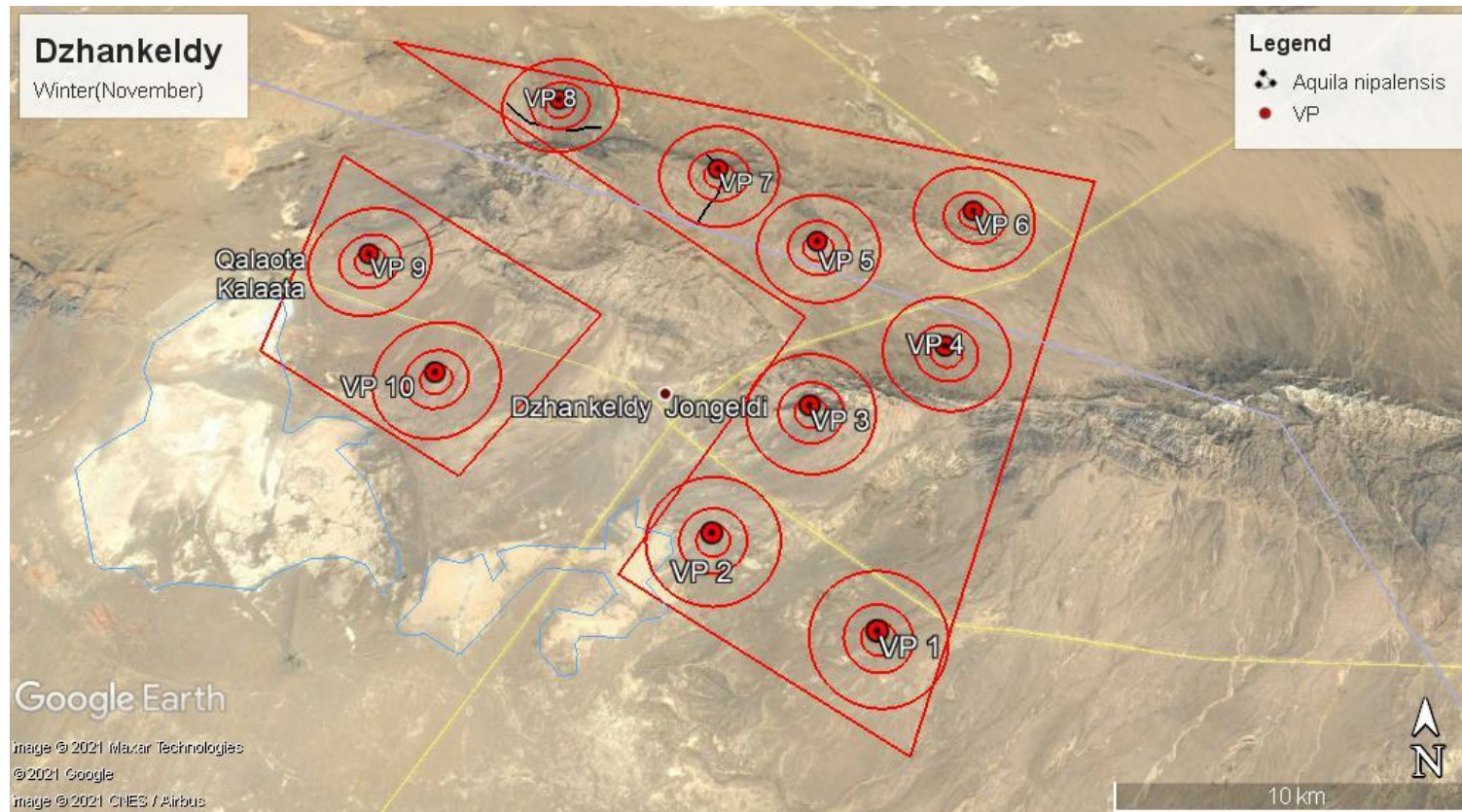


Figure 1 Target species observations in November

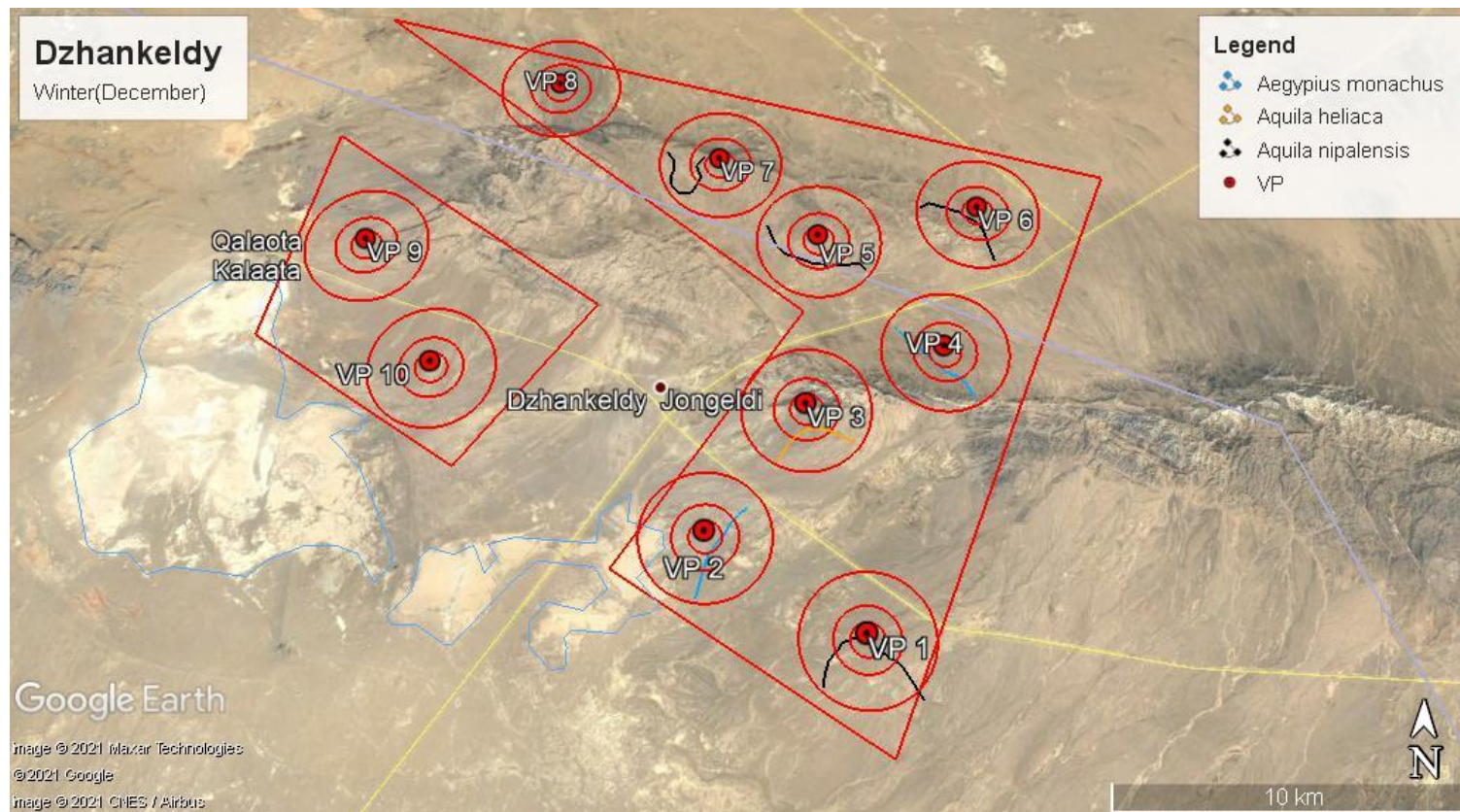


Figure 2 Target species observations in December



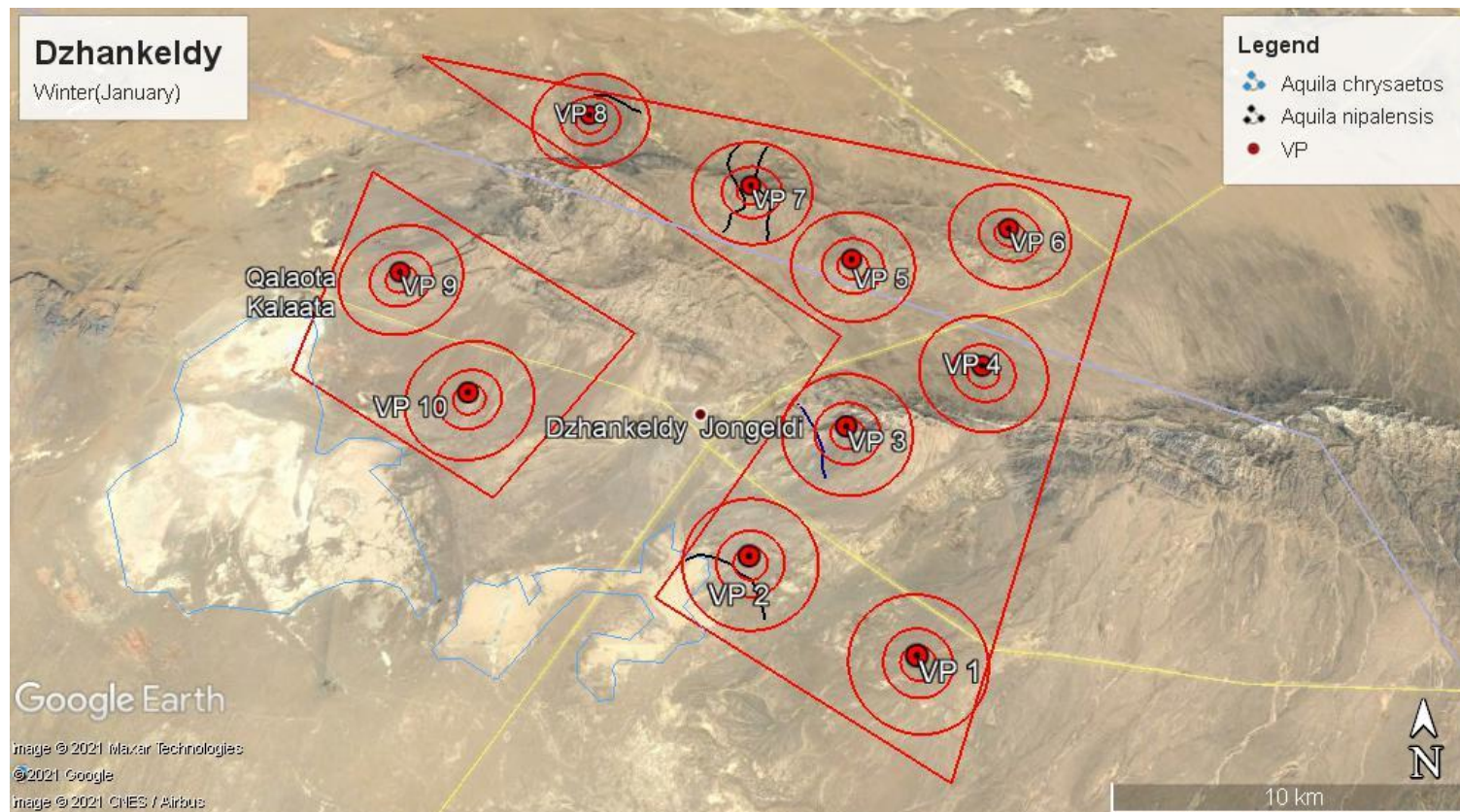


Figure 3 Target species observations in January



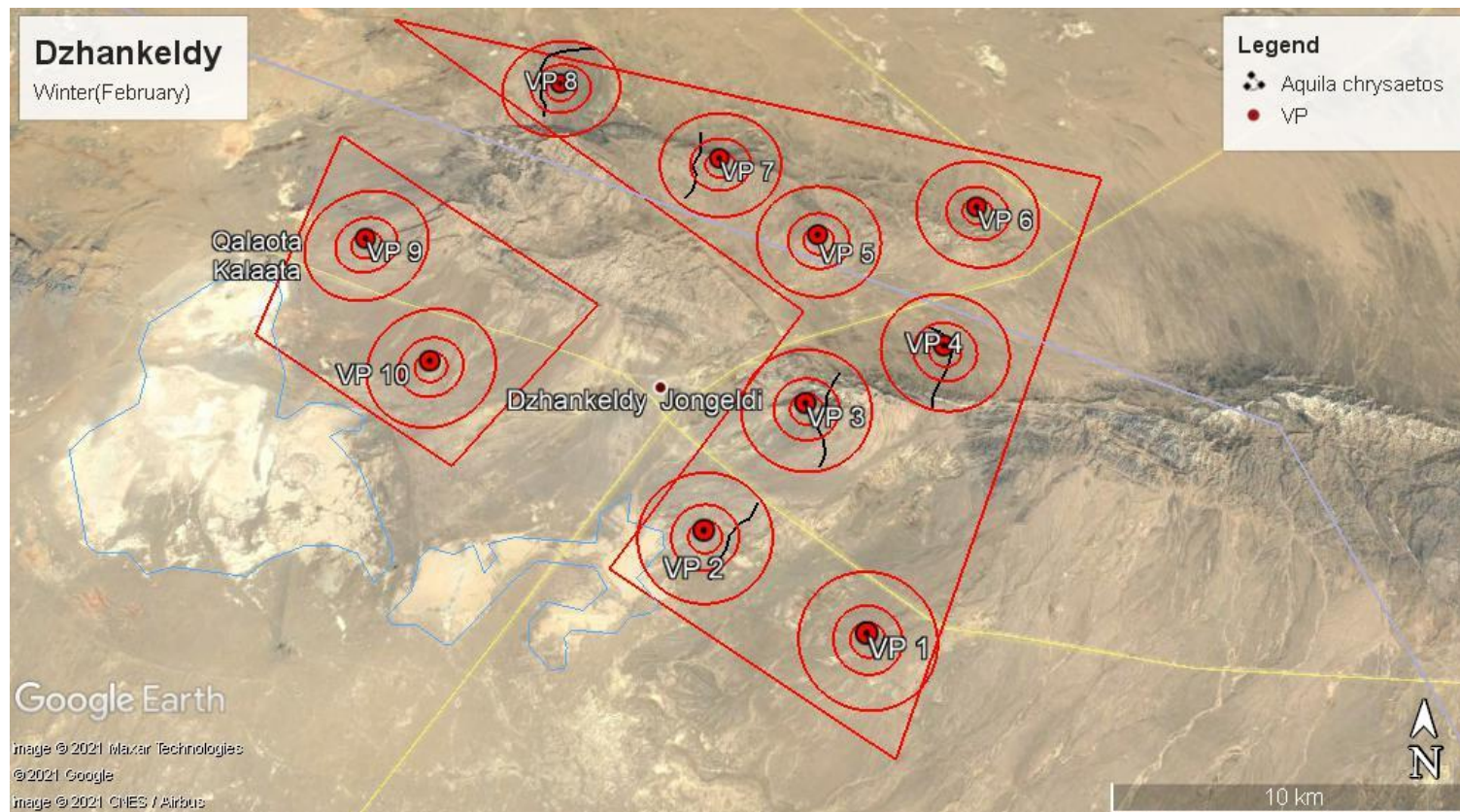


Figure 4 Target species observations in February

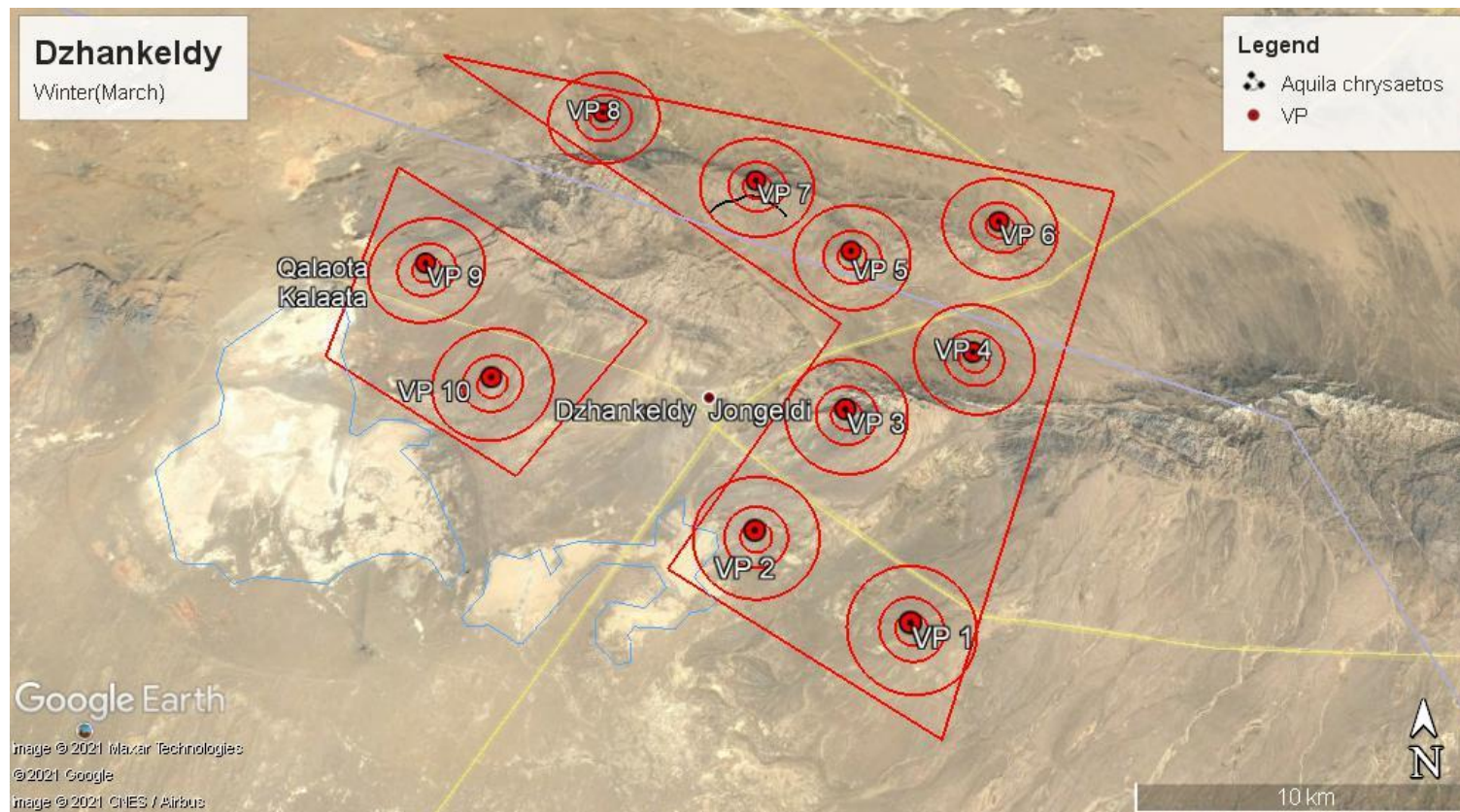


Figure 5 Target species observations in March

## ***Aquila nipalensis* – Steppe Eagle**

There are two subspecies in Uzbekistan:

1. *Aquila nipalensis* Temminck, 1828. ssp. *nipalensis* Hodgson, 1833
2. *Aquila nipalensis* Temminck, 1828. ssp. *orientalis* Cabanis, 1854

*Near Threatened 2 (VU-D), migratory European (2) and eastern (1) subspecies. It is distributed across the Plateau Ustyurt (1 - nesting, migration, roaming); plainlands and low mountain regions (1 - roaming, 2 - migration, wintering). Single individuals and groups were recorded during migration. Sometimes, about one hundred eagles migrate through some desert points per day. Several dozens of roaming birds were recorded; single individuals winter irregularly in Hungry Steppe and the Amudarya River valley, near Termez. Included in the IUCN Red List (EN) and Appendix II of CITES<sup>3</sup>.*

Steppe Eagle is regularly found on flights and wintering grounds. It inhabits plains and low mountains. Spring migration takes place in March-April, Winter migration – in October-November, winters from December to February. On the fly, it is observed singly or in groups of 2-3 individuals; sometimes up to several dozen per day. Young eagles start flying in July. Steppe Eagle feeds on rodents, in the conditions of Uzbekistan mainly large and red-tailed gerbils. It also feeds on carrion.

The world population of Steppe Eagle is rapidly declining. The main factors are: economic development of the land, deaths on power lines, direct human persecution.

According to the literature and our field observations, nesting of this species in the Central Kyzylkum area, including the project territory, has not been detected. The susceptibility to wind turbines collisions for this species could be high,

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<sup>3</sup> Red book of Uzbekistan

especially during the spring and Winter migration periods, when the area is heavily overflowed, but the final interpretation of wind farm risk for this species will be presented in the collision risk modeling report, performed by the international wind-wildlife expert.

**On the territory of Dzankeldy during Winter 11 individuals of Steppe Eagle were recorded.**

## ***Aquila chrysaetos* - Golden Eagle**

There are two subspecies in Uzbekistan:

1. *Aquila chrysaetos* Linnaeus, 1758 ssp. *daphanea* Severtzov, 1888
2. *Aquila chrysaetos* Linnaeus, 1758 ssp. *fulva* Linnaeus, 1758

*Vulnerable, naturally rare 2 (VU:R), resident, locally distributed South-European (1) and Central Asian (2) subspecies. It is distributed across the Plateau Ustyurt, in the southern Aral region, the desert Kyzylkum (1); in mountain regions (2). It inhabits sandy areas and low mountains in the deserts, loess precipices of foothills, rocks of the mid- and high belts of the mountains. The number was always low. In 1970-80s, 80-100 nesting pairs were recorded. During the last years, nests on power lines and loess cliffs of major channels of the Kyzylkum desert. Currently, approximately 200 pairs are nesting. Limiting factors: deforestation; long-term changes in food resources associated with the reduction of wildlife population and an increase in the number of grazing livestock; destruction of nests; direct persecution by human. Included in the IUCN Red List (LC) and Appendix II of CITES<sup>4</sup>.*

The population of Golden Eagle has always been small in Uzbekistan. But during flights and migrations, it can be found in different habitats – in mountains, steppes and plains.

Golden Eagle lives on sandy massifs and outlier mountains of deserts, foothills, rock formations of the middle and upper belt of mountains up to 2500-3000 m above the sea level. It nests on rocks, loess cliffs, trees, power transmission poles, towers, etc.

Golden Eagles build nests from large, thick, dry branches of various trees and shrubs, most common near the nesting site. The same nest can be inhabited for many years in a row, sometimes birds alternate them. The duration of construction, depending on whether the birds occupy the old nest or build a new one, can range from 5 to 22 days.

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<sup>4</sup> Red book of Uzbekistan

When re-nesting, the birds lay an additional thick layer of fresh branches. Such nests often fall under their weight, breaking off the branches that support them. A characteristic feature of an old Golden Eagle nest in the desert part of its habitat is the fragments of the large tortoises' shells, a large number of which are thrown under the nest and on its edge. In the sands, where the Golden Eagle can not break the shell of a tortoise, their remains are absent.

The clutch occurs in February-March and contains 1-3 eggs. Incubation lasts 43-45 days, young birds begin to fly in June-July. The Golden Eagle feeds on small mammals, birds, snakes, tortoises, and rarely carrion.

**During Winter observations, 6 Golden Eagles were observed on the Dzankeldy project territory.**



## ***Aquila heliaca* – Imperial Eagle**

*Vulnerable, declining 2 (VU:D), nesting and migrating nominal subspecies. It is distributed across the Plateu Ustyurt and in the northern Kyzylkum desert (nesting), plainland regions (migration, roaming), Central and Southern Uzbekistan (irregular wintering). The number was always low. In 1970-80s, the density of settlements in the low mountains of the Bukantau and the northern Kyzylkum reached 0.4 to 0.8 pairs per 100 sq. km. Single birds and small groups up to 15 individuals are recorded during migration. At present, number has sharply dropped. Limiting factors: human development of virgin lands in desert and semi-desert zones, mortality due to power lines, destruction of nests, disturbance during nesting. Included in the IUCN Red List (VU) and Appendix I of CITES<sup>5</sup>.*

It inhabits plains and foothills. During seasonal migrations, it is found everywhere throughout the republic.

The spring flight takes place in February-April, during which the birds fly singly and in groups of up to 15 birds. Breeding pairs are quite rare. Nests of **Imperial Eagles** are arranged mainly on saxaul or elm, on old trees at a low height. The nest is built from thick dry branches of trees and shrubs, up to 1.2-1.5 m in diameter. The Chicks during the period of stay in the nest is strongly trample it down, and it becomes flatter. The inner parts of the nest are lined with thin twigs, often green, freshly plucked. The tray is usually lined with soaked ferula stalks, bundles of dry grass, and sometimes wool. Occasionally, it builds nests on the basis of old buildings of the barrow, in empty nests of Golden Eagle and Black Vulture. The old nests of **Imperial Eagles** are very similar to the nests of Golden Eagle, but usually differ in the absence of fragments of the shells of large tortoises around the nest. Clutches (1-2 eggs) occur in February-May. Both parents stay on eggs for about 43 days. Young birds begin to fly in July and August. It feeds on rodents, hedgehogs, tortoises, and carrion.

**During our Winter observations, the Imperial Eagle was observed on the Dzankeldy project territory only once.**

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<sup>5</sup> Red book of Uzbekistan



## ***Falco cherrug* – Saker Falcon**

*Near Threatened 1 (EN), migratory Turkestanian (1) and northern (2, 3) subspecies of the Palearctic species. It is distributed in the plainland and low mountain regions (1 - nesting, roaming; 2 - migration, wintering). It inhabits the loess precipices, rocks of low mountains and foothills. From 1990s the numbers have been declining. At present, totally about 70 pairs are nesting in Uzbekistan. Number of migrating and wintering birds are about some hundreds. Limiting factors: fluctuations of rodent numbers, illegal trapping, destruction of nests; death on power lines. Included in the IUCN Red List (EN) and Appendix II of CITES<sup>6</sup>.*

During the period of migration and wintering, this species is found almost on all the plains of the republic, agricultural oases and even in the vicinity of cities. They roam widely in mountainous areas, but in much smaller numbers.

Saker Falcon is a nesting, wintering, sometimes sedentary bird. Most of the breeding population is sedentary. Previously, it was widely encountered in lowland and low-mountain areas. The spring flight occurs in March. It breeds on Relic mountains cliffs in the valleys of lowland rivers, on rocky areas, supports of power lines, and in the mountains up to a height of 2500 m above sea level.

A completely empty area can be used as a nest, and the eggs in this case are laid directly on the ground or on the pebbles in a small depression, but much more often Saker Falcon occupies the nests of other birds of prey (Golden Eagle, Vulture) or crows. He doesn't build nests himself. Cases of nesting in trees in Uzbekistan are unknown.

A prerequisite for Saker Falcon nesting is a sufficiently high number of rodents. Even in areas where Saker Falcon is common in years with a high number of rodents, it stops nesting in their absence. Egg laying (3-5) is carried out in February-April. Only the female incubates the eggs for 28 days, the male feeds her. Young Saker Falcons begin to fly in May-June. The Winter migration takes place in September-November. Saker Falcon winters from December to February. It feeds on rodents and birds.

**During Winter observations, the Saker Falcon was not found on the project territory.**

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<sup>6</sup> Red book of Uzbekistan

## ***Neophron percnopterus* – Egyptian Vulture**

*Vulnerable, declining 2 (VU:D), mosaically distributed species. It is distributed in the Kugitang, the Babatag, the Hissar, the Baysantau, the Chatkal, the Pskem, the Kurama and Turkestan ridges, mountains of central part of the Kyzylkum desert, the Amudarya River valley. It inhabits desert low mountains, the mergins of arid ridges of the Tien-Shan and Pamir- Alay. In 1990-2000s, the amount in Uzbekistan was 200 pairs. At the present - 134-140 pairs. Limiting factors: Searcity of feed due to small cattle decline, direct persecution by human, trouble during the breeding season. Included in the IUCN Red List (ENJ and Appendix II of CITES<sup>7</sup>.*

A common relatively numerous breeding bird, confined to depressions of the lower belt of all mountain systems and plains of Uzbekistan. It flies away for the winter, only rare loners spend the winter. Well withstands the proximity of humans, if not specifically pursued by them. Egyptian Vulture nests in niches and voids of rocks, loess and sandstone cliffs, less often on eaves or ledges, but more often with a ledge overhanging the nest. Egyptian Vulture nests can be often found not far from the nests of other birds of prey (vultures, kites, buzzards), black stork and raven. There is a known case of its nesting on the support of a power line pole in the old nest of another predator. Egyptian Vulture puts different soft materials (wool, rags, ropes, etc.) on the future nest foundation. During the feeding of chicks, the nest niche is cluttered with all sorts of food residues (bones of ungulates, skulls of small animals, etc.) and with a large amount of droppings. A specific, extremely pungent and persistent smell emanating from the nest can be felt in the wind for tens and hundreds of meters. The rocks around the nest, and especially under it, are covered with white streaks of droppings, visible from a great distance. The beginning of breeding occurs in April, ends in the second week of May. Single, possibly repeated clutches appear before the end of May. In a clutch there are 2, less often – 1 egg. Chicks in nests begin to appear in late May – early June, flying young birds in mid-July-August. According to trophic connections, the vulture is primarily a herpetophage, as well as a collector of the corpses of small animals. It often feeds on large carrion, as well as on dump sites in the vicinity of human settlements and slaughterhouses.

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<sup>7</sup> Red book of Uzbekistan

**During the Winter period on the territory of Dzankeldy WF Egyptian Vulture was not observed.**

## ***Chlamydotis macqueenii* – Houbara Bustard**

*Vulnerable, declining 2 (VU:D), nesting, migratory eastern subspecies. It is distributed in the Plateau Ustyurt, the Kyzylkum desert, the Karshi Steppe (nesting, migration), Southern Kyzylkum (irregular wintering), Golodnaya Steppe (former nesting, migration). It inhabiting undulated loose sandy and clayey saline parts of the desert with rare shrubs (nesting); in all plains, except oases migration. Nesting population ranges in 1960-80-s from 1,500 to 3,000 individuals; during migration up to 20,000 individuals were recorded. The numbers and nesting area were sharp decreasing during last decades. During the last years, can be sometimes met while wintering in the South Kyzylkum. Limiting factors: agricultural development of virgin lands (since 1960s), poaching, uncontrolled hunting and falconry in migratory and wintering sites, collection of eggs and chicks. Two nurseries conduct scientific research on the ecology, breeding and regular bird releases in nature. Included in the IUCN Red List (VU) and in Appendix I of CITES<sup>8</sup>.*

It breeds in Uzbekistan and can be seen during migration. Spring migration occurs in February-March. The males begin the courtship display right after migration. The females appear in these places after about ten days, but they do not stay there permanently, but only visit them. The nests are arranged on another site, which can be considered as a nest site. In April-May, eggs are laid by birds in small depressions on the ground in the complete absence of a nest lining. After laying the eggs, males leave the females. The clutch consists of 2-5 eggs, the female incubates them for 21-24 days. Young bustards begin to fly in June and July. Then the broods break up, and the birds keep to themselves. Even during the Winter flight, which falls on August-November, single individuals are more common, but there are also small flocks. It feeds on grasses, seeds, invertebrates, small rodents and reptiles.

This bird is wary of human contact and usually lives in sparsely populated steppe areas.

**During Winter observations, we did not observe any Houbara Bustards on the Dzankeldy project territory.**

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<sup>8</sup> Red book of Uzbekistan

## ***Vanellus gregarius* - Sociable Lapwing**

*Vulnerable, naturally rare 2 (VU:R), migratory species. It is spread at the Central Kyzylkum, the Aydarkul Lake, the Tudakul and the Talimarjan water reservoirs. It can be found on the banks of reservoirs and marshes in the plainland wetlands and dry steppe areas, fallow land and harvested fields - for feeding and lodging. Numbers were always low. In 1970-80s, flocks of 10-20 individuals were recorded. Now, significant concentrations of birds were found during the Winter migration in the Talimarzhan reservoir - more than 2000 birds in 2012 and more than 4000 in 2015. Limiting factors: the development of virgin lands. Tall vegetation overgrowing of habitats as a result of grazing loads reduction. Included in the IUCN Red List [CR] and Appendix 1 of CMS<sup>9</sup>.*

The Sociable Lapwing habitats are coastal, often swampy areas of lowland reservoirs. Sociable Lapwing prefers moist open banks of water bodies with low herbaceous vegetation. Spring migration begins at the end of February, the peak is in March-early April. The Winter flight takes place in July-October. Sociable Lapwing feeds on aquatic invertebrates, partly on plant food.

**We did not observe Sociable Lapwing on the Dzankeldy project territory in Winter.**

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<sup>9</sup> Red book of Uzbekistan

## CONCLUSIONS

The project territory of the planned Dzankeldy wind farm is located on the Western part of the lowlands of Kul'dzhuktau Mountains surrounded by the desert. The majority of animals and plants belong to desert species, but during migration species of different ecological groups could be found there. The territory of the planned Dzankeldy wind farm is deserted, waterless and arid. There are two settlements on the project territory: Dzankeldy and Kal'ata. Due to the lack of water, the local population is engaged in breeding small cattle and camels. There is a camel farm in the village of Kal'ata.

On the territory of the planned Dzankeldy wind farm bird observations were conducted at 10 vantage points.

Table 9 Birds observation summary

Month	Number of individuals of target species	Number of individuals of secondary species	Number of individuals of other species	Total
November	2	7	317	326
December	5	14	1131	1150
January	5	17	579	601
February	5	29	613	647
March	1	13	246	260
<b>Total</b>	<b>18</b>	<b>80</b>	<b>2886</b>	<b>2984</b>

The total number of bird individuals observed during Winter survey is 2984 (Table 9). Among them there were 18 individuals of target species (0.6%) and 80 (2.68%) individuals of secondary species.

Only 3 species of target species were observed in Winter – Steppe Eagle (*Aquila nipalensis*) - 11, Imperial Eagle (*Aquila heliaca*) - 1, Golden Eagle (*Aquila chrysaetos*) – 6.

Temperature on the project site changes very sharply in winter. It was sometimes quite cold: the temperature dropped to  $-12^{\circ}\text{C}$ , and the wind speed reached 8 m/s, sometimes up to 10-12 m/s; on the other hand in early February it was unexpectedly very warm:  $+20^{\circ}\text{C}$  and above. Precipitation in winter was not much in this area. The sharp warming in February activated rodents that came out of their burrows, and they in turn become the main food object of predators.

In winter, the large birds of prey such as *Golden Eagle*, *Cinereous Vulture*, *White-tailed Sea-eagle*, *Common Buzzard*, *Long-legged Buzzard* and *Steppe Eagle* were observed during VP sessions. In December, we met the *Imperial Eagle* once. Of the falcons, *Common Kestrel* was regularly encountered. We regularly met the sedentary *Little Owl* (static mostly). Of the sparrow-like species, numerous *Crested Lark*, *Lesser Short-toed Lark*, *White-winged Lark*, *Isabelline Wheatear*, *Black-necked Wheatear*, *Hooded Crow*, and *Northern Raven* were found in winter. Among the localities there are such synanthropic species as *Laughing Turtle Dove*, *Indian Myna*, *Collared Turtle Dove*, *Rock Dove*. In early March, when the spring migration began, the *Long-legged Buzzard* was encountered, and other migratory birds such as *Pied Wagtail*, *Northern Swift*, *Hoopoe*, *Great Shrike*, and *Grey Heron*.

On the territory of the Dzankeldy WF there are no regular open reservoirs, but the number of temporary reservoirs and puddles appear after heavy precipitation, sometimes they are quite large. But 30-40 km south of the project territory there is the Karakyr ornithological reserve. It is a system of lakes overgrown with reeds, which is used by waterfowl as a wintering ground, for recreation during migration, and some birds for nesting. During a site visit to this reservoir in March this year, a large number of waterfowl were encountered, such as the *Black-Headed Gull*, *Yellow-legged (Caspian) Gull*, *Green-winged Teal*, *Garganey*, *Northern Shoveler*, *Red-Crested Pochard*, *Mallard*, *Greylag Goose* and *Pygmy Cormorant*. These species can theoretically cross the project area, but in reality, they are very rare in the territory.



## Appendix 1. Weather conditions during VP Winter surveys

Table 10 Weather conditions and visibility in November, 2020

	VP 1	VP 2	VP 3	VP 4	VP 5	VP 6	VP 7	VP 8	VP 9	VP 10
16 November									half cloudy, cold 6-7 m/s	half cloudy, cold 6-7 m/s
17 November	half cloudy, cold 5-6 m/s	partly cloudy, cold 6-8 m/s								
18 November			cloudy, cold 5-6 m/s	cloudy, cold 4-6 m/s						
19 November					half cloudy, cold 6-7 m/s	half cloudy, cold 6-7 m/s				
20 November							half cloudy, cold 5-6 m/s	partly cloudy, cold 6-8 m/s		

Table 11 Weather conditions and visibility in December, 2020

	VP 1	VP 2	VP 3	VP 4	VP 5	VP 6	VP 7	VP 8	VP 9	VP 10
1 December									half cloudy, cold 5-6 m/s	half cloudy, cold 3-4 m/s
2 December	half cloudy, cold 4-5 m/s	half cloudy, cold 6-7 m/s								
3 December			half cloudy, cold 4-5 m/s	half cloudy, cold 5-6 m/s						
10 December					half cloudy, cold 5-6 m/s	half cloudy, cold 5-6 m/s				
11 December							half cloudy, cold 4-5 m/s	cloudy, cold 5-6 m/s		
12 December									cloudy, cold 4-6 m/s	half cloudy, cold 6-7 m/s
13 December	half cloudy, cold 6-7 m/s	half cloudy, cold 5-6 m/s								
14 December			partly cloudy,cold 6-8 m/s	partly cloudy,cold 6-8 m/s						
15 December					sunny, cold 4-5 m/s	sunny, cold 6-7 m/s				
16 December							partly cloudy,cold 5-6 m/s	half cloudy, cold 4-5 m/s		
17 December									sunny, cold 5-6 m/s	sunny, cold 5-6 m/s

<b>23 December</b>	<b>partly cloudy, cold 4-5 m/s</b>	<b>cloudy, 5-6 m/s</b>								
<b>24 December</b>			<b>cloudy, cold 4-6 m/s</b>	<b>half cloudy, cold 6-7 m/s</b>						
<b>25 December</b>					<b>half cloudy, cold 6-7 m/s</b>	<b>half cloudy, cold 5-6 m/s</b>				
<b>26 December</b>							<b>partly cloudy, cold 6-8 m/s</b>	<b>partly cloudy, cold 6-8 m/s</b>		

Table 12 Weather conditions and visibility in January, 2021

	VP 1	VP 2	VP 3	VP 4	VP 5	VP 6	VP 7	VP 8	VP 9	VP 10
4 January									sunny, 5-6 m/s	half cloudy, 3-4 m/s
5 January	cloudy, 4-5 m/s	cloudy, 6-7 m/s								
6 January			sunny, 5-6 m/s	half cloudy, 4-5 m/s						
9 January					sunny, 5-6 m/s	half cloudy, 5-6 m/s				
10 January							sunny, 4-5 m/s	partly cloudy, 5-6 m/s		
11 January									partly cloudy, 4-5 m/s	partly cloudy, 6-7 m/s
12 January	sunny, 6-7 m/s	half cloudy, 5-6 m/s								
13 January			partly cloudy, 6-8 m/s	partly cloudy, 6-8 m/s						
14 January					partly cloudy, 6-8 m/s	partly cloudy, 6-8 m/s				
15 January							sunny, 4-5 m/s	sunny, 6-7 m/s		
19 January									half cloudy, 4-5 m/s	partly cloudy, 5-6 m/s
20 January	sunny, 5-6 m/s	sunny, 5-6 m/s								

21 January			partly cloudy, 4-5 m/s	cloudy, 5-6 m/s						
24 January					half cloudy, 6-7 m/s	cloudy, 4-6 m/s				
25 January							half cloudy, 6-7 m/s	half cloudy 5-6 m/s		

Table 13 Weather conditions and visibility in February, 2021

	VP 1	VP 2	VP 3	VP 4	VP 5	VP 6	VP 7	VP 8	VP 9	VP 10
1 February									half cloudy, 5-6 m/s	sunny, 3-4 m/s
2 February	cloudy, 4-6 m/s	cloudy, 4-5 m/s								
3 February			sunny, 5-6 m/s	half cloudy, 4-5 m/s						
4 February					sunny, 3-4 m/s	half cloudy, 3-5 m/s				
5 February							sunny, 4-5 m/s	partly cloudy, 5-6 m/s		
6 February									partly cloudy, 6-7 m/s	partly cloudy, 4-6 m/s
7 February	cloudy, 3-4 m/s	half cloudy, 5-6 m/s								
10 February			partly cloudy, 3-5 m/s	partly cloudy, 6-8 m/s						
11 February					sunny, 4-6 m/s	sunny, 5-6 m/s s				
12 February							half cloudy, 4-5 m/s	half cloudy, 6-7 m/s		
13 February									half cloudy, 4-5 m/s	partly cloudy, 5-6 m/s
14 February	sunny, 5-6 m/s	sunny, 5-6 m/s								

15 February			sunny, 4-5 m/s	cloudy, 5-6 m/s						
18 February					half cloudy, 6-7 m/s	cloudy, 4-6 m/s				
19 February							half cloudy, 6-7 m/s	half cloudy 5-6 m/s		
20 February									cloudy 4-6 m/s	cloudy 5-6 m/s
21 February	half cloudy, 6-7 m/s	half cloudy 6-7 m/s								
22 February			half cloudy, 6-7 m/s	half cloudy 5-6 m/s						



Table 14 Weather conditions and visibility in March, 2021

	VP 1	VP 2	VP 3	VP 4	VP 5	VP 6	VP 7	VP 8	VP 9	VP 10
1 March							cloudy, 5-6 m/s	half cloudy, 5-6 m/s		
2 March					cloudy, 4-6 m/s	cloudy, 4-5 m/s				
3 March	half cloudy 5-6 m/s	half cloudy, 4-5 m/s								
4 March			sunny, 3-4 m/s	sunny, 3-5 m/s						
5 March									partly cloudy, 4-5 m/s	partly cloudy, 5-6 m/s
6 March							half cloudy, 5-6 m/s	cloudy, 6-8 m/s		
7 March					sunny, 4-6 m/s	sunny, 5-6 m/s				

## Appendix 2. Vantage Point Data Logs

### VP survey results in November

#### VP.9

Date: 16.11.2020. Start and end time: 9:23 – 12:23

**Weather:**

The air temperature around -3°C end 0°C sky half cloudy, cold

Wind speed approx. (6-7 m/s) No precipitation

***Primary species not found***

Table 15. Secondary and other species (VP 9), 16.11.2020

No	Latin names	English names	Amount	Flight altitude
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	9	0-8
2.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	2	0-4
3.	<i>Corvus corax</i>	Northern Raven	12	3-12
4.	<i>Columba livia</i>	Rock Dove	5	40
5.	<i>Corvus cornix</i>	Eurasian Hooded Crow	2	25

**VP. 10**

Date: 16.11.2020. Start and end time: 13:33 – 15:36

**Weather:**

The air temperature around 0 end -1°C sky half cloudy, cold

Wind speed approx. (6-7 m/s) No precipitation

***Primary species not found***

Table 16. Secondary and other species (VP 10), 16.11.2020

No	Latin names	English names	Amount	Flight altitude
OTHER SPECIES				
1.	<i>Galerida cristata</i>	Little owl	1	0-2
2.	<i>Oenanthe isabellina</i>	Crested lark	3	0-10
3.	<i>Calandrella rufescens</i>	Isabelline Wheatear	2	0-4
4.	<i>Corvus cornix</i>	Lesser Short-toed Lark	3	0-9

### VP. 1

Date: 17.11.2020 Start and end time: 9:27 – 12:37

**Weather:**

The air temperature around -4°C end -2°C sky half cloudy, cold

Wind speed approx. (5-6 m/s) No precipitation

***Primary species not found***

Table 17. Secondary and other species (VP 1), 17.11.2020.

No	Latin names	English names	Amount	Flight altitude
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	6	0-9
2.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	12	0-6
3.	<i>Oenanthe isabellina</i>	Isabelline wheatear	1	0-6
4.	<i>Melanocorypha leucoptera</i>	White-winged Lark	18	0-9

## VP. 2

Date: 17.11.2020. Start and end time: 13:23 – 15:23

### **Weather:**

The air temperature around -2 end -3°C partly cloudy, cold  
Wind speed approx. (6-8 m/s) No precipitation

Table 18. Secondary and other species (VP 2), 17.11.2020.

No	Latin names	English names	Amount	Flight altitude
<b>SECONDARY SPECIES</b>				
1.	<i>Falco tinnunculus</i>	Kestrel	1	3-10
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	9	0-15
2.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	6	0-5
3.	<i>Corvus cornix</i>	Hooded Crow	6	12
4.	<i>Columba livia</i>	Rock Dove	5	30

**VP. 3**

Date: 18.11.2020. Start and end time: 9:52 – 12:55

**Weather:**

The air temperature around -2°C end -1°C cloudy, cold

Wind speed approx. (5-6 m/s) No precipitation

***Primary species not found***

Table 19. Secondary and other species (VP 3), 18.11.2020.

<b>No</b>	<b>Latin names</b>	<b>English names</b>	<b>Amount</b>	<b>Flight altitude</b>
<b>SECONDARY SPECIES</b>				
1.	<i>Falco tinnunculus</i>	Kestrel	2	15-30
2.	<i>Buteo buteo</i>	Common Buzzard	1	10-25
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	5	0-15
2.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	15	0-5
3.	<i>Columba livia</i>	Rock Dove	6	30
4.	<i>Oenanthe isabellina</i>	Isabelline wheatear	1	0-10
5.	<i>Pterocles orientalis</i>	Black-bellied sandgrouse	5	35
6.	<i>Acridotheres tristis</i>	Indian Myna	3	2-9

#### VP. 4

Date: 18.11.2020. Start and end time: 13:32 – 15:35

**Weather:**

The air temperature around -1°C end -3°C cloudy, cold

Wind speed approx. (4-6 m/s) No precipitation

***Primary species not found***

Table 20. Secondary and other species (VP 4), 18.11.2020.

No	Latin names	English names	Amount	Flight altitude
<b>SECONDARY SPECIES</b>				
1.	<i>Falco tinnunculus</i>	Kestrel	2	10-30
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	9	0-9
2.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	12	0-5
3.	<i>Turdus atrogularis</i>	Black-throated Thrush	3	0-12
4.	<i>Sitta tephronota</i>	Greater Rock Nuthatch	2	6
5.	<i>Melanocorypha leucoptera</i>	White-winged Lark	15	0-5



### VP.5

Date: 19.11.2020. Start and end time: 9:16 – 12:16

**Weather:**

The air temperature around -2°C end -1°C sky half cloudy, cold

Wind speed approx. (6-7 m/s) No precipitation

***Primary species not found***

Table 21. Secondary and other species (VP 5), 19.11.2020

No	Latin names	English names	Amount	Flight altitude
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	4	0-8
2.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	1	0-4
3.	<i>Acridotheres tristis</i>	Common myna	3	6-10
4.	<i>Corvus corax</i>	Northern Raven	1	5
5.	<i>Corvus cornix</i>	Hooded Crow	12	10

**VP. 6**

Date: 19.11.2020. Start and end time: 13:33 – 15:36

**Weather:**

The air temperature around -1°C end -2 °C sky half cloudy, cold

Wind speed approx. (6-7 m/s) No precipitation

***Primary species not found***

Table 22. Secondary and other species (VP 6), 19.11.2020

<b>№</b>	<b>Latin names</b>	<b>English names</b>	<b>Amount</b>	<b>Flight altitude</b>
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	3	0-10
2.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	2	0-4
3.	<i>Athene noctua</i>	Little owl	1	0-5
4.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	32	0-9
5.	<i>Corvus cornix</i>	Hooded Crow	6	8
6.	<i>Corvus frugilegus</i>	Eurasian Rook	3	7

## VP. 7

Date: 20.11.2020 Start and end time: 9:27 – 12:37

### **Weather:**

The air temperature around -2°C end -1°C sky half cloudy,cold

Wind speed approx. (5-6 m/s) No precipitation

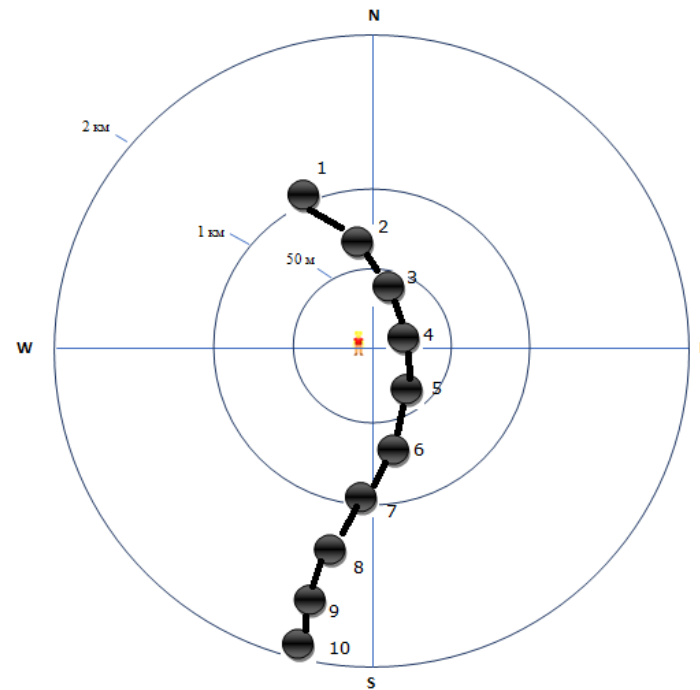


Fig.2 Flight path (VP 7), 20.11.2020

Table 23. Target species log (VP 7), 20.11.2020.

●	<i>Aquila nipalensis</i>	1 90 m	2 90 m	3 85 m	4 80 m	5 85 m	6 85 m	7 85 m	8 80 m	9 85 m	10 85 m
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Table 24. Secondary and other species (VP 7), 20.11.2020.

No	Latin names	English names	Amount	Flight altitude
<b>OTHER SPECIES</b>				
1.	<i>Corvus frugilegus</i>	Eurasian Rook	12	10
2.	<i>Corvus cornix</i>	Eurasian Hooded Crow	6	10
3.	<i>Galerida cristata</i>	Crested lark	3	0-9
4.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	13	0-6

### VP. 8

Date: 20.11.2020. Start and end time: 13:23 – 15:23

**Weather:**

The air temperature around -1°C end-2°C partly cloudy, cold

Wind speed approx. (6-8 m/s) No precipitation

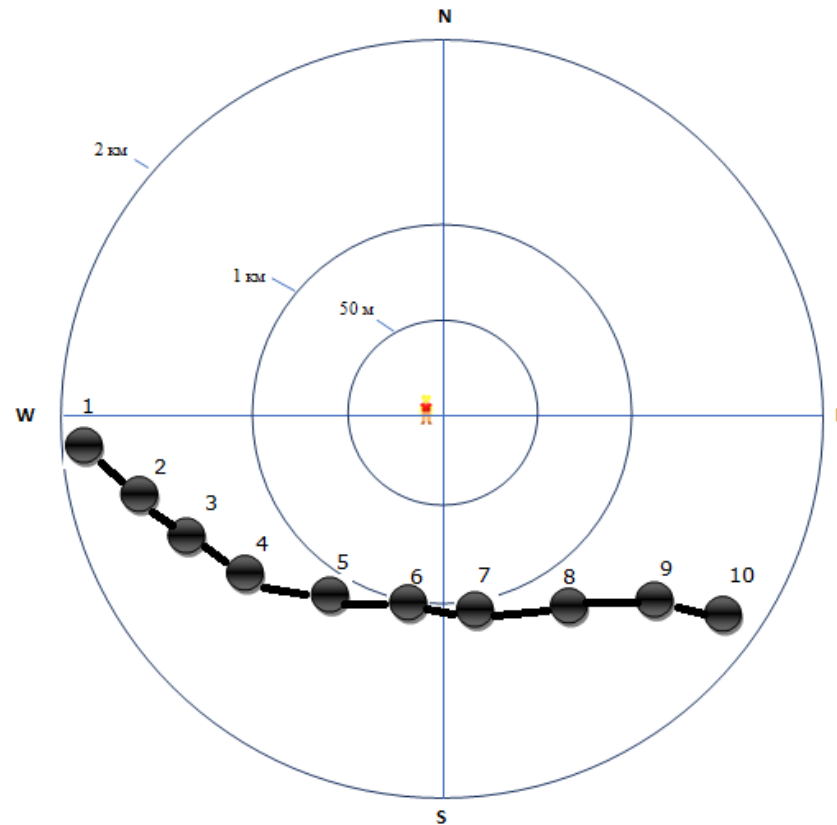


Fig.3 Flight path (VP 8), 20.11.2020

Table 25. Target species log (VP 8), 20.11.2020.

●	<i>Aquila nipalensis</i>	1 90 m	2 90 m	3 95 m	4 90 m	5 95 m	6 95 m	7 95 m	8 90 m	9 95 m	10 95 m
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Table 26. Secondary and other species (VP 8), 20.11.2020.

No	Latin names	English names	Amount	Flight altitude
<b>SECONDARY SPECIES</b>				
1.	<i>Falco tinnunculus</i>	Common Kestrel	1	12-35
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	4	0-15
2.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	12	0-5
3.	<i>Oenanthe isabellina</i>	Isabelline wheatear	1	0-3
4.	<i>Corvus cornix</i>	Hooded Crow	20	12

## VP survey results in December

### VP.9

Date: 01.12.2020. Start and end time: 9:16 – 12:16

**Weather:**

The air temperature around -1°C end 0°C sky half cloudy, cold

Wind speed approx. (5-6 m/s) No precipitation

***Primary species not found***

Table 27. Secondary and other species (VP 9), 01.12.2020

No	Latin names	English names	Amount	Flight altitude
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	6	0-5
2.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	1	0-4
3.	<i>Acridotheres tristis</i>	Common myna	3	6-10
4.	<i>Corvus corax</i>	Northern Raven	1	5
5.	<i>Corvus cornix</i>	Hooded Crow	6	10
6.	<i>Melanocorypha leucoptera</i>	White-winged Lark	360	0-6



**VP. 10**

Date: 01.12.2020. Start and end time: 13:33 – 15:36

**Weather:**

The air temperature around 0°C end -1 °C sky half cloudy, cold

Wind speed approx. (3-4 m/s) No precipitation

***Primary species not found***

Table 28. Secondary and other species (VP 10), 01.12.2020

<b>№</b>	<b>Latin names</b>	<b>English names</b>	<b>Amount</b>	<b>Flight altitude</b>
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	3	0-10
2.	<i>Corvus cornix</i>	Hooded Crow	1	8
3.	<i>Melanocorypha leucoptera</i>	White-winged Lark	21	0-7

### VP. 1

Date: 02.12.2020 Start and end time: 9:27 – 12:37

**Weather:**

The air temperature around  $-2^{\circ}\text{C}$  end  $0^{\circ}\text{C}$  sky half cloudy, cold

Wind speed approx. (4-5 m/s) No precipitation

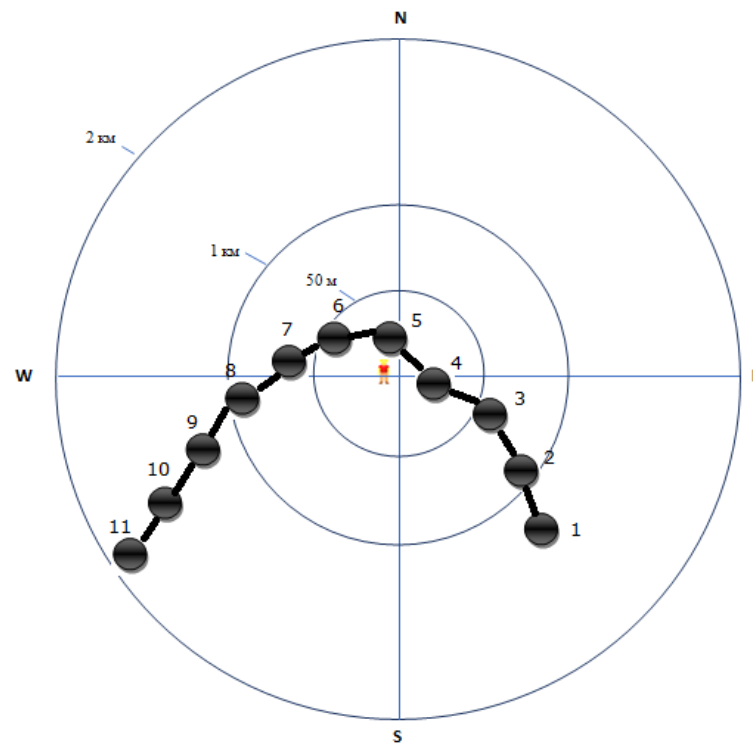


Fig.4 Flight path (VP 1), 02.12.2020

Table 29. Target species log (VP 1), 02.12.2020.

●	<i>Aquila nipalensis</i>	1 30 m	2 40 m	3 55 m	4 60 m	5 65 m	6 65 m	7 55 m	8 60 m	9 65 m	10 65 m	11 65 m
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Table 30. Secondary and other species (VP 1), 02.12.2020.

No	Latin names	English names	Amount	Flight altitude
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	4	0-8
2.	<i>Corvus corax</i>	Northern Raven	12	3-12
3.	<i>Columba livia</i>	Rock Dove	5	40
4.	<i>Corvus cornix</i>	Eurasian Hooded Crow	1	15

## VP.2

Date: 02.12.2020. Start and end time: 13:23 – 15:23

### **Weather:**

The air temperature around 1°C end 0°C sky half cloudy, cold  
Wind speed approx. (6-7 m/s) No precipitation

### ***Primary species not found***

Table 31. Secondary and other species (VP 2), 02.12.2020

No	Latin names	English names	Amount	Flight altitude
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	6	0-8
2.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	1	0-4
3.	<i>Corvus corax</i>	Northern Raven	9	3-12
4.	<i>Columba livia</i>	Rock Dove	3	40
5.	<i>Corvus cornix</i>	Eurasian Hooded Crow	1	25

#### VP. 4

Date: 03.12.2020. Start and end time: 9:13 – 12:13

**Weather:**

The air temperature around -1°C end 0°C partly cloudy, cold  
Wind speed approx. (5-6 m/s) No precipitation

Table 32. Secondary and other species (VP 4), 03.12.2020.

No	Latin names	English names	Amount	Flight altitude
<b>SECONDARY SPECIES</b>				
1.	<i>Circus cyaneus</i>	Hen Harrier	1	10-25
2.	<i>Aegypius monachus</i> (flight also recorded see log below)		1	(flight also recorded see log below)
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	4	0-15
2.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	6	0-5
3.	<i>Oenanthe isabellina</i>	Isabelline wheatear	1	0-3
4.	<i>Corvus cornix</i>	Hooded Crow	12	9-25

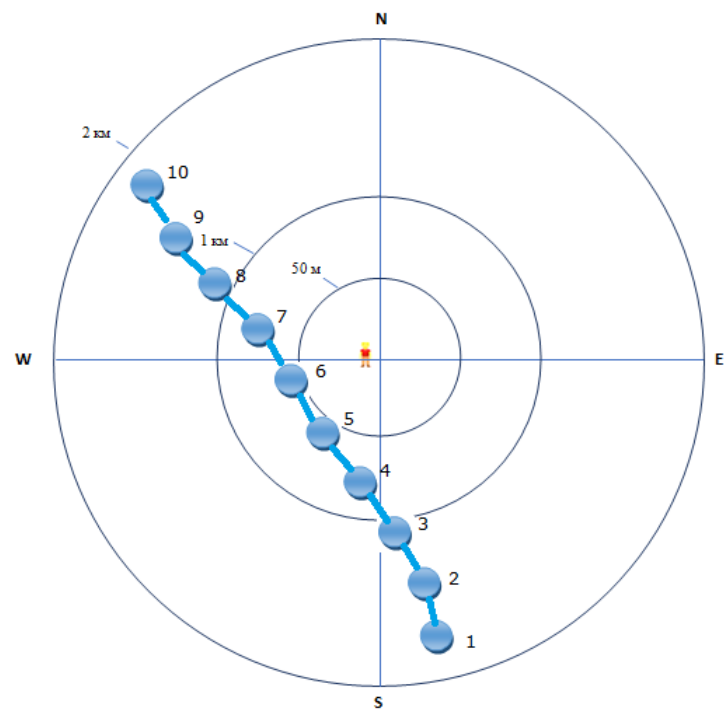



Fig.5 Flight path (VP 4), 03.12.2020

Table 33. *Aegypius monachus* log (VP 4), 03.12.2020.

	<i>Aegypius monachus</i>	1 90 m	2 90 m	3 95 m	4 90 m	5 95 m	6 95 m	7 95 m	8 90 m	9 95 m	10 95 m
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### VP.3

Date: 03.12.2020. Start and end time: 13:56 – 15:59

**Weather:**

The air temperature around 0°C end -1°C sky half cloudy, cold

Wind speed approx. (4-5 m/s) No precipitation

***Primary species not found***

Table 34. Secondary and other species (VP 3), 03.12.2020

No	Latin names	English names	Amount	Flight altitude
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	6	0-8
2.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	1	0-4
3.	<i>Corvus corax</i>	Northern Raven	9	3-12
4.	<i>Columba livia</i>	Rock Dove	5	40
5.	<i>Corvus cornix</i>	Eurasian Hooded Crow	6	25



**VP. 5**

Date: 10.12.2020. Start and end time: 9:33 – 12:36

**Weather:**

The air temperature around -2 end 0°C sky half cloudy, cold  
Wind speed approx. (5-6 m/s) No precipitation

***Primary species not found***

Table 35. Secondary and other species (VP 5), 10.12.2020

No	Latin names	English names	Amount	Flight altitude
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested Lark	9	0-9
2.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	6	0-6
3.	<i>Oenanthe isabellina</i>	Isabelline wheatear	2	0-6
4.	<i>Melanocorypha leucoptera</i>	White-winged Lark	80	0-9

## VP. 6

Date: 10.12.2020 Start and end time: 13:27 – 16:39

**Weather:**

The air temperature around 1°C end -1°C sky half cloudy, cold

Wind speed approx. (5-6 m/s) No precipitation

***Primary species not found***

Table 36. Secondary and other species (VP 6), 10.12.2020.

No	Latin names	English names	Amount	Flight altitude
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested Lark	6	0-9
2.	<i>Oenanthe isabellina</i>	Isabelline wheatear	1	0-6
3.	<i>Melanocorypha leucoptera</i>	White-winged Lark	18	0-9

**VP. 7**

Date: 11.12.2020. Start and end time: 9:26 – 12:26

**Weather:**

The air temperature around -2 end 0°C partly cloudy, cold

Wind speed approx. (4-5 m/s) No precipitation

**Primary species not found**

Table 37. Secondary and other species (VP 7), 11.12.2020.

No	Latin names	English names	Amount	Flight altitude
<b>SECONDARY SPECIES</b>				
1.	<i>Falco tinnunculus</i>	Kestrel	1	10-15
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	6	0-15
2.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	4	0-5
3.	<i>Columba livia</i>	Rock Dove	4	30

**VP. 8**

Date: 11.12.2020. Start and end time: 13:12 – 15:18

**Weather:**

The air temperature around -2°C end -1°C cloudy, cold

Wind speed approx. (5-6 m/s) No precipitation

***Primary species not found***

Table 38. Secondary and other species (VP 8), 11.12.2020.

No	Latin names	English names	Amount	Flight altitude
<b>SECONDARY SPECIES</b>				
1.	<i>Falco tinnunculus</i>	Kestrel	1	15-30
2.	<i>Circus cyaneus</i>	Hen Harrier	1	10-25
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	5	0-15
2.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	13	0-5
3.	<i>Pterocles orientalis</i>	Black-bellied sandgrouse	4	35
4.	<i>Acridotheres tristis</i>	Indian Myna	2	2-9

**VP. 9**

Date: 12.12.2020. Start and end time: 9:32 – 12:35

**Weather:**

The air temperature around -1°C end 0°C cloudy, cold

Wind speed approx. (4-6 m/s) No precipitation

***Primary species not found***

Table 39. Secondary and other species (VP 9), 12.12.2020.

<b>№</b>	<b>Latin names</b>	<b>English names</b>	<b>Amount</b>	<b>Flight altitude</b>
<b>SECONDARY SPECIES</b>				
1.	<i>Falco tinnunculus</i>	Kestrel	1	10-20
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	6	0-9
2.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	10	0-5
3.	<i>Turdus atrogularis</i>	Black-throated Thrush	2	0-12
4.	<i>Melanocorypha leucoptera</i>	White-winged Lark	16	0-5

**VP.10**

Date: 12.12.2020. Start and end time: 13:16 – 15:18

**Weather:**

The air temperature around 1°C end -1°C sky half cloudy, cold

Wind speed approx. (6-7 m/s) No precipitation

***Primary species not found***

Table 40. Secondary and other species (VP 10), 12.12.2020

<b>№</b>	<b>Latin names</b>	<b>English names</b>	<b>Amount</b>	<b>Flight altitude</b>
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	4	0-8
2.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	1	0-4
3.	<i>Corvus corax</i>	Northern Raven	1	5
4.	<i>Corvus cornix</i>	Hooded Crow	5	10

### VP. 1

Date: 13.12.2020. Start and end time: 9:33 – 12:36

**Weather:**

The air temperature around -2°C end -1 °C sky half cloudy, cold

Wind speed approx. (6-7 m/s) No precipitation

***Primary species not found***

Table 41. Secondary and other species (VP 1), 13.12.2020

No	Latin names	English names	Amount	Flight altitude
OTHER SPECIES				
1.	<i>Galerida cristata</i>	Crested lark	3	0-10
2.	<i>Athene noctua</i>	Little owl	1	0-5
3.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	12	0-9
4.	<i>Corvus cornix</i>	Hooded Crow	5	8
5.	<i>Corvus frugilegus</i>	Eurasian Rook	3	7



## VP. 2

Date: 13.12.2020 Start and end time: 13:17 – 16:17

**Weather:**

The air temperature around 0°C end -2°C sky half cloudy, cold

Wind speed approx. (5-6 m/s) No precipitation

Table 42. Secondary and other species (VP 2), 13.12.2020.

No	Latin names	English names	Amount	Flight altitude
<b>SECONDARY SPECIES</b>				
1.	<i>Aegypius monachus</i> (flight also recorded see log below)		1	(flight also recorded see log below)
<b>OTHER SPECIES</b>				
1.	<i>Corvus frugilegus</i>	Eurasian Rook	6	10
2.	<i>Corvus cornix</i>	Eurasian Hooded Crow	4	10
3.	<i>Galerida cristata</i>	Crested lark	3	0-9
4.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	12	0-6

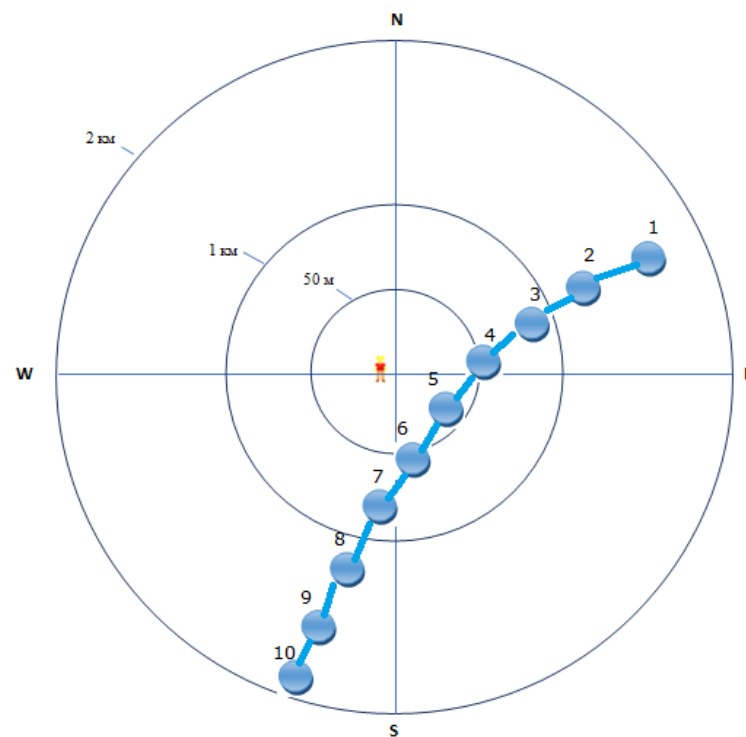



Fig.6 Flight path (VP 2), 13.12.2020

Table 43. *Aegypius monachus* species log (VP 2), 13.12.2020.

	<i>Aegypius monachus</i>	1	2	3	4	5	6	7	8	9	10
		90 m	90 m	85 m	80 m	85 m	85 m	85 m	80 m	85 m	85 m

### VP. 3

Date: 14.12.2020. Start and end time: 9:12 – 12:16

**Weather:**

The air temperature around  $-2^{\circ}\text{C}$  end  $-1^{\circ}\text{C}$  partly cloudy, cold

Wind speed approx. (6-8 m/s) No precipitation

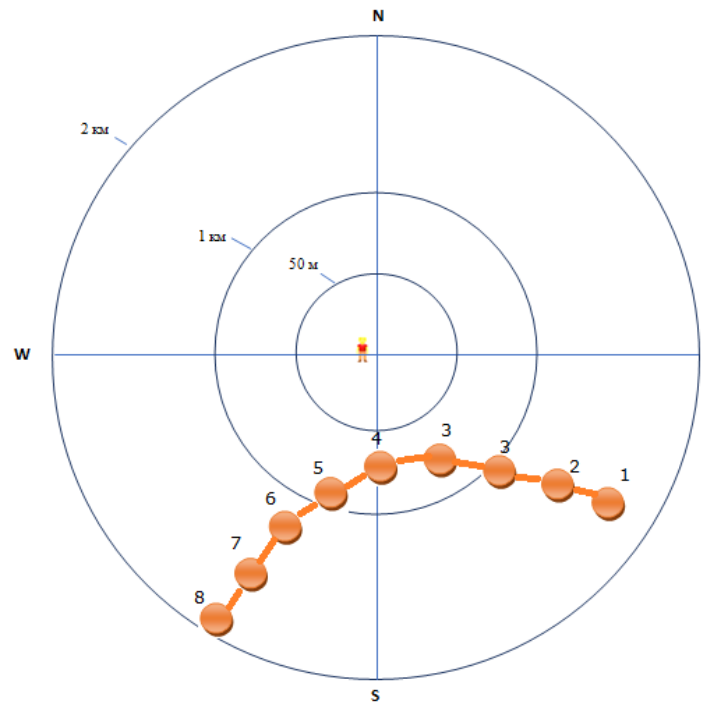


Fig.7 Flight path (VP 3), 14.12.2020

Table 44. Target species log (VP 3), 14.12.2020.


	<i>Aquila heliaca</i>	1 90 m	2 90 m	3 95 m	4 90 m	5 95 m	6 95 m	7 95 m	8 90 m
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Table 45. Secondary and other species (VP 3), 14.12.2020.

No	Latin names	English names	Amount	Flight altitude
<b>SECONDARY SPECIES</b>				
1.	<i>Falco tinnunculus</i>	Common Kestrel	1	5-15
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	4	0-15
2.	<i>Sitta tephronota</i>	Greater Rock Nuthatch	2	4
3.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	3	0-5
4.	<i>Oenanthe isabellina</i>	Isabelline wheatear	1	0-3
5.	<i>Corvus cornix</i>	Hooded Crow	14	12

#### VP. 4

Date: 14.12.2020. Start and end time: 13:02 – 16:06

**Weather:**

The air temperature around -1°C end-2°C partly cloudy, cold  
Wind speed approx. (6-8 m/s) No precipitation

**Primary species not found**

Table 46. Secondary and other species (VP 4), 14.12.2020.

No	Latin names	English names	Amount	Flight altitude
OTHER SPECIES				
1.	<i>Galerida cristata</i>	Crested lark	6	0-15
2.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	6	0-5
3.	<i>Corvus cornix</i>	Hooded Crow	12	21

### VP. 5

Date: 15.12.2020 Start and end time: 8:57 – 11:57

**Weather:**

The air temperature around  $-3^{\circ}\text{C}$  end  $-2^{\circ}\text{C}$  is sunny, cold

Wind speed approx. (4-5 m/s) No precipitation

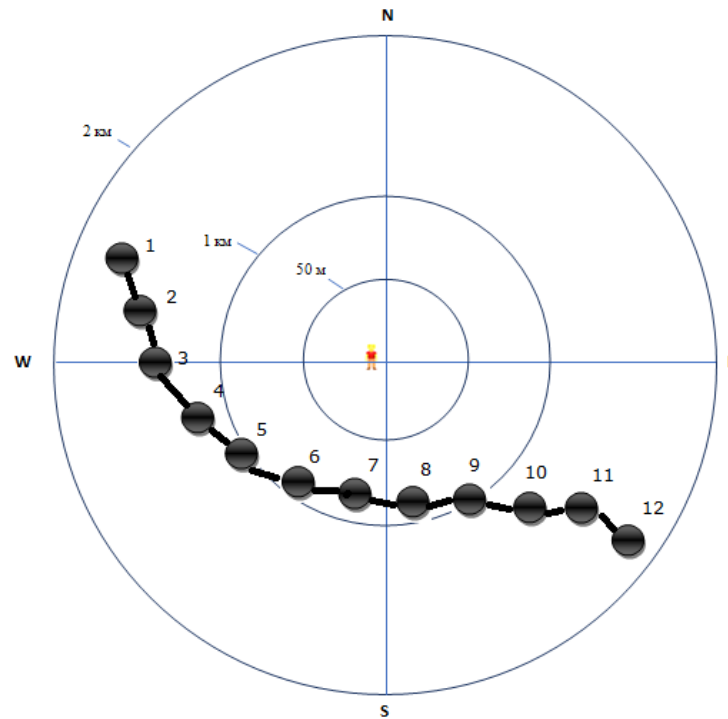


Fig.8 Flight path (VP 5), 15.12.2020

Table 47. Target species log (VP 5), 15.12.2020.

●	<i>Aquila nipalensis</i>	1 30 m	2 40 m	3 55 m	4 60 m	5 65 m	6 65 m	7 55 m	8 60 m	9 65 m	10 65 m	11 65 m	12 65 m
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Table 48. Secondary and other species (VP 5), 15.12.2020.

№	Latin names	English names	Amount	Flight altitude
<b>OTHER SPECIES</b>				
1.	<i>Corvus frugilegus</i>	Eurasian Rook	6	0-10
2.	<i>Corvus cornix</i>	Eurasian Hooded Crow	8	40
3.	<i>Galerida cristata</i>	Crested lark	2	0-9



## VP.6

Date: 15.12.2020. Start and end time: 13:22 – 15:22

### **Weather:**

The air temperature around 1°C end 0°C is sunny, cold

Wind speed approx. (6-7 m/s) No precipitation

### ***Primary species not found***

Table 49. Secondary and other species (VP 6), 15.12.2020

No	Latin names	English names	Amount	Flight altitude
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	9	0-8
2.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	2	0-4
3.	<i>Corvus corax</i>	Northern Raven	12	3-12
4.	<i>Columba livia</i>	Rock Dove	5	40
5.	<i>Corvus cornix</i>	Eurasian Hooded Crow	1	25

**VP. 7**

Date: 16.12.2020. Start and end time: 9:10 – 12:10

**Weather:**

The air temperature around -2°C end -1°C partly cloudy, cold

Wind speed approx. (5-6 m/s) No precipitation

**Primary species not found**

Table 50. Secondary and other species (VP 7), 16.12.2020.

No	Latin names	English names	Amount	Flight altitude
<b>SECONDARY SPECIES</b>				
1.	<i>Circus cyaneus</i>	Hen Harrier	1	12-25
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	6	0-15
2.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	14	0-5
3.	<i>Corvus cornix</i>	Hooded Crow	13	9-25

## VP.8

Date: 16.12.2020. Start and end time: 13:56 – 15:59

### **Weather:**

The air temperature around 0°C end -1°C sky half cloudy, cold

Wind speed approx. (4-5 m/s) No precipitation

### ***Primary species not found***

Table 51. Secondary and other species (VP 8), 16.12.2020

<b>№</b>	<b>Latin names</b>	<b>English names</b>	<b>Amount</b>	<b>Flight altitude</b>
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	6	0-8
2.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	1	0-4
3.	<i>Corvus corax</i>	Northern Raven	9	3-12
4.	<i>Columba livia</i>	Rock Dove	5	40
5.	<i>Corvus cornix</i>	Eurasian Hooded Crow	6	25

**VP. 9**

Date: 17.12.2020. Start and end time: 9:14 – 12:14

**Weather:**

The air temperature around -1end 0°C is sunny, cold

Wind speed approx. (5-6 m/s) No precipitation

***Primary species not found***

Table 52. Secondary and other species (VP 9), 17.12.2020

No	Latin names	English names	Amount	Flight altitude
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	4	0-9
2.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	6	0-6
3.	<i>Melanocorypha leucoptera</i>	White-winged Lark	23	0-9

**VP. 10**

Date: 17.12.2020 Start and end time: 13:21 – 16:21

**Weather:**

The air temperature around 1°C end -1°C is sunny, cold

Wind speed approx. (5-6 m/s) No precipitation

***Primary species not found***

Table 53. Secondary and other species (VP 10), 17.12.2020.

No	Latin names	English names	Amount	Flight altitude
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	4	0-9
2.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	8	0-6
3.	<i>Oenanthe isabellina</i>	Isabelline wheatear	1	0-6
4.	<i>Melanocorypha leucoptera</i>	White-winged Lark	12	0-9

**VP. 1**

Date: 23.12.2020. Start and end time: 9:25 – 12:25

**Weather:**

The air temperature around -1 end 3°C partly cloudy, cold

Wind speed approx. (4-5 m/s) No precipitation

Table 54. Secondary and other species (VP 1), 23.12.2020.

No	Latin names	English names	Amount	Flight altitude
<b>SECONDARY SPECIES</b>				
1.	<i>Falco tinnunculus</i>	Kestrel	1	5-15
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	8	0-9
2.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	9	0-5
3.	<i>Columba livia</i>	Rock Dove	3	30

## VP. 2

Date: 23.12.2020. Start and end time: 13:16 – 16:18

### **Weather:**

The air temperature around 3°C end 2°C cloudy

Wind speed approx. (5-6 m/s) No precipitation

### **Primary species not found**

Table 55. Secondary and other species (VP 2), 23.12.2020.

No	Latin names	English names	Amount	Flight altitude
<b>SECONDARY SPECIES</b>				
1.	<i>Falco tinnunculus</i>	Kestrel	1	5-20
2.	<i>Circus cyaneus</i>	Hen Harrier	2	10-25
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	4	0-15
2.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	12	0-5
3.	<i>Columba livia</i>	Rock Dove	5	30
4.	<i>Pterocles orientalis</i>	Black-bellied sandgrouse	3	35
5.	<i>Acridotheres tristis</i>	Indian Myna	2	2-9



### VP. 3

Date: 24.12.2020. Start and end time: 9:11 – 12:11

**Weather:**

The air temperature around -1°C end 3°C cloudy, cold

Wind speed approx. (4-6 m/s) No precipitation

***Primary species not found***

Table 56. Secondary and other species (VP 3), 24.12.2020.

No	Latin names	English names	Amount	Flight altitude
<b>SECONDARY SPECIES</b>				
1.	<i>Falco tinnunculus</i>	Kestrel	1	10-20
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	6	0-9
2.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	10	0-5
3.	<i>Turdus atrogularis</i>	Black-throated Thrush	2	0-12
4.	<i>Sitta tephronota</i>	Greater Rock Nuthatch	2	4
5.	<i>Melanocorypha leucoptera</i>	White-winged Lark	16	0-5

#### VP.4

Date: 24.12.2020. Start and end time: 13:16 – 16:18

**Weather:**

The air temperature around 2°C end -1°C sky half cloudy, cold

Wind speed approx. (6-7 m/s) No precipitation

***Primary species not found***

Table 57. Secondary and other species (VP 4), 24.12.2020

No	Latin names	English names	Amount	Flight altitude
OTHER SPECIES				
1.	<i>Galerida cristata</i>	Crested lark	4	0-8
2.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	1	0-4
3.	<i>Corvus corax</i>	Northern Raven	1	5
4.	<i>Corvus cornix</i>	Hooded Crow	6	23

**VP. 5**

Date: 25.12.2020. Start and end time: 9:08 – 12:12

**Weather:**

The air temperature around -1°C end 2 °C sky half cloudy, cold  
Wind speed approx. (6-7 m/s) No precipitation

***Primary species not found***

Table 58. Secondary and other species (VP 5), 25.12.2020

<b>№</b>	<b>Latin names</b>	<b>English names</b>	<b>Amount</b>	<b>Flight altitude</b>
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	4	0-10
2.	<i>Athene noctua</i>	Little owl	1	0-5
3.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	8	0-9
4.	<i>Corvus cornix</i>	Hooded Crow	6	8
5.	<i>Corvus frugilegus</i>	Eurasian Rook	5	7

## VP. 6

Date: 25.12.2020 Start and end time: 13:19 – 16:20

### **Weather:**

The air temperature around 2°C end -1°C sky half cloudy, cold

Wind speed approx. (5-6 m/s) No precipitation

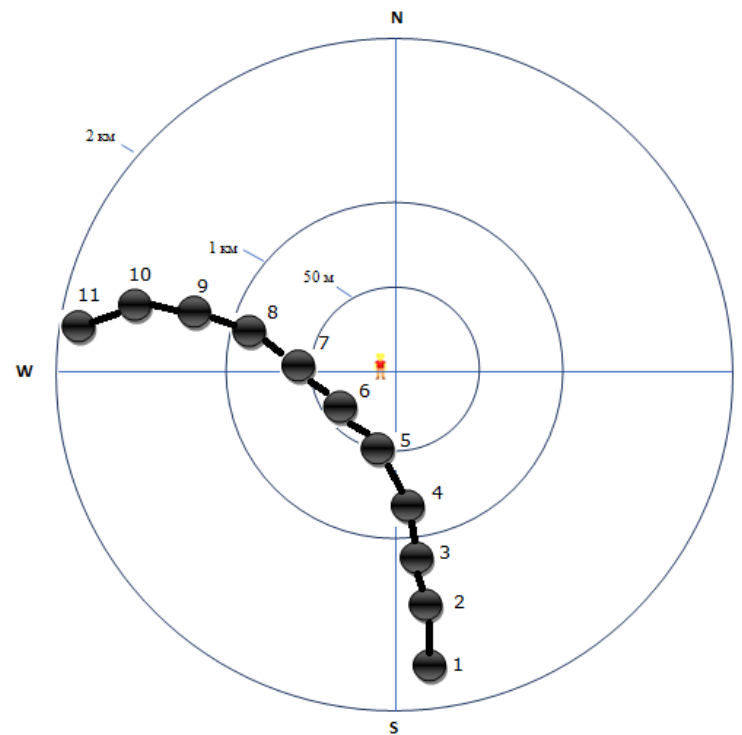


Fig.9 Flight path (VP 6), 25.12.2020

Table 59. Target species log (VP 6), 25.12.2020.


	<i>Aquila nipalensis</i>	1 90 m	2 90 m	3 85 m	4 80 m	5 85 m	6 85 m	7 85 m	8 80 m	9 85 m	10 85 m	11 85 m
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Table 60. Secondary and other species (VP 6), 25.12.2020.

No	Latin names	English names	Amount	Flight altitude
<b>OTHER SPECIES</b>				
1.	<i>Corvus frugilegus</i>	Eurasian Rook	6	10
2.	<i>Corvus cornix</i>	Eurasian Hooded Crow	4	10
3.	<i>Galerida cristata</i>	Crested lark	6	0-9
4.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	8	0-6

### VP. 7

Date: 26.12.2020. Start and end time: 9:10 – 12:16

**Weather:**

The air temperature around -2°C end-1°C partly cloudy, cold

Wind speed approx. (6-8 m/s) No precipitation

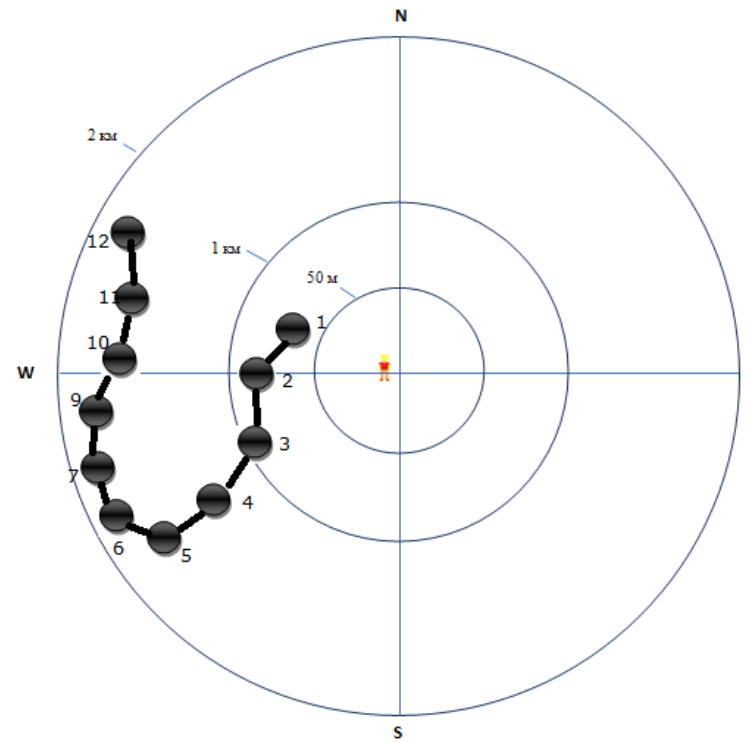


Fig.10 Flight path (VP 7), 26.12.2020

Table 61. Target species log (VP 7), 26.12.2020.

●	<i>Aquila nipalensis</i>	1 90 m	2 90 m	3 95 m	4 90 m	5 95 m	6 95 m	7 95 m	8 90 m	9 95 m	10 95 m	11 90 m	12 95 m
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Table 62. Secondary and other species (VP 7), 26.12.2020.

No	Latin names	English names	Amount	Flight altitude
<b>SECONDARY SPECIES</b>				
1.	<i>Falco tinnunculus</i>	Common Kestrel	1	5-15
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	6	0-15
2.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	5	0-5
3.	<i>Oenanthe isabellina</i>	Isabelline wheatear	2	0-3
4.	<i>Corvus cornix</i>	Hooded Crow	6	12



**VP. 8**

Date: 26.12.2020. Start and end time: 13:10 – 16:16

**Weather:**

The air temperature around -1°C end 1°C partly cloudy, cold

Wind speed approx. (6-8 m/s) No precipitation

**Primary species not found**

Table 63. Secondary and other species (VP 8), 26.12.2020.

No	Latin names	English names	Amount	Flight altitude
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	5	0-15
2.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	3	0-5
3.	<i>Corvus cornix</i>	Hooded Crow	5	12

## VP survey results in January

### VP.9

Date: 04.01.2021. Start and end time: 9:17 – 12:20

**Weather:**

The air temperature around -2°C end 0°C is sunny, cold

Wind speed approx. (5-6 m/s) No precipitation

***Primary species not found***

Table 64. Secondary and other species (VP 9), 04.01.2021

No	Latin names	English names	Amount	Flight altitude
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	4	0-5
2.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	1	0-4
3.	<i>Melanocorypha leucoptera</i>	White-winged Lark	12	0-6
4.	<i>Oenanthe finschii</i>	Black-necked Wheatear	1	0-3

**VP. 10**

Date: 04.01.2021. Start and end time: 13:33 – 15:36

**Weather:**

The air temperature around 0°C end -1 °C sky half cloudy, cold

Wind speed approx. (3-4 m/s) No precipitation

***Primary species not found***

Table 65. Secondary and other species (VP 10), 04.01.2021

<b>№</b>	<b>Latin names</b>	<b>English names</b>	<b>Amount</b>	<b>Flight altitude</b>
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	3	0-10
2.	<i>Corvus cornix</i>	Hooded Crow	1	8
3.	<i>Melanocorypha leucoptera</i>	White-winged Lark	5	0-7
4.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	2	0-2

### VP. 1

Date: 05.01.2021 Start and end time: 9:27 – 12:37

**Weather:**

The air temperature around -2°C end 0°C cloudy,cold

Wind speed approx. (4-5 m/s) No precipitation

**Primary species not found**

Table 66. Secondary and other species (VP 1), 05.01.2021.

No	Latin names	English names	Amount	Flight altitude
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	4	0-8
2.	<i>Corvus corax</i>	Northern Raven	6	3-12
3.	<i>Columba livia</i>	Rock Dove	5	40
4.	<i>Oenanthe finschii</i>	Black-necked Wheatear	1	0-3

## VP.2

Date: 05.01.2021. Start and end time: 13:23 – 15:23

### **Weather:**

The air temperature around 1°C end -1°C cloudy, cold  
Wind speed approx. (6-7 m/s) No precipitation

### ***Primary species not found***

Table 67. Secondary and other species (VP 2), 05.01.2021

<b>№</b>	<b>Latin names</b>	<b>English names</b>	<b>Amount</b>	<b>Flight altitude</b>
<b>SECONDARY SPECIES</b>				
1.	<i>Falco tinnunculus</i>	Common Kestrel	1	10-25
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	4	0-15
2.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	4	0-5
3.	<i>Oenanthe isabellina</i>	Isabelline wheatear	1	0-3
4.	<i>Corvus cornix</i>	Hooded Crow	6	9-25

### VP. 3

Date: 06.01.2021. Start and end time: 9:13 – 12:13

**Weather:**

The air temperature around  $-1^{\circ}\text{C}$  end  $0^{\circ}\text{C}$  is sunny, cold

Wind speed approx. (5-6 m/s) No precipitation

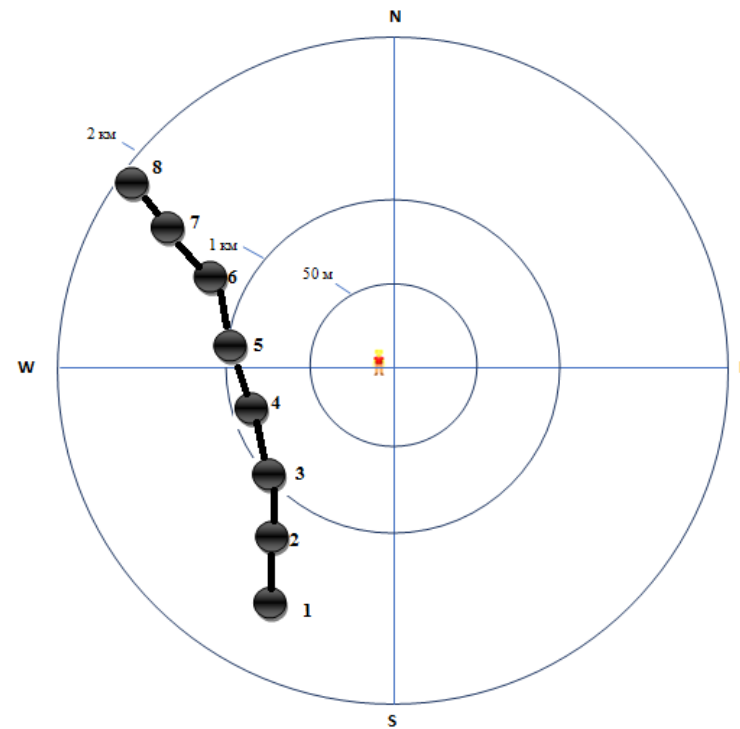


Fig.11 Flight path (VP 3), 06.01.2021

Table 68. Target species log (VP 3), 06.01.2021.


	<i>Aquila chrysaetos</i>	1 120 m	2 120 m	3 125 m	4 120 m	5 125 m	6 125 m	7 125 m	8 120 m
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Table 69. Secondary and other species (VP 3), 06.01.2021.

No	Latin names	English names	Amount	Flight altitude
<b>SECONDARY SPECIES</b>				
1.	<i>Circus cyaneus</i>	Hen Harrier	1	10-25
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	7	0-15
2.	<i>Oenanthe isabellina</i>	Isabelline wheatear	1	0-3
3.	<i>Alectoris chukar</i>	Chuckar partridge	6	0-5
4.	<i>Corvus cornix</i>	Hooded Crow	12	9-25
5.	<i>Athene noctua</i>	Little Owl	1	0-5



#### VP.4

Date: 06.01.2020. Start and end time: 13:56 – 15:59

**Weather:**

The air temperature around 0°C end -1°C sky half cloudy, cold

Wind speed approx. (4-5 m/s) No precipitation

***Primary species not found***

Table 70. Secondary and other species (VP 3), 03.12.2020

No	Latin names	English names	Amount	Flight altitude
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	6	0-8
2.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	1	0-4
3.	<i>Corvus corax</i>	Northern Raven	9	3-12
4.	<i>Corvus cornix</i>	Eurasian Hooded Crow	6	25

**VP. 6**

Date: 9.01.2021. Start and end time: 9:33 – 12:36

**Weather:**

The air temperature around -2 end 0°C is sunny, cold

Wind speed approx. (5-6 m/s) No precipitation

***Primary species not found***

Table 71. Secondary and other species (VP 6), 01.2021

No	Latin names	English names	Amount	Flight altitude
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested Lark	3	0-5
2.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	4	0-6
3.	<i>Oenanthe isabellina</i>	Isabelline wheatear	2	0-6
4.	<i>Melanocorypha leucoptera</i>	White-winged Lark	13	0-6
5.	<i>Oenanthe finschii</i>	Black-necked Wheatear	1	0-3

## VP. 5

Date: 09.01.2021 Start and end time: 13:27 – 16:39

**Weather:**

The air temperature around 0°C end -2°C sky half cloudy, cold

Wind speed approx. (5-6 m/s) No precipitation

***Primary species not found***

Table 72. Secondary and other species (VP 5), 09.01.2021.

No	Latin names	English names	Amount	Flight altitude
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested Lark	3	0-9
2.	<i>Oenanthe isabellina</i>	Isabelline wheatear	1	0-6

**VP. 7**

Date: 10.01.2021. Start and end time: 9:26 – 12:26

**Weather:**

The air temperature around 1 end 3°C is sunny, cold

Wind speed approx. (4-5 m/s) No precipitation

**Primary species not found**

Table 73. Secondary and other species (VP 7), 10.01.2021.

No	Latin names	English names	Amount	Flight altitude
<b>SECONDARY SPECIES</b>				
1.	<i>Falco tinnunculus</i>	Kestrel	1	10-15
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	4	0-15
2.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	5	0-5
3.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	1	0-3
4.	<i>Haliaeetus albicilla</i>	White-tailed Sea-eagle	1	120

**VP. 8**

Date: 10.01.2021. Start and end time: 13:12 – 16:18

**Weather:**

The air temperature around 3°C end 2°C partly cloudy

Wind speed approx. (5-6 m/s) No precipitation

***Primary species not found***

Table 74. Secondary and other species (VP 8), 10.01.2021.

No	Latin names	English names	Amount	Flight altitude
<b>SECONDARY SPECIES</b>				
1.	<i>Falco tinnunculus</i>	Kestrel	1	15-30
2.	<i>Circus cyaneus</i>	Hen Harrier	1	10-25
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	3	0-5
2.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	12	0-5
3.	<i>Athene noctua</i>	Little Owl	1	0-3
4.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	2	0-3

**VP. 9**

Date: 11.01.2021. Start and end time: 9:32 – 12:35

**Weather:**

The air temperature around 3°C end 5°C sky partly cloudy

Wind speed approx. (4-6 m/s) No precipitation

***Primary species not found***

Table 75. Secondary and other species (VP 9), 11.01.2021.

<b>№</b>	<b>Latin names</b>	<b>English names</b>	<b>Amount</b>	<b>Flight altitude</b>
<b>SECONDARY SPECIES</b>				
1.	<i>Falco tinnunculus</i>	Kestrel	1	10-20
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	6	0-9
2.	<i>Athene noctua</i>	Little Owl	1	0-5
3.	<i>Melanocorypha leucoptera</i>	White-winged Lark	16	0-5
4.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	2	0-3

**VP.10**

Date: 11.01.2021. Start and end time: 13:36 – 16:38

**Weather:**

The air temperature around 4°C end 2°C sky half cloudy.

Wind speed approx. (6-7 m/s) No precipitation

***Primary species not found***

Table 76. Secondary and other species (VP 10), 11.01.2021

<b>№</b>	<b>Latin names</b>	<b>English names</b>	<b>Amount</b>	<b>Flight altitude</b>
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	4	0-8
2.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	1	0-4
3.	<i>Corvus corax</i>	Northern Raven	1	5
4.	<i>Alectoris chukar</i>	Chuckar partridge	5	0-3
5.	<i>Corvus cornix</i>	Hooded Crow	5	10



**VP. 1**

Date: 12.01.20201. Start and end time: 9:23 – 12:26

**Weather:**

The air temperature around -2°C end -1 °C is sunny, cold  
Wind speed approx. (6-7 m/s) No precipitation

***Primary species not found***

Table 77. Secondary and other species (VP 1), 12.01.2021

<b>№</b>	<b>Latin names</b>	<b>English names</b>	<b>Amount</b>	<b>Flight altitude</b>
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	3	0-10
2.	<i>Athene noctua</i>	Little owl	1	0-5
3.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	6	0-9
4.	<i>Corvus cornix</i>	Hooded Crow	4	8
5.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	2	0-2

## VP. 2

Date: 12.01.2021. Start and end time: 13:27 – 16:27

### **Weather:**

The air temperature around 0°C end -2°C sky half cloudy, cold

Wind speed approx. (5-6 m/s) No precipitation

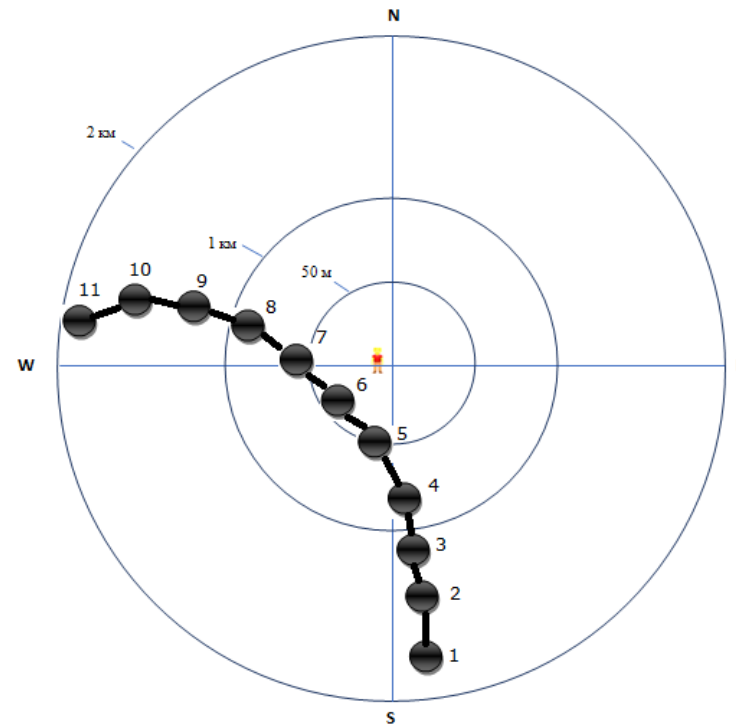


Fig.12 Flight path (VP 2), 12.01.2021

Table 78. Target species log (VP 2), 12.01.2021.


	<i>Aquila nipalensis</i>	1 160 m	2 160 m	3 165 m	4 160 m	5 165 m	6 165 m	7 165 m	8 160 m	9 165 m	10 165 m	10 165 m
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Table 79. Secondary and other species (VP 2), 12.01.2021.

No	Latin names	English names	Amount	Flight altitude
<b>OTHER SPECIES</b>				
1.	<i>Corvus frugilegus</i>	Eurasian Rook	4	0-5
2.	<i>Corvus cornix</i>	Eurasian Hooded Crow	4	10
3.	<i>Galerida cristata</i>	Crested lark	3	0-9
4.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	12	0-6

**VP. 3**

Date: 13.01.2021. Start and end time: 9:12 – 12:16

**Weather:**

The air temperature around -2°C end-1°C partly cloudy,cold

Wind speed approx. (6-8 m/s) No precipitation

Table 80. Secondary and other species (VP 3), 13.01.2021.

<b>№</b>	<b>Latin names</b>	<b>English names</b>	<b>Amount</b>	<b>Flight altitude</b>
<b>SECONDARY SPECIES</b>				
1.	<i>Falco tinnunculus</i>	Common Kestrel	1	5-15
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	4	0-15
2.	<i>Sitta tephronota</i>	Greater Rock Nuthatch	1	0-4
3.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	3	0-5
4.	<i>Oenanthe isabellina</i>	Isabelline wheatear	1	0-3
5.	<i>Corvus cornix</i>	Hooded Crow	14	12

#### VP. 4

Date: 13.12.2020. Start and end time: 13:02 – 16:06

**Weather:**

The air temperature around 0°C end -2°C partly cloudy,cold

Wind speed approx. (6-8 m/s) No precipitation

**Primary species not found**

Table 81. Secondary and other species (VP 4), 13.01.2021.

No	Latin names	English names	Amount	Flight altitude
OTHER SPECIES				
1.	<i>Galerida cristata</i>	Crested lark	3	0-15
2.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	4	0-5
3.	<i>Corvus cornix</i>	Hooded Crow	12	21
4.	<i>Oenanthe finschii</i>	Black-necked Wheatear	1	0-3

# VP. 5

Date: 14.01.2021. Start and end time: 9:12 – 12:16

## **Weather:**

The air temperature around -2°C end 0-°C partly cloudy, cold

Wind speed approx. (6-8 m/s) No precipitation

Table 82. Secondary and other species (VP 5), 14.01.2021.

<b>№</b>	<b>Latin names</b>	<b>English names</b>	<b>Amount</b>	<b>Flight altitude</b>
<b>SECONDARY SPECIES</b>				
1.	<i>Falco tinnunculus</i>	Common Kestrel	1	10-15
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	3	0-15
2.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	3	0-5
3.	<i>Oenanthe isabellina</i>	Isabelline wheatear	1	0-3

#### VP. 4

Date: 14.01.2021. Start and end time: 13:02 – 16:06

**Weather:**

The air temperature around 0°C end -2°C partly cloudy,cold

Wind speed approx. (6-8 m/s) No precipitation

**Primary species not found**

Table 83. Secondary and other species (VP 4), 14.01.2021.

No	Latin names	English names	Amount	Flight altitude
OTHER SPECIES				
1.	<i>Galerida cristata</i>	Crested lark	3	0-15
2.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	4	0-5
3.	<i>Corvus cornix</i>	Hooded Crow	5	21
4.	<i>Oenanthe finschii</i>	Black-necked Wheatear	1	0-3



### VP. 7

Date: 15.01.2021. Start and end time: 8:57 – 11:57

**Weather:**

The air temperature around 3°C and 5°C is sunny

Wind speed approx. (4-5 m/s) No precipitation

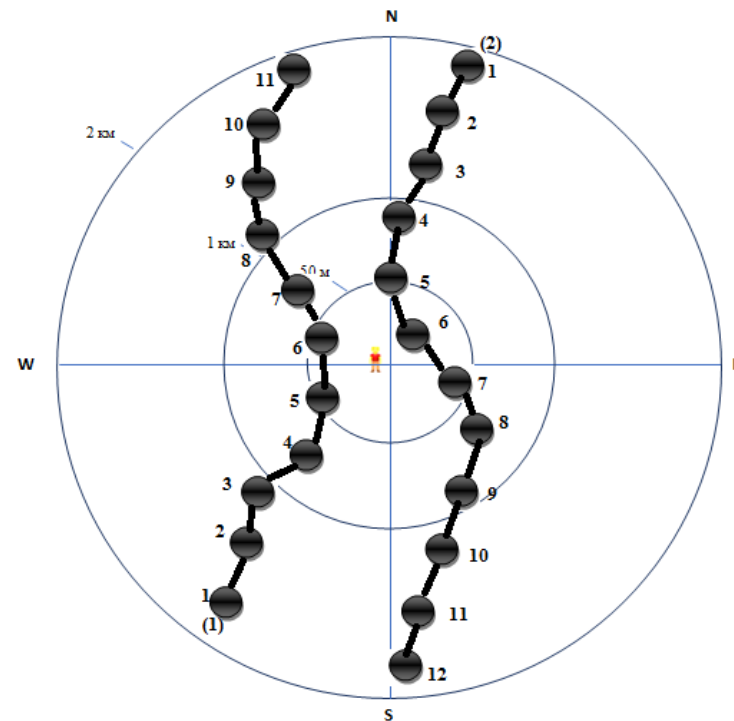


Fig.13 Flight path (VP 7), 15.01.2021

Table 84. Target species log (VP 7), 15.01.2021.

●	<i>Aquila nipalensis</i> (1)	1 130 m	2 140 m	3 155 m	4 160 m	5 165 m	6 165 m	7 155 m	8 160 m	9 165 m	10 165 m	11 165 m	
●	<i>Aquila nipalensis</i> (2)	1 160 m	2 160 m	3 155 m	4 130 m	5 125 m	6 185 m	7 185 m	8 190 m	9 195 m	10 195 m	11 195 m	12 195 m

Table 85. Secondary and other species (VP 7), 15.01.2021.

No	Latin names	English names	Amount	Flight altitude
<b>OTHER SPECIES</b>				
1.	<i>Corvus frugilegus</i>	Eurasian Rook	6	0-10
2.	<i>Corvus cornix</i>	Eurasian Hooded Crow	8	40
3.	<i>Galerida cristata</i>	Crested lark	6	0-9
4.	<i>Oenanthe finschii</i>	Black-necked Wheatear	2	0-3
5.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	2	0-2

### VP.8

Date: 15.01.2021. Start and end time: 13:22 – 15:22

**Weather:**

The air temperature around 5°C end 3°C is sunny,  
Wind speed approx. (6-7 m/s) No precipitation

***Primary species not found***

Table 86. Secondary and other species (VP 8), 15.01.2021

No	Latin names	English names	Amount	Flight altitude
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	9	0-8
2.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	2	0-4
3.	<i>Corvus corax</i>	Northern Raven	12	3-12
4.	<i>Columba livia</i>	Rock Dove	5	40
5.	<i>Corvus cornix</i>	Eurasian Hooded Crow	1	25

**VP. 10**

Date: 19.01.2021. Start and end time: 9:10 – 12:10

**Weather:**

The air temperature around -1°C end 0°C partly cloudy, cold

Wind speed approx. (5-6 m/s) No precipitation

**Primary species not found**

Table 87. Secondary and other species (VP 10), 19.01.2021.

<b>№</b>	<b>Latin names</b>	<b>English names</b>	<b>Amount</b>	<b>Flight altitude</b>
<b>SECONDARY SPECIES</b>				
1.	<i>Circus cyaneus</i>	Hen Harrier	1	12-25
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	6	0-15
2.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	6	0-5
3.	<i>Corvus cornix</i>	Hooded Crow	13	9-25
4.	<i>Acridotheres tristis</i>	Indian Myna	5	8-10
5.	<i>Athene noctua</i>	Little Owl	1	0-4

**VP.9**

Date: 19.01.2021. Start and end time: 13:56 – 16:59

**Weather:**

The air temperature around 0°C end -1°C sky half cloudy, cold

Wind speed approx. (4-5 m/s) No precipitation

***Primary species not found***

Table 88. Secondary and other species (VP 9), 19.01.2021

No	Latin names	English names	Amount	Flight altitude
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	5	0-8
2.	<i>Corvus corax</i>	Northern Raven	9	3-12
3.	<i>Corvus cornix</i>	Eurasian Hooded Crow	6	25
4.	<i>Oenanthe finschii</i>	Black-necked Wheatear	1	0-3
5.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	2	0-4

**VP. 1**

Date: 20.01.2021. Start and end time: 9:14 – 12:14

**Weather:**

The air temperature around -2°C end 0°C is sunny, cold

Wind speed approx. (5-6 m/s) No precipitation

***Primary species not found***

Table 89. Secondary and other species (VP 1), 20.01.2021

No	Latin names	English names	Amount	Flight altitude
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	4	0-9
2.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	6	0-6
3.	<i>Melanocorypha leucoptera</i>	White-winged Lark	12	0-9

## VP. 2

Date: 20.01.2021. Start and end time: 13:21 – 16:21

**Weather:**

The air temperature around 1°C end -1°C is sunny, cold

Wind speed approx. (5-6 m/s) No precipitation

***Primary species not found***

Table 90. Secondary and other species (VP 2), 20.01.2021.

No	Latin names	English names	Amount	Flight altitude
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	2	0-9
2.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	8	0-6
3.	<i>Oenanthe isabellina</i>	Isabelline wheatear	1	0-6
4.	<i>Melanocorypha leucoptera</i>	White-winged Lark	15	0-9



**VP. 3**

Date: 21.01.2021. Start and end time: 9:25 – 12:25

**Weather:**

The air temperature around -1 end 3°C partly cloudy, cold  
Wind speed approx. (4-5 m/s) No precipitation

Table 91. Secondary and other species (VP 3), 21.01.2021.

<b>№</b>	<b>Latin names</b>	<b>English names</b>	<b>Amount</b>	<b>Flight altitude</b>
<b>SECONDARY SPECIES</b>				
1.	<i>Falco tinnunculus</i>	Kestrel	1	5-20
2.	<i>Buteo rufinus</i>	Long-legged Buzzard	1	20-30
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	5	0-9
2.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	6	0-5
3.	<i>Columba livia</i>	Rock Dove	3	30
4.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	1	0-3

#### VP. 4

Date: 21.01.2021. Start and end time: 13:16 – 16:18

**Weather:**

The air temperature around 3°C end 2°C cloudy

Wind speed approx. (5-6 m/s) No precipitation

***Primary species not found***

Table 92. Secondary and other species (VP 4), 21.01.2021.

No	Latin names	English names	Amount	Flight altitude
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	4	0-15
2.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	6	0-5
3.	<i>Columba livia</i>	Rock Dove	8	30
4.	<i>Acridotheres tristis</i>	Indian Myna	2	2-9
5.	<i>Haliaeetus albicilla</i>	White-tailed Sea-eagle	1	120-160

**VP. 6**

Date: 24.01.2021. Start and end time: 9:11 – 12:11

**Weather:**

The air temperature around -2°C end 0°C cloudy, cold

Wind speed approx. (4-6 m/s) No precipitation

***Primary species not found***

Table 93. Secondary and other species (VP 6), 24.01.2021.

<b>№</b>	<b>Latin names</b>	<b>English names</b>	<b>Amount</b>	<b>Flight altitude</b>
<b>SECONDARY SPECIES</b>				
1.	<i>Falco tinnunculus</i>	Kestrel	1	10-20
2.	<i>Aegypius monachus</i>	Cinereous Vulture	1	160-180
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	4	0-9
2.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	6	0-5
3.	<i>Melanocorypha leucoptera</i>	White-winged Lark	12	0-5
4.	<i>Oenanthe finschii</i>	Black-necked Wheatear	1	0-3
5.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	2	0-2

**VP.5**

Date: 24.01.2021. Start and end time: 13:16 – 16:18

**Weather:**

The air temperature around 0°C end -2°C sky half cloudy, cold

Wind speed approx. (6-7 m/s) No precipitation

***Primary species not found***

Table 94. Secondary and other species (VP 5), 24.01.2021

<b>№</b>	<b>Latin names</b>	<b>English names</b>	<b>Amount</b>	<b>Flight altitude</b>
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	4	0-8
2.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	1	0-4
3.	<i>Corvus corax</i>	Northern Raven	1	5
4.	<i>Corvus cornix</i>	Hooded Crow	6	23

**VP. 7**

Date: 25.01.2021. Start and end time: 9:08 – 12:12

**Weather:**

The air temperature around -2°C end -1 °C sky half cloudy, cold

Wind speed approx. (6-7 m/s) No precipitation

***Primary species not found***

Table 95. Secondary and other species (VP 7), 25.01.2021

<b>№</b>	<b>Latin names</b>	<b>English names</b>	<b>Amount</b>	<b>Flight altitude</b>
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	4	0-10
2.	<i>Athene noctua</i>	Little owl	1	0-5
3.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	8	0-9
4.	<i>Corvus cornix</i>	Hooded Crow	6	8
5.	<i>Corvus frugilegus</i>	Eurasian Rook	5	7

### VP. 8

Date: 25.01.2021. Start and end time: 13:19 – 16:20

**Weather:**

The air temperature around  $-1^{\circ}\text{C}$  end  $0^{\circ}\text{C}$  sky half cloudy, cold

Wind speed approx. (5-6 m/s) No precipitation

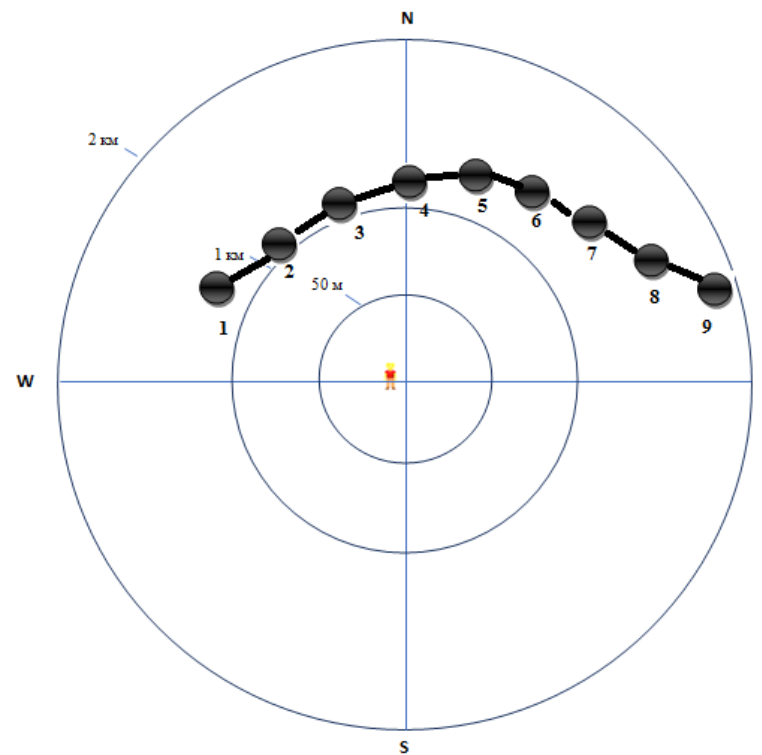


Fig.14 Flight path (VP 8), 25.01.2021

Table 96. Target species log (VP 8), 25.01.2021.


	<i>Aquila nipalensis</i>	1 90 m	2 90 m	3 125 m	4 130 m	5 155 m	6 155 m	7 185 m	8 180 m	9 185 m
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Table 97. Secondary and other species (VP 8), 25.01.2021.

No	Latin names	English names	Amount	Flight altitude
<b>SECONDARY SPECIES</b>				
1.	<i>Falco tinnunculus</i>	Common Kestrel	1	5-15
2.	<i>Buteo rufinus</i>	Long-legged Buzzard	1	25-55
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	6	0-15
2.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	5	0-5
3.	<i>Oenanthe isabellina</i>	Isabelline wheatear	2	0-3
4.	<i>Corvus cornix</i>	Hooded Crow	6	12



## VP survey results in February

### VP.10

Date: 01.02.2021. Start and end time: 9:17 – 12:20

**Weather:**

The air temperature around 1°C end 6°C is sunny,  
Wind speed approx. (3-4 m/s) No precipitation

***Primary species not found***

Table 98. Secondary and other species (VP 10), 01.02.2021

No	Latin names	English names	Amount	Flight altitude
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	6	0-5
2.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	2	0-4
3.	<i>Melanocorypha leucoptera</i>	White-winged Lark	12	0-6
4.	<i>Oenanthe finschii</i>	Black-necked Wheatear	1	0-3

### VP. 9

Date: 01.02.2021. Start and end time: 13:33 – 16:36

**Weather:**

The air temperature around 6°C end 3 °C sky half cloudy,  
Wind speed approx. (5-6 m/s) No precipitation

***Primary species not found***

Table 99. Secondary and other species (VP 9), 01.02.2021

No	Latin names	English names	Amount	Flight altitude
<b>SECONDARY SPECIES</b>				
1.	<i>Falco tinnunculus</i>	Common Kestrel	1	10-25
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	4	0-15
2.	<i>Oenanthe isabellina</i>	Isabelline wheatear	3	0-3
3.	<i>Corvus cornix</i>	Hooded Crow	4	9-25

## VP. 2

Date: 02.02.2021 Start and end time: 9:27 – 12:37

**Weather:**

The air temperature around 2°C end 5°C cloudy,

Wind speed approx. (4-5 m/s) No precipitation

**Primary species not found**

Table 100. Secondary and other species (VP 2), 02.02.2021.

No	Latin names	English names	Amount	Flight altitude
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	3	0-8
2.	<i>Corvus corax</i>	Northern Raven	2	3-12
3.	<i>Columba livia</i>	Rock Dove	12	40
4.	<i>Oenanthe finschii</i>	Black-necked Wheatear	1	0-3

**VP.1**

Date: 02.02.2021. Start and end time: 13:23 – 16:23

**Weather:**

The air temperature around 6°C end 3°C cloudy,  
Wind speed approx. (4-6 m/s) No precipitation

***Primary species not found***

Table 101. Secondary and other species (VP 1), 02.02.2021

No	Latin names	English names	Amount	Flight altitude
<b>SECONDARY SPECIES</b>				
1.	<i>Falco tinnunculus</i>	Common Kestrel	1	10-25
<b>OTHER SPECIES</b>				
1	<i>Galerida cristata</i>	Crested lark	6	0-15
2	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	7	0-5
3	<i>Oenanthe isabellina</i>	Isabelline wheatear	2	0-3
4	<i>Corvus cornix</i>	Hooded Crow	4	9-25
5	<i>Haliaeetus albicilla</i>	White-tailed Sea-eagle	1	0-60

### VP. 3

Date: 03.02.2021. Start and end time: 9:13 – 12:13

**Weather:**

The air temperature around 2°C end 9°C is sunny,  
Wind speed approx. (5-6 m/s) No precipitation

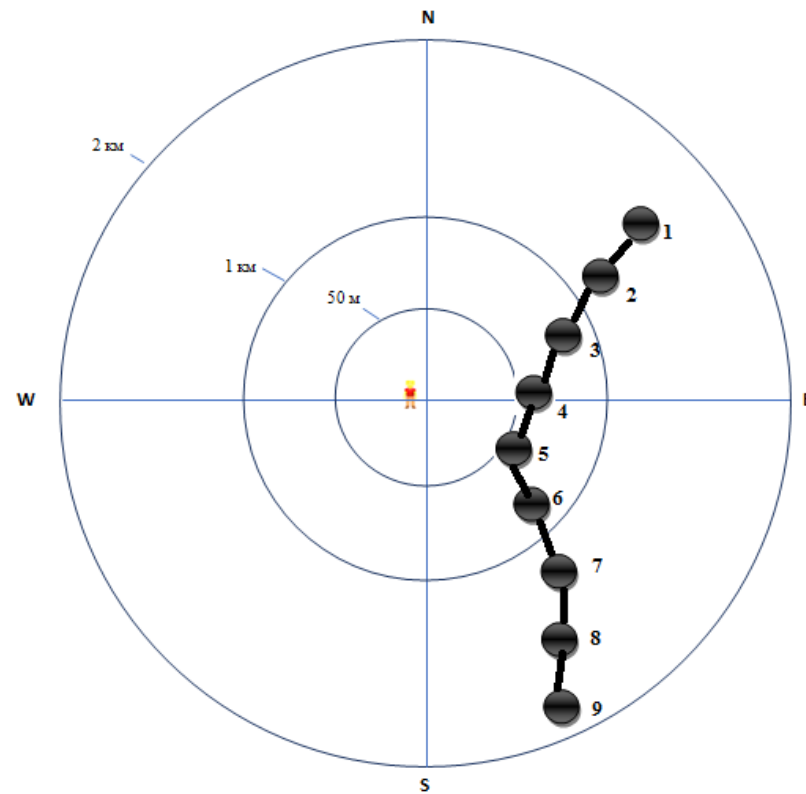


Fig.15 Flight path (VP 3), 03.02.2021

Table 102. Target species log (VP 3), 03.02.2021.


	<i>Aquila chrysaetos</i>	1	2	3	4	5	6	7	8	9
		120 m	120 m	125 m	60 m	65 m	125 m	125 m	120 m	120 m

Table 103. Secondary and other species (VP 3), 03.02.2021.

No	Latin names	English names	Amount	Flight altitude
<b>SECONDARY SPECIES</b>				
1.	<i>Circus cyaneus</i>	Hen Harrier	1	10-25
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	5	0-15
2.	<i>Oenanthe isabellina</i>	Isabelline wheatear	2	0-3
3.	<i>Alectoris chukar</i>	Chuckar partridge	5	0-5
4.	<i>Corvus cornix</i>	Hooded Crow	9	9-25
5.	<i>Athene noctua</i>	Little Owl	1	0-5

#### VP.4

Date: 03.02.2021. Start and end time: 13:56 – 16:59

**Weather:**

The air temperature around 9°C end 4°C sky half cloudy,  
Wind speed approx. (4-5 m/s) No precipitation

***Primary species not found***

Table 104. Secondary and other species (VP 4), 03.02.2021

No	Latin names	English names	Amount	Flight altitude
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	4	0-8
2.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	3	0-4
3.	<i>Corvus corax</i>	Northern Raven	2	3-12
4.	<i>Corvus cornix</i>	Eurasian Hooded Crow	6	25



**VP. 5**

Date: 04.02.2021. Start and end time: 9:33 – 12:36

**Weather:**

The air temperature around 2 end 9°C is sunny,  
Wind speed approx. (3-4 m/s) No precipitation

***Primary species not found***

Table 105. Secondary and other species (VP 5), 04.02.2021

No	Latin names	English names	Amount	Flight altitude
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested Lark	2	0-5
2.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	4	0-6
3.	<i>Oenanthe isabellina</i>	Isabelline wheatear	1	0-6
4.	<i>Melanocorypha leucoptera</i>	White-winged Lark	10	0-6
5.	<i>Oenanthe finschii</i>	Black-necked Wheatear	1	0-3

**VP. 6**

Date: 04.02.2021 Start and end time: 13:27 – 16:28

**Weather:**

The air temperature around 10°C end 4°C sky half cloudy,  
Wind speed approx. (3-5 m/s) No precipitation

***Primary species not found***

Table 106. Secondary and other species (VP 6), 04.02.2021.

No	Latin names	English names	Amount	Flight altitude
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested Lark	3	0-9
2.	<i>Oenanthe isabellina</i>	Isabelline wheatear	6	0-6
3.	<i>Athene noctua</i>	Little Owl	1	0-5

**VP. 7**

Date: 05.02.2021. Start and end time: 9:26 – 12:26

**Weather:**

The air temperature around 4 and 12°C is sunny,  
Wind speed approx. (4-5 m/s) No precipitation

**Primary species not found**

Table 107. Secondary and other species (VP 7), 05.02.2021.

No	Latin names	English names	Amount	Flight altitude
<b>SECONDARY SPECIES</b>				
1.	<i>Falco tinnunculus</i>	Kestrel	1	10-15
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	4	0-15
2.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	5	0-5
3.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	2	0-3
4.	<i>Haliaeetus albicilla</i>	White-tailed Sea-eagle	1	160

**VP. 8**

Date: 05.02.2021. Start and end time: 13:12 – 16:18

**Weather:**

The air temperature around 12°C end 5°C partly cloudy

Wind speed approx. (5-6 m/s) No precipitation

***Primary species not found***

Table 108. Secondary and other species (VP 8), 05.02.2021.

<b>№</b>	<b>Latin names</b>	<b>English names</b>	<b>Amount</b>	<b>Flight altitude</b>
<b>SECONDARY SPECIES</b>				
1.	<i>Falco tinnunculus</i>	Kestrel	1	15-30
2.	<i>Circus cyaneus</i>	Hen Harrier	1	10-30
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	3	0-5
2.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	9	0-5
3.	<i>Athene noctua</i>	Little Owl	1	0-3
4.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	2	0-3

**VP. 10**

Date: 06.02.2021. Start and end time: 9:32 – 12:35

**Weather:**

The air temperature around 3°C end 11°C sky partly cloudy.

Wind speed approx. (4-6 m/s) No precipitation

***Primary species not found***

Table 109. Secondary and other species (VP 10), 06.02.2021.

<b>№</b>	<b>Latin names</b>	<b>English names</b>	<b>Amount</b>	<b>Flight altitude</b>
<b>SECONDARY SPECIES</b>				
1.	<i>Falco tinnunculus</i>	Kestrel	1	10-20
2.	<i>Buteo rufinus</i>	Long-legged Buzzard	2	10-60
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	6	0-9
2.	<i>Athene noctua</i>	Little Owl	1	0-5
3.	<i>Melanocorypha leucoptera</i>	White-winged Lark	16	0-5
4.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	2	0-3

**VP.9**

Date: 06.02.2021. Start and end time: 13:36 – 16:38

**Weather:**

The air temperature around 11°C end 3°C sky half cloudy.

Wind speed approx. (6-7 m/s) No precipitation

***Primary species not found***

Table 110. Secondary and other species (VP 9), 06.02.2021

<b>№</b>	<b>Latin names</b>	<b>English names</b>	<b>Amount</b>	<b>Flight altitude</b>
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	4	0-8
2.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	3	0-4
3.	<i>Corvus corax</i>	Northern Raven	1	5
4.	<i>Corvus cornix</i>	Hooded Crow	5	10

**VP. 1**

Date: 07.02.20201. Start and end time: 9:23 – 12:26

**Weather:**

The air temperature around 4°C end 10 °C cloudy,  
Wind speed approx. (3-4 m/s) No precipitation

***Primary species not found***

Table 111. Secondary and other species (VP 1), 07.02.2021

<b>№</b>	<b>Latin names</b>	<b>English names</b>	<b>Amount</b>	<b>Flight altitude</b>
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	3	0-10
2.	<i>Athene noctua</i>	Little owl	1	0-5
3.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	5	0-9
4.	<i>Corvus cornix</i>	Hooded Crow	4	8
5.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	1	0-2



## VP. 2

Date: 07.02.2021. Start and end time: 13:27 – 16:27

### **Weather:**

The air temperature around 10°C end 3°C sky half cloudy,  
Wind speed approx. (5-6 m/s) No precipitation

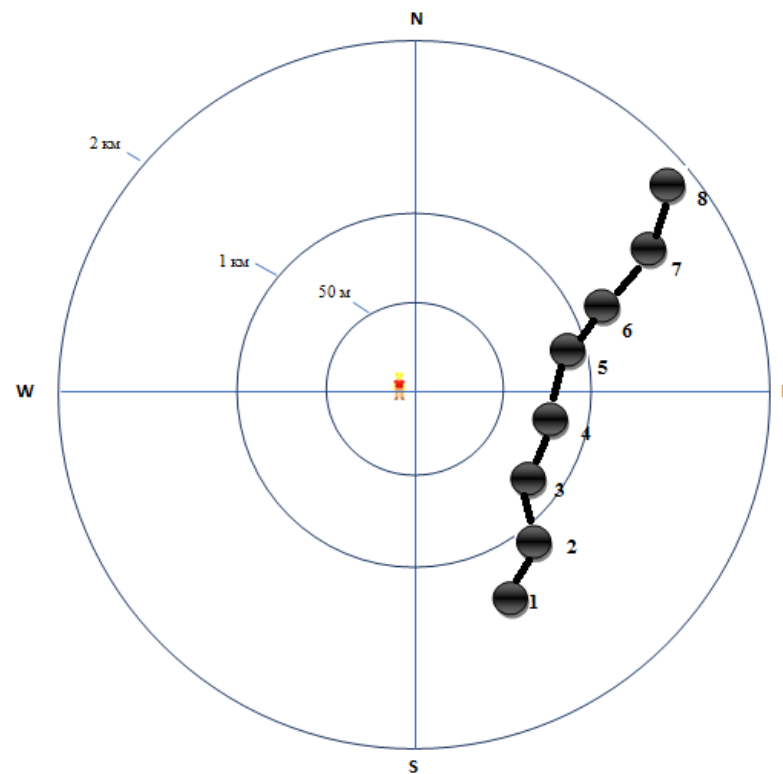


Fig.16 Flight path (VP 2), 07.02.2021

Table 112. Target species log (VP 2), 07.02.2021.


	<i>Aquila chrysaetos</i>	1 160 m	2 160 m	3 165 m	4 160 m	5 165 m	6 165 m	7 165 m	8 160 m
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Table 113. Secondary and other species (VP 2), 07.02.2021.

<b>№</b>	<b>Latin names</b>	<b>English names</b>	<b>Amount</b>	<b>Flight altitude</b>
<b>OTHER SPECIES</b>				
1.	<i>Corvus frugilegus</i>	Eurasian Rook	6	0-5
2.	<i>Corvus cornix</i>	Eurasian Hooded Crow	3	10
3.	<i>Galerida cristata</i>	Crested lark	3	0-9
4.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	11	0-6

**VP. 3**

Date: 10.02.2021. Start and end time: 9:12 – 12:16

**Weather:**

The air temperature around 4°C end 8°C cloudy,

Wind speed approx. (6-8 m/s) No precipitation

**Primary species not found**

Table 114. Secondary and other species (VP 3), 10.02.2021.

<b>№</b>	<b>Latin names</b>	<b>English names</b>	<b>Amount</b>	<b>Flight altitude</b>
<b>SECONDARY SPECIES</b>				
1.	<i>Falco tinnunculus</i>	Common Kestrel	1	5-15
2.	<i>Circus cyaneus</i>	Hen Harrier	1	0-25
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	4	0-15
2.	<i>Sitta tephronota</i>	Greater Rock Nuthatch	1	0-4
3.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	4	0-5
4.	<i>Oenanthe isabellina</i>	Isabelline wheatear	2	0-3

#### VP. 4

Date: 10.02.2021. Start and end time: 13:02 – 16:06

**Weather:**

The air temperature around 8°C end 3°C partly cloudy,  
Wind speed approx. (3-5 m/s) No precipitation

**Primary species not found**

Table 115. Secondary and other species (VP 4), 10.02.2021.

No	Latin names	English names	Amount	Flight altitude
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	3	0-15
2.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	4	0-5
3.	<i>Oenanthe finschii</i>	Black-necked Wheatear	1	0-3

**VP. 5**

Date: 11.02.2021. Start and end time: 9:12 – 12:16

**Weather:**

The air temperature around 4°C end 9°C is sunny

Wind speed approx. (4-6 m/s) No precipitation

Table 116. Secondary and other species (VP 5), 11.02.2021.

<b>№</b>	<b>Latin names</b>	<b>English names</b>	<b>Amount</b>	<b>Flight altitude</b>
<b>SECONDARY SPECIES</b>				
1.	<i>Falco tinnunculus</i>	Common Kestrel	1	10-15
2.	<i>Aegypius monachus</i>	Cinereous Vulture	1	160-180
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	4	0-15
2.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	6	0-5
3.	<i>Oenanthe isabellina</i>	Isabelline wheatear	2	0-3
4.	<i>Scotocerca inquieta</i>	Streaked Scrub Warbler	1	1-4

**VP. 6**

Date: 11.02.2021. Start and end time: 13:02 – 16:06

**Weather:**

The air temperature around 10°C end 4°C is sunny

Wind speed approx. (5-6 m/s) No precipitation

**Primary species not found**

Table 117. Secondary and other species (VP 6), 11.02.2021.

No	Latin names	English names	Amount	Flight altitude
OTHER SPECIES				
1.	<i>Galerida cristata</i>	Crested lark	4	0-15
2.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	5	0-5
3.	<i>Corvus cornix</i>	Hooded Crow	4	21
4.	<i>Oenanthe finschii</i>	Black-necked Wheatear	2	0-3
5.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	2	0-4

### VP. 7

Date: 12.02.2021. Start and end time: 8:57 – 11:57

**Weather:**

The air temperature around 5°C end 10°C partly cloudy,  
Wind speed approx. (4-5 m/s) No precipitation

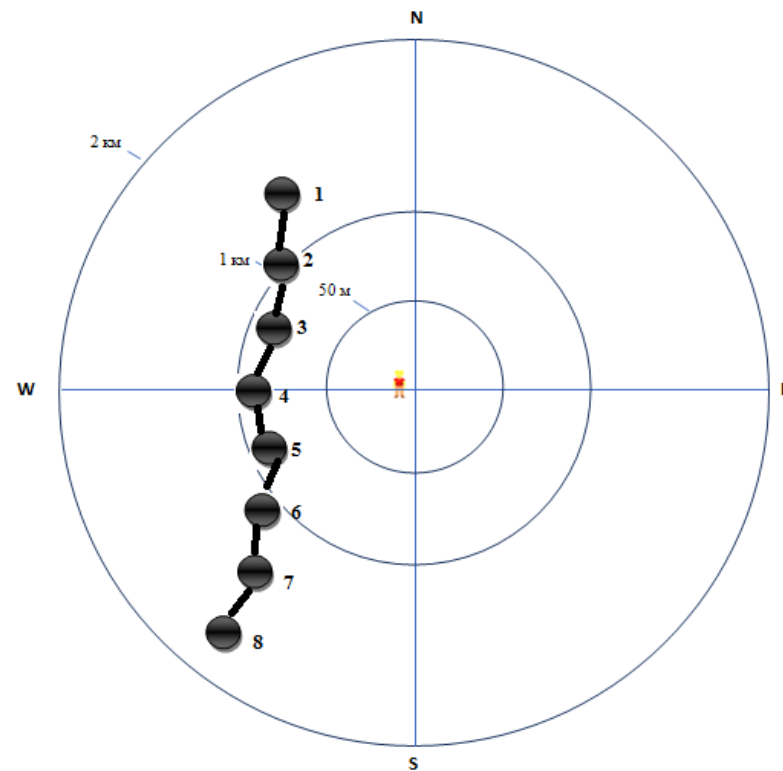


Fig.17 Flight path (VP 7), 12.02.2021

Table 118. Target species log (VP 7), 12.02.2021.

●	<i>Aquila nipalensis</i>	1	2	3	4	5	6	7	8
		130 m	140 m	155 m	160 m	165 m	165 m	155 m	160 m

Table 119. Secondary and other species (VP 7), 12.02.2021.

№	Latin names	English names	Amount	Flight altitude
<b>OTHER SPECIES</b>				
1.	<i>Corvus frugilegus</i>	Eurasian Rook	6	0-10
2.	<i>Corvus cornix</i>	Eurasian Hooded Crow	8	40
3.	<i>Galerida cristata</i>	Crested lark	6	0-9
4.	<i>Oenanthe finschii</i>	Black-necked Wheatear	2	0-3
5.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	2	0-2



**VP.8**

Date: 12.02.2021. Start and end time: 13:22 – 16:22

**Weather:**

The air temperature around 11°C end 6°C partly cloudy,  
Wind speed approx. (6-7 m/s) No precipitation

***Primary species not found***

Table 120. Secondary and other species (VP 8), 12.02.2021

No	Latin names	English names	Amount	Flight altitude
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	9	0-8
2.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	2	0-4
3.	<i>Columba livia</i>	Rock Dove	5	40

**VP. 10**

Date: 13.02.2021. Start and end time: 9:10 – 12:10

**Weather:**

The air temperature around 3°C end 9°C partly cloudy,  
Wind speed approx. (5-6 m/s) No precipitation

**Primary species not found**

Table 121. Secondary and other species (VP 10), 13.02.2021.

No	Latin names	English names	Amount	Flight altitude
<b>SECONDARY SPECIES</b>				
1.	<i>Circus cyaneus</i>	Hen Harrier	1	12-25
2.	<i>Buteo buteo</i>	Common Buzzard	1	20-40
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	5	0-15
2.	<i>Corvus cornix</i>	Hooded Crow	13	9-25
3.	<i>Acridotheres tristis</i>	Indian Myna	5	8-10
4.	<i>Athene noctua</i>	Little Owl	1	0-4

**VP.9**

Date: 13.02.2021. Start and end time: 13:56 – 16:59

**Weather:**

The air temperature around 11°C end 4°C sky half cloudy,  
Wind speed approx. (4-5 m/s) No precipitation

***Primary species not found***

Table 122. Secondary and other species (VP 9), 13.02.2021

No	Latin names	English names	Amount	Flight altitude
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	5	0-8
2.	<i>Oenanthe finschii</i>	Black-necked Wheatear	2	0-3
3.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	3	0-4

**VP. 1**

Date: 14.02.2021. Start and end time: 9:14 – 12:14

**Weather:**

The air temperature around 3°C end 9°C is sunny,  
Wind speed approx. (5-6 m/s) No precipitation

***Primary species not found***

Table 123. Secondary and other species (VP 1), 14.02.2021

No	Latin names	English names	Amount	Flight altitude
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	4	0-9
2.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	13	0-6
3.	<i>Melanocorypha leucoptera</i>	White-winged Lark	12	0-9
4.	<i>Lanius excubitor</i>	Great (Gray) Shrik	1	3-8

## VP. 2

Date: 14.02.2021. Start and end time: 13:21 – 16:21

**Weather:**

The air temperature around 11°C and 5°C is sunny,

Wind speed approx. (5-6 m/s) No precipitation

***Primary species not found***

Table 124. Secondary and other species (VP 2), 14.02.2021.

No	Latin names	English names	Amount	Flight altitude
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	2	0-9
2.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	8	0-6
3.	<i>Oenanthe isabellina</i>	Isabelline wheatear	2	0-6
4.	<i>Lanius excubitor</i>	Great (Gray) Shrike	1	2-9
5.	<i>Rhodospiza obsoleta</i>	Black-billed Desert Finch	5	2-5

**VP. 3**

Date: 15.02.2021. Start and end time: 9:25 – 12:25

**Weather:**

The air temperature around 2 end 8°C is sunny.

Wind speed approx. (4-5 m/s) No precipitation

Table 125. Secondary and other species (VP 3), 15.02.2021.

No	Latin names	English names	Amount	Flight altitude
<b>SECONDARY SPECIES</b>				
1.	<i>Falco tinnunculus</i>	Kestrel	2	5-20
2.	<i>Buteo rufinus</i>	Long-legged Buzzard	2	20-30
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	4	0-9
2.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	6	0-5
3.	<i>Columba livia</i>	Rock Dove	3	30
4.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	2	0-3

#### VP. 4

Date: 15.02.2021. Start and end time: 13:16 – 16:18

**Weather:**

The air temperature around 9°C end 4°C cloudy

Wind speed approx. (5-6 m/s) No precipitation

***Primary species not found***

Table 126. Secondary and other species (VP 4), 15.02.2021.

No	Latin names	English names	Amount	Flight altitude
<b>SECONDARY SPECIES</b>				
1.	<i>Circus cyaneus</i>	Hen Harrier	1	5-15
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	4	0-15
2.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	6	0-5
3.	<i>Columba livia</i>	Rock Dove	8	30
4.	<i>Acridotheres tristis</i>	Indian Myna	2	2-9
5.	<i>Haliaeetus albicilla</i>	White-tailed Sea-eagle	1	120-160

**VP. 6**

Date: 18.02.2021. Start and end time: 9:11 – 12:11

**Weather:**

The air temperature around 2°C end 9°C cloudy,  
Wind speed approx. (4-6 m/s) No precipitation

***Primary species not found***

Table 127. Secondary and other species (VP 6), 18.02.2021.

<b>№</b>	<b>Latin names</b>	<b>English names</b>	<b>Amount</b>	<b>Flight altitude</b>
<b>SECONDARY SPECIES</b>				
1.	<i>Falco tinnunculus</i>	Kestrel	1	5-20
2.	<i>Aegypius monachus</i>	Cinereous Vulture	1	140-160
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	4	0-9
2.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	6	0-5
3.	<i>Oenanthe finschii</i>	Black-necked Wheatear	2	0-3
4.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	3	0-2



**VP.5**

Date: 18.02.2021. Start and end time: 13:16 – 16:18

**Weather:**

The air temperature around 10°C end 2°C sky half cloudy,  
Wind speed approx. (6-7 m/s) No precipitation

***Primary species not found***

Table 128. Secondary and other species (VP 5), 18.02.2021

<b>№</b>	<b>Latin names</b>	<b>English names</b>	<b>Amount</b>	<b>Flight altitude</b>
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	4	0-8
2.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	1	0-4
3.	<i>Corvus corax</i>	Northern Raven	1	5
4.	<i>Corvus cornix</i>	Hooded Crow	6	23
5.	<i>Pica pica</i>	Black-billed Magpie	2	3

**VP. 7**

Date: 19.02.2021. Start and end time: 9:08 – 12:12

**Weather:**

The air temperature around 1°C end 8 °C sky half cloudy,  
Wind speed approx. (6-7 m/s) No precipitation

***Primary species not found***

Table 129. Secondary and other species (VP 7), 19.02.2021

<b>№</b>	<b>Latin names</b>	<b>English names</b>	<b>Amount</b>	<b>Flight altitude</b>
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	6	0-10
2.	<i>Athene noctua</i>	Little owl	1	0-5
3.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	6	0-9
4.	<i>Corvus cornix</i>	Hooded Crow	4	8
5.	<i>Corvus frugilegus</i>	Eurasian Rook	3	7

### VP. 8

Date: 19.02.2021. Start and end time: 13:19 – 16:20

**Weather:**

The air temperature around 9°C end 2°C sky half cloudy,  
Wind speed approx. (5-6 m/s) No precipitation

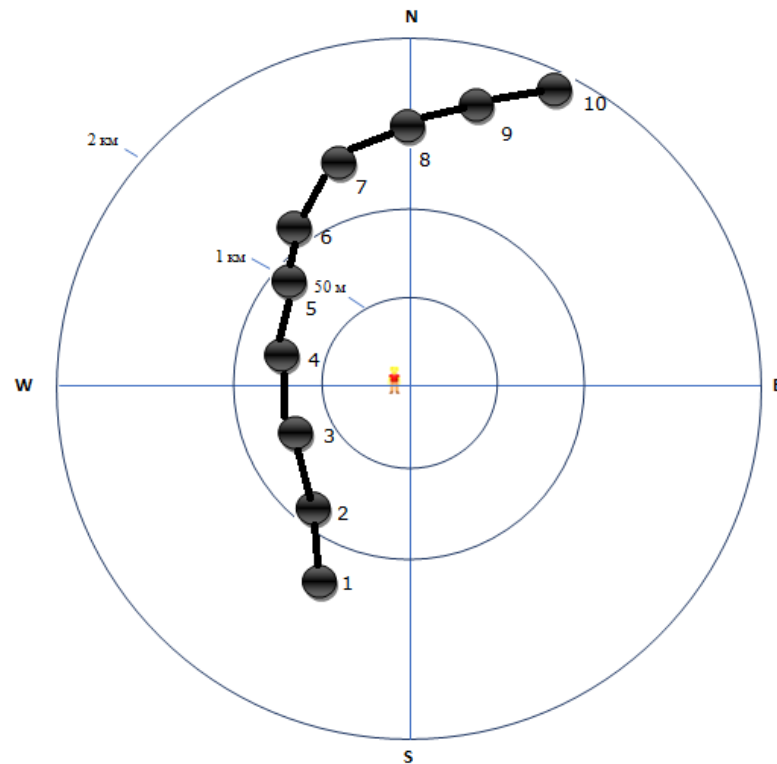


Fig.18 Flight path (VP 8), 19.02.2021

Table 130. Target species log (VP 8), 19.02.2021.


	<i>Aquila chrysaetos</i>	1 90 m	2 90 m	3 125 m	4 130 m	5 155 m	6 155 m	7 185 m	8 180 m	9 185 m	10 185 m
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Table 131. Secondary and other species (VP 8), 19.02.2021.

No	Latin names	English names	Amount	Flight altitude
<b>SECONDARY SPECIES</b>				
1.	<i>Falco tinnunculus</i>	Common Kestrel	2	5-15
2.	<i>Buteo rufinus</i>	Long-legged Buzzard	1	15-35
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	6	0-15
2.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	5	0-5
3.	<i>Oenanthe isabellina</i>	Isabelline wheatear	2	0-3
4.	<i>Corvus cornix</i>	Hooded Crow	6	12

**VP. 10**

Date: 20.02.2021. Start and end time: 9:16 – 12:18

**Weather:**

The air temperature around 1°C end 6°C cloudy.

Wind speed approx. (5-6 m/s) No precipitation

***Primary species not found***

Table 132. Secondary and other species (VP 10), 20.02.2021.

<b>№</b>	<b>Latin names</b>	<b>English names</b>	<b>Amount</b>	<b>Flight altitude</b>
<b>SECONDARY SPECIES</b>				
1.	<i>Circus cyaneus</i>	Hen Harrier	1	5-15
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	3	0-15
2.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	3	0-5
3.	<i>Columba livia</i>	Rock Dove	7	30
4.	<i>Acridotheres tristis</i>	Indian Myna	2	2-9
5.	<i>Motacilla personata</i>	Masked wagtail	2	0-1

**VP. 9**

Date: 20.02.2021. Start and end time: 13:53 – 16:54

**Weather:**

The air temperature around 8°C end 2°C cloudy,  
Wind speed approx. (4-6 m/s) No precipitation

***Primary species not found***

Table 133. Secondary and other species (VP 9), 20.02.2021.

<b>№</b>	<b>Latin names</b>	<b>English names</b>	<b>Amount</b>	<b>Flight altitude</b>
<b>SECONDARY SPECIES</b>				
1.	<i>Falco tinnunculus</i>	Kestrel	1	5-20
2.	<i>Buteo buteo</i>	Common Buzzard	1	15-35
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	4	0-9
2.	<i>Scotocerca inquieta</i>	Streaked Scrub Warbler	2	1-4
3.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	6	0-5
4.	<i>Oenanthe finschii</i>	Black-necked Wheatear	2	0-3
5.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	3	0-2
6.	<i>Rhodospiza obsoleta</i>	Black-billed Desert Finch	11	1-5

**VP.1**

Date: 21.02.2021. Start and end time: 9:16 – 12:18

**Weather:**

The air temperature around 2°C end 8°C sky half cloudy,  
Wind speed approx. (6-7 m/s) No precipitation

***Primary species not found***

Table 134. Secondary and other species (VP 1), 21.02.2021

No	Latin names	English names	Amount	Flight altitude
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	6	0-8
2.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	2	0-4
3.	<i>Corvus corax</i>	Northern Raven	1	5
4.	<i>Corvus cornix</i>	Hooded Crow	6	23
5.	<i>Ardea cinerea</i>	Gray heron	1	20-35

## VP. 2

Date: 21.02.2021. Start and end time: 13:48 – 16:48

**Weather:**

The air temperature around 8°C end 2 °C sky half cloudy,  
Wind speed approx. (6-7 m/s) No precipitation

***Primary species not found***

Table 135. Secondary and other species (VP 2), 21.02.2021

No	Latin names	English names	Amount	Flight altitude
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	6	0-10
2.	<i>Athene noctua</i>	Little owl	1	0-5
3.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	6	0-9
4.	<i>Corvus frugilegus</i>	Eurasian Rook	3	7
5.	<i>Ardea cinerea</i>	Gray heron	1	35



**VP. 3**

Date: 22.02.2021. Start and end time: 9:18 – 12:18

**Weather:**

The air temperature around -1°C end 5 °C sky half cloudy, cold

Wind speed approx. (6-7 m/s) No precipitation

***Primary species not found***

Table 136. Secondary and other species (VP 3), 22.02.2021

<b>№</b>	<b>Latin names</b>	<b>English names</b>	<b>Amount</b>	<b>Flight altitude</b>
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	3	0-10
2.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	3	0-9
3.	<i>Upupa epops</i>	Hoopoe	1	0-3

#### VP. 4

Date: 22.02.2021. Start and end time: 13:48 – 16:48

**Weather:**

The air temperature around 5°C end 1°C sky half cloudy,  
Wind speed approx. (5-6 m/s) No precipitation

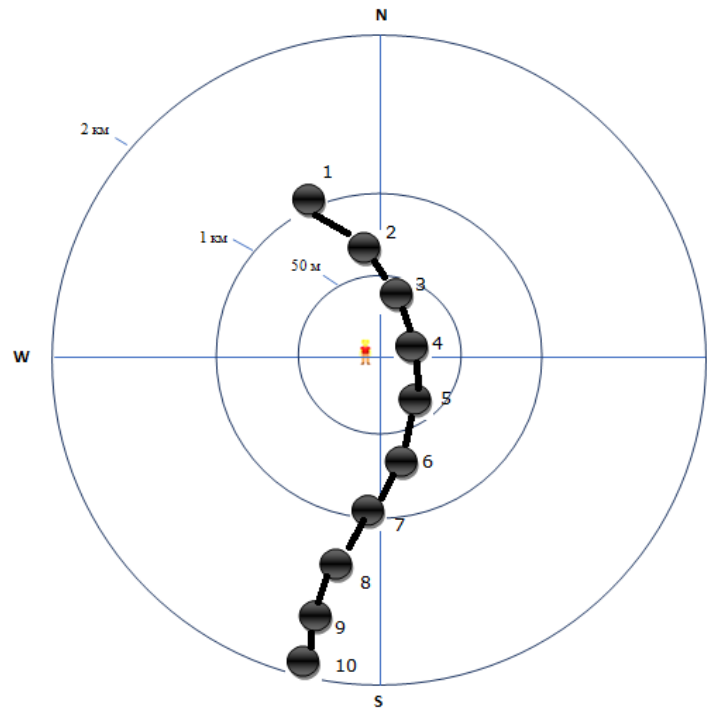


Fig.19 Flight path (VP 4), 22.02.2021

Table 137. Target species log (VP 4), 22.02.2021.


	<i>Aquila chrysaetos</i>	1 150 m	2 150 m	3 155 m	4 150 m	5 155 m	6 155 m	7 185 m	8 180 m	9 185 m	10 185 m
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Table 138. Secondary and other species (VP 4), 22.02.2021.

No	Latin names	English names	Amount	Flight altitude
<b>SECONDARY SPECIES</b>				
1.	<i>Buteo rufinus</i>	Long-legged Buzzard	1	15-35
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	3	0-15
2.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	9	0-5
3.	<i>Oenanthe isabellina</i>	Isabelline wheatear	1	0-3
4.	<i>Corvus cornix</i>	Hooded Crow	4	12

## VP survey results in March

### VP.7

Date: 01.03.2021. Start and end time: 9:22 – 12:22

**Weather:**

The air temperature around 2°C end 6°C cloudy,

Wind speed approx. (5-6 m/s) No precipitation

***Primary species not found***

Table 139. Secondary and other species (VP 7), 01.03.2021

No	Latin names	English names	Amount	Flight altitude
<b>OTHER SPECIES</b>				
1.	<i>Alectoris chukar</i>	Chuckar partridge	7	0-2
2.	<i>Galerida cristata</i>	Crested lark	5	0-5
3.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	3	0-4
4.	<i>Oenanthe finschii</i>	Black-necked Wheatear	3	0-3
5.	<i>Haliaeetus albicilla</i>	White-tailed Sea-eagle	1	90-120
6.	<i>Rhodospiza obsoleta</i>	Black-billed Desert Finch	3	2-8

**VP. 8**

Date: 01.03.2021. Start and end time: 13:33 – 16:36

**Weather:**

The air temperature around 6°C end 3 °C sky half cloudy,  
Wind speed approx. (5-6 m/s) No precipitation

***Primary species not found***

Table 140. Secondary and other species (VP 8), 01.03.2021

No	Latin names	English names	Amount	Flight altitude
<b>SECONDARY SPECIES</b>				
1.	<i>Falco tinnunculus</i>	Common Kestrel	1	0-25
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	4	0-15
2.	<i>Oenanthe isabellina</i>	Isabelline wheatear	3	0-3
3.	<i>Athene noctua</i>	Little Owl	1	0-3

## VP. 6

Date: 02.03.2021 Start and end time: 9:23 – 12:37

**Weather:**

The air temperature around 3°C end 6°C cloudy,

Wind speed approx. (4-5 m/s) No precipitation

**Primary species not found**

Table 141. Secondary and other species (VP 6), 02.03.2021.

No	Latin names	English names	Amount	Flight altitude
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	6	0-8
2.	<i>Corvus corax</i>	Northern Raven	2	3-12
3.	<i>Columba livia</i>	Rock Dove	12	40
4.	<i>Oenanthe finschii</i>	Black-necked Wheatear	2	0-3
5.	<i>Corvus monedula</i>	Jackdaw	5	4-10
6.	<i>Apus apus</i>	Northern Swift	2	6-15

### VP.5

Date: 02.03.2021. Start and end time: 13:23 – 16:23

**Weather:**

The air temperature around 6°C end 3°C cloudy,  
Wind speed approx. (4-6 m/s) No precipitation

***Primary species not found***

Table 142. Secondary and other species (VP 5), 02.03.2021

No	Latin names	English names	Amount	Flight altitude
<b>SECONDARY SPECIES</b>				
1.	<i>Falco tinnunculus</i>	Common Kestrel	1	10-25
<b>OTHER SPECIES</b>				
1	<i>Galerida cristata</i>	Crested lark	7	0-15
2	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	7	0-5
3	<i>Oenanthe isabellina</i>	Isabelline wheatear	1	0-3
4	<i>Corvus cornix</i>	Hooded Crow	3	9-25
5	<i>Haliaeetus albicilla</i>	White-tailed Sea-eagle	1	0-60
6	<i>Upupa epops</i>	Hoopoe	2	0-3

**VP. 1**

Date: 03.03.2021. Start and end time: 9:13 – 12:13

**Weather:**

The air temperature around 2°C end 9°C sky half cloudy,  
Wind speed approx. (5-6 m/s) No precipitation

***Primary species not found***

Table 143. Secondary and other species (VP 1), 03.03.2021.

No	Latin names	English names	Amount	Flight altitude
<b>SECONDARY SPECIES</b>				
1.	<i>Circus cyaneus</i>	Hen Harrier	1	10-25
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	5	0-15
2.	<i>Oenanthe isabellina</i>	Isabelline wheatear	3	0-3
3.	<i>Athene noctua</i>	Little Owl	1	0-5
4.	<i>Ardea cinerea</i>	Grey Heron	1	35



## VP.2

Date: 03.03.2021. Start and end time: 13:56 – 16:59

### **Weather:**

The air temperature around 9°C end 4°C sky half cloudy,  
Wind speed approx. (4-5 m/s) No precipitation

### ***Primary species not found***

Table 144. Secondary and other species (VP 2), 03.03.2021

<b>No</b>	<b>Latin names</b>	<b>English names</b>	<b>Amount</b>	<b>Flight altitude</b>
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	4	0-8
2.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	3	0-4
3.	<i>Corvus corax</i>	Northern Raven	2	3-12
4.	<i>Corvus cornix</i>	Eurasian Hooded Crow	3	25
5.	<i>Acridotheres tristis</i>	Indian Myna	3	15
6.	<i>Motacilla personata</i>	Masked wagtail	2	0-1

### VP. 3

Date: 04.03.2021. Start and end time: 9:33 – 12:36

**Weather:**

The air temperature around 3 end 9°C is sunny,  
Wind speed approx. (3-4 m/s) No precipitation

***Primary species not found***

Table 145. Secondary and other species (VP 3), 04.03.2021

No	Latin names	English names	Amount	Flight altitude
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested Lark	4	0-5
2.	<i>Sitta tephronota</i>	Greater Rock Nuthatch	2	2-8
3.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	4	0-6
4.	<i>Oenanthe isabellina</i>	Isabelline wheatear	2	0-6
5.	<i>Oenanthe finschii</i>	Black-necked Wheatear	3	0-3

#### VP. 4

Date: 04.03.2021 Start and end time: 13:27 – 16:28

**Weather:**

The air temperature around 10°C end 4°C is sunny,  
Wind speed approx. (3-5 m/s) No precipitation

***Primary species not found***

Table 146. Secondary and other species (VP 4), 04.03.2021.

No	Latin names	English names	Amount	Flight altitude
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested Lark	6	0-9
2.	<i>Oenanthe isabellina</i>	Isabelline wheatear	4	0-6
3.	<i>Athene noctua</i>	Little Owl	1	0-5
4.	<i>Alectoris chukar</i>	Chuckar partridge	6	0-2

**VP. 9**

Date: 05.03.2021. Start and end time: 9:26 – 12:26

**Weather:**

The air temperature around 4 end 8°C partly cloudy.

Wind speed approx. (4-5 m/s) No precipitation

**Primary species not found**

Table 147. Secondary and other species (VP 9), 05.03.2021.

No	Latin names	English names	Amount	Flight altitude
<b>SECONDARY SPECIES</b>				
1.	<i>Falco tinnunculus</i>	Kestrel	2	5-15
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	5	0-15
2.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	5	0-5
3.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	2	0-3
4.	<i>Haliaeetus albicilla</i>	White-tailed Sea-eagle	1	120
5.	<i>Corvus monedula</i>	Jackdaw	4	4-10

**VP. 10**

Date: 05.03.2021. Start and end time: 13:12 – 16:18

**Weather:**

The air temperature around 10°C end 5°C partly cloudy

Wind speed approx. (5-6 m/s) No precipitation

***Primary species not found***

Table 148. Secondary and other species (VP 10), 05.03.2021.

<b>№</b>	<b>Latin names</b>	<b>English names</b>	<b>Amount</b>	<b>Flight altitude</b>
<b>SECONDARY SPECIES</b>				
1.	<i>Falco tinnunculus</i>	Kestrel	1	15-30
2.	<i>Circus cyaneus</i>	Hen Harrier	2	10-30
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	3	0-5
2.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	9	0-5
3.	<i>Athene noctua</i>	Little Owl	1	0-3
4.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	3	0-3
5.	<i>Ardea cinerea</i>	Gray heron	1	15-25

### VP. 7

Date: 06.03.2021. Start and end time: 9:27 – 12:27

**Weather:**

The air temperature around 10°C end 3°C sky half cloudy,  
Wind speed approx. (5-6 m/s) No precipitation

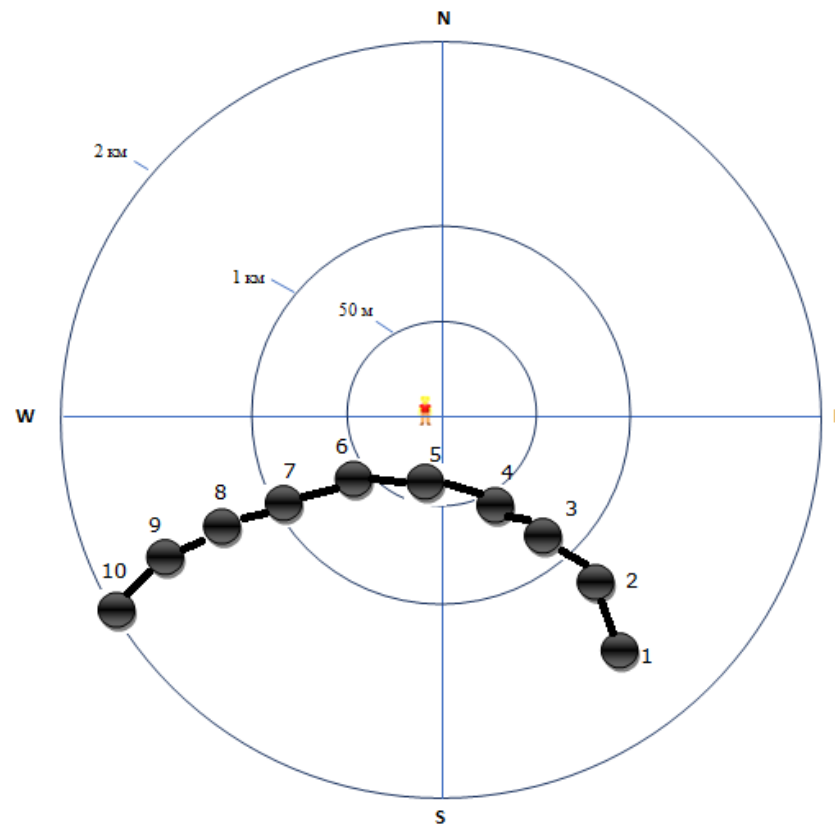


Fig.20 Flight path (VP 7), 06.03.2021

Table 149. Target species log (VP 7), 06.03.2021.


	<i>Aquila chrysaetos</i>	1 160 m	2 160 m	3 165 m	4 160 m	5 165 m	6 165 m	7 165 m	8 160 m	9 165 m	10 160 m
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Table 150. Secondary and other species (VP 7), 06.03.2021.

No	Latin names	English names	Amount	Flight altitude
<b>OTHER SPECIES</b>				
1.	<i>Corvus frugilegus</i>	Eurasian Rook	4	0-5
2.	<i>Corvus cornix</i>	Eurasian Hooded Crow	2	10
3.	<i>Upupa epops</i>	Hoopoe	1	0-3
4.	<i>Galerida cristata</i>	Crested lark	6	0-9
5.	<i>Oenanthe finschii</i>	Black-necked Wheatear	2	0-3

**VP. 8**

Date: 06.03.2021. Start and end time: 13:42 – 16:46

**Weather:**

The air temperature around 4°C end 8°C cloudy,

Wind speed approx. (6-8 m/s) No precipitation

**Primary species not found**

Table 151. Secondary and other species (VP 8), 06.03.2021.

<b>№</b>	<b>Latin names</b>	<b>English names</b>	<b>Amount</b>	<b>Flight altitude</b>
<b>SECONDARY SPECIES</b>				
1.	<i>Falco tinnunculus</i>	Common Kestrel	1	5-15
2.	<i>Circus cyaneus</i>	Hen Harrier	2	0-25
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	4	0-15
2.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	4	0-5
3.	<i>Oenanthe isabellina</i>	Isabelline wheatear	3	0-3



**VP. 5**

Date: 07.03.2021. Start and end time: 9:12 – 12:16

**Weather:**

The air temperature around 4°C end 9°C is sunny

Wind speed approx. (4-6 m/s) No precipitation

Table 152. Secondary and other species (VP 5), 07.03.2021.

<b>№</b>	<b>Latin names</b>	<b>English names</b>	<b>Amount</b>	<b>Flight altitude</b>
<b>SECONDARY SPECIES</b>				
1.	<i>Falco tinnunculus</i>	Common Kestrel	1	5-25
2.	<i>Aegypius monachus</i>	Cinereous Vulture	1	160-180
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	6	0-15
2.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	7	0-5
3.	<i>Pica pica</i>	Black-billed Magpie	2	1-5
4.	<i>Oenanthe isabellina</i>	Isabelline wheatear	2	0-3
5.	<i>Scotocerca inquieta</i>	Streaked Scrub Warbler	1	1-4

**VP. 6**

Date: 07.02.2021. Start and end time: 13:02 – 16:06

**Weather:**

The air temperature around 10°C end 4°C is sunny

Wind speed approx. (5-6 m/s) No precipitation



**Primary species not found**

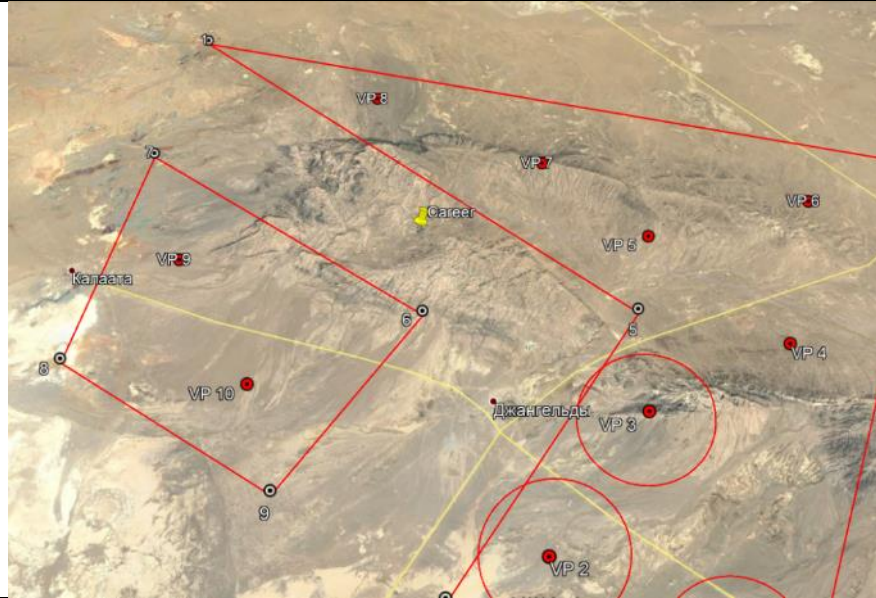
Table 153. Secondary and other species (VP 6), 07.03.2021.

No	Latin names	English names	Amount	Flight altitude
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	3	0-15
2.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	5	0-5
3.	<i>Corvus cornix</i>	Hooded Crow	2	21
4.	<i>Oenanthe finschii</i>	Black-necked Wheatear	3	0-3
5.	<i>Lanius excubitor</i>	Great (Gray) Shrike	1	3-4
6.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	2	0-4

## ATTACHMENTS

All the pictures are taken during VP surveys on the Dzankeldy WF project territory in Winter

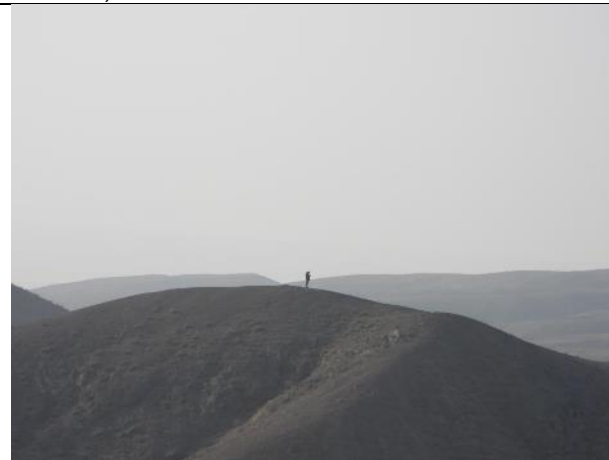
	
40°53'53.63"C, 63°28'56.94"B	40°54'7.01"C, 63°29'16.70"B



A mining between two wind farm plots 40°54'20.78", 63°18'12.92"B



Near VP7. 40°56'13.17"C, 63°20'21.25"B



VP 9. 40°53'58.69"C, 63°14'58.76"B





40°53'56.84"C, 63°15'52.03"B



Weather mast erected on the WF territory 40°53'33.83"C,  
63°14'35.13"B



Dzankeldy village 40°51'2.89"C, 63°20'28.68"B



40°53'56.87"C, 63°15'38.98"B



Shepperd settlement near VP 6. 40°53'39.42"C? 63°26'28.04"B



*Alectoris chukar* - Chuckar partridge at VP 3. 40°51'21.31"C, 63°21'53.10"B



*Buteo rufinus* - Long-legged Buzzard, VP 5. 40°54'8.37"C, 63°23'32.80"B



*Aquila chrysaetos* - Golden Eagle. 40°55'47.71"C, 63°19'9.91"



*Oenanthe finschii* - Black-necked Wheatear. 40°48'42.95"C, 63°21'0.07"B





Dead Crested Lark, most likely due to a blow on the cables holding the weather mast 40°55'41.75"C, 63°20'43.36"B





Well near the Kalata village. 40°53'36.12"C, 63°10'46.68"B.



Rocky areas near VP 8 40°55'59.74"C, 63°18'18.66"B

## SPRING QUARTERLY BIRD MONITORING REPORT

<b>Report Title</b>	SPRING QUARTERLY BIRD MONITORING REPORT
<b>Scope</b>	BIRDS VP / BIRDS NESTING
<b>Areas Covered</b>	DZHANKELDY WF
<b>Seasons Covered</b>	SPRING 2021
<b>Notes</b>	

# **SPRING QUARTERLY BIRD MONITORING REPORT**

Dzhankeldy Wind Farm

Client: 5 Capitals

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June 2021

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## INTRODUCTION

In the framework of the Dzhankeldy Wind Farm Project, bird survey was conducted in the project area in Spring 2021. The purpose of ornithological monitoring was to conduct systematic field studies at specific vantage points to assess bird species composition that occur within the project's area of influence, its abundance and territorial distribution, the nature of the stay, and daily activity of birds during spring migration and the beginning of nesting and also to identify birds that are of conservation interest under IUCN and Uzbekistan Redlist.

This report presents the primary materials of field studies in this territory from March 10, 2021 to May 20, 2021.

It was planned to conduct regular bird monitoring to evaluate the risks from the wind farm for birds in the project area.

This report is a statement of work made by Juru Energy` local senior ornitologists Alisher Atakhodjaev and Yakub Ametov, and ornitologists Ramzjon Sohibnazarov and Asilbek Sokhibnazarov. This report was reviewed by the international expert Caleb Gordon.

## **SURVEY METHODS**

The research methods were based on international best practice recommendations, in particular those set forth in the Scottish Natural Heritage: recommended bird survey methods to justify the assessment of the impact of surface wind farms<sup>1</sup>. The range of detection and identification of large species as golden eagles was up to 2 km, and small passerines 50 m. Directions and flight altitude were taken into account.

The observations were carried out at 10 Vantage points (Table 2). The number and location of Vantage points for stationary observation in the project area have been agreed with the company employees and international expert. The points are located so as to cover the territory as completely as possible (Fig.1).

The duration of one bird count at each Vantage point (VP) was 3 hours. The total duration of all the observations in the territory was **360 hours** (Table 3).

During observations weather conditions such as wind speed and direction, and air temperature were recorded. Wind speed and air temperature were measured using an anemometer. Whenever possible, the number of species, approximate flight altitude, speed, and flight direction of each target species were recorded every 15 seconds.

During the observations, photographing and short video shooting of birds were carried out, which is used to confirm the correct determination of species and obtain additional data on the number of individuals. Following equipment was used: binoculars (Viking) with 10x zoom; cameras (Nikon P1000, Canon 550D) with 24x and 50x zoom, with focal length of 550 mm and 1200 mm, respectively; field telescope (Viking).

### **Target and Secondary Species**

Defining a project-specific subset of sensitive, or “target” species provides a basis for designing a project-specific set of biological monitoring and mitigation programs that is optimally suited for the key wildlife risk issues associated with

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<sup>1</sup> Scottish Natural Heritage (SNH) 2017, Recommended bird survey methods to inform impact assessment of onshore wind farms. March 2017 version 2, Scotland, UK.

a wind project. It is important to note that any bird or bat species, if impacted severely enough, can become a significant risk concern for a wind energy facility. For this reason, any potentially impacted species has a level of sensitivity, warranting a taxonomically comprehensive approach to impact monitoring and adaptive management and mitigation during the operational phase.

Nonetheless, some species are more sensitive than others from a wind farm risk management standpoint. This is generally because they are classified as highly protected species by national and/or international authorities, because they are known or suspected to be highly susceptible to wind farm impacts (especially collision with rotors), or both. In addition, some species may be regarded as sensitive due to their cultural or iconic significance, or based on ecological/demographic factors (e.g. slow reproductive rate, naturally low population density).

In the present section, these different criteria have been integrated and considered together to produce a preliminary list of suggested target species for the DWEP, to be used to prioritize the Project's biological monitoring and mitigation programs, including the biological baseline studies. Table 1 below presents a suggested list of sensitive, or "target" bird species for the DWEP, subdivided into two tiers, reflecting different priority levels (tier 1 is higher sensitivity, higher priority than tier 2).

#### Selection and classification of target/priority species

The objective of identifying a list of Project-specific target/priority species is to focus the Project's biodiversity monitoring and management programs on key, potentially-affected species, as such represent the most important biodiversity risk issues for the Project.

Characteristics, and specific elements of the list include the following:

- includes all raptor species that are either known to occur, or likely to occur within the Project area
- includes all nationally- or internationally-listed species that are either known to occur, or likely to occur within the Project area

- includes selected additional species, especially other large-bodied birds, that could represent significant risk issues if significant impact occurs
- the list is intended to be comprehensive of all potentially affected species that could represent significant risk issues for the Project, potentially requiring management actions, if serious impacts are detected. Regarding this point, we note that any bird or bat species could become a risk issue for the project requiring management actions if serious enough impacts are detected during Project operations. For this reason, the monitoring efforts are inclusive of all bird and bat species observed, and such is expected to be the case for operations-phase impact monitoring and management programs.
- the list is intended to be adaptable, and subject to revision in the future under the auspice of adaptive management, for example if a species that was not initially expected to occur with the Project area is detected on-site, or if impacts to specific species differ substantially from initial predictions (the latter could, in principle, result in an upgrade or downgrade in the Project priority level of a species, for example, under the auspice of adaptive management)

The process for generating the list was as follows:

- An initial draft list was generated by the international wind-wildlife specialist on the basis of the criteria described below, based on information from the following sources: IUCN distribution maps, eBird data on bird distributions, species- and country-specific information in the BirdLife International Data Zone, initial bird monitoring results from the Project area, technical literature and prior experience with studying and managing wildlife impacts at wind energy facilities, IFC policy, guidelines, and typical practice for the management of biodiversity impacts at development projects, and specifically the management of wildlife impacts at wind energy facilities.
- The list was revised with input from regional expert ornithologists
- The list is periodically updated based on ongoing monitoring data being conducted at the facility (e.g. inclusion of newly documented species)



The criteria for classifying species initially as tier 1(primary) or tier 2 (secondary) target species are multiple and varied, and initial classification was based on synthesizing and balancing all of the factors listed below. Note that these classifications are subject to revision on an ongoing basis under the auspice of adaptive management, in light of ongoing monitoring results:

- IUCN listed status
- Uzbek redlist status
- Other potential conservation sensitivity factors (i.e. societal values)
- known susceptibility of the species, or similar species, to wind turbine collisions
- where specific susceptibility of species, or very closely related species is not known, predicted collision susceptibility as a function of flight morphology, ecology, and behaviour
- demographic and ecological factors that contribute to relatively high sensitivity to anthropogenic mortality (e.g. slow reproduction rate, late age of first reproduction, low population density)
- expected or known abundance of the species within the Project site (i.e. species expected to occur very rarely at the Project site are considered lower risk than are species expected to have higher abundance at the site, all other factors being equal)

Table 1 below presents a suggested list of sensitive, or “target” bird species for the Dzhankeldy project, subdivided into two tiers, reflecting different priority levels (tier 1 is higher sensitivity, higher priority than tier 2).

Table 1 Target and secondary species

Latin name	English name	IUCN status	Uzbek status	Notes on Likely Occurrence/Risk <sup>2</sup>
<b>Tier 1 Target Species (top priority)</b>				
<i>Aquila nipalensis</i>	Steppe Eagle	EN	VU	Likely present, though uncommon at site based on nearby, recent eBird records in similar habitat
<i>Neophron percnopterus</i>	Egyptian Vulture	EN	VU	Nested in region. Observed in 2018 in project area (Ten, Soldatov 2018), present at DWEP site, confirmed with four separate observations of single individuals during May 2021 VP surveys at three different VP
<i>Falco cherrug</i>	Saker Falcon	EN	NT	Nested in project area, observed in 2018 (Ten, Soldatov 2018)
<i>Aquila chrysaetos</i>	Golden Eagle	LC	VU	Common resident and nests in project area (Ten, Soldatov 2018)
<i>Aquila heliaca</i>	Imperial Eagle	VU	VU	Migrant
<i>Chlamydotis macqueenii</i>	Asian Houbara	VU	VU	Common nesting and migrant species (Burnside)
<i>Vanellus gregarius</i>	Sociable Lapwing	CR	VU	possible rarity, recent eBird photo record in desert habitat ca 60km SE suggests possibility of occurrence. Extremely sensitive species with CR status
<i>Aegypius monachus</i>	Cinereous Vulture	NT	VU	The species is elevated to Target Species list according to recommendations provided by Caleb Gordon in Winter 2020/2021 report evaluation Memo

<sup>2</sup> Patterns of regional and seasonal abundance determined from analysis of eBird data (ebird.org) accessed 10 June, 2020

<i>Haliaeetus albicilla</i>	White-tailed Sea-Eagle	LC	VU	The species is elevated to Target Species list according to recommendations provided by Caleb Gordon in Winter 2020/2021 report evaluation Memo
<b>Tier 2 Target Species (second priority)</b>				
<i>Gyps fulvus</i>	Eurasian Griffon	NT	VU	Resident in region
<i>Circaetus gallicus</i>	Short-toed Snake-Eagle	LC	VU	Likely present at site based on recent, nearby eBird records, though uncommon in region
<i>Hieraaetus pennatus</i>	Booted Eagle	LC	VU	Very rare in region according to eBird records. Two individuals documented at DWEP during May 2021 during a VP Survey (VP 4)
<i>Circus aeruginosus</i>	Eurasian Marsh-Harrier	LC	NA	Fairly common in region, several individuals documented at DWEP during May, 2021 VP surveys
<i>Circus cyaneus</i>	Hen Harrier	LC	NA	Fairly common in region
<i>Circus macrourus</i>	Pallid Harrier	NT	NT	Fairly common in region
<i>Circus pygargus</i>	Montagu's Harrier	LC	NA	Uncommon in region
<i>Accipiter badius</i>	Shikra	LC	NA	Uncommon in region
<i>Accipiter nisus</i>	Eurasian Sparrowhawk	LC	NA	Uncommon in region
<i>Buteo rufinus</i>	Long-legged Buzzard	LC	NA	Fairly common in region, documented at DWEP site in May, 2021
<i>Buteo buteo</i>	Common Buzzard	LC	NA	Fairly common in region
<i>Milvus migrans</i>	Black Kite	LC	NA	Uncommon in region
<i>Anthropoides virgo</i>	Demoiselle Crane	LC	NA	Uncommon in region
<i>Grus grus</i>	Common Crane	LC	NA	Uncommon in region
<i>Falco tinnunculus</i>	Common Kestrel	LC	NA	Common in region, documented at DWEP site in May, 2021

## **TERRITORY DESCRIPTION**

The project territory is located in the Southwestern part of Uzbekistan in the Peshku district of Bukhara region. The landscape of the project area is steppe and arid. Accordingly, steppe and desert species of animals and plants are common here. But during the migration period, representatives of other biotopes can also be met there.

The village of Dzhankeldy is located near the project territory. About 90 families live in the village, there is one school and one preschool (kindergarten). The local population is mainly ethnic Kazakhs - they are engaged in breeding small cattle, camels and horse breeding. Due to lack of water, they practically do not engage in agriculture. In most cases, young people leave village to work in the cities of Bukhara and Navoi. Some houses are abandoned. Geological works are being carried out near the village.

The project area includes mountains of Beltau, which are considered as the spurs of the Kul'dzhuktau mountains, - a mountain island range in the Central part of the Kyzylkum desert (length about 100 km, width up to 15 km, height up to 785 m). The southern slopes of Kul'dzhuktau Mountains are slanting, dissected by dry canyons; the Northern slopes are rocky and steep. It is composed mainly of crystalline shales and limestones; along the margin — Jurassic, Cretaceous and Paleogene sedimentary strata, on the surface of which there are sometimes sifted sands.

## VANTAGE POINTS

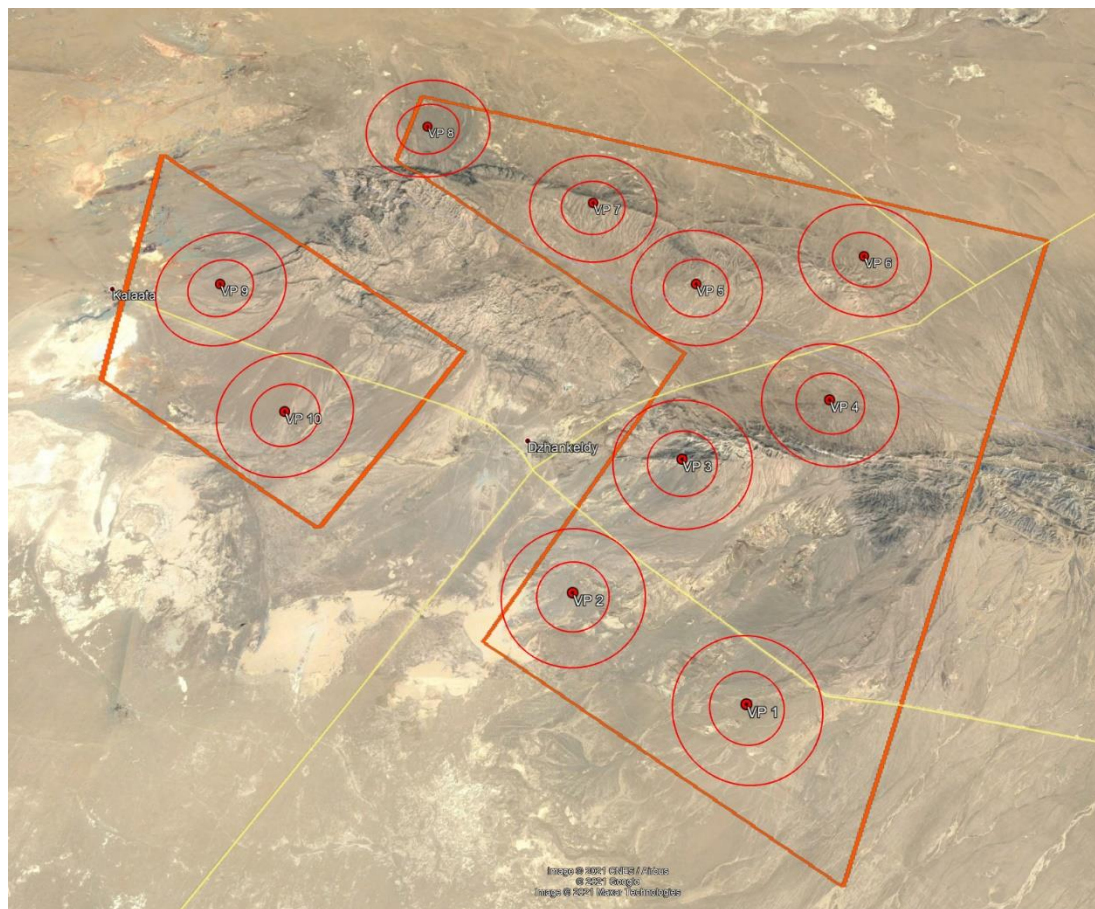


Fig. 1 Vantage Points locations

The number of Vantage Points was agreed with the Client. Points are located so as to cover the project territory as fully as possible. The coordinates of the Vantage Points of Dzhankeldy are shown in Table 2. The radius of a single observation point is 2 km. Time spent at one point is 3 hours' average.

Table 2 Coordinates of the VPs of Dzhankeldy project territory

Vantage Points	Coordinates	
VP 1	40.784300°	63.404295°
VP 2	40.811066°	63.347802°
VP 3	40.847481°	63.383422°
VP 4	40.865322°	63.434670°
VP 5	40.899852°	63.388194°
VP 6	40.909887°	63.449732°
VP 7	40.925033°	63.349676°
VP 8	40.951100°	63.284526°
VP 9	40.896820°	63.214673°
VP 10	40.858649°	63.244772°

Table 3 Total Number of VP survey hours

	VP 1	VP 2	VP 3	VP 4	VP 5	VP 6	VP 7	VP 8	VP 9	VP 10	
<b>March hr</b>	15	15	15	15	9	9	9	9	9	9	
<b>April hr</b>	15	15	15	15	15	15	15	15	15	15	
<b>May hr</b>	6	6	6	6	12	12	12	12	12	12	
<b>accounts for Spring</b>	36	36	36	36	36	36	36	36	36	36	<b>360</b>

360 total hours of VP survey effort were conducted at the 10 VP survey points in the project area during the reporting period (Table 3), which corresponds to the Spring season. Each of the 10 points received at least 36 hours of VP survey effort during the Spring season. This is a strong level of effort, and will provide a strong source of data for a robust seasonal collision risk modelling effort, and overall interpretation of Spring season collision risk for target bird species.

## BIRD OBSERVATIONS RESULTS

Among birds registered during bird survey in from March 10, 2021 – May 20, 2021 (Tables 4-6), following bird species belonging to top priority target species were found in the project area: Steppe Eagle (*Aquila nipalensis*), Golden Eagle (*Aquila chrysaetos*), Cinereous Vulture (*Aegypius monachus*), White-tailed Sea-eagle (*Haliaeetus albicilla*), Egyptian Vulture (*Neophron percnopterus*), Asian Houbara (*Chlamydotis macqueenii*).

Among the secondary species, following bird species were found in the project area: Hen Harrier (*Circus cyaneus*), Long-legged Buzzard (*Buteo rufinus*), Common Buzzard (*Buteo buteo*), Common Kestrel (*Falco tinnunculus*), Eurasian Marsh-Harrier (*Circus aeruginosus*).

Table 4 Results of bird observations in March, 2021

SPECIES			VANTAGE POINTS NUMBER OF INDIVIDUALS											IUCN status	Uzb Red Book status	Natur e of stay
№	Latin	English	VP 1	VP 2	VP 3	VP 4	VP 5	VP 6	VP 7	VP 8	VP 9	VP 10	Total			
TARGET SPECIES																
1.	<i>Aquila nipalensis</i>	Steppe Eagle			1								1	EN	2 (VU:D)	NMW
2.	<i>Aegypius monachus</i>	Cinereous Vulture			1		1						2	NT	3 (NT)	R
3.	<i>Haliaeetus albicilla</i>	White-tailed Sea-eagle	1				1			1			3	LC	2 (VU:R)	NMW
4.	<i>Neophron percnopterus</i>	Egyptian Vulture												EN	2 (VU:R)	R
5.	<i>Falco cherrug</i>	Saker Falcon												EN	2 (VU:D)	NMS
6.	<i>Aquila chrysaetos</i>	Golden Eagle	2		2			1			2		7	LC	2 (VU:D)	NMW
7.	<i>Aquila heliaca</i>	Imperial Eagle												VU	2 (VU:D)	NM
8.	<i>Chlamydotis macqueenii</i>	Asian Houbara												VU	2 (VU:R)	M



9.	<i>Vanellus gregarius</i>	Sociable Lapwing												CR	2 (VU:R)	M
Total number of individuals of target species in March													13			
SECONDARY SPECIES																
1.	<i>Accipiter badius</i>	Shikra												LC	not listed	NM
2.	<i>Accipiter nisus</i>	Eurasian Sparrowhawk												LC	not listed	NMW
3.	<i>Anthropoides virgo</i>	Demoiselle Crane												LC	not listed	M
4.	<i>Buteo buteo</i>	Common Buzzard				1							1	LC	not listed	MW
5.	<i>Buteo rufinus</i>	Long-legged Buzzard	1	1	3	9	1						15	LC	not listed	NMW
6.	<i>Circaetus gallicus</i>	Short-toed Snake- Eagle												LC	2 (VU:D)	NM
7.	<i>Circus aeruginosus</i>	Eurasian Marsh-Harrier	3									2	5	LC	not listed	NMW
8.	<i>Circus cyaneus</i>	Hen Harrier	1	3								6	10	LC	not listed	MW
9.	<i>Circus macrourus</i>	Pallid Harrier												NT	3 (NT)	MS
10.	<i>Circus pygargus</i>	Montagu's Harrier												LC	not listed	NM
11.	<i>Falco tinnunculus</i>	Common Kestrel		3	5		3			5	3	1	20	LC	not listed	NMW
12.	<i>Grus grus</i>	Common Crane												LC	not listed	MW
13.	<i>Gyps fulvus</i>	Eurasian Griffon												NT	2 (VU:D)	R
14.	<i>Hieraaetus pennatus</i>	Booted Eagle												LC	2 (VU:D)	NM
15.	<i>Milvus migrans</i>	Black Kite												LC	not listed	NMW
Total number of individuals of secondary species in March													51			
OTHER SPECIES OF BIRDS																



№	Latin	English	VP 1	VP 2	VP 3	VP 4	VP 5	VP 6	VP 7	VP 8	VP 9	VP 10	Total	IUCN status	Uzb Red Book status	Nature of stay
16	<i>Phalacrocorax pygmaeus</i>	Pygmy Cormorant	7										7	LC	3 (NT)	NMW
17	<i>Athene noctua</i>	Little Owl	2			1				4		3	10	LC	not listed	R
18	<i>Ardea cinerea</i>	Gray heron	3									3	6	LC	not listed	NMW
19	<i>Anas crecca</i>	Green-winged Teal										15	15	LC	not listed	MWS
20	<i>Anas strepera</i>	Gadwall	14										14	LC	not listed	NMW
21	<i>Alectoris chukar</i>	Chukar partridge							12				12	LC	not listed	R
22	<i>Columba livia</i>	Rock Dove		9	5	12	12	20					58	LC	not listed	R
23	<i>Pterocles orientalis</i>	Black-bellied sandgrouse	7	19					7		6		39	LC	not listed	NMW
24	<i>Larus cachinnans</i>	Yellow-legged Gull	6	12							12		30	LC	not listed	NMW
25	<i>Larus ridibundus</i>	Black-Headed Gull										13	13	LC	not listed	NMW
26	<i>Upupa epops</i>	Hoopoe	3	1			2	2			2		10	LC	not listed	NMW
27	<i>Apus apus</i>	Northern Swift					12	13					25	LC	not listed	NM
28	<i>Hirundo rustica</i>	Barn swallow	8		8	7					9		32	LC	not listed	NM
29	<i>Corvus cornix</i>	Hooded Crow			2	4							6	LC	not listed	MW
30	<i>Corvus corax</i>	Northern Raven					2	3					5	LC	not listed	R
31	<i>Corvus frugilegus</i>	Eurasian Rook	20										20	LC	not listed	RMW
32	<i>Corvus monedula</i>	Jackdaw					5	9			7		21	LC	not listed	RMW
33	<i>Pica pica</i>	Black-billed Magpie			6								6	LC	not listed	R
34	<i>Acridotheres tristis</i>	Indian Myna		7							3		10	LC	not listed	NMW
35	<i>Galerida cristata</i>	Crested lark	26	36	39	14	13	27	20	16	14	22	227	LC	not listed	R

36	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	6	35	55	39	5	26	6		30	31	233	LC	not listed	<b>NMW</b>
37	<i>Calandrella brachydactyla</i>	Short-toed lark					12	21					33	LC	not listed	<b>NM</b>
38	<i>Oenanthe oenanthe</i>	Northern Wheatear	8	6							3	1	18	LC	not listed	<b>NM</b>
39	<i>Oenanthe isabellina</i>	Isabelline Wheatear	7	15	9	8	2	4	8	7	6	8	74	LC	not listed	<b>NM</b>
40	<i>Oenanthe finschii</i>	Black-necked Wheatear	7	1	9	11	2	7	5	2			44	LC	not listed	<b>RMW</b>
41	<i>Melanocorypha leucoptera</i>	White-winged Lark												LC	not listed	<b>MW</b>
42	<i>Sitta tephronota</i>	Greater Rock Nuthatch	1		3								4	LC	not listed	<b>R</b>
43	<i>Lanius excubitor</i>	Great (Gray) Shrik				3				2			5	LC	not listed	<b>MW</b>
44	<i>Rhodospiza obsoleta</i>	Black-billed Desert Finch		4		12			13				29	LC	not listed	<b>R</b>
45	<i>Scotocerca inquieta</i>	Streaked Scrub Warbler			5								5	LC	not listed	<b>R</b>
46	<i>Passer indicus</i>	Indian House Sparrow		24		38					33		95	LC	not listed	<b>NM</b>
47	<i>Motacilla personata</i>	Pied Wagtail		13			3	5			2		23	LC	not listed	<b>RMW</b>
48	<i>Motacilla citreola</i>	Citrine Wagtail		4									4	LC	not listed	<b>NM</b>
49	<i>Motacilla alba</i>	White Wagtail		3									3	LC	not listed	<b>MW</b>
Total number of individuals of other species in March													<b>1136</b>			
Total number of individuals in March													<b>1200</b>			

\*R - (residents) settled, W - (Springing) Springing, M - (migrant) migratory, N - nesting species, S – summering

Table 5 Results of bird observations in April, 2021

SPECIES			VANTAGE POINTS NUMBER OF INDIVIDUALS											IUCN status	Uzb Red Book status	Nature of stay
No	Latin	English	VP 1	VP 2	VP 3	VP 4	VP 5	VP 6	VP 7	VP 8	VP 9	VP 10	Total			
TARGET SPECIES																
	<i>Aquila nipalensis</i>	Steppe Eagle									1		1	EN	2 (VU:D)	NMW
2.	<i>Aegypius monachus</i>	Cinereous Vulture			1					1		1	3	NT	3 (NT)	R
3.	<i>Haliaeetus albicilla</i>	White-tailed Sea-eagle	1										1	LC	2 (VU:R)	NMW
4.	<i>Neophron percnopterus</i>	Egyptian Vulture	2				2	1				1	6	EN	2 (VU:R)	R
5.	<i>Falco cherrug</i>	Saker Falcon												EN	2 (VU:D)	NMS
6.	<i>Aquila chrysaetos</i>	Golden Eagle	1		2	1	2			1	1	1	9	LC	2 (VU:D)	NMW
7.	<i>Aquila heliaca</i>	Imperial Eagle												VU	2 (VU:D)	NM
8.	<i>Chlamydotis macqueenii</i>	Asian Houbara									1	2	3	VU	2 (VU:R)	M
9.	<i>Vanellus gregarius</i>	Sociable Lapwing												CR	2 (VU:R)	M
Total number of individuals of target species in April													23			
SECONDARY SPECIES																
	<i>Accipiter badius</i>	Shikra												LC	not listed	NM
2.	<i>Accipiter nisus</i>	Eurasian Sparrowhawk												LC	not listed	NMW
3.	<i>Anthropoides virgo</i>	Demoiselle Crane												LC	not listed	M
4.	<i>Buteo buteo</i>	Common Buzzard	1										1	LC	not listed	MW
5.	<i>Buteo rufinus</i>	Long-legged Buzzard			1		2	5	3	2	3	1	17	LC	not listed	NMW

6.	<i>Circaetus gallicus</i>	Short-toed Snake- Eagle												LC	2 (VU:D)	NM
7.	<i>Circus aeruginosus</i>	Eurasian Marsh- Harrier		4	2	1							7	LC	not listed	NMW
8.	<i>Circus cyaneus</i>	Hen Harrier		1	3	2					1		7	LC	not listed	MW
9.	<i>Circus macrourus</i>	Pallid Harrier												NT	3 (NT)	MS
10.	<i>Circus pygargus</i>	Montagu's Harrier												LC	not listed	NM
11.	<i>Falco tinnunculus</i>	Common Kestrel	1	5	3	1	2	1		2	3	2	20	LC	not listed	NMW
12.	<i>Grus grus</i>	Common Crane									11		11	LC	not listed	MW
13.	<i>Gyps fulvus</i>	Eurasian Griffon												NT	2 (VU:D)	R
14.	<i>Hieraaetus pennatus</i>	Booted Eagle												LC	2 (VU:D)	NM
15.	<i>Milvus migrans</i>	Black Kite				2							2	LC	not listed	NMW
Total number of individuals of secondary species in April													65			
OTHER SPECIES OF BIRDS																
№	Latin	English	VP 1	VP 2	VP 3	VP 4	VP 5	VP 6	VP 7	VP 8	VP 9	VP 10	Total	IUCN status	Uzb Red Book status	Nature of stay
	<i>Phalacrocorax pygmaeus</i>	Pygmy Cormorant		7			5						12	LC	3 (NT)	NMW
2.	<i>Athene noctua</i>	Little Owl		5	3	2				3		1	14	LC	not listed	R
3.	<i>Ardea cinerea</i>	Gray heron	1	2	1	2						1	7	LC	not listed	NMW
4.	<i>Ardea purpurea</i>	Purple Heron		1									1	LC	not listed	NM
5.	<i>Anas crecca</i>	Green-winged Teal		25		4							29	LC	not listed	MWS
6.	<i>Anas strepera</i>	Gadwall	5									22	27	LC	not listed	NMW
7.	<i>Alectoris chukar</i>	Chukar partridge	5						2				7	LC	not listed	R
8.	<i>Columba livia</i>	Rock Dove			6		10	12		11	11	9	59	LC	not listed	R

9.	<i>Pterocles orientalis</i>	Black-bellied sandgrouse	16	4	4	6		3	6	5	4		48	LC	not listed	<b>NMW</b>
10.	<i>Larus cachinnans</i>	Yellow-legged Gull	4		3	10							17	LC	not listed	<b>NMW</b>
11.	<i>Larus ridibundus</i>	Black-Headed Gull		7		4							11	LC	not listed	<b>NMW</b>
12.	<i>Upupa epops</i>	Hoopoe	1			1	1	1			2		6	LC	not listed	<b>NMW</b>
13.	<i>Merops apiaster</i>	European Bee-eater	2		5	11			3			6	27	LC	not listed	<b>NM</b>
14.	<i>Merops persicus</i>	Blue-cheeked Bee-eater	5	6	15	12	6			14	26		84	LC	not listed	<b>NM</b>
15.	<i>Coracias garrulus</i>	Eurasian Roller			1	2		1				2	6	LC	not listed	<b>NM</b>
16.	<i>Caprimulgus europaeus</i>	European nightjar				1							1	LC	not listed	<b>NM</b>
17.	<i>Apus apus</i>	Northern Swift	2		4	2	5		4			6	23	LC	not listed	<b>NM</b>
18.	<i>Hirundo rustica</i>	Barn swallow	12	11	5	8	14	16	13	8	6	7	100	LC	not listed	<b>NM</b>
19.	<i>Hirundo daurica</i>	Red-rumped Swallow		4		3		7	3			3	20	LC	not listed	<b>NM</b>
20.	<i>Corvus cornix</i>	Hooded Crow						2					2	LC	not listed	<b>MW</b>
21.	<i>Corvus corax</i>	Northern Raven						2					2	LC	not listed	<b>R</b>
22.	<i>Corvus frugilegus</i>	Eurasian Rook										12	12	LC	not listed	<b>RMW</b>
23.	<i>Corvus monedula</i>	Jackdaw	4		4		5				2	5	20	LC	not listed	<b>RMW</b>
24.	<i>Pica pica</i>	Black-billed Magpie					2						2	LC	not listed	<b>R</b>
25.	<i>Acridotheres tristis</i>	Indian Myna			5	4		4					13	LC	not listed	<b>R</b>
26.	<i>Sturnus vulgaris</i>	Common Starling				66			9				75	LC	not listed	<b>NMW</b>
27.	<i>Galerida cristata</i>	Crested lark	56	51	46	47	48	42	21	45	39	34	429	LC	not listed	<b>R</b>
28.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	30	12		27	47	57	34	16	46	14	283	LC	not listed	<b>NMW</b>
29.	<i>Calandrella brachydactyla</i>	Short-toed lark			9	10		12			12	10	53	LC	not listed	<b>NM</b>

30.	<i>Oenanthe oenanthe</i>	Northern Wheatear	6	5	9	2	1		4	3		3	33	LC	not listed	NM
31.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	7	18	8	11	8	12	6	15	12	6	103	LC	not listed	NM
32.	<i>Oenanthe finschii</i>	Black-necked Wheatear	5		2		4	8	9	8	3	7	46	LC	not listed	RMW
33.	<i>Oenanthe pleschanka</i>	Pied Wheatear				2	1						3	LC	not listed	NM
34.	<i>Sitta tephronota</i>	Greater Rock Nuthatch							2				2	LC	not listed	R
35.	<i>Lanius minor</i>	Lesser Grey Shrike				1				4			5	LC	not listed	NM
36.	<i>Lanius excubitor</i>	Great (Gray) Shrik		1	1		1	3	1	2		1	10	LC	not listed	MW
37.	<i>Lanius pallidirostris</i>	Steppe Grey Shrike			3	2	1			2	1		9	LC	not listed	NM
38.	<i>Muscicapa striata</i>	Spotted Flycatcher							2		1	1	4	LC	not listed	NM
39.	<i>Rhodospiza obsoleta</i>	Black-billed Desert Finch	2					6	4	9	9		30	LC	not listed	R
40.	<i>Scotocerca inquieta</i>	Streaked Scrub Warbler	1		1		3			1	2	1	9	LC	not listed	R
41.	<i>Phylloscopus collybita</i>	Chiffchaff			1	1							2	LC	not listed	MW
42.	<i>Passer indicus</i>	Indian House Sparrow	20	13	13			36		6	22	6	116	LC	not listed	NM
43.	<i>Passer montanus</i>	Tree sparrow						4					4	LC	not listed	R
44.	<i>Motacilla personata</i>	Pied Wagtail		2	5	3					7	6	23	LC	not listed	RMW
45.	<i>Motacilla citreola</i>	Citrine Wagtail		2							2		4	LC	not listed	NM
46.	<i>Motacilla alba</i>	White Wagtail		2							1		3	LC	not listed	MW
Total number of individuals of other species in April													1796			
Total number of individuals in April													1884			

\*R - (residents) settled, W - (Springing) Springing, M - (migrant) migratory, N - nesting species, S – summering

The voices of Egyptian Nightjar (*Caprimulgus aegyptius*) were heard at night near VP9 on April, 15.

Table 6 Results of bird observations in May, 2021

SPECIES			VANTAGE POINTS NUMBER OF INDIVIDUALS											IUCN status	Uzb Red Book status	Nature of stay
№	Latin	English	VP 1	VP 2	VP 3	VP 4	VP 5	VP 6	VP 7	VP 8	VP 9	VP 10	Total			
TARGET SPECIES																
	<i>Aquila nipalensis</i>	Steppe Eagle												EN	2 (VU:D)	NMW
2.	<i>Aegypius monachus</i>	Cinereous Vulture												NT	3 (NT)	R
3.	<i>Haliaeetus albicilla</i>	White-tailed Sea-eagle												LC	2 (VU:R)	NMW
4.	<i>Neophron percnopterus</i>	Egyptian Vulture				1	2	1			2		6	EN	2 (VU:R)	R
5.	<i>Falco cherrug</i>	Saker Falcon												EN	2 (VU:D)	NMS
6.	<i>Aquila chrysaetos</i>	Golden Eagle						1		4			5	LC	2 (VU:D)	NMW
7.	<i>Aquila heliaca</i>	Imperial Eagle												VU	2 (VU:D)	NM
8.	<i>Chlamydotis macqueenii</i>	Asian Houbara						1					1	VU	2 (VU:R)	M
9.	<i>Vanellus gregarius</i>	Sociable Lapwing												CR	2 (VU:R)	M
Total number of individuals of target species in May													12			
SECONDARY SPECIES																
	<i>Accipiter badius</i>	Shikra												LC	not listed	NM
2.	<i>Accipiter nisus</i>	Eurasian Sparrowhawk												LC	not listed	NMW
3.	<i>Anthropoides virgo</i>	Demoiselle Crane												LC	not listed	M
4.	<i>Buteo buteo</i>	Common Buzzard	1					1			2		4	LC	not listed	MW
5.	<i>Buteo rufinus</i>	Long-legged Buzzard			2		1	2		1		2	8	LC	not listed	NMW

6.	<i>Circaetus gallicus</i>	Short-toed Snake- Eagle												LC	2 (VU:D)	NM
7.	<i>Circus aeruginosus</i>	Eurasian Marsh- Harrier	1										1	LC	not listed	NMW
8.	<i>Circus cyaneus</i>	Hen Harrier	1	1			1				1		4	LC	not listed	MW
9.	<i>Circus macrourus</i>	Pallid Harrier												NT	3 (NT)	MS
10.	<i>Circus pygargus</i>	Montagu's Harrier												LC	not listed	NM
11.	<i>Falco tinnunculus</i>	Common Kestrel				2	1	2	1	2	3	1	12	LC	not listed	NMW
12.	<i>Grus grus</i>	Common Crane												LC	not listed	MW
13.	<i>Gyps fulvus</i>	Eurasian Griffon												NT	2 (VU:D)	R
14.	<i>Hieraaetus pennatus</i>	Booted Eagle												LC	2 (VU:D)	NM
15.	<i>Milvus migrans</i>	Black Kite												LC	not listed	NMW
Total number of individuals of secondary species in May													29			
OTHER SPECIES OF BIRDS																
№	Latin	English	VP 1	VP 2	VP 3	VP 4	VP 5	VP 6	VP 7	VP 8	VP 9	VP 10	Total	IUCN status	Uzb Red Book status	Nature of stay
	<i>Phalacrocorax pygmaeus</i>	Pygmy Cormorant									5		5	LC	3 (NT)	NMW
2.	<i>Athene noctua</i>	Little Owl	2			2	1	1	2		3		11	LC	not listed	R
3.	<i>Ardea cinerea</i>	Gray heron	2										2	LC	not listed	NMW
4.	<i>Ardea purpurea</i>	Purple Heron										1	1	LC	not listed	NM
5.	<i>Anas crecca</i>	Green-winged Teal		4								6	10	LC	not listed	MWS
6.	<i>Alectoris chukar</i>	Chukar partridge									3		3	LC	not listed	R
7.	<i>Columba livia</i>	Rock Dove			10		12		6			8	36	LC	not listed	R
8.	<i>Streptopelia decaocto</i>	Collared Turtle Dove						2					2	LC	not listed	R



9.	<i>Pterocles orientalis</i>	Black-bellied sandgrouse		6	3	2		2			2	7	22	LC	not listed	<b>NMW</b>
10.	<i>Larus cachinnans</i>	Yellow-legged Gull		2									2	LC	not listed	<b>NMW</b>
11.	<i>Upupa epops</i>	Hoopoe			1		2	1				1	5	LC	not listed	<b>NMW</b>
12.	<i>Merops apiaster</i>	European Bee-eater	6			16			2	5	8		37	LC	not listed	<b>NM</b>
13.	<i>Merops persicus</i>	Blue-cheeked Bee-eater	9				5		24	15	12	25	90	LC	not listed	<b>NM</b>
14.	<i>Coracias garrulus</i>	Eurasian Roller	1	2			5						8	LC	not listed	<b>NM</b>
15.	<i>Apus apus</i>	Northern Swift					8		3	1			12	LC	not listed	<b>NM</b>
16.	<i>Hirundo rustica</i>	Barn swallow	6	6	6	12	5	5		5	10	11	66	LC	not listed	<b>NM</b>
17.	<i>Hirundo daurica</i>	Red-rumped Swallow			6			9	3		2		20	LC	not listed	<b>NM</b>
18.	<i>Corvus corax</i>	Northern Raven							2				2	LC	not listed	<b>R</b>
19.	<i>Corvus monedula</i>	Jackdaw					1						1	LC	not listed	<b>RMW</b>
20.	<i>Acridotheres tristis</i>	Indian Myna		2						2			4	LC	not listed	<b>R</b>
21.	<i>Galerida cristata</i>	Crested lark	13	9	8	9	16	19	18	13	15	19	139	LC	not listed	<b>R</b>
22.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	6	6	10			14	8	29	10	6	89	LC	not listed	<b>NMW</b>
23.	<i>Calandrella brachydactyla</i>	Short-toed lark						35					35	LC	not listed	<b>NM</b>
24.	<i>Alauda arvensis</i>	Skylark			5						3		8			
25.	<i>Oenanthe oenanthe</i>	Northern Wheatear	4	6		6			1		3	1	21	LC	not listed	<b>NM</b>
26.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	3	3	5	1	6	8	7	14	9	7	63	LC	not listed	<b>NM</b>
27.	<i>Oenanthe finschii</i>	Black-necked Wheatear			2	1	5		5	1		3	17	LC	not listed	<b>RMW</b>
28.	<i>Oenanthe pleschanka</i>	Pied Wheatear							3				3	LC	not listed	<b>NM</b>
29.	<i>Lanius minor</i>	Lesser Grey Shrike					2			1	1	1	5	LC	not listed	<b>NM</b>

30.	<i>Lanius excubitor</i>	Great (Gray) Shrik				1	1	2		1		5	LC	not listed	<b>MW</b>
31.	<i>Lanius pallidirostris</i>	Steppe Grey Shrike		3	1				1	1		6	LC	not listed	<b>NM</b>
32.	<i>Muscicapa striata</i>	Spotted Flycatcher							1		2	3	LC	not listed	<b>NM</b>
33.	<i>Rhodospiza obsoleta</i>	Black-billed Desert Finch	2		12	5	4	2	2	3	6	36	LC	not listed	<b>R</b>
34.	<i>Scotocerca inquieta</i>	Streaked Scrub Warbler				1		1		3		5	LC	not listed	<b>R</b>
35.	<i>Passer indicus</i>	Indian House Sparrow		8		6	5	8			26	53	LC	not listed	<b>NM</b>
36.	<i>Motacilla personata</i>	Pied Wagtail		3		3	1					7	LC	not listed	<b>RMW</b>
37.	<i>Motacilla citreola</i>	Citrine Wagtail									3	3	LC	not listed	<b>NM</b>
38.	<i>Motacilla alba</i>	White Wagtail					1				2	3	LC	not listed	<b>MW</b>
Total number of individuals of other species in May												<b>840</b>			
Total number of individuals in May												<b>881</b>			

\*R - (residents) settled, W - (Springing) Springing, M - (migrant) migratory, N - nesting species, S - summering

## TARGET SPECIES ECOLOGY

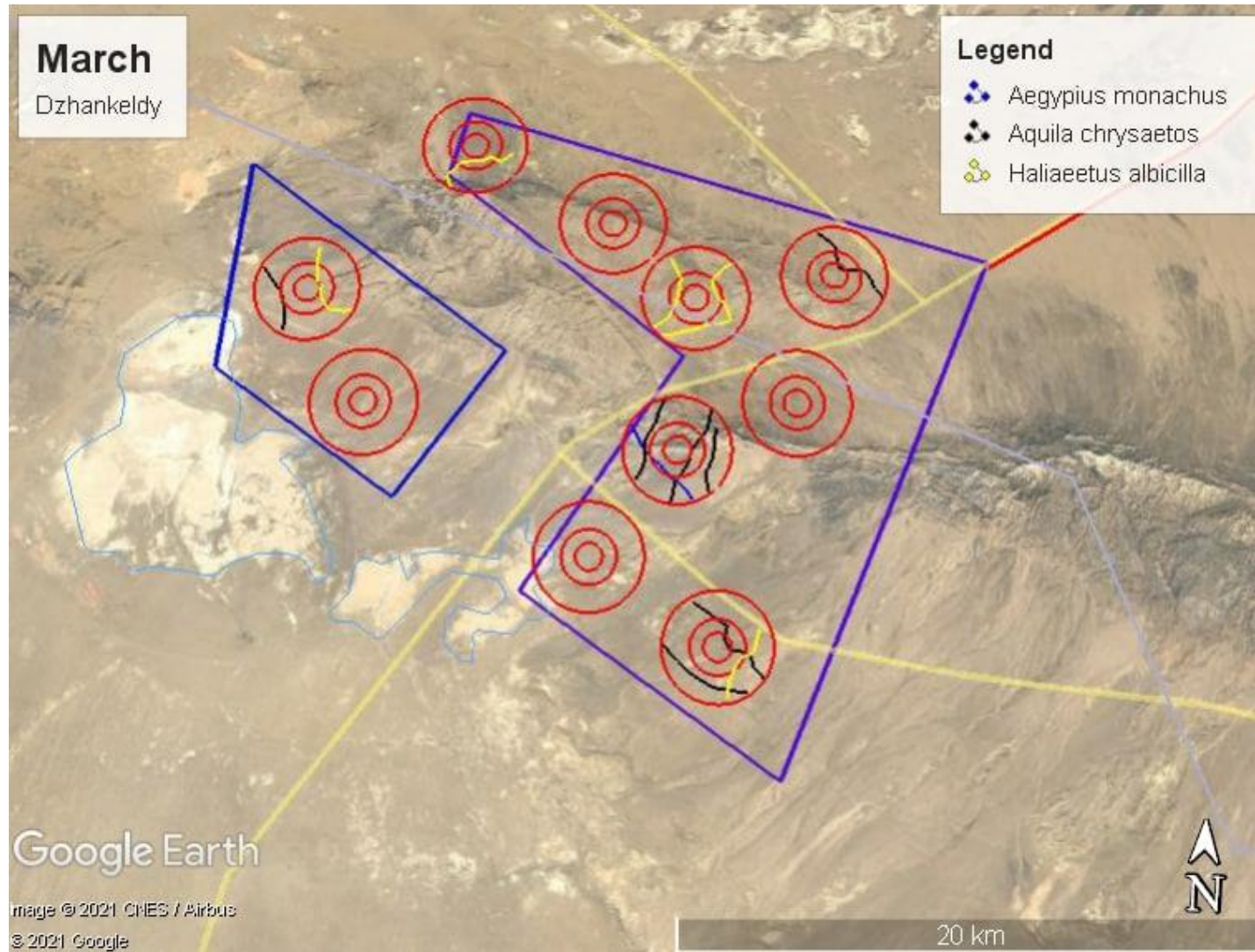


Figure 1 Target species observations in March

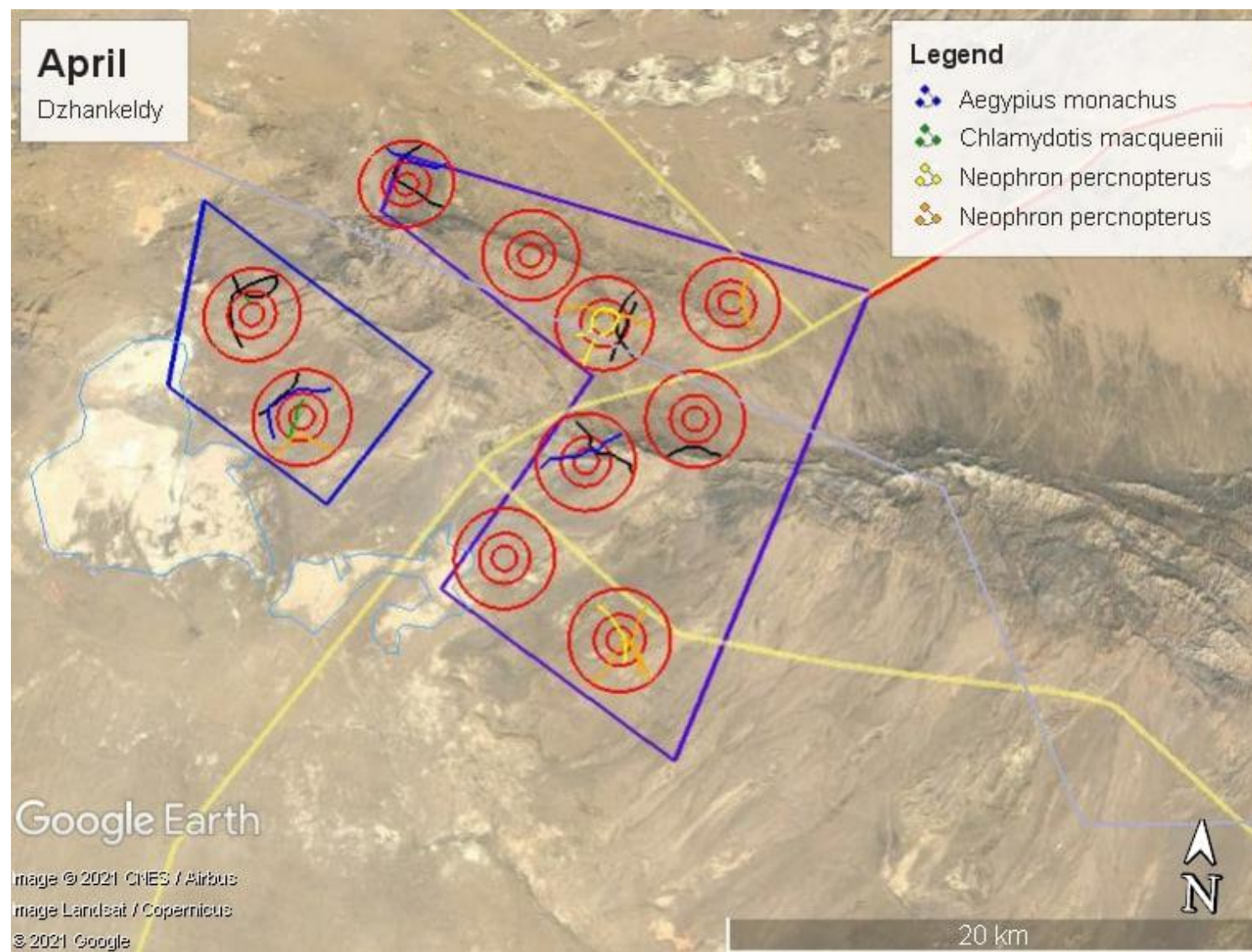


Figure 2 Target species observations in April



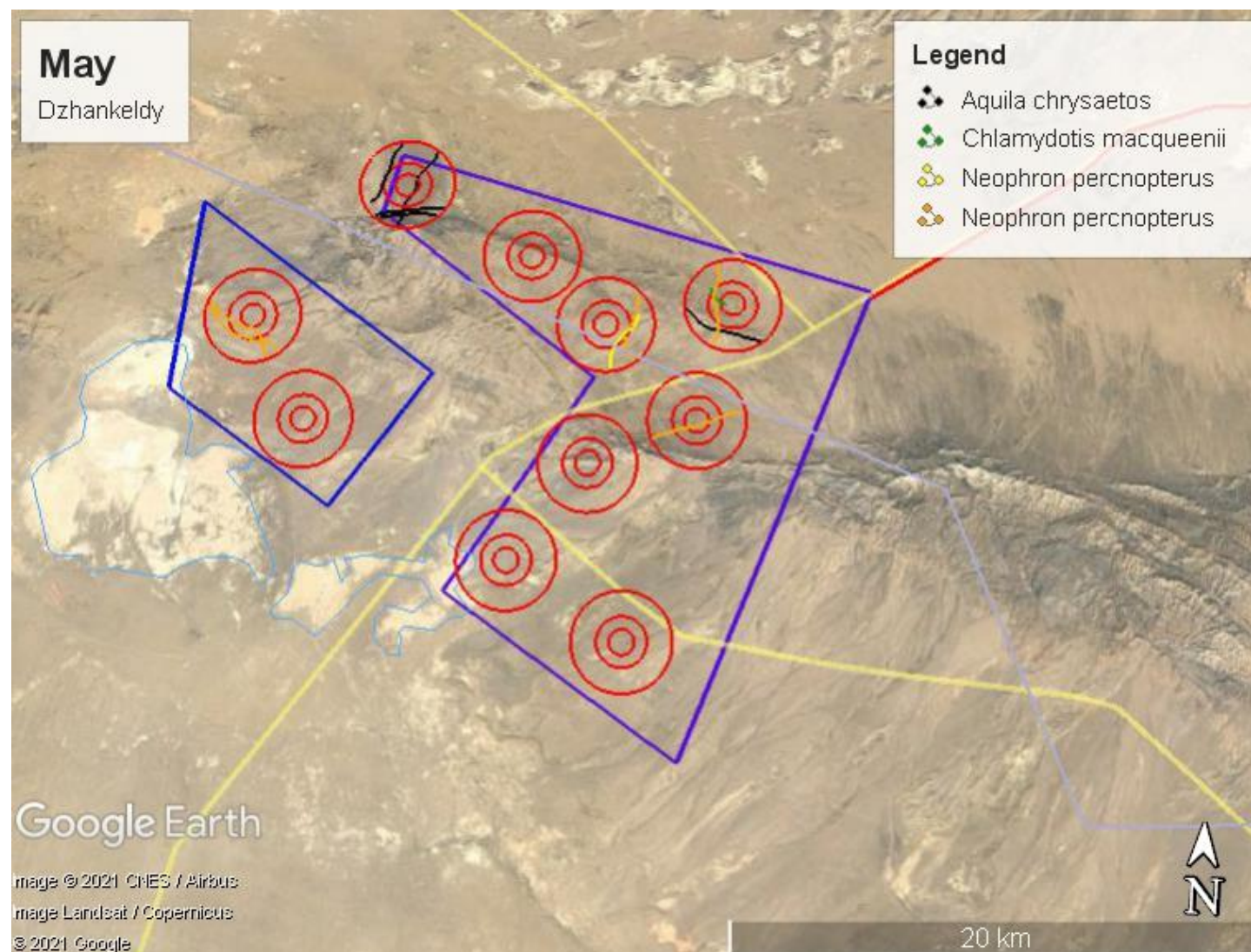


Figure 3 Target species observations in May

## ***Aquila nipalensis* – Steppe Eagle**

There are two subspecies in Uzbekistan:

1. *Aquila nipalensis* Temminck, 1828. ssp. *nipalensis* Hodgson, 1833
2. *Aquila nipalensis* Temminck, 1828. ssp. *orientalis* Cabanis, 1854

*Near Threatened 2 (VU-D), migratory European (2) and eastern (1) subspecies. It is distributed across the Plateau Ustyurt (1 - nesting, migration, roaming); plainlands and low mountain regions (1 - roaming, 2 - migration, Springing). Single individuals and groups were recorded during migration. Sometimes, about one hundred eagles migrate through some desert points per day. Several dozens of roaming birds were recorded; single individuals Spring irregularly in Hungry Steppe and the Amudarya River valley, near Termez. Included in the IUCN Red List (EN) and Appendix II of CITES<sup>3</sup>.*

Steppe Eagle is regularly found on flights and Springing grounds. It inhabits plains and low mountains. Spring migration takes place in March-April, Spring migration – in October-November, Springs from December to February. On the fly, it is observed singly or in groups of 2-3 individuals; sometimes up to several dozen per day. Young eagles start flying in July. Steppe Eagle feeds on rodents, in the conditions of Uzbekistan mainly large and red-tailed gerbils. It also feeds on carrion.

The world population of Steppe Eagle is rapidly declining. The main factors are: economic development of the land, deaths on power lines, direct human persecution.

According to the literature and our field observations, nesting of this species in the Central Kyzylkum area, including the project territory, has not been detected. The susceptibility to wind turbines collisions for this species could be high, especially during the spring and Spring migration periods, when the area is heavily overflowed, but the final interpretation

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<sup>3</sup> Red book of Uzbekistan, 2019

of wind farm risk for this species will be presented in the collision risk modeling report, performed by the international wind-wildlife expert.

**On the territory of Dzhankeldy during Spring 2 individuals of Steppe Eagle were recorded.**

## ***Aquila chrysaetos* - Golden Eagle**

There are two subspecies in Uzbekistan:

1. *Aquila chrysaetos* Linnaeus, 1758 ssp. *daphanea* Severtzov, 1888
2. *Aquila chrysaetos* Linnaeus, 1758 ssp. *fulva* Linnaeus, 1758

*Vulnerable, naturally rare 2 (VU:R), resident, locally distributed South-European (1) and Central Asian (2) subspecies. It is distributed across the Plateau Ustyurt, in the southern Aral region, the desert Kyzylkum (1); in mountain regions (2). It inhabits sandy areas and low mountains in the deserts, loess precipices of foothills, rocks of the mid- and high belts of the mountains. The number was always low. In 1970-80s, 80-100 nesting pairs were recorded. During the last years, nests on power lines and loess cliffs of major channels of the Kyzylkum desert. Currently, approximately 200 pairs are nesting. Limiting factors: deforestation; long-term changes in food resources associated with the reduction of wildlife population and an increase in the number of grazing livestock; destruction of nests; direct persecution by human. Included in the IUCN Red List (LC) and Appendix II of CITES<sup>4</sup>.*

The population of Golden Eagle has always been small in Uzbekistan. But during flights and migrations, it can be found in different habitats – in mountains, steppes and plains.

Golden Eagle lives on sandy massifs and outlier mountains of deserts, foothills, rock formations of the middle and upper belt of mountains up to 2500-3000 m above the sea level. It nests on rocks, loess cliffs, trees, power transmission poles, towers, etc.

Golden Eagles build nests from large, thick, dry branches of various trees and shrubs, most common near the nesting site. The same nest can be inhabited for many years in a row, sometimes birds alternate them. The duration of construction, depending on whether the birds occupy the old nest or build a new one, can range from 5 to 22 days.

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<sup>4</sup> Red book of Uzbekistan, 2019



When re-nesting, the birds lay an additional thick layer of fresh branches. Such nests often fall under their weight, breaking off the branches that support them. A characteristic feature of an old Golden Eagle nest in the desert part of its habitat is the fragments of the large tortoises' shells, a large number of which are thrown under the nest and on its edge. In the sands, where the Golden Eagle can not break the shell of a tortoise, their remains are absent.

The clutch occurs in February-March and contains 1-3 eggs. Incubation lasts 43-45 days, young birds begin to fly in June-July. The Golden Eagle feeds on small mammals, birds, snakes, tortoises, and rarely carrion.

**During Spring observations, 21 Golden Eagles were observed on the Dzhankeldy project territory.**

## ***Aquila heliaca* – Imperial Eagle**

*Vulnerable, declining 2 (VU:D), nesting and migrating nominal subspecies. It is distributed across the Plateu Ustyurt and in the northern Kyzylkum desert (nesting), plainland regions (migration, roaming), Central and Southern Uzbekistan (irregular Springing). The number was always low. In 1970-80s, the density of settlements in the low mountains of the Bukantau and the northern Kyzylkum reached 0.4 to 0.8 pairs per 100 sq. km. Single birds and small groups up to 15 individuals are recorded during migration. At present, number has sharply dropped. Limiting factors: human development of virgin lands in desert and semi-desert zones, mortality due to power lines, destruction of nests, disturbance during nesting. Included in the IUCN Red List (VU) and Appendix I of CITES<sup>5</sup>.*

It inhabits plains and foothills. During seasonal migrations, it is found everywhere throughout the republic.

The spring flight takes place in February-April, during which the birds fly singly and in groups of up to 15 birds. Breeding pairs are quite rare. Nests of **Imperial Eagles** are arranged mainly on saxaul or elm, on old trees at a low height. The nest is built from thick dry branches of trees and shrubs, up to 1.2-1.5 m in diameter. The Chicks during the period of stay in the nest is strongly trample it down, and it becomes flatter. The inner parts of the nest are lined with thin twigs, often green, freshly plucked. The tray is usually lined with soaked ferula stalks, bundles of dry grass, and sometimes wool. Occasionally, it builds nests on the basis of old buildings of the barrow, in empty nests of Golden Eagle and Black Vulture. The old nests of **Imperial Eagles** are very similar to the nests of Golden Eagle, but usually differ in the absence of fragments of the shells of large tortoises around the nest. Clutches (1-2 eggs) occur in February-May. Both parents stay on eggs for about 43 days. Young birds begin to fly in July and August. It feeds on rodents, hedgehogs, tortoises, and carrion.

**During Spring observations, no Imperial Eagles were observed on the Dzhankeldy project territory.**

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<sup>5</sup> Red book of Uzbekistan, 2019

## ***Falco cherrug* – Saker Falcon**

*Near Threatened 1 (EN), migratory Turkestanian (1) and northern (2, 3) subspecies of the Palearctic species. It is distributed in the plainland and low mountain regions (1 - nesting, roaming; 2 - migration, Springing). It inhabits the loess precipices, rocks of low mountains and foothills. From 1990s the numbers have been declining. At present, totally about 70 pairs are nesting in Uzbekistan. Number of migrating and Springing birds are about some hundreds. Limiting factors: fluctuations of rodent numbers, illegal trapping, destruction of nests; death on power lines. Included in the IUCN Red List (EN) and Appendix II of CITES<sup>6</sup>.*

During the period of migration and Springing, this species is found almost on all the plains of the republic, agricultural oases and even in the vicinity of cities. They roam widely in mountainous areas, but in much smaller numbers.

Saker Falcon is a nesting, Springing, sometimes sedentary bird. Most of the breeding population is sedentary. Previously, it was widely encountered in lowland and low-mountain areas. The spring flight occurs in March. It breeds on Relic mountains cliffs in the valleys of lowland rivers, on rocky areas, supports of power lines, and in the mountains up to a height of 2500 m above sea level.

A completely empty area can be used as a nest, and the eggs in this case are laid directly on the ground or on the pebbles in a small depression, but much more often Saker Falcon occupies the nests of other birds of prey (Golden Eagle, Vulture) or crows. He doesn't build nests himself. Cases of nesting in trees in Uzbekistan are unknown.

A prerequisite for Saker Falcon nesting is a sufficiently high number of rodents. Even in areas where Saker Falcon is common in years with a high number of rodents, it stops nesting in their absence. Egg laying (3-5) is carried out in February-April. Only the female incubates the eggs for 28 days, the male feeds her. Young Saker Falcons begin to fly in May-June. The Spring migration takes place in September-November. Saker Falcon Springs from December to February. It feeds on rodents and birds.

**During Spring observations, the Saker Falcon was not found on the project territory.**

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<sup>6</sup> Red book of Uzbekistan, 2019

## ***Neophron percnopterus* – Egyptian Vulture**

*Vulnerable, declining 2 (VU:D), mosaically distributed species. It is distributed in the Kugitang, the Babatag, the Hissar, the Baysuntau, the Chatkal, the Pskem, the Kurama and Turkestan ridges, mountains of central part of the Kyzylkum desert, the Amudarya River valley. It inhabits desert low mountains, the mergins of arid ridges of the Tien-Shan and Pamir- Alay. In 1990-2000s, the amount in Uzbekistan was 200 pairs. At the present - 134-140 pairs. Limiting factors: Searcity of feed due to small cattle decline, direct persecution by human, trouble during the breeding season. Included in the IUCN Red List (ENJ and Appendix II of CITES<sup>7</sup>.*

A common relatively numerous breeding bird, confined to depressions of the lower belt of all mountain systems and plains of Uzbekistan. It flies away for the Spring, only rare loners spend the Spring. Well withstands the proximity of humans, if not specifically pursued by them. Egyptian Vulture nests in niches and voids of rocks, loess and sandstone cliffs, less often on eaves or ledges, but more often with a ledge overhanging the nest. Egyptian Vulture nests can be often found not far from the nests of other birds of prey (vultures, kites, buzzards), black stork and raven. There is a known case of its nesting on the support of a power line pole in the old nest of another predator. Egyptian Vulture puts different soft materials (wool, rags, ropes, etc.) on the future nest foundation. During the feeding of chicks, the nest niche is cluttered with all sorts of food residues (bones of ungulates, skulls of small animals, etc.) and with a large amount of droppings. A specific, extremely pungent and persistent smell emanating from the nest can be felt in the wind for tens and hundreds of meters. The rocks around the nest, and especially under it, are covered with white streaks of droppings, visible from a great distance. The beginning of breeding occurs in April, ends in the second week of May. Single, possibly repeated clutches appear before the end of May. In a clutch there are 2, less often – 1 egg. Chicks in nests begin to appear in late May – early June, flying young birds in mid-July-August. According to trophic connections, the vulture is primarily a herpetophage, as well as a collector of the corpses of small animals. It often feeds on large carrion, as well as on dump sites in the vicinity of human settlements and slaughterhouses.

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<sup>7</sup> Red book of Uzbekistan, 2019

During the Spring period on the territory of Dzhankeldy WF 12 Egyptian Vultures were not observed.

### ***Chlamydotis macqueenii* – Houbara Bustard**

*Vulnerable, declining 2 (VU:D), nesting, migratory eastern subspecies. It is distributed in the Plateau Ustyurt, the Kyzylkum desert, the Karshi Steppe (nesting, migration), Southern Kyzylkum (irregular Springing), Golodnaya Steppe (former nesting, migration). It inhabiting undulated loose sandy and clayey saline parts of the desert with rare shrubs (nesting); in all plains, except oases migration. Nesting population ranges in 1960-80-s from 1,500 to 3,000 individuals; during migration up to 20,000 individuals were recorded. The numbers and nesting area were sharp decreasing during last decades. During the last years, can be sometimes met while Springing in the South Kyzylkum. Limiting factors: agricultural development of virgin lands (since 1960s), poaching, uncontrolled hunting and falconry in migratory and Springing sites, collection of eggs and chicks. Two nurseries conduct scientific research on the ecology, breeding and regular bird releases in nature. Included in the IUCN Red List (VU) and in Appendix I of CITES<sup>8</sup>.*

It breeds in Uzbekistan and can be seen during migration. Spring migration occurs in February-March. The males begin the courtship display right after migration. The females appear in these places after about ten days, but they do not stay there permanently, but only visit them. The nests are arranged on another site, which can be considered as a nest site. In April-May, eggs are laid by birds in small depressions on the ground in the complete absence of a nest lining. After laying the eggs, males leave the females. The clutch consists of 2-5 eggs, the female incubates them for 21-24 days. Young bustards begin to fly in June and July. Then the broods break up, and the birds keep to themselves. Even during the Spring flight, which falls on August-November, single individuals are more common, but there are also small flocks. It feeds on grasses, seeds, invertebrates, small rodents and reptiles.

This bird is wary of human contact and usually lives in sparsely populated steppe areas.

**During Spring VP observations, 4 Houbara Bustards were observed on the Dzhankeldy project territory.**

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<sup>8</sup> Red book of Uzbekistan, 2019

**Vanellus gregarius - Sociable Lapwing**

*Vulnerable, naturally rare 2 (VU:R), migratory species. It is spread at the Central Kyzylkum, the Aydarkul Lake, the Tudakul and the Talimarjan water reservoirs. It can be found on the banks of reservoirs and marshes in the plainland wetlands and dry steppe areas, fallow land and harvested fields - for feeding and lodging. Numbers were always low. In 1970-80s, flocks of 10-20 individuals were recorded. Now, significant concentrations of birds were found during the Spring migration in the Talimarzhan reservoir - more than 2000 birds in 2012 and more than 4000 in 2015. Limiting factors: the development of virgin lands. Tall vegetation overgrowing of habitats as a result of grazing loads reduction. Included in the IUCN Red List [CR] and Appendix 1 of CMS<sup>9</sup>.*

The Sociable Lapwing habitats are coastal, often swampy areas of lowland reservoirs. Sociable Lapwing prefers moist open banks of water bodies with low herbaceous vegetation. Spring migration begins at the end of February, the peak is in March-early April. The Spring flight takes place in July-October. Sociable Lapwing feeds on aquatic invertebrates, partly on plant food.

**We did not observe Sociable Lapwing on the Dzhankeldy project territory in Spring.**

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<sup>9</sup> Red book of Uzbekistan, 2019

***Aegypius monachus* - Cinereous Vulture**

*Near Threatened 3 (NT), resident, mosaically distributed species. It is distributed in the Western Tien-Shan, the Western Pamir-Alay, the Bukantau and Tamdytau mountains. It inhabits low and mid-belts of the mountains within 500–2500 m above sea level (nesting), mountains and plains, including agricultural lands (roaming). In 1980s, about 80 nesting pairs were recorded. At present, number in the Hissar range is increased, in the Western Tien-Shan – stable. Total number is more than 250 individuals. Limiting factors: decline of numbers of wild ungulates, poaching. Included in the IUCN Red List (NT) and in Appendix II of CITES.<sup>10</sup>*

It is a breeding, relatively numerous bird of the mountain systems of Uzbekistan. It is associated with low-mountain and mid-mountain areas when breeding. On migrations, during the non-breeding season, both adult and immature birds visit almost all lowland and mountainous areas, avoiding only the zone of agricultural oases. On the territory of Uzbekistan, nesting of 2 types is known - in trees and on rocks. The breeding period of the Cinereous Vulture is stretched: from the third decade of February to the first decade of April. Vulture nests are concentrated in group settlements - colonies where nests are located 100-500 meters from each other. The Cinereous Vultures has important function and destroys animal waste.

**During the Spring period on the territory of Dzhankeldy WF 5 Cinereous Vultures were observed.**

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<sup>10</sup> Red book of Uzbekistan, 2019



***Haliaeetus albicilla* - White-tailed Sea-Eagle**

*Vulnerable, naturally rare 2 (VU:R), migratory subspecies. It is distributed in the southern Aral Sea region (nesting); migration and wintering almost elsewhere in Uzbekistan except high mountains and the Ferghana Valley. It inhabits large plainland and foothill water reservoirs. The number was always low, but last years is increased. During migration – single individuals, pairs, families and groups of birds are recorded. Nesting is single pair and irregular. About 300-400 birds overwinter. Limiting factors: destruction of habitats as a result of the changes of the water regime in the basin of the Aral Sea, poaching. Included in the IUCN Red List (LC) and in Appendixes I of CITES and CMS.<sup>11</sup>*

One of the largest birds of prey. According to the peculiarities of nutrition, white-tailed eagles are mainly associated with water bodies, although in winter they can feed away from them in the presence of abundant available food (landfills of meat and fish waste, animal corpses). On reservoirs, it feeds mainly on waterfowl and fish.

**During the Spring period on the territory of Dzhankeldy WF 4 White-tailed Sea-Eagles were observed.**

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<sup>11</sup> Red book of Uzbekistan, 2019

## **SPECIALIZED RAPTOR NEST SEARCH**

The specialized raptor nest search was conducted in Spring 2021 on April 12, April 14, May 21, and May 23. The purpose of the survey was to identify the species that nest in the project area and collect data on their nesting.

The methodology of birds of prey nests search consisted in walking transects in places of possible nesting – on rocky areas and cliffs, followed by mapping the nests found (Figure 4). During the survey optical devices such as binoculars and telescope were used. The method of interviewing local residents and shepherds about the presence of predator nests was also used. Due to the lack of large trees and shrubs, nesting birds in trees was excluded. Surveys were conducted both in the project area and in the surrounding area.

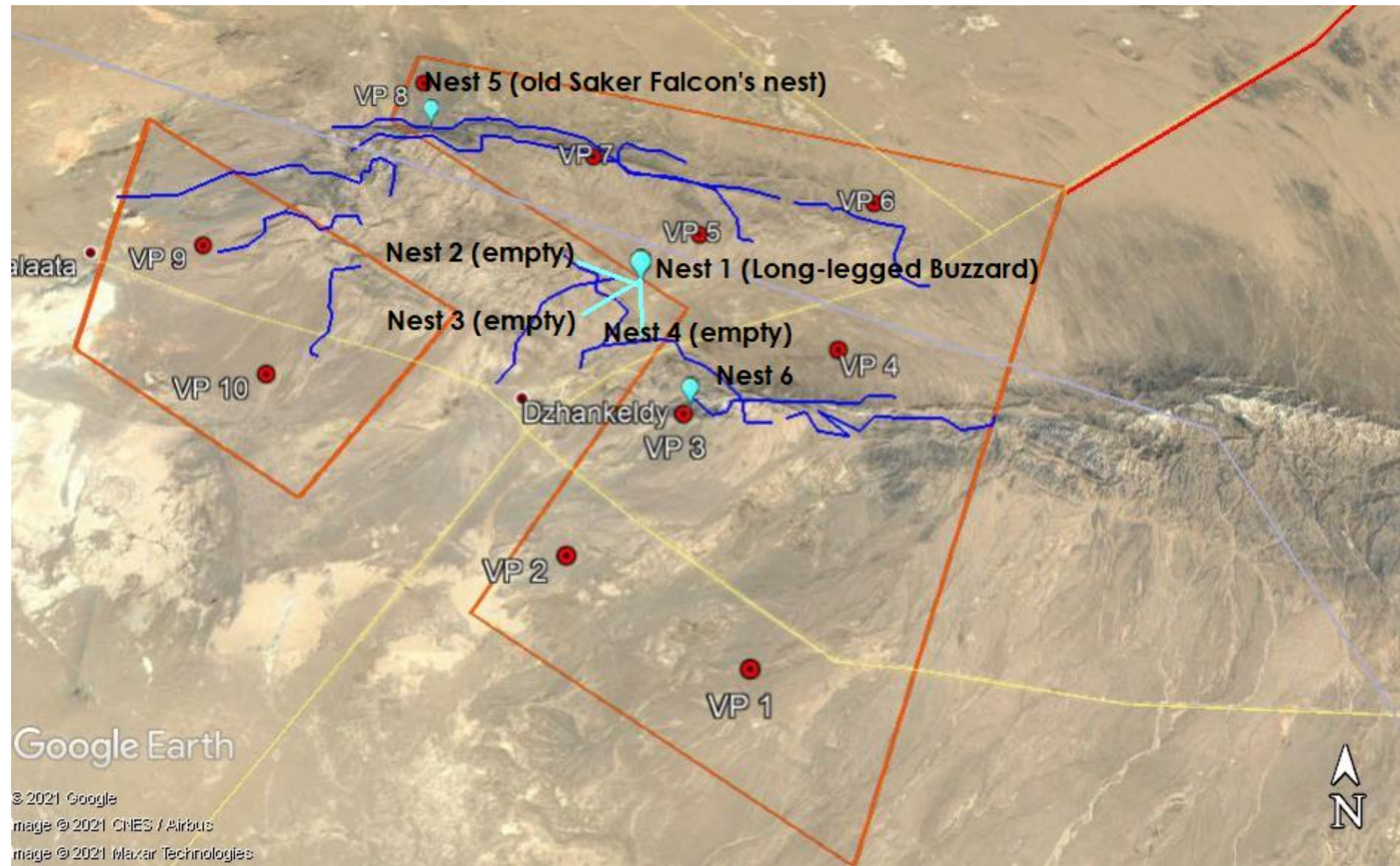


Figure 4 Raptor nest search transects and identified Nests.



During observations on April 14, we found only one inhabited nest - a Long-legged buzzard with three eggs (Nest 1). Three empty old nests were found right next to it (Nest 2, 3 and 4). Perhaps these are old nests of the same Long-legged Buzzard, but at the time of the first observation a Golden Eagle was flying next to a Long-legged Buzzard and they sat together. Probably, these nests can also belong to Golden Eagle. At the time of the visit on May 21 there were already three chicks in Nest 1. Two more nests were found on the Dzhankeldy site, but they were empty, on the Figure 4 they are designated as Nest 5 and Nest 6.



Figure 5 Long-legged Buzzard on the nest



Figure 6 Three eggs in the nest of Long-legged Buzzard





Figure 7 Long-legged Buzzard's (*Buteo rufinus*) nest with three eggs. April 14, 2021 N 40°52'27.41", E 63°22'7.69"



Figure 8 Long-legged Buzzard's (*Buteo rufinus*) nest with three eggs April 14, 2021 N 40°52'27.41", E 63°22'7.69"



Figure 9 The same nest on May 21, 2021 with three chicks



Figure 10 Long-legged Buzzard flying over the nest





Figure 11 Landscape near the Long-legged Buzzard's nest



Figure 12 Landscape near the Long-legged Buzzard's nest

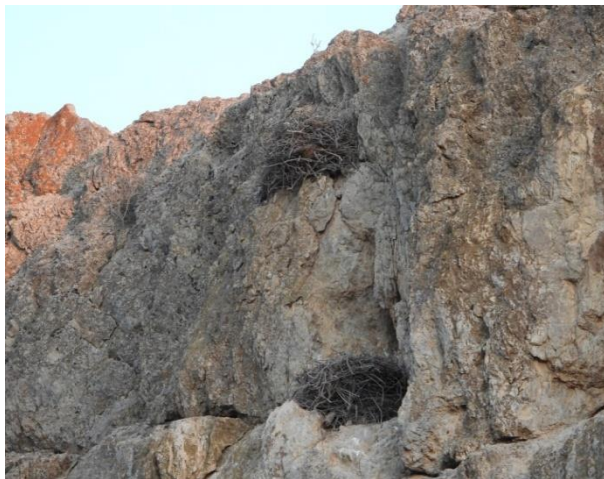


Figure 13 Three empty nests near the Long-legged Buzzard's Nest (Nests 2, 3 and 4)



Figure 14 Golden Eagle and Long-legged  
Buzzard sitting together  
April 14, 2021

According to the local expert Anna Ten, on May 07, 2018, a Saker Falcon's nest was found near the VP 8, but in 2021 this nest was empty (Nest 5).



Figure 15 Old Saker Falcon's nest near VP 8. N 40°56'9.86", E 63°17'21.12" (Nest 5)



Figure 16 Nests search



Another old and empty nest (Nest 6) on the territory of the Dzhankeldy wind farm was found near VP 4.



Figure 17 An empty nest near VP 4 N 40°51'0.58", E 63°23'6.59"



Figure 18 An empty nest near VP 4 (Nest 6)



Figure 19 Nest search



Figure 20 Nest search



Other possible nesting sites were searched as well.



Figure 21 Nest search



Figure 22 Nest search near VP 3



Figure 23 Nest search near VP 8



Figure 24 Nest search near

The territory of the Dzhankeldy wind farm is located in a desert zone, the climate is sharply continental. Large concentrations of birds are not found in such arid regions. Nesting of birds of prey also depends on many factors, such as: the state and success of breeding of forage (rodents, reptiles, etc), on weather conditions, the success wintering and migration, disturbance factors and others. For this reason, it is possible that nesting in the area has an unstable character and vary from year to year. It is known from the literature that many large birds of prey do not breed in the years of the lowest density of rodents - their main food objects. Despite the fact that large birds of prey such as Cinereous Vulture, Egyptian Vulture, and Golden Eagle were regularly seen on the territory during VP sessions, their nestings were not found on the site.

This year in the Spring on the territory of Uzbekistan, maybe throughout Central Asia, the weather was very unstable. In early February, the temperature rose to 20°C and many animals woke up from hibernation early. In mid-March there were a few days of cold weather with frosts, followed by snow and rain throughout the desert zone of Uzbekistan. Cattle farmers and shepherds suffered great losses – many newborn lambs and even adult animals died - first from the sharp cold, and then from lack of food. The desert's already sparse vegetation, mostly ephemeral plants, has barely appeared this year. All this was reflected in the activity of birds of prey and their nesting. Only one nest was found – the nest belonged to *Buteo rufinus* (Long-legged Buzzard) with three eggs, from which 3 chicks later hatched. Nesting of other large predators in this area has not been observed this year.



## BIRD COLLISIONS WITH THE WEATHER MASTS

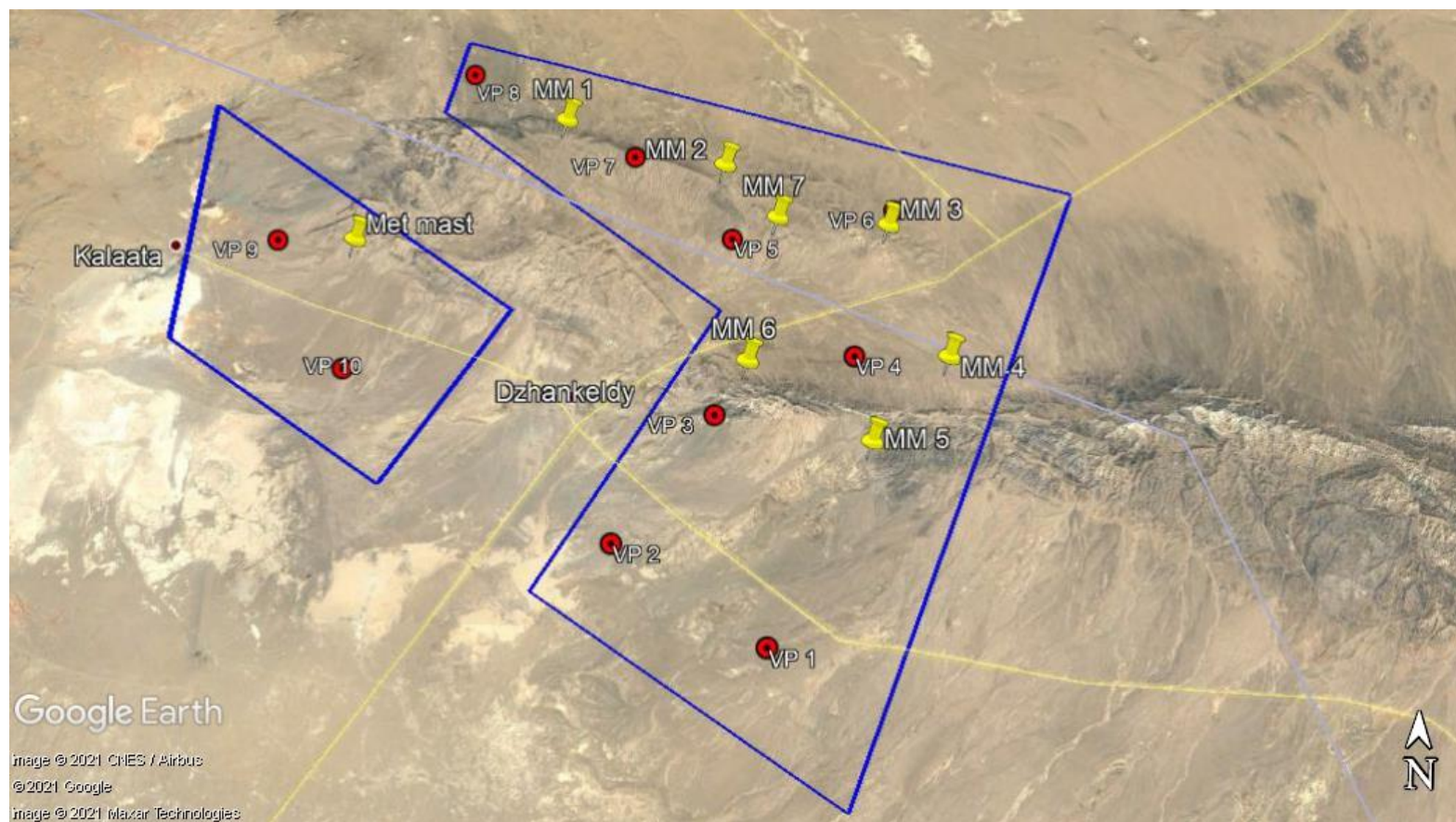


Figure 25 Met masts on the territory of Dzhankeldy project site

Several weather masts were installed on Dzhankeldy project site in 2020. The height of these met masts is 100 meters. Weather masts are installed mainly in open areas, usually on high ground, and it is constantly windy there. For stability the met masts are supported with 12 cables on each side of three side - a total of 36 cables, in some places even more.

Sometimes birds collide with these cables. For small birds these collisions are fatal. During the survey of the territory, we repeatedly noted the death of birds under the weather masts. The materials presented here are collected from February to June 2021.



Figure 26 Met mast MM 3. April 05, 2021



Figure 27 Cables holding the mast MM 6.





Figure 28 Met mast MM 2



Figure 29 MM 2, Black-necked Wheatear April 05, 2021



Figure 30 MM 2, April 05, 2021: killed Isabelline Wheatear



Figure 31 MM 2, April 11, 2021: killed Isabelline Wheatear

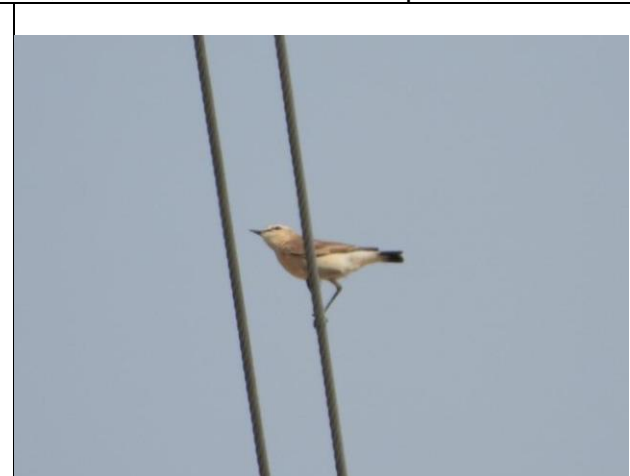


Figure 32 MM 2, Isabelline Wheatear April 09, 2021





Figure 33 Crested lark MM 1, February 9, 2021



Figure 34 Crested lark MM 6, May 13, 2021



Figure 35 Crested lark MM 4, April 14, 2021



Figure 36 Met mast (wasn't provided by ACWA) N 40°53'36.12",  
63°14'32.21" (near VP 9)



Figure 37 Crested lark on March 28, 2021 N 40°53'36.12", 63°14'32.21"

Table 7 The list of dead birds found under the met masts on Dzhankeldy project site

№	Species	Number of Individuals	Met mast	Date
1.	Crested lark	1	MM 1	09.02.2021
2.	Crested lark	2	N 40°53'36.12", 63°14'32.21" (wasn't provided by ACWA, near VP 9)	28.03.2021
3.	Crested lark	1	MM 4	14.04.2021
4.	Crested lark	1	MM 6	13.05.2021
5.	Isabelline Wheatear	1	MM 2	05.04.2021
6.	Isabelline Wheatear	1	MM 2	11.04.2021

In total, 7 dead birds of two species were recorded in February and Spring 2021: 5 individuals of Crested lark and 2 individuals of Isabelline Wheatear.

Although deaths of birds from collisions with the cables supporting met masts appear on the project site, during the survey we haven't recorded the large number of such cases. But one thing must be taken into account: dead birds under the power lines are regularly collected by ground and winged predators, such as foxes, kestrels, and even beetles, and the actual number of birds killed under the met masts can be higher.

Installing the bird diverters on the cables would make them more visible to the birds and possibly reduce the number of collisions.

## CONCLUSIONS

The project territory of the planned Dzhankeldy wind farm is located on the Western part of the lowlands of Kul'dzhuktau Mountains surrounded by the desert. The majority of animals and plants belong to desert species, but during migration species of different ecological groups could be found there. The territory of the planned Dzhankeldy wind farm is deserted, waterless and arid. There are two settlements on the project territory: Dzhankeldy and Kal'ata. Due to the lack of water, the local population is engaged in breeding small cattle and camels. There is a camel farm in the village of Kal'ata.

On the territory of the planned Dzhankeldy wind farm bird observations were conducted at 10 vantage points.

Table 8 Birds observation summary

Month	Number of individuals of target species	Number of individuals of secondary species	Number of individuals of other species	Total
March	13	51	1136	1200
April	23	65	1796	1884
May	12	29	840	881
<b>Total</b>	<b>48</b>	<b>145</b>	<b>3772</b>	<b>3965</b>

The total number of bird individuals observed during Spring survey is 3965 (Table 7). Among them there were 48 individuals of target species (1.21%) and 145 (3.66%) individuals of secondary species.

6 species of target species were observed in Spring – Steppe Eagle (*Aquila nipalensis*) - 2, Golden Eagle (*Aquila chrysaetos*) - 21, Cinereous Vulture (*Aegypius monachus*) - 5, White-tailed Sea-eagle (*Haliaeetus albicilla*) - 4, Egyptian Vulture (*Neophron percnopterus*) - 12, Asian Houbara (*Chlamydotis macqueenii*) - 4.

This year in the Spring on the territory of Uzbekistan, maybe throughout Central Asia, the weather was very unstable. In early February, the temperature rose to 20°C and many animals woke up from hibernation early. In mid-March there



were a few days of cold weather with frosts, followed by snow and rain throughout the desert zone of Uzbekistan. Cattle farmers and shepherds suffered great losses – many newborn lambs and even adult animals died - first from the sharp cold, and then from lack of food. The desert's already sparse vegetation, mostly ephemeral plants, has barely appeared this year. All this was reflected in the activity of birds of prey and their nesting. Only one nest was found – the nest belonged to *Buteo rufinus* (Long-legged Buzzard) with three eggs, from which 3 chicks later hatched. The other 3 old nests were left empty all spring season. Nesting of other large predators in this area has not been observed this year. It is known from the literature that many large birds of prey do not breed in the years of the lowest density of rodents - their main food objects. Large birds of prey such as Cinereous Vulture, Egyptian Vulture, and Golden Eagle were regularly seen on the territory, but their nesting was not noted. Perhaps they nested outside the project area, for example, on the eastern side of Kulzhuktau range. According to the literature, the Steppe Eagle breeds only in the Karakalpak Ustyurt, and nesting is not recorded anywhere in the Kyzylkum mountains. The White-tailed Sea-eagle is observed mainly in the winter season and in early spring, during wintering and migration.

The Karakyr ornithological Reserve located 30-40 km to the south, is a wetland, a lake overgrown with reeds. Near-water birds such as Pygmy Cormorant, Gray Heron, Purple Heron, Black-Headed Gull and Yellow-legged Gull observed on VPs are more likely to be attracted to this reed pond. And Green-winged Teal and Gadwall were often found near the village of Kalaata on the spills from the wells. 11 individuals of migrating Common Cranes encountered on April 14 near the village of Kalata on VP 9 were probably feeding on insects in that area .

Flocks of Crested Lark, Black-necked Wheatear and White-necked Wheatear were common on the project territory in Spring. In the village of Dzhankeldy and Kalaata there are artificial wells with water, around which we regularly met small birds like Larks, Pigeons, Sparrows, Indian Myna, Collared Turtle Dove and Laughing Turtle Dove.

## Appendix 1. Weather conditions during VP Spring surveys

Table 9 Weather conditions and visibility in March, 2021

	VP 1	VP 2	VP 3	VP 4	VP 5	VP 6	VP 7	VP 8	VP 9	VP 10
11 March							half cloudy 4-5 m/s	half cloudy 4-5 m/s		
12 March					sunny, 3-5 m/s	sunny, 2-4 m/s				
13 March	completely cloudy 5-6 m/s	completely cloudy 4-5 m/s								
14 March			sunny, 3-4 m/s	sunny, 4-5 m/s						
15 March									sunny, 4-5 m/s	partly cloudy, 3-4 m/s
16 March							partly cloudy, 4-5 m/s	partly cloudy, 4-5 m/s		
17 March					partly cloudy, 4-6 m/s	partly cloudy, 4-6 m/s				
19 March	partly cloudy, 2-4 m/s	partly cloudy, 2-4 m/s								
20 March			sunny, 4-6 m/s	sunny, 5-6 m/s						
21 March									half cloudy 4-5 m/	half cloudy 5-6 m/s
22 March	cloudy 6-7 m/s	cloudy 6-8 m/s								
23 March			sunny, 4-6 m/s	sunny, 4-6 m/s						

25 March							sunny, 4-5 m/s	sunny, 4-5 m/s		
26 March					sunny, 4-6 m/s	sunny, 5-6 m/s				
27 March	sunny, 5-6 m/s	sunny, 4-5 m/s								
28 March			sunny, 3-4 m/s	sunny, 3-5 m/s						
29 March									partly cloudy, 4-5 m/s	partly cloudy, 3-4 m/s
30 March	sunny, 2-4 m/s	sunny, 2-4 m/s								
31 March			sunny, 4-6 m/s	sunny, 4-6 m/s						

Table 10 Weather conditions and visibility in April, 2021

	VP 1	VP 2	VP 3	VP 4	VP 5	VP 6	VP 7	VP 8	VP 9	VP 10
2 April							sunny, 4-6 m/s	sunny, 4-5 m/s		
3 April									sunny, 4-5 m/s	sunny, 3-4 m/s
4 April	cloudy, 5-6 m/s	cloudy, 4-5 m/s								
5 April					sunny, 3-4 m/s	sunny, 3-5 m/s				
6 April			sunny, 3-5 m/s	sunny, 4-5 m/s						
7 April							sunny, 4-5 m/s	sunny, 4-5 m/s		
8 April									partly cloudy, 4-6 m/s	partly cloudy, 4-6 m/s
10 April	partly cloudy, 3-4 m/s	partly cloudy, 5-6 m/s								
11 April					half cloudy 4-6 m/s	half cloudy 5-6 m/s				
12 April			half cloudy 5-6 m/s	half cloudy 4-5 m/s						
13 April							cloudy 6-7 m/s	cloudy 6-8 m/s		
14 April									sunny, 4-6 m/s	sunny, 5-6 m/s
15 April	sunny, 4-5 m/s	sunny, 4-5 m/s								
16 April					partly cloudy,	partly cloudy,				

					5-6 m/s	4-6 m/s				
19 April			sunny, 4-5 m/s	sunny, 5-6 m/s						
20 April							partly cloudy, 5-6 m/s	partly cloudy, 4-5 m/s		
21 April	partly cloudy, 4-5 m/s	partly cloudy, 3-4 m/s								
22 April									sunny, 2-4 m/s	sunny, 2-4 m/s
23 April					partly cloudy, 4-6 m/s	partly cloudy, 4-6 m/s				
24 April			sunny, 4-5 m/s	sunny, 3-4 m/s						
25 April							cloudy, 4-6 m/s	cloudy, 5-6 m/s		
27 April	sunny, 3-4 m/s	sunny, 4-5 m/s								
28 April									sunny, 3-5 m/s	sunny, 3-5 m/s
29 April					sunny, 4-5 m/s	sunny, 4-5 m/s				
30 April			sunny, 4-5 m/s	sunny, 4-5 m/s						

Table 11 Weather conditions and visibility in May, 2021

	VP 1	VP 2	VP 3	VP 4	VP 5	VP 6	VP 7	VP 8	VP 9	VP 10
2 May							partly cloudy, 4-6 m/s	partly cloudy, 4-6 m/s		
3 May									half cloudy 4-6 m/s	partly cloudy, 5-6 m/s
4 May					partly cloudy, 5-6 m/s	partly cloudy, 4-6 m/s				
5 May	partly cloudy, 5-6 m/s	partly cloudy, 4-5 m/s								
6 May			partly cloudy, 4-5 m/s	partly cloudy, 3-4 m/s						
7 May							sunny, 4-5 m/s	sunny, 3-5 m/s		
8 May									sunny, 4-6 m/s	sunny, 3-5 m/s
10 May					sunny, 4-5 m/s	sunny, 4-5 m/s				
11 May	sunny, 4-5 m/s	sunny, 4-5 m/s								
12 May			sunny, 4-5 m/s	sunny, 4-5 m/s						
13 May							sunny, 4-5 m/s	sunny, 5-6 m/s		
14 May					partly cloudy, 4-5 m/s	partly cloudy, 3-4 m/s				

15 May									cloudy, 4-5 m/s	cloudy, 5-6 m/s
16 May							cloudy, 3-4 m/s	sunny, 3-5 m/s		
18 May					sunny, 3-5 m/s	sunny, 4-5 m/s				
19 May									sunny, 4-5 m/s	sunny, 4-5 m/s

## Appendix 2. Vantage Point Data Logs

### VP survey results in March

#### VP.7

Date: 11.03.2021. Start and end time: 9:12 – 12:12

**Weather:**

The air temperature around 6°C end 12°C sky half cloudy

Wind speed approx. (4-5 m/s) No precipitation

***Primary species not found***

Table 12. Secondary and other species (VP 7), 11.03.2021

No	Latin names	English names	Amount	Flight altitude
OTHER SPECIES				
1.	<i>Galerida cristata</i>	Crested lark	6	0-10
2.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	2	0-4
3.	<i>Oenanthe finschii</i>	Black-necked Wheatear	2	0-5
4.	<i>Rhodospiza obsoleta</i>	Black-billed Desert Finch	4	0-5
5.	<i>Pterocles orientalis</i>	Black-bellied sandgrouse	2	0-8



# VP. 8

Date: 11.03.2021. Start and end time: 13:12 – 16:14

## **Weather:**

The air temperature around 12°C end 6 °C sky half cloudy

Wind speed approx. (4-5 m/s) No precipitation

## **Primary species not found**

Table 13. Secondary and other species (VP 8), 11.03.2021

No	Latin names	English names	Amount	Flight altitude
<b>SECONDARY SPECIES</b>				
1.	<i>Falco tinnunculus</i>	Common Kestrel	1	10-25
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	3	0-15
2.	<i>Oenanthe isabellina</i>	Isabelline wheatear	2	0-3
3.	<i>Athene noctua</i>	Little Owl	1	0-3
4.	<i>Oenanthe finschii</i>	Black-necked Wheatear	2	0-3

**VP. 5**

Date: 12.03.2021 Start and end time: 9:05 – 12:07

**Weather:**

The air temperature around 8°C end 14°C is sunny

Wind speed approx. (3-5 m/s) No precipitation

**Primary species not found**

Table 14. Secondary and other species (VP 5), 12.03.2021.

<b>№</b>	<b>Latin names</b>	<b>English names</b>	<b>Amount</b>	<b>Flight altitude</b>
		<b>SECONDARY SPECIES</b>		
1.	<i>Buteo rufinus</i>	Long-legged Buzzard	1	25-60
		<b>OTHER SPECIES</b>		
1.	<i>Galerida cristata</i>	Crested lark	7	0-8
2.	<i>Corvus corax</i>	Northern Raven	2	3-12
3.	<i>Columba livia</i>	Rock Dove	12	40
4.	<i>Oenanthe finschii</i>	Black-necked Wheatear	2	0-3
5.	<i>Corvus monedula</i>	Jackdaw	5	4-10
6.	<i>Apus apus</i>	Northern Swift	12	6-15
7.	<i>Motacilla personata</i>	Pied wagtail	3	0-6

**VP.6**

Date: 12.03.2021. Start and end time: 13:14 – 16:14

**Weather:**

The air temperature around 16°C end 10°C is sunny  
Wind speed approx. (2-4 m/s) No precipitation

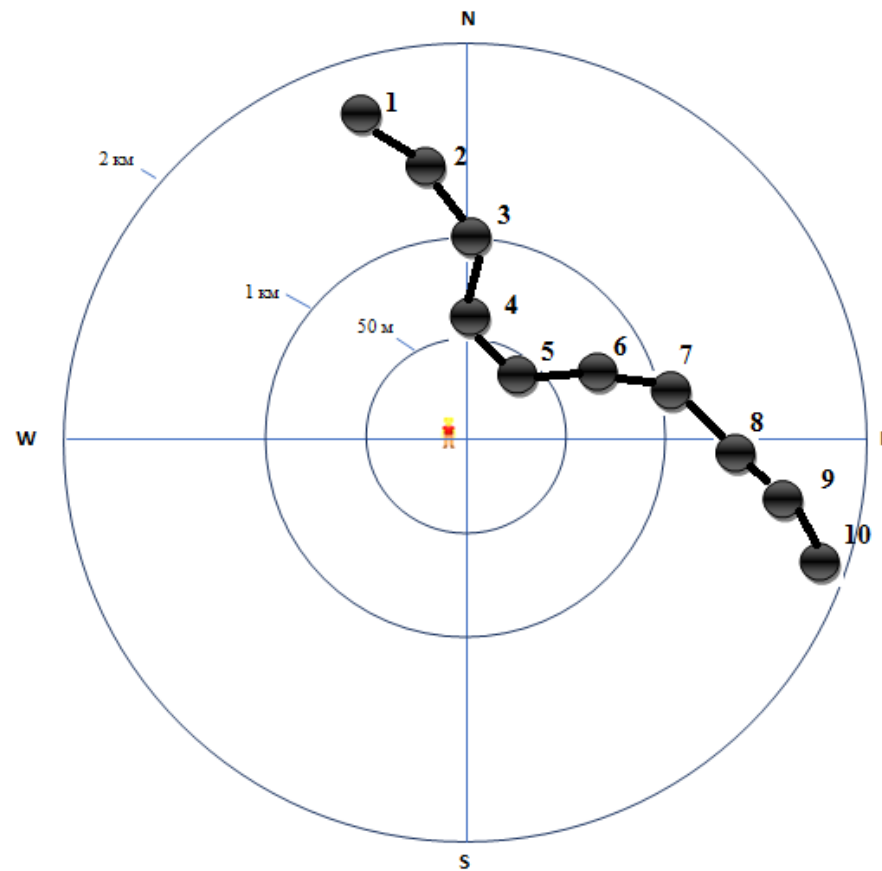


Fig.2 Flight path (VP 6), 12.03.2021

Table 15. Target species log (VP 6), 12.03.2021.10


	<i>Aquila chrysaetos</i>	1 180 m	2 160 m	3 165 m	4 180 m	5 185 m	6 165 m	7 175 m	8 170 m	9 170 m	10 170 m
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Table 16. Secondary and other species (VP 6), 12.03.2021

No	Latin names	English names	Amount	Flight altitude
<b>OTHER SPECIES</b>				
1	<i>Galerida cristata</i>	Crested lark	10	0-10
2	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	13	0-5
3	<i>Oenanthe isabellina</i>	Isabelline wheatear	1	0-3
4	<i>Upupa epops</i>	Hoopoe	1	0-3
5	<i>Calandrella brachydactyla</i>	Short-toed lark	9	0-5
6	<i>Motacilla personata</i>	Pied Wagtail	1	0-3

**VP. 1**

Date: 13.03.2021. Start and end time: 8:43 – 11:43

**Weather:**

The air temperature around 7°C end 11°C sky completely cloudy

Wind speed approx. (5-6 m/s) No precipitation

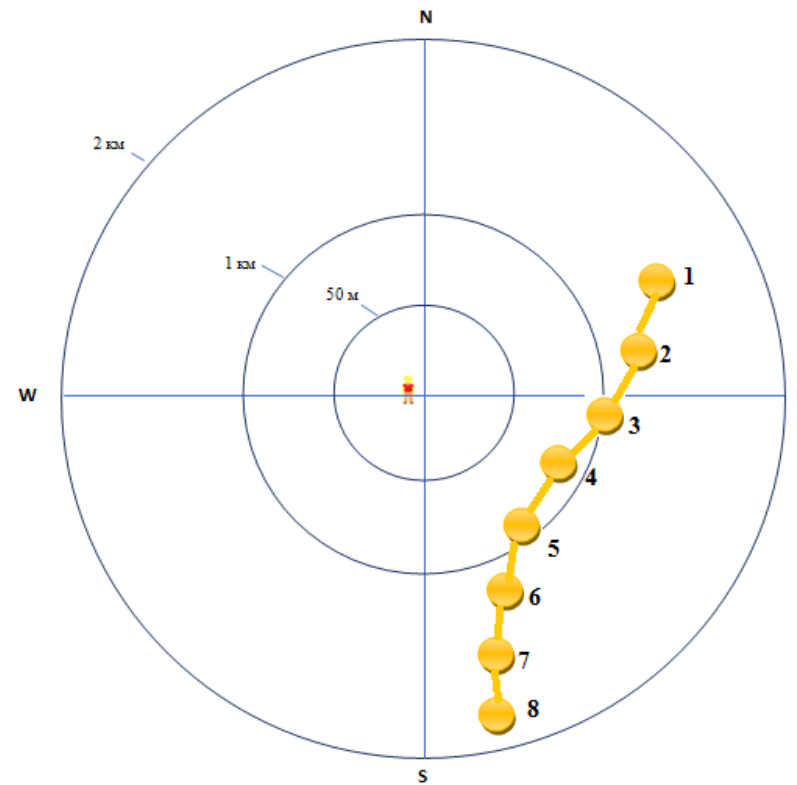


Fig.3 Flight path (VP 1), 13.03.2021

Table 17. Target species log (VP 1), 13.03.2021.


	<i>Haliaeetus albicilla</i>	1 0 m	2 20 m	3 35 m	4 50 m	5 65 m	6 65 m	7 75 m	8 70 m
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Table 18. Secondary and other species (VP 1), 13.03.2021.

No	Latin names	English names	Amount	Flight altitude
<b>SECONDARY SPECIES</b>				
1.	<i>Circus aeruginosus</i>	Eurasian Marsh-Harrier	2	5-25
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	4	0-15
2.	<i>Oenanthe isabellina</i>	Isabelline wheatear	3	0-3
3.	<i>Athene noctua</i>	Little Owl	1	0-5
4.	<i>Oenanthe oenanthe</i>	Northern Wheatear	2	0-3
5.	<i>Ardea cinerea</i>	Grey Heron	1	35
6.	<i>Larus cachinnans</i>	Yellow-legged Gull	6	40-50
7.	<i>Phalacrocorax pygmaeus</i>	Pygmy Cormorant	7	85-95

## VP.2

Date: 13.03.2021. Start and end time: 13:45 – 16:45

### **Weather:**

The air temperature around 12°C end 6°C sky completely cloudy

Wind speed approx. (4-5 m/s) No precipitation

### ***Primary species not found***

Table 19. Secondary and other species (VP 2), 13.03.2021

No	Latin names	English names	Amount	Flight altitude
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	5	0-5
2.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	4	0-4
3.	<i>Acridotheres tristis</i>	Indian Myna	4	15
4.	<i>Oenanthe oenanthe</i>	Northern Wheatear	3	0-3
5.	<i>Pterocles orientalis</i>	Black-bellied sandgrouse	6	0-12
6.	<i>Motacilla personata</i>	Pied Wagtail	3	0-3



**VP. 3**

Date: 14.03.2021. Start and end time: 9:11 – 12:12

**Weather:**

The air temperature around 9 end 16°C is sunny,

Wind speed approx. (3-4 m/s) No precipitation

***Primary species not found***

Table 20. Secondary and other species (VP 3), 14.03.2021

No	Latin names	English names	Amount	Flight altitude
<b>SECONDARY SPECIES</b>				
1	<i>Buteo rufinus</i>	Long-legged Buzzard	1	0-65
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested Lark	12	0-5
2.	<i>Sitta tephronota</i>	Greater Rock Nuthatch	2	2-8
3.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	16	0-6
4.	<i>Oenanthe isabellina</i>	Isabelline wheatear	1	0-6
5.	<i>Oenanthe finschii</i>	Black-necked Wheatear	2	0-3

# VP. 4

Date: 14.03.2021 Start and end time: 13:17 – 16:18

## **Weather:**

The air temperature around 14°C end 10°C is sunny,

Wind speed approx. (3-5 m/s) No precipitation

## **Primary species not found**

Table 21. Secondary and other species (VP 4), 14.03.2021.

No	Latin names	English names	Amount	Flight altitude
<b>SECONDARY SPECIES</b>				
1	<i>Buteo rufinus</i>	Long-legged Buzzard	1	15-35
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested Lark	5	0-5
2.	<i>Passer indicus</i>	Indian House Sparrow	11	1-4
3.	<i>Rhodospiza obsoleta</i>	Black-billed Desert Finch	6	3-6
4.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	12	0-2
5.	<i>Oenanthe isabellina</i>	Isabelline wheatear	1	0-3
6.	<i>Oenanthe finschii</i>	Black-necked Wheatear	2	0-3
7.	<i>Columba livia</i>	Rock Dove	6	5-20

**VP. 9**

Date: 15.03.2021. Start and end time: 9:03 – 12:06

**Weather:**

The air temperature around 9 end 15°C is sunny,  
Wind speed approx. (4-5 m/s) No precipitation

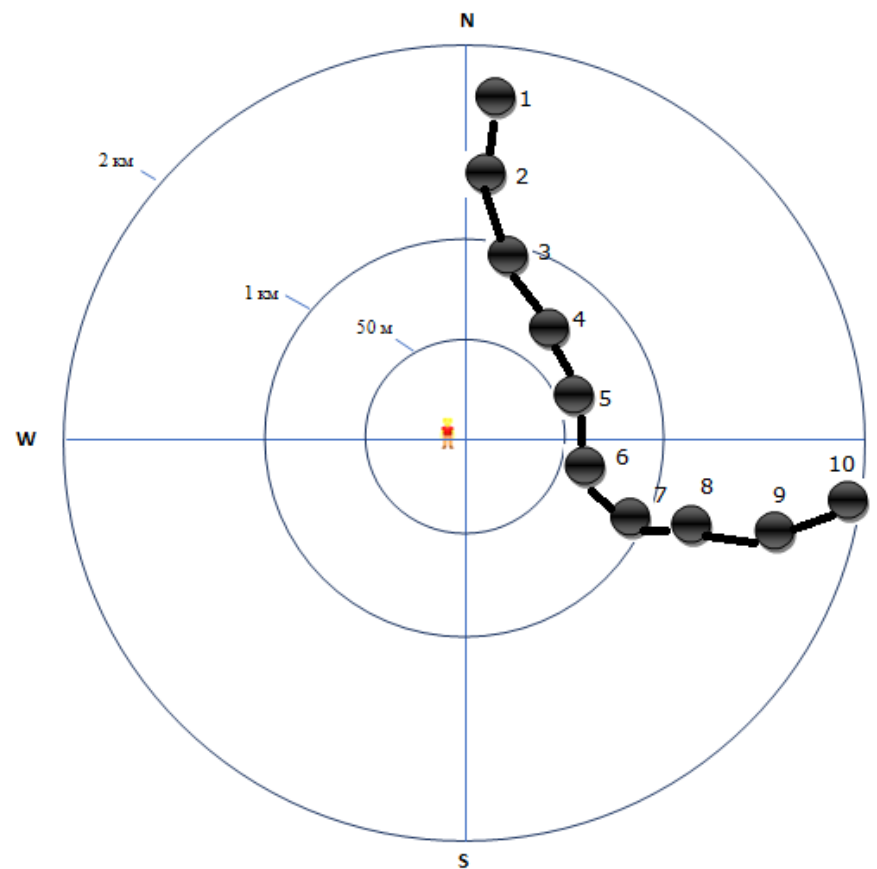


Fig.4 Flight path (VP 9), 15.03.2021

Table 22. Target species log (VP 9), 15.03.2021.


	<i>Aquila chrysaetos</i>	1 30 m	2 60 m	3 95 m	4 110 m	5 115 m	6 115 m	7 115 m	8 110 m	9 115 m	10 110 m
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Table 23. Secondary and other species (VP 9), 15.03.2021.

No	Latin names	English names	Amount	Flight altitude
<b>SECONDARY SPECIES</b>				
1.	<i>Falco tinnunculus</i>	Kestrel	1	0-15
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	5	0-15
2.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	12	0-5
3.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	1	0-3
4.	<i>Hirundo rustica</i>	Barn swallow	7	3-8
5.	<i>Passer indicus</i>	Indian House Sparrow	13	2-5
6.	<i>Corvus monedula</i>	Jackdaw	3	4-10

# VP. 10

Date: 15.03.2021. Start and end time: 13:12 – 16:13

## **Weather:**

The air temperature around 17°C end 10°C partly cloudy

Wind speed approx. (3-4 m/s) No precipitation

## **Primary species not found**

Table 24. Secondary and other species (VP 10), 15.03.2021.

No	Latin names	English names	Amount	Flight altitude
<b>SECONDARY SPECIES</b>				
1.	<i>Circus cyaneus</i>	Hen Harrier	2	0-25
<b>OTHER SPECIES</b>				
2.	<i>Galerida cristata</i>	Crested lark	6	0-5
3.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	19	0-5
4.	<i>Athene noctua</i>	Little Owl	1	0-3
5.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	2	0-3
6.	<i>Ardea cinerea</i>	Gray heron	1	15-25
7.	<i>Anas crecca</i>	Green-winged Teal	6	5-15
8.	<i>Larus ridibundus</i>	Black-Headed Gull	6	8-15

# VP.7

Date: 16.03.2021. Start and end time: 9:12 – 12:12

## **Weather:**

The air temperature around 6°C end 10°C partly cloudy

Wind speed approx. (4-5 m/s) No precipitation

## **Primary species not found**

Table 25. Secondary and other species (VP 7), 16.03.2021

No	Latin names	English names	Amount	Flight altitude
<b>OTHER SPECIES</b>				
1.	<i>Alectoris chukar</i>	Chuckar partridge	3	0-15
2.	<i>Galerida cristata</i>	Crested lark	10	0-10
3.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	6	0-5
4.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	3	0-3
5.	<i>Oenanthe finschii</i>	Black-necked Wheatear	2	0-5
6.	<i>Rhodospiza obsoleta</i>	Black-billed Desert Finch	4	0-6
7.	<i>Pterocles orientalis</i>	Black-bellied sandgrouse	3	0-8

**VP. 8**

Date: 16.03.2021. Start and end time: 13:12 – 16:16

**Weather:**

The air temperature around 14°C end 9 °C partly cloudy

Wind speed approx. (4-5 m/s) No precipitation

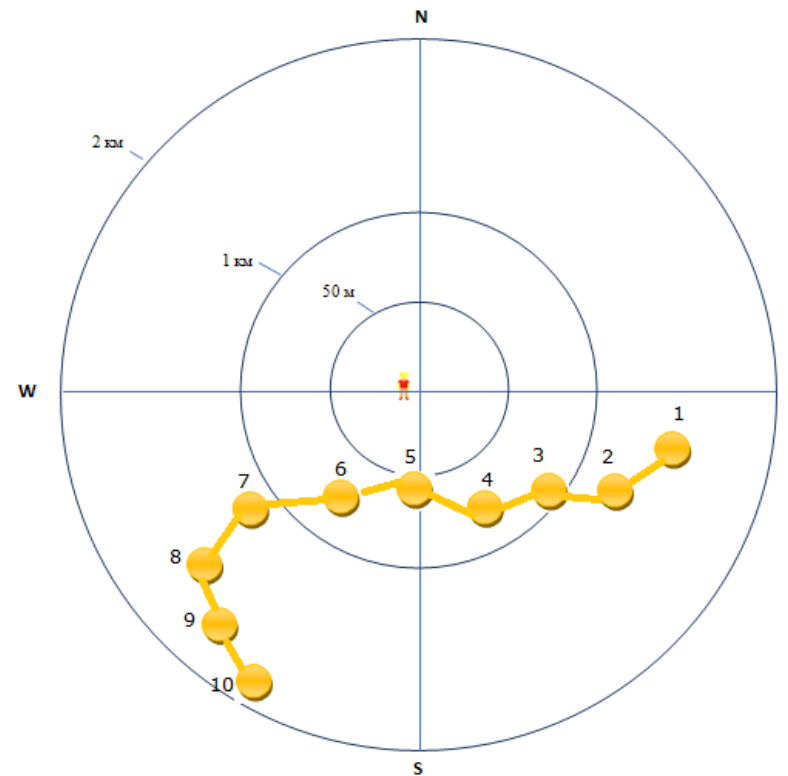


Fig.5 Flight path (VP 8), 16.03.2021



Table 26. Target species log (VP 8), 16.03.2021.


	<i>Haliaeetus albicilla</i>	1	2	3	4	5	6	7	8	9	10
		130 m	160 m	195 m	110 m	115 m	115 m	115 m	110 m	115 m	110 m

Table 27. Secondary and other species (VP 8), 16.03.2021

No	Latin names	English names	Amount	Flight altitude
<b>SECONDARY SPECIES</b>				
1.	<i>Falco tinnunculus</i>	Common Kestrel	2	5-25
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	7	0-15
2.	<i>Oenanthe isabellina</i>	Isabelline wheatear	3	0-3
3.	<i>Athene noctua</i>	Little Owl	2	0-5
4.	<i>Lanius exubitor</i>	Great (Gray) Shrike	1	0-3

**VP. 6**

Date: 17.03.2021 Start and end time: 9:03 – 12:07

**Weather:**

The air temperature around 10°C end 12°C partly cloudy

Wind speed approx. (4-6 m/s) No precipitation

**Primary species not found**

Table 28. Secondary and other species (VP 6), 17.03.2021.

No	Latin names	English names	Amount	Flight altitude
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	5	0-8
2.	<i>Corvus corax</i>	Northern Raven	2	3-12
3.	<i>Columba livia</i>	Rock Dove	12	40
4.	<i>Oenanthe finschii</i>	Black-necked Wheatear	4	0-3
5.	<i>Corvus monedula</i>	Jackdaw	4	4-10
6.	<i>Apus apus</i>	Northern Swift	11	6-15
7.	<i>Motacilla personata</i>	Pied wagtail	2	0-6

**VP.5**

Date: 17.03.2021. Start and end time: 13:13 – 16:13

**Weather:**

The air temperature around 15°C end 10°C partly cloudy

Wind speed approx. (4-6 m/s) No precipitation

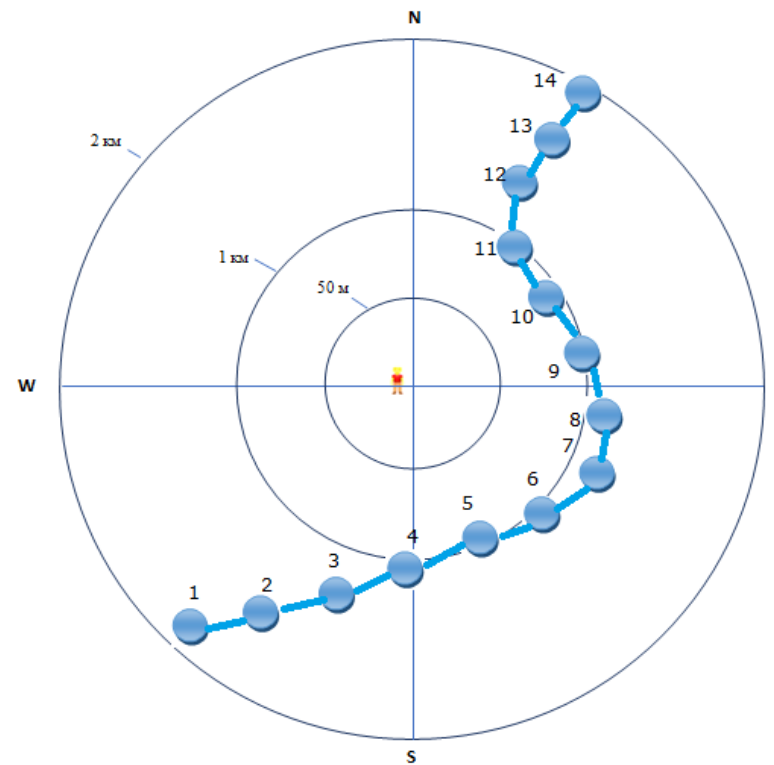


Fig.6 Flight path (VP 5), 17.03.2021

Table 29. Target species log (VP 5), 17.03.2021.


	<i>Aegypius monachus</i>	1 180 m	2 160 m	3 165 m	4 180 m	5 185 m	6 165 m	7 175 m	8 170 m	9 170 m	10 185 m	11 165 m	12 175 m	13 170 m	14 170 m
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Table 30. Secondary and other species (VP 5), 17.03.2021

Nº	Latin names	English names	Amount	Flight altitude
<b>SECONDARY SPECIES</b>				
1.	<i>Falco tinnunculus</i>	Common Kestrel	2	0-15
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	6	0-15
2.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	13	0-5
3.	<i>Oenanthe isabellina</i>	Isabelline wheatear	3	0-3
4.	<i>Upupa epops</i>	Hoopoe	1	0-3
5.	<i>Calandrella brachydactyla</i>	Short-toed lark	12	0-5

**VP. 1**

Date: 19.03.2021. Start and end time: 8:27 – 11:27

**Weather:**

The air temperature around 8°C end 11°C partly cloudy

Wind speed approx. (2-4 m/s) No precipitation

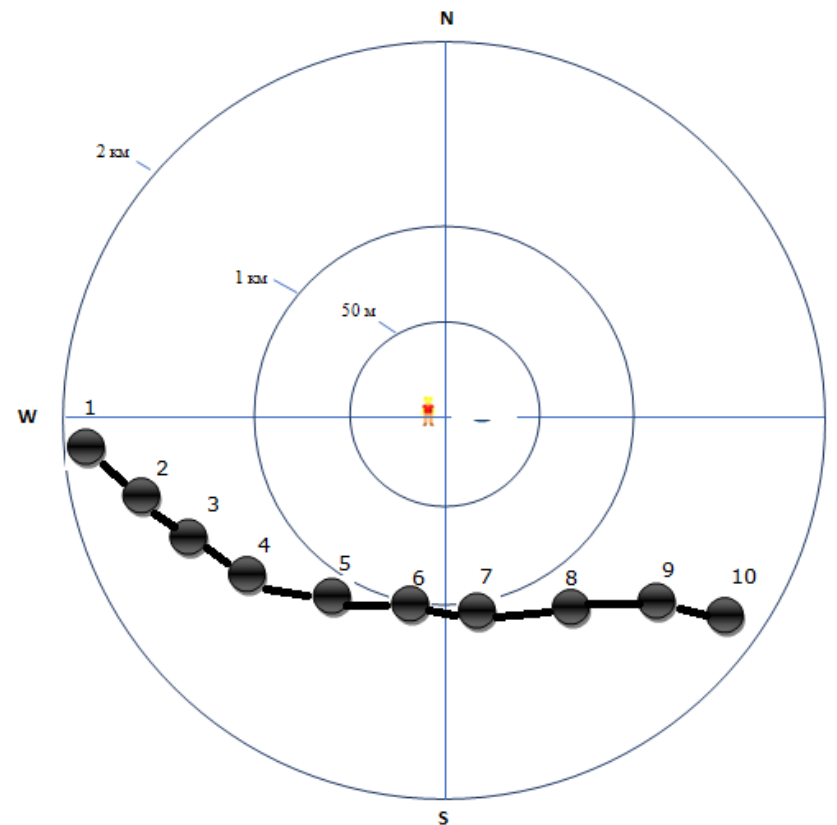


Fig.7 Flight path (VP 1), 19.03.2021

Table 31. Target species log (VP 1), 19.03.2021.


	<i>Aquila chrysaetos</i>	1	2	3	4	5	6	7	8	9	10
		210 m	210 m	215 m	210 m	195 m	195 m	195 m	190 m	195 m	190 m

Table 32. Secondary and other species (VP 1), 19.03.2021.

No	Latin names	English names	Amount	Flight altitude
<b>OTHER SPECIES</b>				
1.	<i>Corvus frugilegus</i>	Eurasian Rook	8	0-5
2.	<i>Pterocles orientalis</i>	Black-bellied sandgrouse	4	12-25
3.	<i>Upupa epops</i>	Hoopoe	2	0-3
4.	<i>Galerida cristata</i>	Crested lark	5	0-6
5.	<i>Oenanthe finschii</i>	Black-necked Wheatear	3	0-3
6.	<i>Oenanthe oenanthe</i>	Northern Wheatear	1	0-6
7.	<i>Hirundo rustica</i>	Barn swallow	4	5-15
8.	<i>Anas strepera</i>	Gadwall	5	60

## VP. 2

Date: 19.03.2021. Start and end time: 13:22 – 16:26

### **Weather:**

The air temperature around 14°C end 8°C partly cloudy

Wind speed approx. (2-4 m/s) No precipitation

### **Primary species not found**

Table 33. Secondary and other species (VP 2), 19.03.2021.

No	Latin names	English names	Amount	Flight altitude
<b>SECONDARY SPECIES</b>				
1.	<i>Falco tinnunculus</i>	Common Kestrel	2	0-15
2.	<i>Circus cyaneus</i>	Hen Harrier	1	10-35
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	13	0-15
2.	<i>Passer indicus</i>	Indian House Sparrow	8	1-4
3.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	12	0-5
4.	<i>Oenanthe isabellina</i>	Isabelline wheatear	2	0-3
5.	<i>Pterocles orientalis</i>	Black-bellied sandgrouse	4	0-15
6.	<i>Motacilla citreola</i>	Citrine Wagtail	2	0
7.	<i>Motacilla personata</i>	Pied Wagtail	4	0-3
8.	<i>Motacilla alba</i>	White Wagtail	2	0-3

**VP. 3**

Date: 20.03.2021. Start and end time: 9:03 – 12:04

**Weather:**

The air temperature around 9°C end 16°C is sunny

Wind speed approx. (4-6 m/s) No precipitation

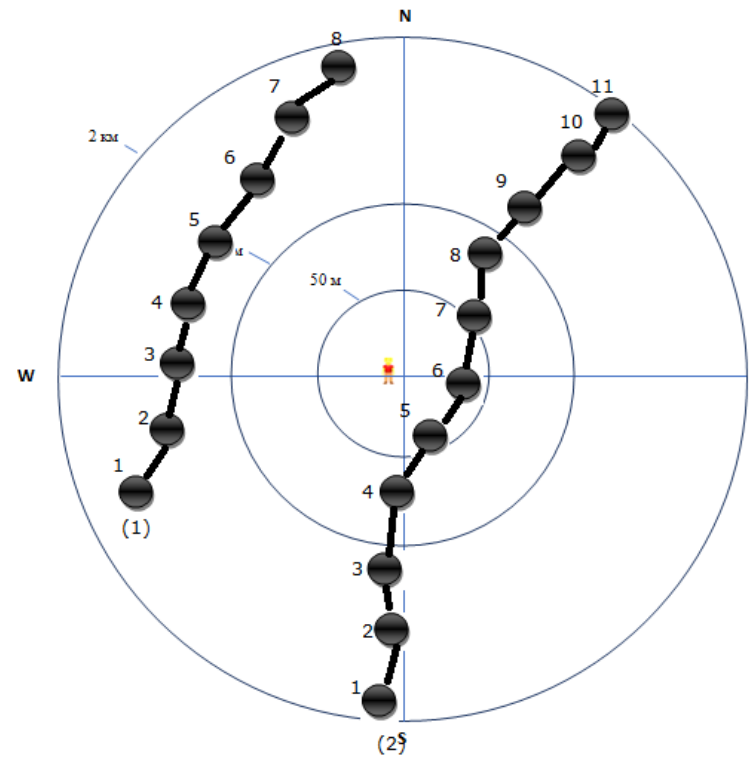


Fig.8 Flight path (VP 3), 20.03.2021



Table 34. Target species log (VP 3), 20.03.2021.



	<i>Aquila chrysaetos</i> (1)	1 180 m	2 160 m	3 165 m	4 190 m	5 195 m	6 185 m	7 185 m	8 180 m			
	<i>Aquila chrysaetos</i> (2)	1 170 m	2 150 m	3 155 m	4 180 m	5 185 m	6 175 m	7 175 m	8 170 m	9 175 m	10 170 m	11 170 m

Table 35. Secondary and other species (VP 3), 20.03.2021.

No	Latin names	English names	Amount	Flight altitude
<b>SECONDARY SPECIES</b>				
1.	<i>Falco tinnunculus</i>	Common Kestrel	2	5-15
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	9	0-15
2.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	15	0-5
3.	<i>Pica pica</i>	Black-billed Magpie	3	1-5
4.	<i>Oenanthe isabellina</i>	Isabelline wheatear	1	0-3
5.	<i>Hirundo rustica</i>	Barn swallow	3	5-15
6.	<i>Scotocerca inquieta</i>	Streaked Scrub Warbler	2	1-4
7.	<i>Columba livia</i>	Rock Dove	5	12-15

**VP. 4**

Date: 20.03.2021. Start and end time: 13:02 – 16:06

**Weather:**

The air temperature around 15°C end 9°C is sunny

Wind speed approx. (5-6 m/s) No precipitation

**Primary species not found**

Table 36. Secondary and other species (VP 4), 20.03.2021.

No	Latin names	English names	Amount	Flight altitude
<b>SECONDARY SPECIES</b>				
1.	<i>Buteo rufinus</i>	Long-legged Buzzard	3	25-55
2.	<i>Buteo buteo</i>	Common Buzzard	1	15-35
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	3	0-15
2.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	5	0-5
3.	<i>Passer indicus</i>	Indian House Sparrow	6	1-4
4.	<i>Corvus cornix</i>	Hooded Crow	2	21
5.	<i>Oenanthe finschii</i>	Black-necked Wheatear	3	0-3
6.	<i>Lanius excubitor</i>	Great (Gray) Shrike	1	3-4
7.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	2	0-4
8.	<i>Hirundo rustica</i>	Barn swallow	4	5-15

# VP. 10

Date: 21.03.2021. Start and end time: 8:53 – 11:53

## **Weather:**

The air temperature around 6°C end 10°C sky half cloudy

Wind speed approx. (5-6 m/s) No precipitation

## **Primary species not found**

Table 37. Secondary and other species (VP 10), 21.03.2021.

No	Latin names	English names	Amount	Flight altitude
<b>SECONDARY SPECIES</b>				
1.	<i>Circus cyaneus</i>	Hen Harrier	2	10-25
2.	<i>Circus aeruginosus</i>	Eurasian Marsh-Harrier	2	5-25
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	6	0-15
2.	<i>Oenanthe isabellina</i>	Isabelline wheatear	3	0-3
3.	<i>Athene noctua</i>	Little Owl	1	0-5
4.	<i>Oenanthe oenanthe</i>	Northern Wheatear	1	0-3
5.	<i>Ardea cinerea</i>	Grey Heron	1	25

# VP.9

Date: 21.03.2021. Start and end time: 13:16 – 16:19

## **Weather:**

The air temperature around 12°C end 6°C sky half cloudy

Wind speed approx. (4-5 m/s) No precipitation

## **Primary species not found**

Table 38. Secondary and other species (VP 9), 21.03.2021

No	Latin names	English names	Amount	Flight altitude
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	4	0-5
2.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	3	0-4
3.	<i>Acridotheres tristis</i>	Indian Myna	3	15
4.	<i>Oenanthe oenanthe</i>	Northern Wheatear	3	0-3
5.	<i>Upupa epops</i>	Hoopoe	1	0-3
6.	<i>Pterocles orientalis</i>	Black-bellied sandgrouse	6	0-12
7.	<i>Motacilla personata</i>	Pied Wagtail	2	0-3
8.	<i>Larus cachinnans</i>	Yellow-legged Gull	12	40-50

**VP. 1**

Date: 22.03.2021. Start and end time: 9:05 – 12:05

**Weather:**

The air temperature around 6 end 12°C cloudy.

Wind speed approx. (6-7 m/s) No precipitation

***Primary species not found***

Table 39. Secondary and other species (VP 1), 22.03.2021

No	Latin names	English names	Amount	Flight altitude
<b>SECONDARY SPECIES</b>				
1.	<i>Buteo rufinus</i>	Long-legged Buzzard	1	35-75
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested Lark	6	0-5
2.	<i>Sitta tephronota</i>	Greater Rock Nuthatch	1	2-8
3.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	6	0-6
4.	<i>Oenanthe isabellina</i>	Isabelline wheatear	2	0-6
5.	<i>Oenanthe finschii</i>	Black-necked Wheatear	2	0-3

## VP. 2

Date: 22.03.2021 Start and end time: 13:17 – 16:18

**Weather:**

The air temperature around 14°C end 10°C cloudy.

Wind speed approx. (6-8 m/s) No precipitation

**Primary species not found**

Table 40. Secondary and other species (VP 2), 22.03.2021.

No	Latin names	English names	Amount	Flight altitude
<b>SECONDARY SPECIES</b>				
1	<i>Buteo rufinus</i>	Long-legged Buzzard	1	15-35
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested Lark	6	0-5
2.	<i>Passer indicus</i>	Indian House Sparrow	6	1-4
3.	<i>Rhodospiza obsoleta</i>	Black-billed Desert Finch	4	3-6
4.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	9	0-2
5.	<i>Oenanthe isabellina</i>	Isabelline wheatear	3	0-3
6.	<i>Oenanthe finschii</i>	Black-necked Wheatear	1	0-3
7.	<i>Columba livia</i>	Rock Dove	9	5-20

**VP. 3**

Date: 23.03.2021. Start and end time: 9:05 – 12:05

**Weather:**

The air temperature around 9°C end 16°C is sunny

Wind speed approx. (4-6 m/s) No precipitation

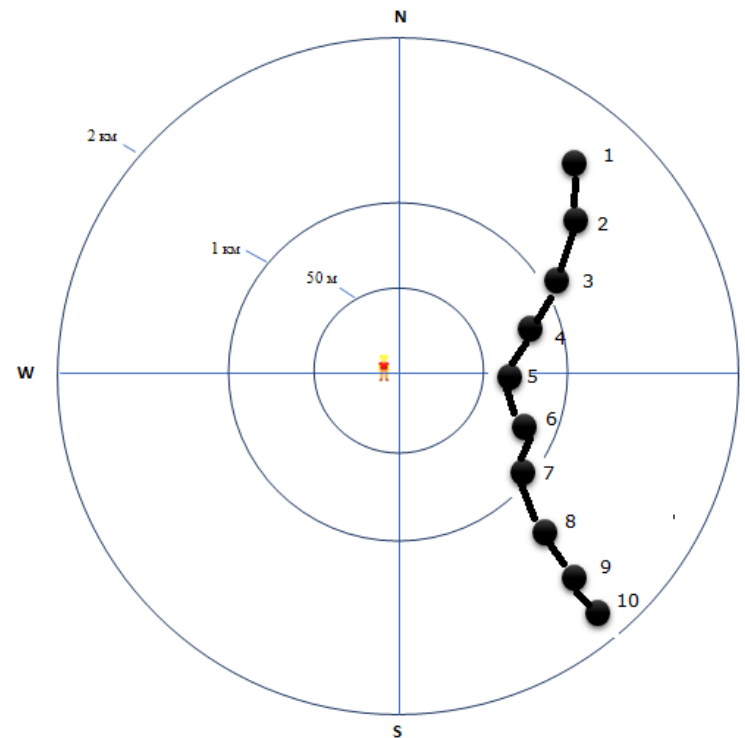


Fig.9 Flight path (VP 3), 23.03.2021

Table 41. Target species log (VP 3), 23.03.2021.

●	<i>Aquila nipalensis</i>	1 80 m	2 60 m	3 65 m	4 90 m	5 95 m	6 85 m	7 85 m	8 80 m	9 85 m	10 80 m
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Table 42. Secondary and other species (VP 3), 23.03.2021.

No	Latin names	English names	Amount	Flight altitude
<b>SECONDARY SPECIES</b>				
1.	<i>Falco tinnunculus</i>	Common Kestrel	2	5-15
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	3	0-15
2.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	6	0-5
3.	<i>Pica pica</i>	Black-billed Magpie	1	1-5
4.	<i>Oenanthe isabellina</i>	Isabelline wheatear	3	0-3
5.	<i>Hirundo rustica</i>	Barn swallow	3	5-15
6.	<i>Scotocerca inquieta</i>	Streaked Scrub Warbler	2	1-4



# VP. 4

Date: 23.03.2021. Start and end time: 13:02 – 16:06

## **Weather:**

The air temperature around 15°C end 9°C is sunny

Wind speed approx. (4-6 m/s) No precipitation

## **Primary species not found**

Table 43. Secondary and other species (VP 4), 23.03.2021.

No	Latin names	English names	Amount	Flight altitude
<b>SECONDARY SPECIES</b>				
1	<i>Buteo rufinus</i>	Long-legged Buzzard	2	15-45
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	6	0-15
2.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	5	0-5
3.	<i>Passer indicus</i>	Indian House Sparrow	4	1-4
4.	<i>Athene noctua</i>	Little Owl	1	0-3
5.	<i>Oenanthe finschii</i>	Black-necked Wheatear	2	0-3
6.	<i>Lanius excubitor</i>	Great (Gray) Shrike	1	3-4
7.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	2	0-4

### VP.7

Date: 25.03.2021. Start and end time: 9:32 – 12:32

**Weather:**

The air temperature around 6°C end 10°C is sunny,  
Wind speed approx. (4-5 m/s) No precipitation

***Primary species not found***

Table 44. Secondary and other species (VP 7), 25.03.2021

No	Latin names	English names	Amount	Flight altitude
<b>OTHER SPECIES</b>				
1.	<i>Alectoris chukar</i>	Chuckar partridge	5	0-15
2.	<i>Galerida cristata</i>	Crested lark	4	0-10
3.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	3	0-3
4.	<i>Oenanthe finschii</i>	Black-necked Wheatear	1	0-5
5.	<i>Rhodospiza obsoleta</i>	Black-billed Desert Finch	5	0-6
6.	<i>Pterocles orientalis</i>	Black-bellied sandgrouse	2	0-8

**VP. 8**

Date: 25.03.2021. Start and end time: 13:33 – 16:36

**Weather:**

The air temperature around 12°C and 6 °C is sunny

Wind speed approx. (4-5 m/s) No precipitation

***Primary species not found***

Table 45. Secondary and other species (VP 8), 25.03.2021

<b>№</b>	<b>Latin names</b>	<b>English names</b>	<b>Amount</b>	<b>Flight altitude</b>
<b>SECONDARY SPECIES</b>				
1.	<i>Falco tinnunculus</i>	Common Kestrel	2	15-25
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	6	0-15
2.	<i>Oenanthe isabellina</i>	Isabelline wheatear	2	0-3
3.	<i>Athene noctua</i>	Little Owl	1	0-3
4.	<i>Lanius exubitor</i>	Great (Gray) Shrike	1	0-3

**VP. 6**

Date: 26.03.2021 Start and end time: 9:23 – 12:37

**Weather:**

The air temperature around 6°C end 12°C is sunny

Wind speed approx. (5-6 m/s) No precipitation

**Primary species not found**

Table 46. Secondary and other species (VP 6), 26.03.2021.

<b>№</b>	<b>Latin names</b>	<b>English names</b>	<b>Amount</b>	<b>Flight altitude</b>
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	6	0-8
2.	<i>Corvus corax</i>	Northern Raven	1	3-12
3.	<i>Columba livia</i>	Rock Dove	8	40
4.	<i>Oenanthe finschii</i>	Black-necked Wheatear	3	0-3
5.	<i>Corvus monedula</i>	Jackdaw	5	4-10
6.	<i>Apus apus</i>	Northern Swift	2	6-15
7.	<i>Motacilla personata</i>	Pied wagtail	2	0-6

**VP.5**

Date: 26.03.2021. Start and end time: 13:23 – 16:23

**Weather:**

The air temperature around 12°C end 8°C is sunny

Wind speed approx. (4-6 m/s) No precipitation

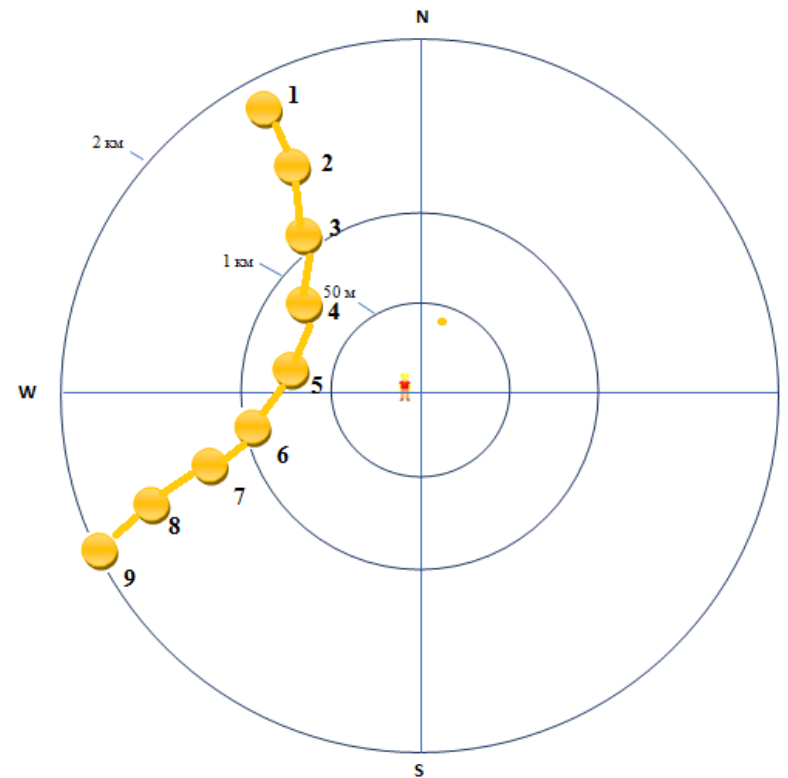


Fig.10 Flight path (VP 5), 26.03.2021

Table 47. Target species log (VP 5), 26.03.2021.


	<i>Haliaeetus albicilla</i>	1	2	3	4	5	6	7	8	9
		180 m	160 m	165 m	180 m	185 m	165 m	175 m	170 m	170 m

Table 48. Secondary and other species (VP 5), 26.03.2021

No	Latin names	English names	Amount	Flight altitude
<b>SECONDARY SPECIES</b>				
1.	<i>Falco tinnunculus</i>	Common Kestrel	1	0-25
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	6	0-15
2.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	5	0-5
3.	<i>Oenanthe isabellina</i>	Isabelline wheatear	2	0-3
4.	<i>Upupa epops</i>	Hoopoe	2	0-3
5.	<i>Calandrella brachydactyla</i>	Short-toed lark	12	0-5

# VP. 1

Date: 27.03.2021. Start and end time: 8:43 – 11:43

## **Weather:**

The air temperature around 6°C end 10°C is sunny

Wind speed approx. (5-6 m/s) No precipitation

## **Primary species not found**

Table 49. Secondary and other species (VP 1), 27.03.2021.

No	Latin names	English names	Amount	Flight altitude
<b>SECONDARY SPECIES</b>				
1.	<i>Circus cyaneus</i>	Hen Harrier	1	10-25
2.	<i>Circus aeruginosus</i>	Eurasian Marsh-Harrier	1	5-25
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	5	0-15
2.	<i>Oenanthe isabellina</i>	Isabelline wheatear	2	0-3
3.	<i>Athene noctua</i>	Little Owl	1	0-5
4.	<i>Oenanthe oenanthe</i>	Northern Wheatear	2	0-3
5.	<i>Ardea cinerea</i>	Grey Heron	1	35

## VP.2

Date: 27.03.2021. Start and end time: 13:56 – 16:59

### **Weather:**

The air temperature around 12°C and 6°C is sunny

Wind speed approx. (4-5 m/s) No precipitation

### ***Primary species not found***

Table 50. Secondary and other species (VP 2), 27.03.2021

No	Latin names	English names	Amount	Flight altitude
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	4	0-5
2.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	3	0-4
3.	<i>Acridotheres tristis</i>	Indian Myna	3	15
4.	<i>Oenanthe oenanthe</i>	Northern Wheatear	3	0-3
5.	<i>Upupa epops</i>	Hoopoe	1	0-3
6.	<i>Pterocles orientalis</i>	Black-bellied sandgrouse	6	0-12
7.	<i>Motacilla personata</i>	Pied Wagtail	2	0-3
8.	<i>Larus cachinnans</i>	Yellow-legged Gull	12	40-50



**VP. 3**

Date: 28.03.2021. Start and end time: 9:15 – 12:15

**Weather:**

The air temperature around 6 end 12°C is sunny,

Wind speed approx. (3-4 m/s) No precipitation

***Primary species not found***

Table 51. Secondary and other species (VP 3), 28.03.2021

No	Latin names	English names	Amount	Flight altitude
<b>SECONDARY SPECIES</b>				
1	<i>Buteo rufinus</i>	Long-legged Buzzard	2	35-75
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested Lark	6	0-5
2.	<i>Sitta tephronota</i>	Greater Rock Nuthatch	1	2-8
3.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	6	0-6
4.	<i>Oenanthe isabellina</i>	Isabelline wheatear	2	0-6
5.	<i>Oenanthe finschii</i>	Black-necked Wheatear	4	0-3

# VP. 4

Date: 28.03.2021 Start and end time: 13:27 – 16:28

## **Weather:**

The air temperature around 14°C end 10°C is sunny,

Wind speed approx. (3-5 m/s) No precipitation

## **Primary species not found**

Table 52. Secondary and other species (VP 4), 28.03.2021.

No	Latin names	English names	Amount	Flight altitude
<b>SECONDARY SPECIES</b>				
1	<i>Buteo rufinus</i>	Long-legged Buzzard	1	15-35
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested Lark	5	0-5
2.	<i>Passer indicus</i>	Indian House Sparrow	11	1-4
3.	<i>Rhodospiza obsoleta</i>	Black-billed Desert Finch	6	3-6
4.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	12	0-2
5.	<i>Oenanthe isabellina</i>	Isabelline wheatear	1	0-3
6.	<i>Oenanthe finschii</i>	Black-necked Wheatear	2	0-3
7.	<i>Columba livia</i>	Rock Dove	6	5-20

**VP. 9**

Date: 29.03.2021. Start and end time: 9:16 – 12:24

**Weather:**

The air temperature around 9 and 15°C partly cloudy.

Wind speed approx. (4-5 m/s) No precipitation

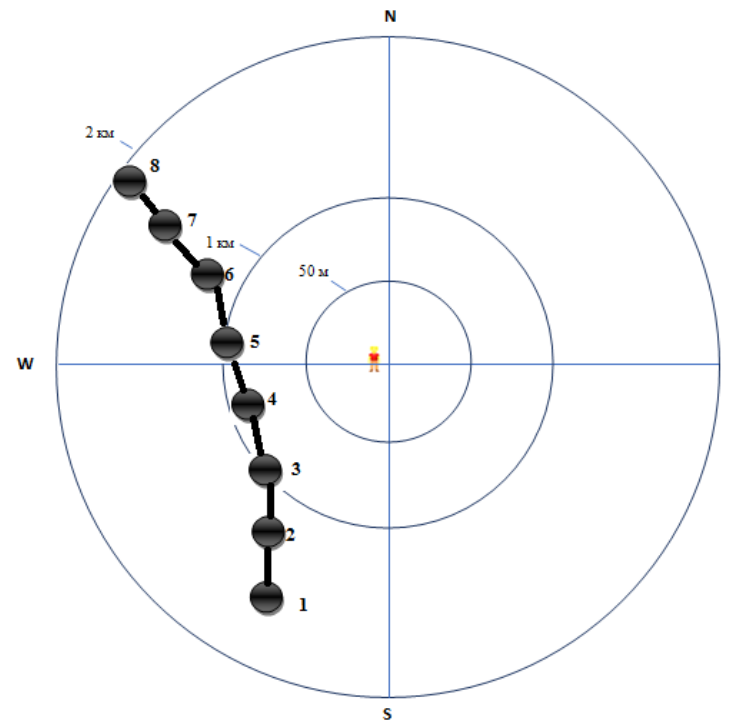


Fig.11 Flight path (VP 9), 29.03.2021

Table 53. Target species log (VP 9), 29.03.2021.


	<i>Aquila chrysaetos</i>	1 180 m	2 160 m	3 165 m	4 180 m	5 185 m	6 165 m	7 175 m	8 170 m
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Table 54. Secondary and other species (VP 9), 29.03.2021.

No	Latin names	English names	Amount	Flight altitude
<b>SECONDARY SPECIES</b>				
1.	<i>Falco tinnunculus</i>	Kestrel	2	0-15
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	5	0-15
2.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	18	0-5
3.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	2	0-3
4.	<i>Hirundo rustica</i>	Barn swallow	2	3-8
5.	<i>Upupa epops</i>	Hoopoe	1	0-3
6.	<i>Passer indicus</i>	Indian House Sparrow	20	2-5
7.	<i>Corvus monedula</i>	Jackdaw	4	4-10

# VP. 10

Date: 29.03.2021. Start and end time: 13:12 – 16:18

## **Weather:**

The air temperature around 14°C end 9°C partly cloudy

Wind speed approx. (3-4 m/s) No precipitation

## **Primary species not found**

Table 55. Secondary and other species (VP 10), 29.03.2021.

No	Latin names	English names	Amount	Flight altitude
<b>SECONDARY SPECIES</b>				
1.	<i>Falco tinnunculus</i>	Kestrel	1	10-30
2.	<i>Circus cyaneus</i>	Hen Harrier	2	0-30
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	10	0-5
2.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	12	0-5
3.	<i>Athene noctua</i>	Little Owl	1	0-3
4.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	3	0-3
5.	<i>Ardea cinerea</i>	Gray heron	1	15-25
6.	<i>Anas crecca</i>	Green-winged Teal	9	5-15
7.	<i>Larus ridibundus</i>	Black-Headed Gull	7	8-15

**VP. 1**

Date: 30.03.2021. Start and end time: 8:27 – 11:27

**Weather:**

The air temperature around 8°C end 13°C is sunny

Wind speed approx. (2-4 m/s) No precipitation

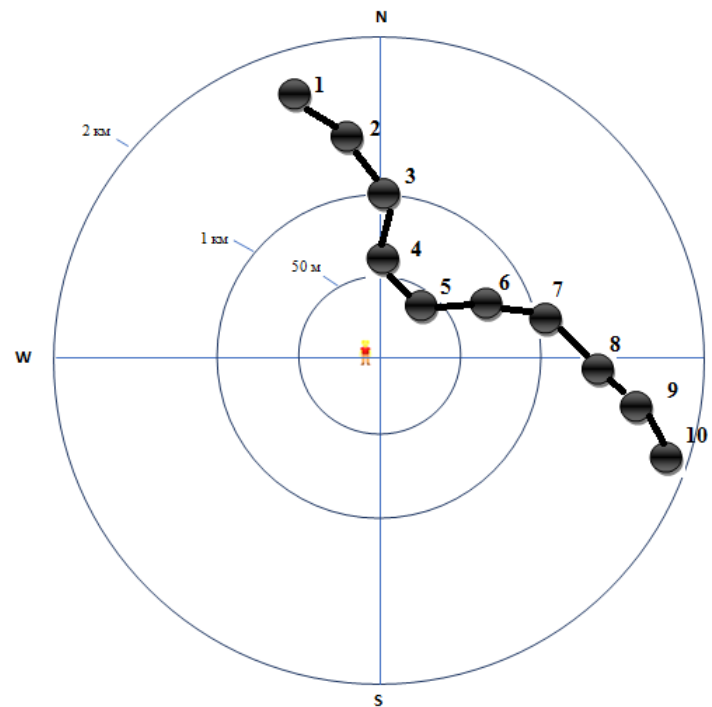


Fig.12 Flight path (VP 1), 30.03.2021

Table 56. Target species log (VP 1), 30.03.2021.


	<i>Aquila chrysaetos</i>	1 160 m	2 160 m	3 165 m	4 160 m	5 165 m	6 165 m	7 165 m	8 160 m	9 165 m	10 160 m
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Table 57. Secondary and other species (VP 1), 30.03.2021.

No	Latin names	English names	Amount	Flight altitude
<b>OTHER SPECIES</b>				
1.	<i>Corvus frugilegus</i>	Eurasian Rook	12	0-5
2.	<i>Pterocles orientalis</i>	Black-bellied sandgrouse	3	12-25
3.	<i>Upupa epops</i>	Hoopoe	1	0-3
4.	<i>Galerida cristata</i>	Crested lark	6	0-9
5.	<i>Oenanthe finschii</i>	Black-necked Wheatear	2	0-3
6.	<i>Oenanthe oenanthe</i>	Northern Wheatear	3	0-5
7.	<i>Ardea cinerea</i>	Grey Heron	1	35
8.	<i>Hirundo rustica</i>	Barn swallow	4	5-15
9.	<i>Anas strepera</i>	Gadwall	9	70

**VP. 2**

Date: 30.03.2021. Start and end time: 13:42 – 16:46

**Weather:**

The air temperature around 14°C end 8°C is sunny

Wind speed approx. (2-4 m/s) No precipitation

**Primary species not found**

Table 58. Secondary and other species (VP 2), 30.03.2021.

No	Latin names	English names	Amount	Flight altitude
<b>SECONDARY SPECIES</b>				
1.	<i>Falco tinnunculus</i>	Common Kestrel	1	10-15
2.	<i>Circus cyaneus</i>	Hen Harrier	2	0-30
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	8	0-15
2.	<i>Passer indicus</i>	Indian House Sparrow	10	1-4
3.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	14	0-5
4.	<i>Oenanthe isabellina</i>	Isabelline wheatear	3	0-3
5.	<i>Pterocles orientalis</i>	Black-bellied sandgrouse	3	0-15
6.	<i>Motacilla citreola</i>	Citrine Wagtail	2	0
7.	<i>Motacilla personata</i>	Pied Wagtail	4	0-3
8.	<i>Motacilla alba</i>	White Wagtail	1	0-3



**VP. 3**

Date: 31.03.2021. Start and end time: 9:02 – 12:08

**Weather:**

The air temperature around 9°C end 16°C is sunny

Wind speed approx. (4-6 m/s) No precipitation

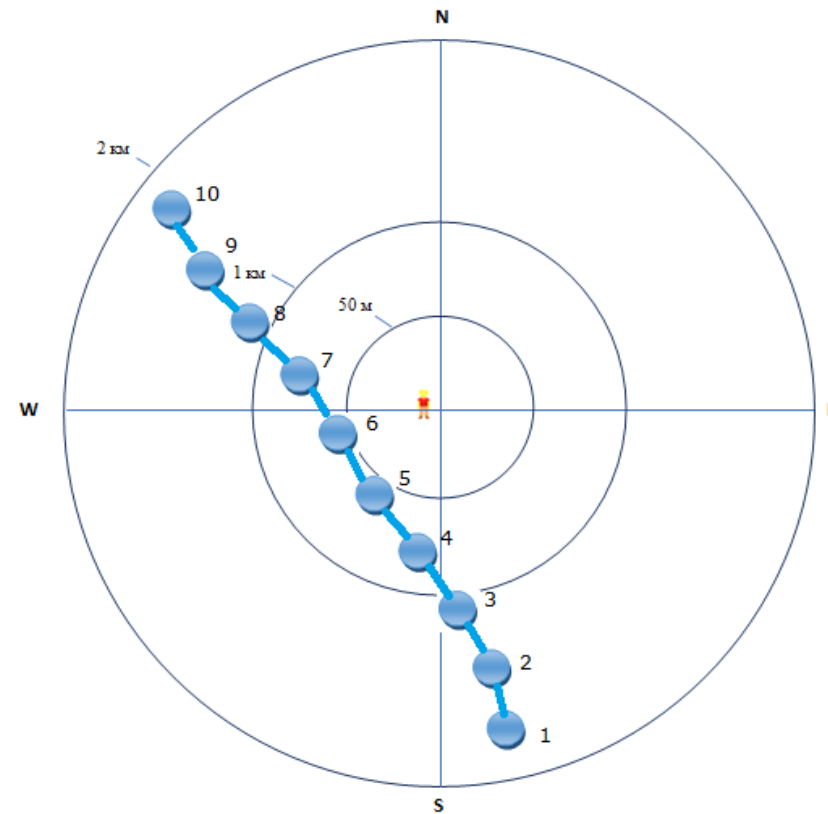


Fig.13 Flight path (VP 3), 31.03.2021

Table 59. Target species log (VP 3), 31.03.2021.


	<i>Aegypius monachus</i>	1 180 m	2 160 m	3 165 m	4 190 m	5 195 m	6 185 m	7 185 m	8 180 m	9 185 m	10 180 m
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Table 60. Secondary and other species (VP 3), 31.03.2021.

No	Latin names	English names	Amount	Flight altitude
<b>SECONDARY SPECIES</b>				
1.	<i>Falco tinnunculus</i>	Common Kestrel	1	5-25
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	9	0-15
2.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	12	0-5
3.	<i>Pica pica</i>	Black-billed Magpie	2	1-5
4.	<i>Oenanthe isabellina</i>	Isabelline wheatear	2	0-3
5.	<i>Hirundo rustica</i>	Barn swallow	2	5-15
6.	<i>Scotocerca inquieta</i>	Streaked Scrub Warbler	1	1-4

# VP. 4

Date: 31.03.2021. Start and end time: 13:02 – 16:06

## **Weather:**

The air temperature around 15°C end 9°C is sunny

Wind speed approx. (4-6 m/s) No precipitation

## **Primary species not found**

Table 61. Secondary and other species (VP 4), 31.03.2021.

No	Latin names	English names	Amount	Flight altitude
<b>SECONDARY SPECIES</b>				
1	<i>Buteo rufinus</i>	Long-legged Buzzard	2	15-55
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	3	0-15
2.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	5	0-5
3.	<i>Passer indicus</i>	Indian House Sparrow	6	1-4
4.	<i>Corvus cornix</i>	Hooded Crow	2	21
5.	<i>Oenanthe finschii</i>	Black-necked Wheatear	3	0-3
6.	<i>Lanius excubitor</i>	Great (Gray) Shrike	1	3-4
7.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	2	0-4
8.	<i>Hirundo rustica</i>	Barn swallow	3	5-15

## VP survey results in April

### VP.7

Date: 02.04.2021. Start and end time: 8:32 – 11:32

#### **Weather:**

The air temperature around 8°C end 14°C is sunny

Wind speed approx. (4-6 m/s) No precipitation

#### **Primary species not found**

Table 62. Secondary and other species (VP 7), 02.04.2021

No	Latin names	English names	Amount	Flight altitude
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	5	0-10
2.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	3	0-4
3.	<i>Oenanthe finschii</i>	Black-necked Wheatear	1	1-5
4.	<i>Pterocles orientalis</i>	Black-bellied sandgrouse	3	8-10

# VP. 8

Date: 02.04.2021. Start and end time: 13:02 – 16:02

## **Weather:**

The air temperature around 16°C end 10 °C is sunny

Wind speed approx. (4-5 m/s) No precipitation

## **Primary species not found**

Table 63. Secondary and other species (VP 8), 02.04.2021

No	Latin names	English names	Amount	Flight altitude
<b>SECONDARY SPECIES</b>				
2.	<i>Falco tinnunculus</i>	Common Kestrel	1	0-25
<b>OTHER SPECIES</b>				
5.	<i>Galerida cristata</i>	Crested lark	12	0-15
6.	<i>Oenanthe isabellina</i>	Isabelline wheatear	3	0-3
7.	<i>Athene noctua</i>	Little Owl	2	0-3
8.	<i>Lanius excubitor</i>	Great (Gray) Shrike	1	0-3
9.	<i>Oenanthe finschii</i>	Black-necked Wheatear	3	0-3

# VP. 9

Date: 03.04.2021 Start and end time: 9:05 – 12:07

## **Weather:**

The air temperature around 8°C end 14°C is sunny

Wind speed approx. (4-5 m/s) No precipitation

**Primary species not found**

Table 64. Secondary and other species (VP 9), 03.04.2021.

No	Latin names	English names	Amount	Flight altitude
		<b>SECONDARY SPECIES</b>		
1.	<i>Buteo rufinus</i>	Long-legged Buzzard	2	25-35
2.	<i>Circus cyaneus</i>	Hen (Northern) Harrier	1	15-35
		<b>OTHER SPECIES</b>		
8.	<i>Galerida cristata</i>	Crested lark	8	0-8
9.	<i>Columba livia</i>	Rock Dove	5	40
10.	<i>Oenanthe finschii</i>	Black-necked Wheatear	2	0-3
11.	<i>Corvus monedula</i>	Jackdaw	2	4-10
12.	<i>Motacilla personata</i>	Pied wagtail	3	0-6

**VP.10**

Date: 03.04.2021. Start and end time: 13:14 – 16:14

**Weather:**

The air temperature around 16°C end 10°C is sunny

Wind speed approx. (3-4 m/s) No precipitation

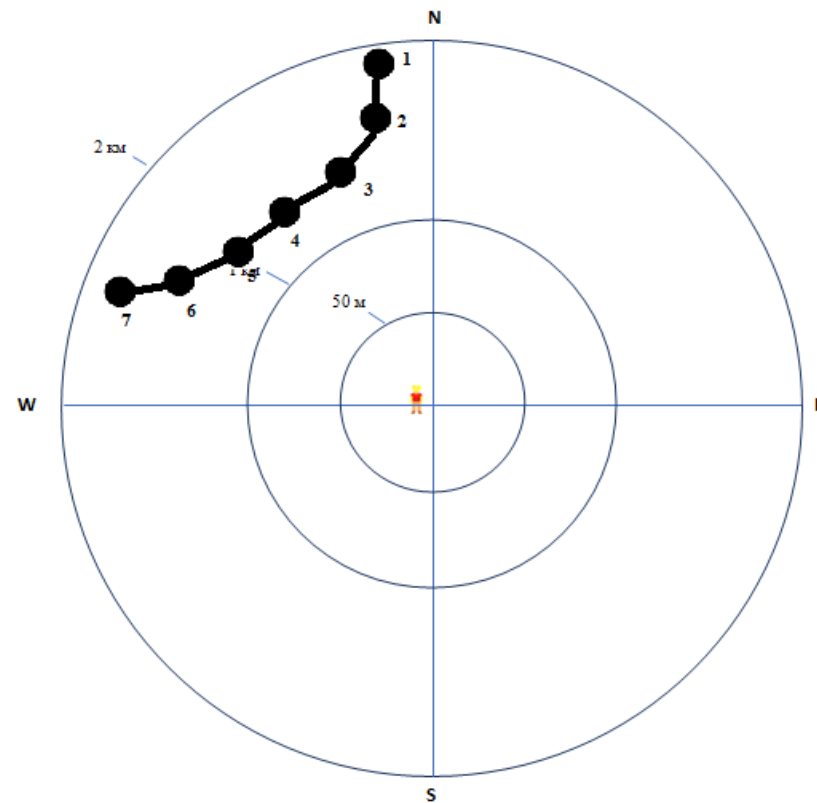


Fig.14 Flight path (VP 10), 03.04.2021

Table 65. Target species log (VP 10), 03.04.2021.


	<i>Aquila chrysaetos</i>	1 160 m	2 170 m	3 165 m	4 180 m	5 185 m	6 165 m	7 175 m
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Table 66. Secondary and other species (VP 10), 03.04.2021

<b>№</b>	<b>Latin names</b>	<b>English names</b>	<b>Amount</b>	<b>Flight altitude</b>
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	11	0-15
2.	<i>Anas strepera</i>	Gadwall	14	45
3.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	14	0-5
4.	<i>Oenanthe isabellina</i>	Isabelline wheatear	2	0-3
5.	<i>Calandrella brachydactyla</i>	Short-toed lark	10	0-5
6.	<i>Motacilla personata</i>	Pied Wagtail	1	0-3



**VP. 1**

Date: 04.04.2021. Start and end time: 8:54 – 11:55

**Weather:**

The air temperature around 7°C end 13°C cloudy  
Wind speed approx. (5-6 m/s) No precipitation

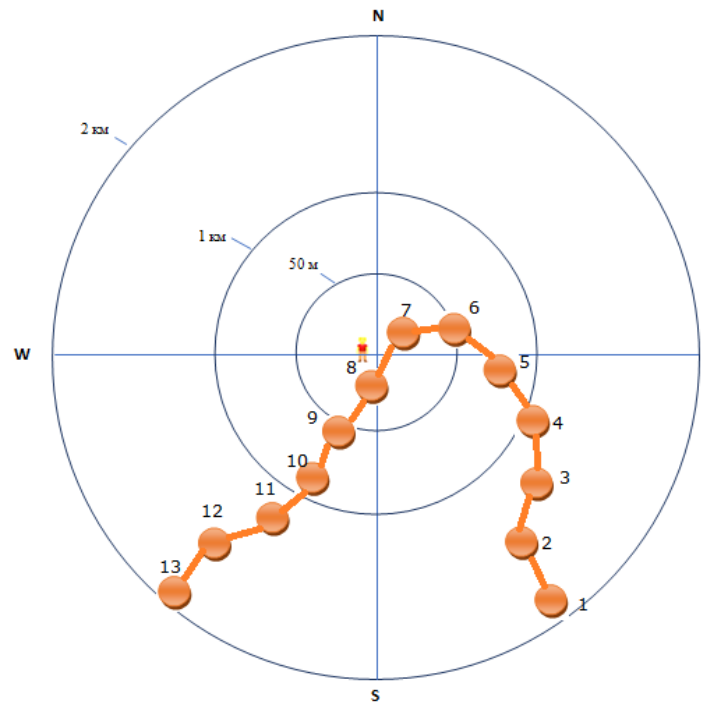


Fig.15 Flight path (VP 1), 04.04.2021

Table 67. Target species log (VP 1), 04.04.2021.


	<i>Haliaeetus albicilla</i>	1 120 m	2 120 m	3 135 m	4 150 m	5 165 m	6 165 m	7 175 m	8 170 m	9 150 m	10 165 m	11 165 m	12 175 m	13 170 m
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Table 68. Secondary and other species (VP 1), 04.04.2021.

No	Latin names	English names	Amount	Flight altitude
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	9	0-5
2.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	4	0-4
3.	<i>Oenanthe oenanthe</i>	Northern Wheatear	3	0-3
4.	<i>Pterocles orientalis</i>	Black-bellied sandgrouse	6	0-12
5.	<i>Larus cachinnans</i>	Yellow-legged Gull	4	40-50

**VP.2**

Date: 04.04.2021. Start and end time: 13:25 – 16:25

**Weather:**

The air temperature around 15°C end 10°C cloudy

Wind speed approx. (4-5 m/s) No precipitation

***Primary species not found***

Table 69. Secondary and other species (VP 2), 04.04.2021

<b>№</b>	<b>Latin names</b>	<b>English names</b>	<b>Amount</b>	<b>Flight altitude</b>
<b>SECONDARY SPECIES</b>				
1.	<i>Circus aeruginosus</i>	Eurasian Marsh-Harrier	2	5-25
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	9	0-15
2.	<i>Oenanthe isabellina</i>	Isabelline wheatear	6	0-3
3.	<i>Athene noctua</i>	Little Owl	1	0-5
4.	<i>Oenanthe oenanthe</i>	Northern Wheatear	2	0-3
5.	<i>Ardea cinerea</i>	Grey Heron	1	35
6.	<i>Phalacrocorax pygmaeus</i>	Pygmy Cormorant	7	85-95

**VP. 5**

Date: 05.04.2021. Start and end time: 9:09 – 12:11

**Weather:**

The air temperature around 9 end 16°C is sunny,

Wind speed approx. (3-4 m/s) No precipitation

***Primary species not found***

Table 70. Secondary and other species (VP 5), 05.04.2021

No	Latin names	English names	Amount	Flight altitude
<b>SECONDARY SPECIES</b>				
1	<i>Buteo rufinus</i>	Long-legged Buzzard	2	10-65
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested Lark	12	0-5
2.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	12	0-6
3.	<i>Oenanthe isabellina</i>	Isabelline wheatear	2	0-6
4.	<i>Oenanthe finschii</i>	Black-necked Wheatear	2	0-3
5.	<i>Oenanthe oenanthe</i>	Northern Wheatear	1	1-3
6.	<i>Lanius excubitor</i>	Great (Gray) Shrike	1	0-15

**VP. 6**

Date: 05.04.2021 Start and end time: 13:17 – 16:18

**Weather:**

The air temperature around 14°C end 10°C is sunny,

Wind speed approx. (3-5 m/s) No precipitation

**Primary species not found**

Table 71. Secondary and other species (VP 6), 05.04.2021.

No	Latin names	English names	Amount	Flight altitude
<b>SECONDARY SPECIES</b>				
1	<i>Buteo rufinus</i>	Long-legged Buzzard	1	5-35
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested Lark	4	0-5
2.	<i>Passer indicus</i>	Indian House Sparrow	16	1-4
3.	<i>Rhodospiza obsoleta</i>	Black-billed Desert Finch	6	3-6
4.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	12	0-2
5.	<i>Oenanthe isabellina</i>	Isabelline wheatear	2	0-3
6.	<i>Oenanthe finschii</i>	Black-necked Wheatear	1	0-3
7.	<i>Columba livia</i>	Rock Dove	12	5-20
8.	<i>Acridotheres tristis</i>	Indian Myna	4	0-10

**VP. 3**

Date: 06.04.2021. Start and end time: 9:03 – 12:06

**Weather:**

The air temperature around 9 end 15°C is sunny,  
Wind speed approx. (3-5 m/s) No precipitation

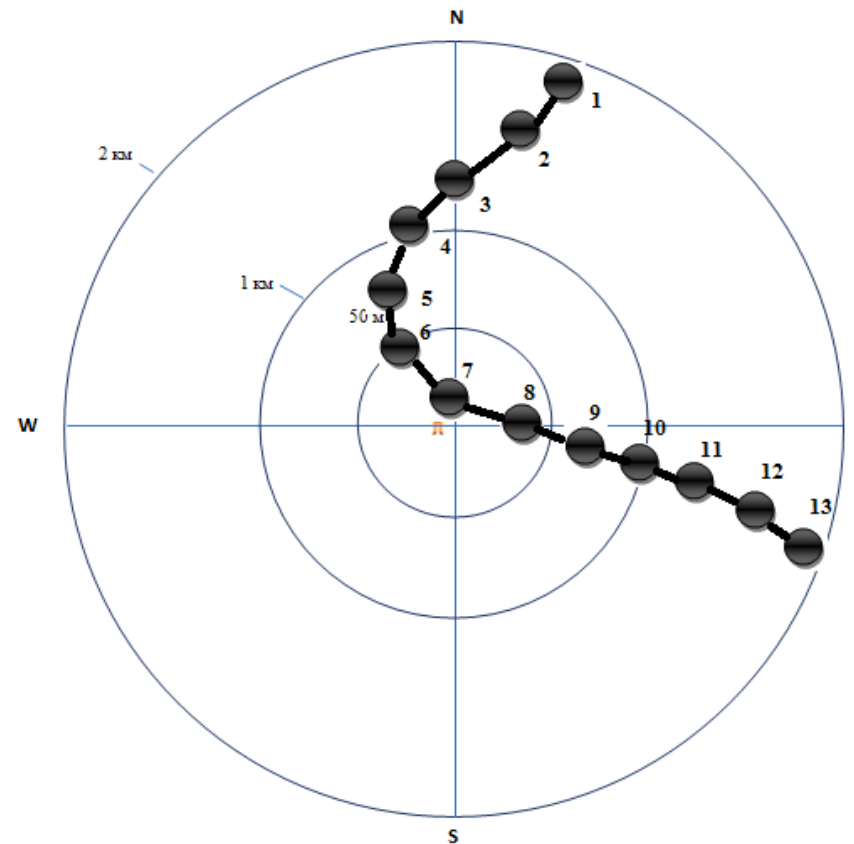


Fig.16 Flight path (VP 3), 06.04.2021

Table 72. Target species log (VP 3), 06.04.2021.


	<i>Aquila chrysaetos</i>	1 50 m	2 70 m	3 95 m	4 110 m	5 115 m	6 135 m	7 135 m	8 150 m	9 155 m	10 150 m
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Table 73. Secondary and other species (VP 3), 06.04.2021.

No	Latin names	English names	Amount	Flight altitude
<b>SECONDARY SPECIES</b>				
1.	<i>Falco tinnunculus</i>	Kestrel	2	0-15
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	7	0-15
2.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	9	0-5
3.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	2	0-3
4.	<i>Hirundo rustica</i>	Barn swallow	3	3-8
5.	<i>Passer indicus</i>	Indian House Sparrow	13	2-5
6.	<i>Corvus monedula</i>	Jackdaw	3	4-10
7.	<i>Apus apus</i>	Northern Swift	4	2-6

# VP. 4

Date: 06.04.2021. Start and end time: 13:12 – 16:13

## **Weather:**

The air temperature around 18°C and 10°C is sunny

Wind speed approx. (4-5 m/s) No precipitation

**Primary species not found**

Table 74. Secondary and other species (VP 4), 06.04.2021.

No	Latin names	English names	Amount	Flight altitude
<b>SECONDARY SPECIES</b>				
1.	<i>Circus cyaneus</i>	Hen Harrier	1	0-25
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	6	0-5
2.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	13	0-5
3.	<i>Athene noctua</i>	Little Owl	1	0-3
4.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	1	0-3
5.	<i>Oenanthe pleschanka</i>	Pied Wheatear	2	2
6.	<i>Sturnus vulgaris</i>	Common Starling	66	0-15
7.	<i>Ardea cinerea</i>	Gray heron	1	15-25
8.	<i>Anas crecca</i>	Green-winged Teal	4	5-15
9.	<i>Lanius pallidirostris</i>	Steppe Grey Shrike	1	3-5
10.	<i>Larus ridibundus</i>	Black-Headed Gull	4	8-15



# VP.7

Date: 07.04.2021. Start and end time: 9:12 – 12:12

## **Weather:**

The air temperature around 8°C end 13°C is sunny

Wind speed approx. (4-5 m/s) No precipitation

## **Primary species not found**

Table 75. Secondary and other species (VP 7), 07.04.2021

No	Latin names	English names	Amount	Flight altitude
<b>OTHER SPECIES</b>				
1.	<i>Alectoris chukar</i>	Chuckar partridge	2	0-5
2.	<i>Galerida cristata</i>	Crested lark	9	0-10
3.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	2	0-3
4.	<i>Oenanthe finschii</i>	Black-necked Wheatear	2	0-5
5.	<i>Rhodospiza obsoleta</i>	Black-billed Desert Finch	4	0-6
6.	<i>Pterocles orientalis</i>	Black-bellied sandgrouse	3	0-8
7.	<i>Lanius excubitor</i>	Great (Gray) Shrike	1	0-3
8.	<i>Hirundo daurica</i>	Red-rumped Swallow	3	4-10
9.	<i>Hirundo rustica</i>	Barn swallow	4	5-8

**VP. 8**

Date: 07.04.2021. Start and end time: 13:12 – 16:16

**Weather:**

The air temperature around 18°C end 12 °C is sunny  
Wind speed approx. (4-5 m/s) No precipitation

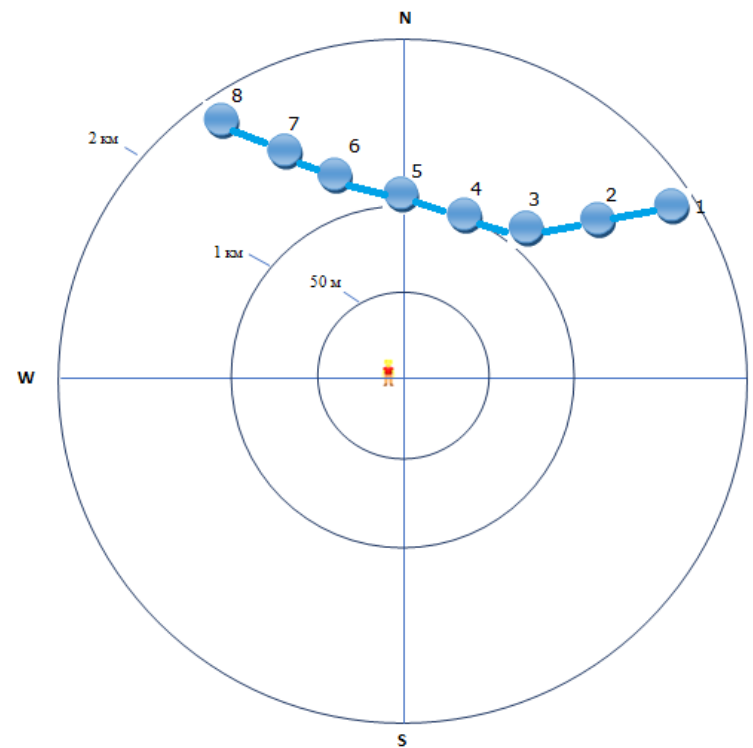


Fig.17 Flight path (VP 8), 07.04.2021

Table 76. Target species log (VP 8), 07.04.2021.


	<i>Aegypius monachus</i>	1 230 m	2 220 m	3 225 m	4 220 m	5 225 m	6 225 m	7 225 m	8 220 m
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Table 77. Secondary and other species (VP 8), 07.04.2021

№	Latin names	English names	Amount	Flight altitude
<b>SECONDARY SPECIES</b>				
1,	<i>Falco tinnunculus</i>	Common Kestrel	1	0-25
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	7	0-15
2.	<i>Oenanthe isabellina</i>	Isabelline wheatear	3	0-3
3.	<i>Athene noctua</i>	Little Owl	1	0-5
4.	<i>Lanius excubitor</i>	Great (Gray) Shrike	1	0-3
5.	<i>Lanius pallidirostris</i>	Southern grey shrike	1	0-4
6.	<i>Hirundo rustica</i>	Barn swallow	2	3-5
7.	<i>Lanius minor</i>	Lesser Grey Shrike	1	1-4

# VP. 10

Date: 08.04.2021 Start and end time: 9:03 – 12:07

## **Weather:**

The air temperature around 6°C end 14°C partly cloudy

Wind speed approx. (4-6 m/s) No precipitation

**Primary species not found**

Table 78. Secondary and other species (VP 10), 08.04.2021.

No	Latin names	English names	Amount	Flight altitude
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	4	0-8
2.	<i>Columba livia</i>	Rock Dove	6	40
3.	<i>Oenanthe finschii</i>	Black-necked Wheatear	2	0-3
4.	<i>Corvus monedula</i>	Jackdaw	2	4-10
5.	<i>Apus apus</i>	Northern Swift	2	6-15
6.	<i>Motacilla personata</i>	Pied wagtail	3	0-6
7.	<i>Scotocerca inquieta</i>	Streaked Scrub Warbler	1	0-1
8.	<i>Hirundo daurica</i>	Red-rumped Swallow	3	0-6

**VP.9**

Date: 08.04.2021. Start and end time: 13:09 – 16:10

**Weather:**

The air temperature around 18°C end 12°C partly cloudy

Wind speed approx. (4-6 m/s) No precipitation

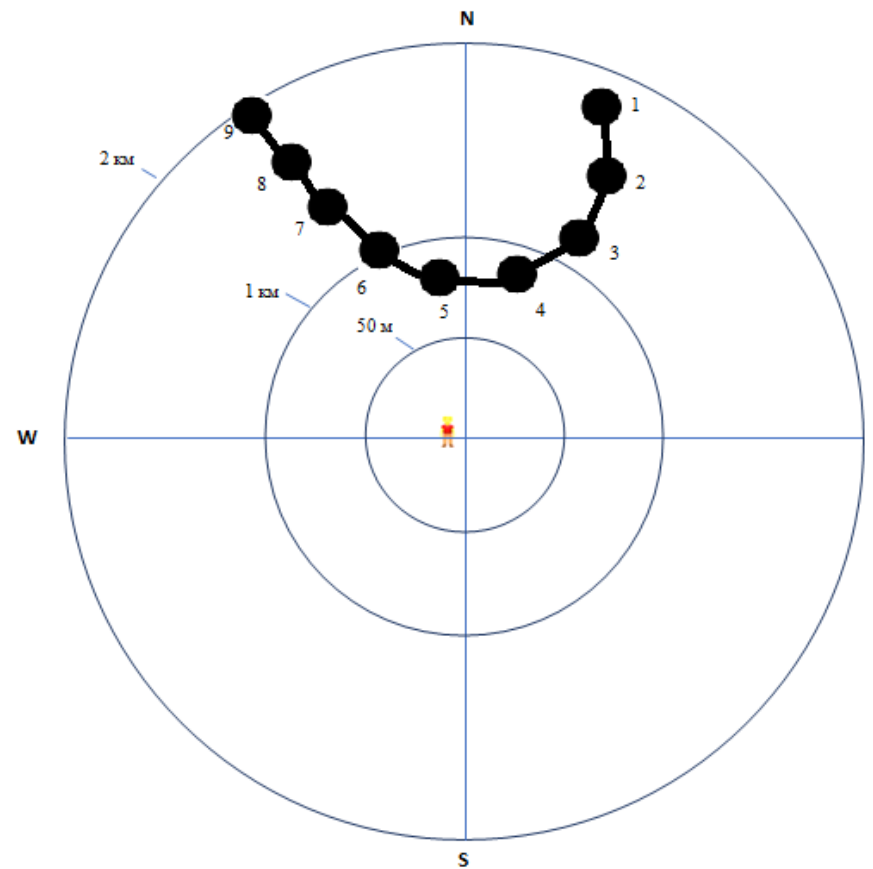


Fig.18 Flight path (VP 9), 08.04.2021

Table 79. Target species log (VP 9), 08.04.2021.


	<i>Aquila chrysaetos</i>	1 120 m	2 130 m	3 125 m	4 140 m	5 145 m	6 165 m	7 175 m	8 170 m	9 170 m
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Table 80. Secondary and other species (VP 9), 08.04.2021

<b>№</b>	<b>Latin names</b>	<b>English names</b>	<b>Amount</b>	<b>Flight altitude</b>
<b>SECONDARY SPECIES</b>				
1.	<i>Falco tinnunculus</i>	Common Kestrel	2	0-15
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	5	0-15
2.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	11	0-5
3.	<i>Oenanthe isabellina</i>	Isabelline wheatear	2	0-3
4.	<i>Passer indicus</i>	Indish sparrow	5	0-5
5.	<i>Upupa epops</i>	Hoopoe	2	0-3
6.	<i>Calandrella brachydactyla</i>	Short-toed lark	12	0-5
7.	<i>Muscicapa striata</i>	Spotted Flycatcher	1	0-3
8.	<i>Hirundo rustica</i>	Barn swallow	5	3-10
9.	<i>Merops persicus</i>	Blue-cheeked Bee-eater	5	12-15

**VP. 1**

Date: 10.04.2021. Start and end time: 8:17 – 11:17

**Weather:**

The air temperature around 8°C end 15°C partly cloudy

Wind speed approx. (3-4 m/s) No precipitation

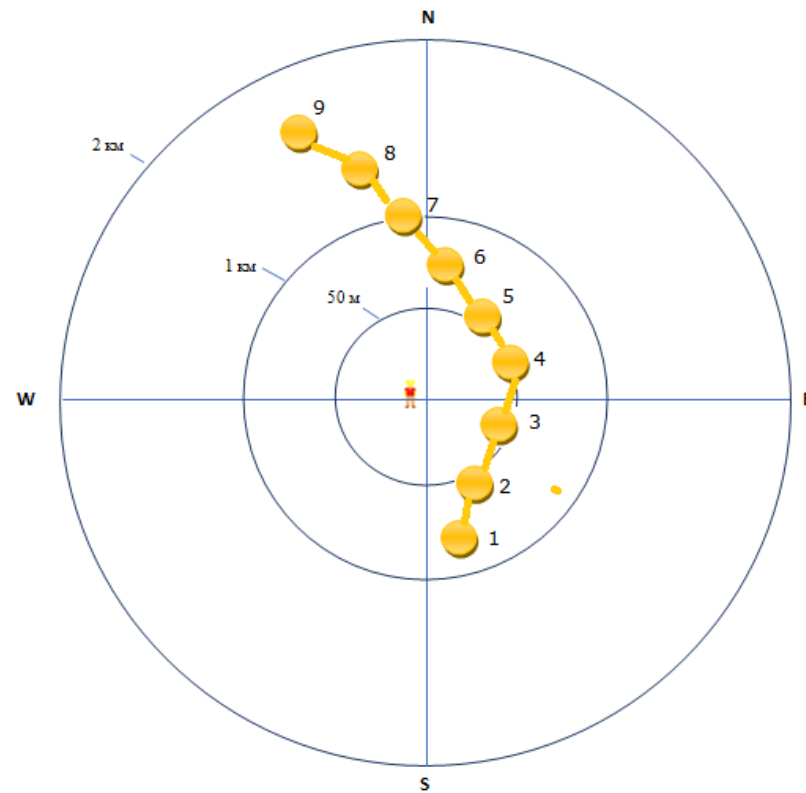


Fig.19 Flight path (VP 1), 10.04.2021

Table 81. Target species log (VP 1), 10.04.2021.


	<i>Neophron percnopterus</i>	1 50 m	2 50 m	3 65 m	4 60 m	5 75 m	6 85 m	7 95 m	8 90 m	9 95 m
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Table 82. Secondary and other species (VP 1), 10.04.2021.

No	Latin names	English names	Amount	Flight altitude
<b>OTHER SPECIES</b>				
1.	<i>Pterocles orientalis</i>	Black-bellied sandgrouse	4	12-25
2.	<i>Galerida cristata</i>	Crested lark	5	0-6
3.	<i>Oenanthe finschii</i>	Black-necked Wheatear	2	0-3
4.	<i>Oenanthe oenanthe</i>	Northern Wheatear	2	0-6
5.	<i>Hirundo rustica</i>	Barn swallow	5	5-15
6.	<i>Anas strepera</i>	Gadwall	5	60
7.	<i>Ardea cinerea</i>	Gray heron	1	35



**VP. 2**

Date: 10.04.2021. Start and end time: 13:02 – 16:06

**Weather:**

The air temperature around 18°C end 10°C partly cloudy

Wind speed approx. (5-6 m/s) No precipitation

**Primary species not found**

Table 83. Secondary and other species (VP 2), 10.04.2021.

No	Latin names	English names	Amount	Flight altitude
<b>SECONDARY SPECIES</b>				
1.	<i>Falco tinnunculus</i>	Common Kestrel	2	0-15
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	14	0-15
2.	<i>Passer indicus</i>	Indian House Sparrow	7	1-4
3.	<i>Oenanthe isabellina</i>	Isabelline wheatear	1	0-3
4.	<i>Pterocles orientalis</i>	Black-bellied sandgrouse	4	0-15
5.	<i>Motacilla citreola</i>	Citrine Wagtail	2	0
6.	<i>Motacilla alba</i>	White Wagtail	2	0-3
7.	<i>Hirundo rustica</i>	Barn swallow	5	3-8
8.	<i>Anas crecca</i>	Green-winged teal	16	25-35

**VP. 5**

Date: 11.04.2021. Start and end time: 8:13 – 11:15

**Weather:**

The air temperature around 9°C end 16°C sky half cloudy

Wind speed approx. (4-6 m/s) No precipitation

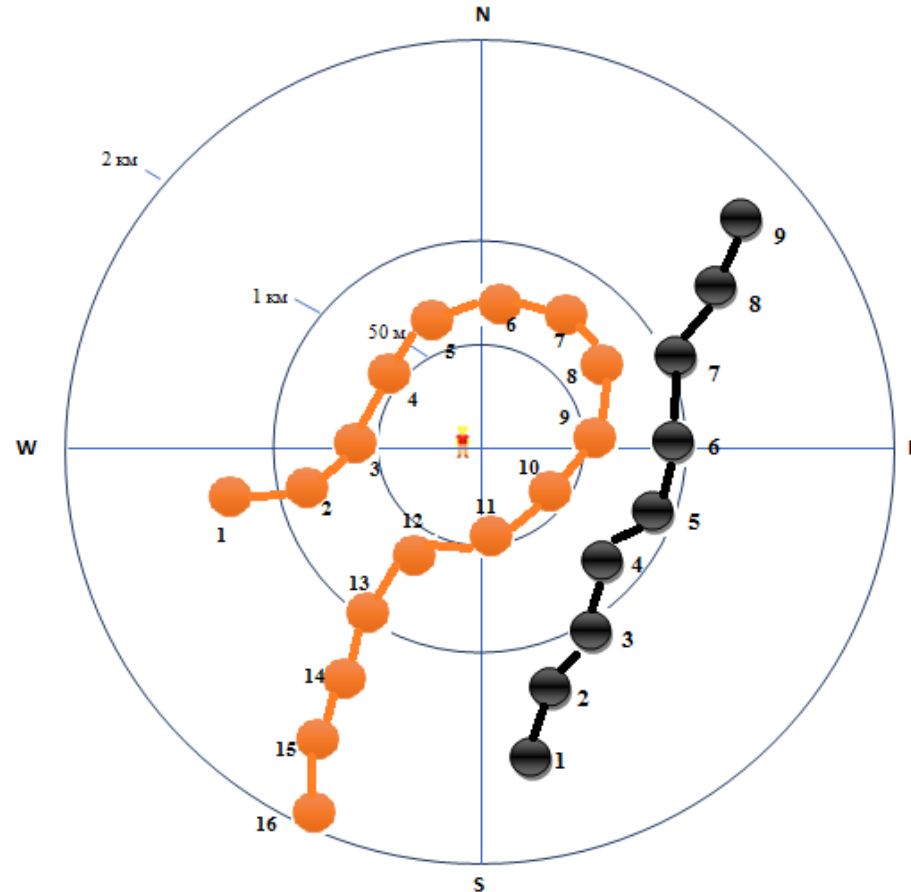


Fig.20 Flight path (VP 5), 11.04.2021

Table 84. Target species log (VP 5), 11.04.2021.



	<i>Aquila chrysaetos</i>	1 120 m	2 130 m	3 135 m	4 130 m	5 195 m	6 125 m	7 125 m	8 110 m	9 115 m							
	<i>Neophron percnopterus</i>	1 80 m	2 90 m	3 95 m	4 90 m	5 95 m	6 85 m	7 85 m	8 80 m	9 85 m	10 90 m	11 90 m	12 90 m	13 80 m	14 85 m	15 90 m	16 95 m

Table 85. Secondary and other species (VP 5), 11.04.2021.

No	Latin names	English names	Amount	Flight altitude
<b>SECONDARY SPECIES</b>				
1.	<i>Falco tinnunculus</i>	Common Kestrel	1	0-15
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	10	0-15
2.	<i>Oenanthe pleschanka</i>	Pied Wheatear	1	1-2
3.	<i>Oenanthe isabellina</i>	Isabelline wheatear	1	0-3
4.	<i>Merops persicus</i>	Blue-cheeked Bee-eater	6	5-20
5.	<i>Hirundo rustica</i>	Barn swallow	3	5-15
6.	<i>Scotocerca inquieta</i>	Streaked Scrub Warbler	2	1-4
7.	<i>Apus apus</i>	Northern Swift	3	2-6
8.	<i>Columba livia</i>	Rock Dove	5	12-15

**VP. 6**

Date: 11.04.2021. Start and end time: 13:02 – 16:06

**Weather:**

The air temperature around 19°C end 12°C sky half cloudy

Wind speed approx. (5-6 m/s) No precipitation

**Primary species not found**

Table 86. Secondary and other species (VP 6), 11.04.2021.

No	Latin names	English names	Amount	Flight altitude
<b>SECONDARY SPECIES</b>				
1.	<i>Buteo rufinus</i>	Long-legged Buzzard	2	25-55
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	10	0-15
2.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	13	0-5
3.	<i>Passer indicus</i>	Indian House Sparrow	6	1-4
4.	<i>Corvus cornix</i>	Hooded Crow	2	21
5.	<i>Oenanthe finschii</i>	Black-necked Wheatear	3	0-3
6.	<i>Lanius excubitor</i>	Great (Gray) Shrike	1	3-4
7.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	1	0-4
8.	<i>Hirundo rustica</i>	Barn swallow	5	5-15

**VP. 3**

Date: 12.04.2021. Start and end time: 8:13 – 11:13

**Weather:**

The air temperature around 6°C end 13°C sky half cloudy

Wind speed approx. (5-6 m/s) No precipitation

***Primary species not found***

Table 87. Secondary and other species (VP 3), 12.04.2021.

No	Latin names	English names	Amount	Flight altitude
<b>SECONDARY SPECIES</b>				
1.	<i>Circus cyaneus</i>	Hen Harrier	2	5-25
2.	<i>Circus aeruginosus</i>	Eurasian Marsh-Harrier	2	15-25
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	10	0-15
2.	<i>Phylloscopus collybita</i>	Chiffchaff	1	0-3
3.	<i>Scotocerca inquieta</i>	Streaked Scrub Warbler	1	0
4.	<i>Oenanthe isabellina</i>	Isabelline wheatear	2	0-3
5.	<i>Athene noctua</i>	Little Owl	2	0-5
6.	<i>Oenanthe oenanthe</i>	Northern Wheatear	2	0-3
7.	<i>Merops persicus</i>	Blue-cheeked Bee-eater	6	3-15
8.	<i>Ardea cinerea</i>	Grey Heron	1	25

**VP.4**

Date: 12.04.2021. Start and end time: 13:16 – 16:19

**Weather:**

The air temperature around 20°C end 11°C sky half cloudy

Wind speed approx. (4-5 m/s) No precipitation

***Primary species not found***

Table 88. Secondary and other species (VP 4), 12.04.2021

No	Latin names	English names	Amount	Flight altitude
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	10	0-5
2.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	2	0-4
3.	<i>Acridotheres tristis</i>	Indian Myna	4	15
4.	<i>Oenanthe oenanthe</i>	Northern Wheatear	2	0-3
5.	<i>Upupa epops</i>	Hoopoe	1	0-3
6.	<i>Pterocles orientalis</i>	Black-bellied sandgrouse	6	0-12
7.	<i>Motacilla personata</i>	Pied Wagtail	2	0-3
8.	<i>Larus cachinnans</i>	Yellow-legged Gull	10	40-50
9.	<i>Caprimulgus europaeus</i>	European nightjar	1	0-5
10.	<i>Hirundo rustica</i>	Barn swallow	6	5-6

**VP. 7**

Date: 13.04.2021. Start and end time: 8:05 – 11:05

**Weather:**

The air temperature around 6 end 12°C cloudy.

Wind speed approx. (6-7 m/s) No precipitation

***Primary species not found***

Table 89. Secondary and other species (VP 7), 13.04.2021

No	Latin names	English names	Amount	Flight altitude
<b>SECONDARY SPECIES</b>				
	<i>Buteo rufinus</i>	Long-legged Buzzard	2	15-35
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested Lark	6	0-5
2.	<i>Sitta tephronota</i>	Greater Rock Nuthatch	1	2-8
3.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	19	0-6
4.	<i>Oenanthe isabellina</i>	Isabelline wheatear	1	0-6
5.	<i>Merops apiaster</i>	European bee-eater	3	15-25
6.	<i>Oenanthe finschii</i>	Black-necked Wheatear	2	0-3
7.	<i>Muscicapa striata</i>	Spotted Flycatcher	1	0

**VP. 8**

Date: 13.04.2021 Start and end time: 13:07 – 16:08

**Weather:**

The air temperature around 18°C end 13°C cloudy.

Wind speed approx. (6-8 m/s) No precipitation

**Primary species not found**

Table 90. Secondary and other species (VP 8), 13.04.2021.

No	Latin names	English names	Amount	Flight altitude
<b>SECONDARY SPECIES</b>				
	<i>Buteo rufinus</i>	Long-legged Buzzard	1	20-35
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested Lark	5	0-5
2.	<i>Passer indicus</i>	Indian House Sparrow	6	1-4
3.	<i>Rhodospiza obsoleta</i>	Black-billed Desert Finch	5	3-6
4.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	16	0-2
5.	<i>Oenanthe isabellina</i>	Isabelline wheatear	2	0-3
6.	<i>Oenanthe finschii</i>	Black-necked Wheatear	3	0-3
7.	<i>Lanius minor</i>	Lesser Grey Shrike	1	0-3
8.	<i>Columba livia</i>	Rock Dove	11	5-20



**VP. 9**

Date: 14.04.2021. Start and end time: 9:05 – 12:05

**Weather:**

The air temperature around 9°C end 16°C is sunny

Wind speed approx. (4-6 m/s) No precipitation

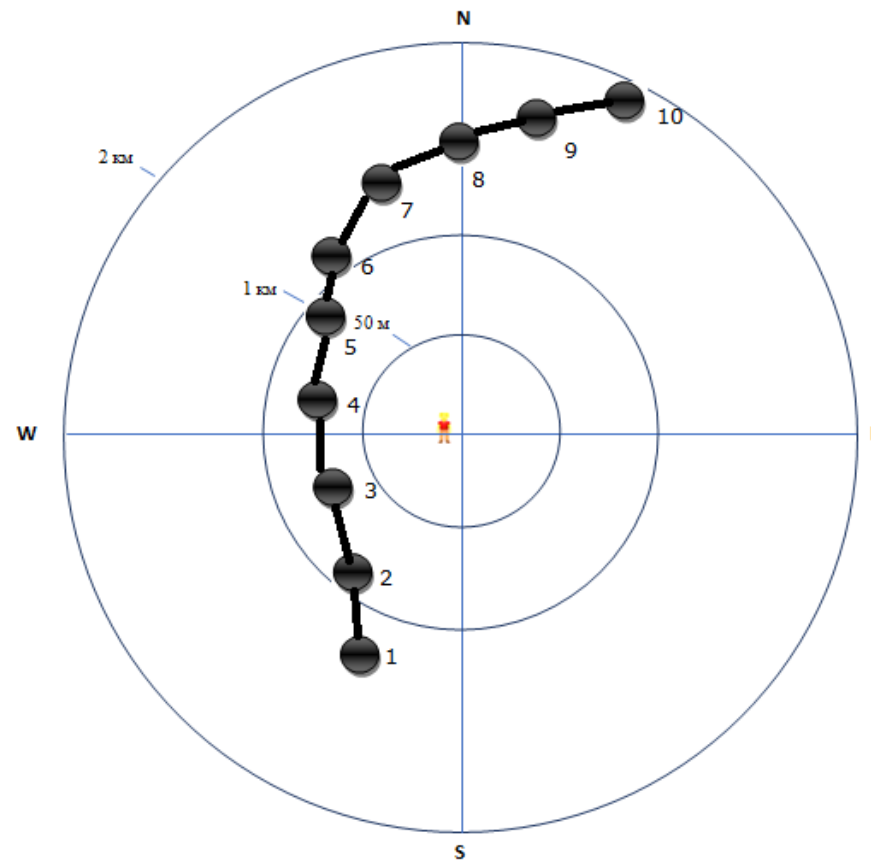


Fig.21 Flight path (VP 9), 14.04.2021

Table 91. Target species log (VP 9), 14.04.2021.

●	<i>Aquila nipalensis</i>	1 180 m	2 160 m	3 165 m	4 190 m	5 195 m	6 185 m	7 185 m	8 180 m	9 185 m	10 180 m
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Table 92. Secondary and other species (VP 9), 14.04.2021.

No	Latin names	English names	Amount	Flight altitude
<b>SECONDARY SPECIES</b>				
1.	<i>Falco tinnunculus</i>	Common Kestrel	1	5-45
2.	<i>Grus grus</i>	Common (Eurasian) Crane	11	0-4
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	12	0-15
2.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	16	0-5
3.	<i>Rhodospiza obsoleta</i>	Black-billed Desert Finch	6	0-3
4.	<i>Oenanthe isabellina</i>	Isabelline wheatear	3	0-3
5.	<i>Hirundo rustica</i>	Barn swallow	1	5-15
6.	<i>Scotocerca inquieta</i>	Streaked Scrub Warbler	2	1-4
7.	<i>Passer indicus</i>	Indish sparrow	5	0-4

**VP. 10**

Date: 14.04.2021. Start and end time: 13:02 – 16:06

**Weather:**

The air temperature around 19°C end 13°C is sunny

Wind speed approx. (5-6 m/s) No precipitation

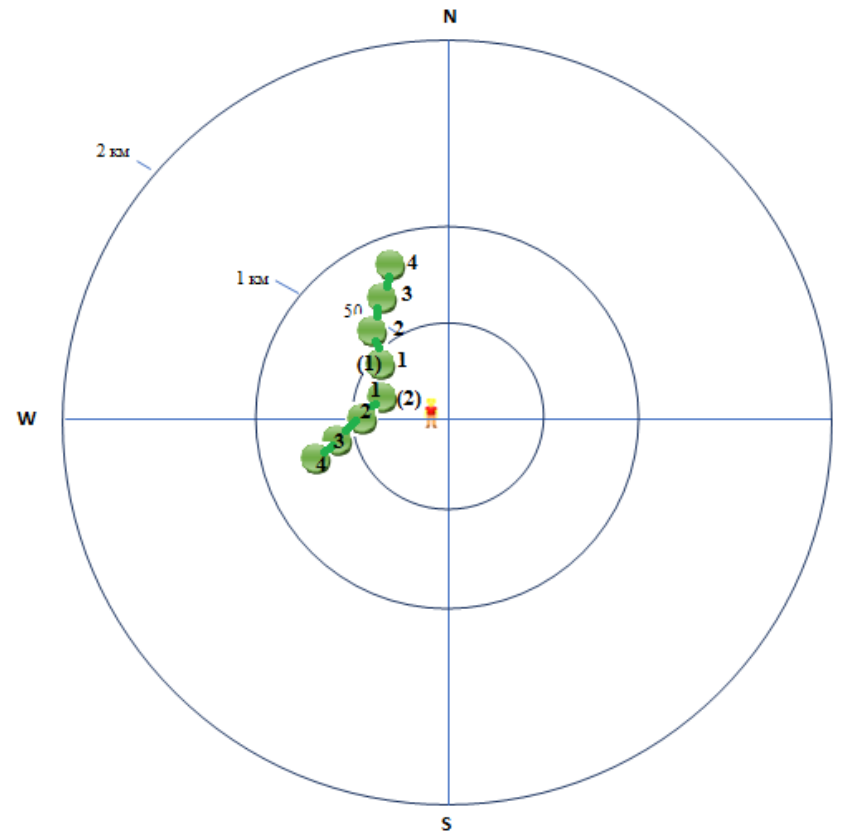


Fig.22 Flight path (VP 10), 14.04.2021. The bustards did not take off, but quietly withdrew.

Table 93. Target species log (VP 10), 14.04.2021.

●	<i>Chlamydotis macqueenii</i> (1)	1 0 m	2 0 m	3 0 m	4 0 m
●	<i>Chlamydotis macqueenii</i> (2)	1 0 m	2 0 m	3 0 m	4 0 m

Table 94. Secondary and other species (VP 10), 14.04.2021.

No	Latin names	English names	Amount	Flight altitude
<b>SECONDARY SPECIES</b>				
1	<i>Buteo rufinus</i>	Long-legged Buzzard	1	5-45
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	6	0-15
2.	<i>Passer indicus</i>	Indian House Sparrow	6	1-4
3.	<i>Athene noctua</i>	Little Owl	1	0-3
4.	<i>Hirundo rustica</i>	Barn swallow	4	3-9
5.	<i>Oenanthe finschii</i>	Black-necked Wheatear	3	0-3
6.	<i>Lanius excubitor</i>	Great (Gray) Shrike	1	3-4
7.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	2	0-4
8.	<i>Muscicapa striata</i>	Spotted Flycatcher	1	0

**VP.1**

Date: 15.04.2021. Start and end time: 9:12 – 12:12

**Weather:**

The air temperature around 6°C end 14°C is sunny,  
Wind speed approx. (4-5 m/s) No precipitation

***Primary species not found***

Table 95. Secondary and other species (VP 1), 15.04.2021

No	Latin names	English names	Amount	Flight altitude
<b>OTHER SPECIES</b>				
1.	<i>Alectoris chukar</i>	Chuckar partridge	5	0-15
2.	<i>Galerida cristata</i>	Crested lark	15	0-10
3.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	1	0-3
4.	<i>Oenanthe finschii</i>	Black-necked Wheatear	1	0-5
5.	<i>Rhodospiza obsoleta</i>	Black-billed Desert Finch	2	0-6
6.	<i>Pterocles orientalis</i>	Black-bellied sandgrouse	2	0-8
7.	<i>Hirundo rustica</i>	Barn swallow	3	3-5
8.	<i>Merops persicus</i>	Blue-cheeked Bee-eater	5	5-15
9.	<i>Merops apiaster</i>	European bee-eater	2	5-25

**VP. 2**

Date: 15.04.2021. Start and end time: 13:23 – 16:26

**Weather:**

The air temperature around 19°C end 12 °C is sunny

Wind speed approx. (4-5 m/s) No precipitation

***Primary species not found***

Table 96. Secondary and other species (VP 2), 15.04.2021

<b>№</b>	<b>Latin names</b>	<b>English names</b>	<b>Amount</b>	<b>Flight altitude</b>
<b>SECONDARY SPECIES</b>				
1.	<i>Falco tinnunculus</i>	Common Kestrel	1	5-25
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	6	0-15
2.	<i>Oenanthe isabellina</i>	Isabelline wheatear	2	0-3
3.	<i>Athene noctua</i>	Little Owl	1	0-3
4.	<i>Lanius excubitor</i>	Great (Gray) Shrike	1	0-3
5.	<i>Merops persicus</i>	Blue-cheeked Bee-eater	6	3-15
6.	<i>Motacilla personata</i>	Masked wagtail	2	0-2

**VP. 5**

Date: 16.04.2021 Start and end time: 8:26 – 11:27

**Weather:**

The air temperature around 6°C end 12°C partly cloudy

Wind speed approx. (5-6 m/s) No precipitation

**Primary species not found**

Table 97. Secondary and other species (VP 5), 16.04.2021.

No	Latin names	English names	Amount	Flight altitude
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	6	0-8
2.	<i>Upupa epops</i>	Hoopoe	1	0-3
3.	<i>Columba livia</i>	Rock Dove	5	40
4.	<i>Oenanthe finschii</i>	Black-necked Wheatear	2	0-3
5.	<i>Corvus monedula</i>	Jackdaw	5	4-10
6.	<i>Apus apus</i>	Northern Swift	2	6-15
7.	<i>Motacilla personata</i>	Pied wagtail	2	0-6
8.	<i>Coracias garrulus</i>	Eurasian Roller	1	5-15

**VP.6**

Date: 16.04.2021. Start and end time: 13:02 – 16:02

**Weather:**

The air temperature around 18°C end 10°C partly cloudy

Wind speed approx. (4-6 m/s) No precipitation

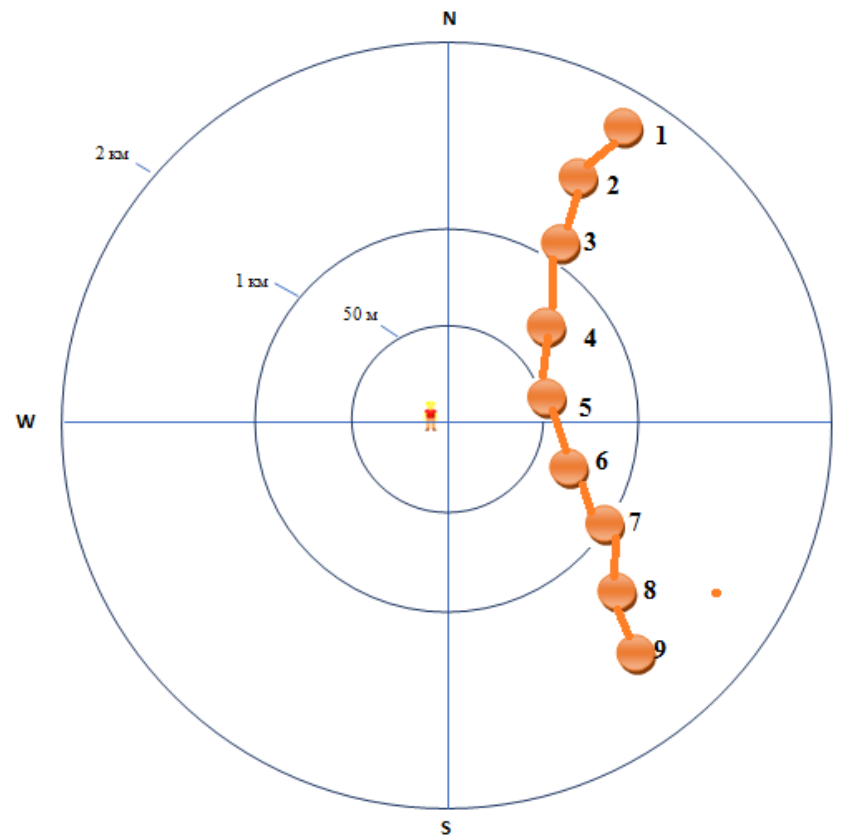


Fig.23 Flight path (VP 6), 16.04.2021



Table 98. Target species log (VP 6), 16.04.2021.


	<i>Neophron percnopterus</i>	1 90 m	2 90 m	3 95 m	4 90 m	5 85 m	6 65 m	7 75 m	8 70 m	9 70 m
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Table 99. Secondary and other species (VP 6), 16.04.2021

No	Latin names	English names	Amount	Flight altitude
<b>SECONDARY SPECIES</b>				
1.	<i>Falco tinnunculus</i>	Common Kestrel	1	0-25
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	10	0-15
2.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	16	0-5
3.	<i>Oenanthe isabellina</i>	Isabelline wheatear	3	0-3
4.	<i>Upupa epops</i>	Hoopoe	1	0-3
5.	<i>Passer indicus</i>	Indish sparrow	8	0-5
6.	<i>Hirundo rustica</i>	Barn swallow	3	3-6
7.	<i>Hirundo daurica</i>	Red-rumped Swallow	2	5-15
8.	<i>Lanius excubitor</i>	Great (Gray) Shrike	1	1-3
9.	<i>Calandrella brachydactyla</i>	Short-toed lark	12	0-5

**VP. 4**

Date: 19.04.2021. Start and end time: 8:42 – 11:42

**Weather:**

The air temperature around 6°C end 16°C is sunny

Wind speed approx. (5-6 m/s) No precipitation

***Primary species not found***

Table 100. Secondary and other species (VP 4), 19.04.2021.

No	Latin names	English names	Amount	Flight altitude
<b>SECONDARY SPECIES</b>				
1.	<i>Circus cyaneus</i>	Hen Harrier	1	10-25
2.	<i>Circus aeruginosus</i>	Eurasian Marsh-Harrier	1	5-25
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	13	0-15
2.	<i>Phylloscopus collybita</i>	Chiffchaff	1	0-3
3.	<i>Oenanthe isabellina</i>	Isabelline wheatear	3	0-3
4.	<i>Merops apiaster</i>	European bee-eater	5	3-12
5.	<i>Coracias garrulus</i>	Eurasian Roller	2	0-12
6.	<i>Athene noctua</i>	Little Owl	1	0-5
7.	<i>Oenanthe oenanthe</i>	Northern Wheatear	3	0-3
8.	<i>Ardea cinerea</i>	Grey Heron	1	35
9.	<i>Merops persicus</i>	Blue-cheeked Bee-eate	6	3-9

**VP. 3**

Date: 19.04.2021. Start and end time: 13:06 – 16:09

**Weather:**

The air temperature around 21°C end 14°C is sunny

Wind speed approx. (4-5 m/s) No precipitation

***Primary species not found***

Table 101. Secondary and other species (VP 3), 19.04.2021

No	Latin names	English names	Amount	Flight altitude
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	14	0-5
2.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	2	0-4
3.	<i>Acridotheres tristis</i>	Indian Myna	5	15
4.	<i>Oenanthe oenanthe</i>	Northern Wheatear	4	0-3
5.	<i>Coracias garrulus</i>	Eurasian Roller	1	5-6
6.	<i>Pterocles orientalis</i>	Black-bellied sandgrouse	4	0-12
7.	<i>Motacilla personata</i>	Pied Wagtail	2	0-3
8.	<i>Lanius pallidirostris</i>	Southern grey shrike	2	3-5
9.	<i>Larus cachinnans</i>	Yellow-legged Gull	3	20-50

**VP. 7**

Date: 20.04.2021. Start and end time: 9:05 – 12:05

**Weather:**

The air temperature around 8 end 17°C partly cloudy,  
Wind speed approx. (5-6 m/s) No precipitation

***Primary species not found***

Table 102. Secondary and other species (VP 7), 20.04.2021

No	Latin names	English names	Amount	Flight altitude
<b>SECONDARY SPECIES</b>				
1	<i>Buteo rufinus</i>	Long-legged Buzzard	1	35-75
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested Lark	6	0-5
2.	<i>Sitta tephronota</i>	Greater Rock Nuthatch	1	2-8
3.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	15	0-6
4.	<i>Oenanthe isabellina</i>	Isabelline wheatear	2	0-6
5.	<i>Oenanthe finschii</i>	Black-necked Wheatear	4	0-3
6.	<i>Apus apus</i>	Northern Swift	4	3-6
7.	<i>Muscicapa striata</i>	Spotted Flycatcher	1	0
8.	<i>Hirundo rustica</i>	Barn swallow	6	5-6

**VP. 8**

Date: 20.04.2021 Start and end time: 13:17 – 16:18

**Weather:**

The air temperature around 22°C end 15°C partly cloudy,  
Wind speed approx. (4-5 m/s) No precipitation

**Primary species not found**

Table 103. Secondary and other species (VP 8), 20.04.2021.

No	Latin names	English names	Amount	Flight altitude
<b>SECONDARY SPECIES</b>				
1	<i>Buteo rufinus</i>	Long-legged Buzzard	1	15-45
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested Lark	9	0-5
2.	<i>Lanius minor</i>	Lesser Grey Shrike	2	2-5
3.	<i>Rhodospiza obsoleta</i>	Black-billed Desert Finch	4	3-6
4.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	12	0-2
5.	<i>Oenanthe isabellina</i>	Isabelline wheatear	3	0-3
6.	<i>Oenanthe finschii</i>	Black-necked Wheatear	2	0-3
7.	<i>Hirundo rustica</i>	Barn swallow	6	3-6
8.	<i>Merops persicus</i>	Blue-cheeked Bee-eater	9	5-15

**VP. 1**

Date: 21.04.2021. Start and end time: 9:06 – 12:07

**Weather:**

The air temperature around 9 end 15°C partly cloudy.

Wind speed approx. (4-5 m/s) No precipitation

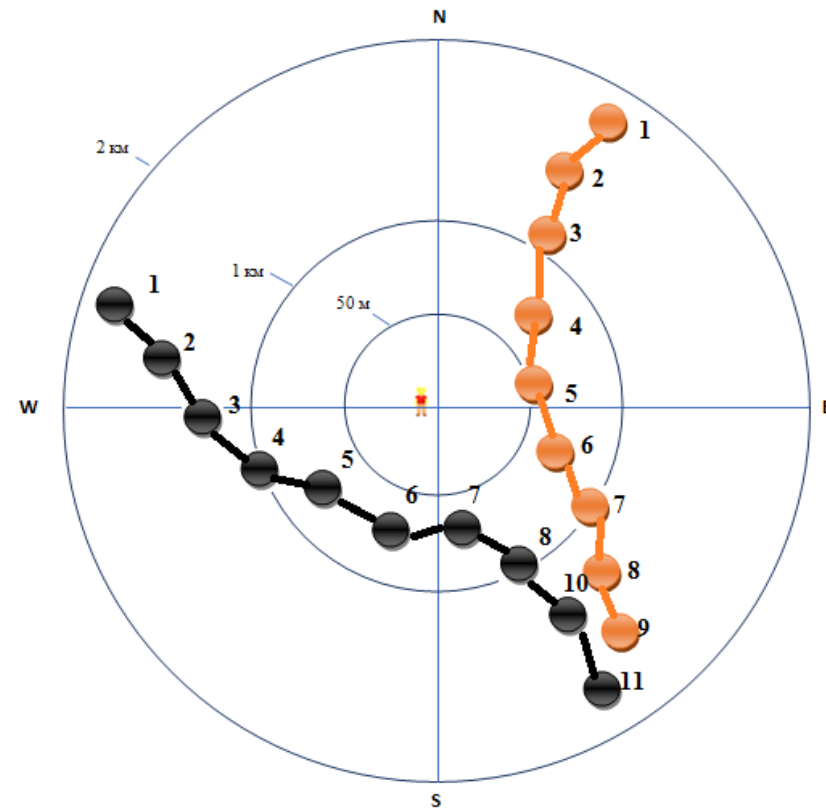


Fig.24 Flight path (VP 1), 21.04.2021

Table 104. Target species log (VP 1), 21.04.2021.



	<i>Neophron percnopterus</i>	1 180 m	2 160 m	3 165 m	4 180 m	5 185 m	6 165 m	7 175 m	8 170 m	9 150 m		
	<i>Aquila chrysaetos</i>	1 60 m	2 60 m	3 65 m	4 60 m	5 55 m	6 55 m	7 55 m	8 50 m	9 50 m	10 50 m	11 50 m

Table 105. Secondary and other species (VP 1), 21.04.2021.

No	Latin names	English names	Amount	Flight altitude
<b>SECONDARY SPECIES</b>				
1.	<i>Falco tinnunculus</i>	Kestrel	1	0-25
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	15	0-15
2.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	18	0-5
3.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	2	0-3
4.	<i>Hirundo rustica</i>	Barn swallow	2	3-8
5.	<i>Upupa epops</i>	Hoopoe	1	0-3
6.	<i>Passer indicus</i>	Indian House Sparrow	20	2-5
7.	<i>Scotocerca inquieta</i>	Streaked Scrub Warbler	1	0-1
8.	<i>Corvus monedula</i>	Jackdaw	4	4-10

## VP. 2

Date: 21.04.2021. Start and end time: 13:14 – 16:18

### **Weather:**

The air temperature around 16°C end 12°C partly cloudy

Wind speed approx. (3-4 m/s) No precipitation

### **Primary species not found**

Table 106. Secondary and other species (VP 2), 21.04.2021.

No	Latin names	English names	Amount	Flight altitude
<b>SECONDARY SPECIES</b>				
1.	<i>Falco tinnunculus</i>	Kestrel	2	10-30
2.	<i>Circus cyaneus</i>	Hen Harrier	1	0-30
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	10	0-5
2.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	12	0-5
3.	<i>Hirundo daurica</i>	Red-rumped Swallow	4	3-9
4.	<i>Athene noctua</i>	Little Owl	1	0-3
5.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	3	0-3
6.	<i>Ardea cinerea</i>	Gray heron	1	15-25
7.	<i>Anas crecca</i>	Green-winged Teal	9	5-15
8.	<i>Passer indicus</i>	Indish sparrow	6	0-4
9.	<i>Larus ridibundus</i>	Black-Headed Gull	7	8-15



**VP. 10**

Date: 22.04.2021. Start and end time: 8:32 – 11:34

**Weather:**

The air temperature around 9°C end 19°C is sunny

Wind speed approx. (2-4 m/s) No precipitation

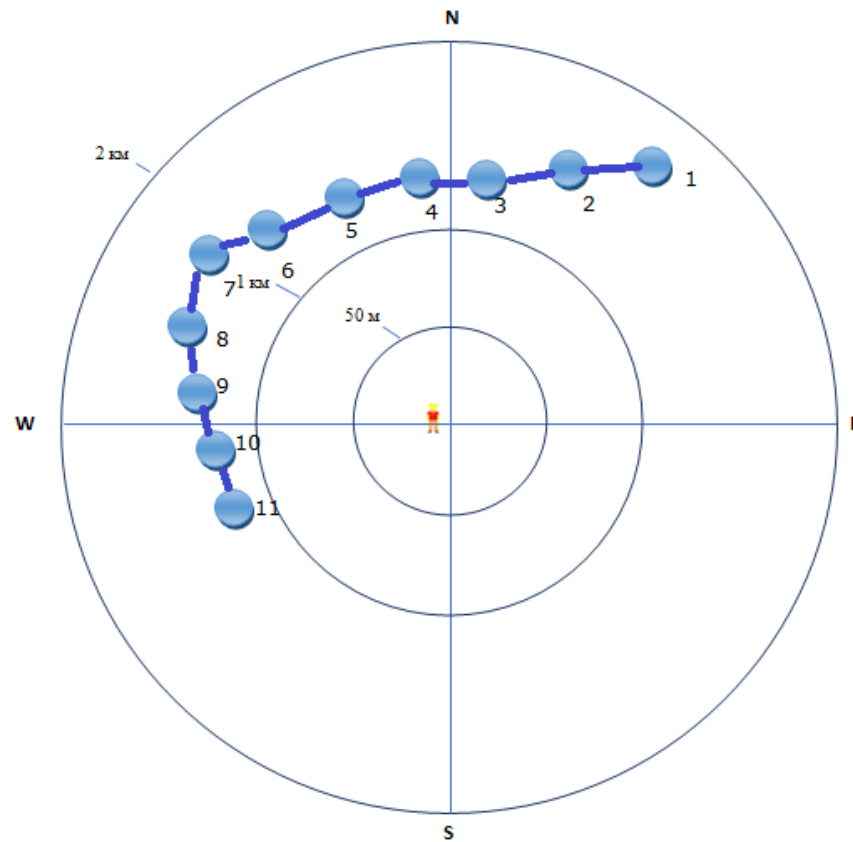


Fig.25 Flight path (VP 10), 22.04.2021

Table 107. Target species log (VP 10), 22.04.2021.


	<i>Aegypius monachus</i>	1 260 m	2 260 m	3 255 m	4 260 m	5 255 m	6 255 m	7 255 m	8 250 m	9 255 m	10 250 m	11 255 m
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Table 108. Secondary and other species (VP 10), 22.04.2021.

No	Latin names	English names	Amount	Flight altitude
<b>OTHER SPECIES</b>				
1.	<i>Corvus frugilegus</i>	Eurasian Rook	12	0-5
2.	<i>Pterocles orientalis</i>	Black-bellied sandgrouse	3	12-25
3.	<i>Galerida cristata</i>	Crested lark	6	0-9
4.	<i>Oenanthe finschii</i>	Black-necked Wheatear	2	0-3
5.	<i>Merops apiaster</i>	European bee-eater	6	5-15
6.	<i>Oenanthe oenanthe</i>	Northern Wheatear	3	0-5
7.	<i>Ardea cinerea</i>	Grey Heron	1	35
8.	<i>Hirundo rustica</i>	Barn swallow	3	5-15
9.	<i>Coracias garrulus</i>	Eurasian Roller	2	0-9
10.	<i>Anas strepera</i>	Gadwall	8	70

**VP. 9**

Date: 22.04.2021. Start and end time: 13:12 – 16:16

**Weather:**

The air temperature around 26°C end 13°C is sunny

Wind speed approx. (2-4 m/s) No precipitation

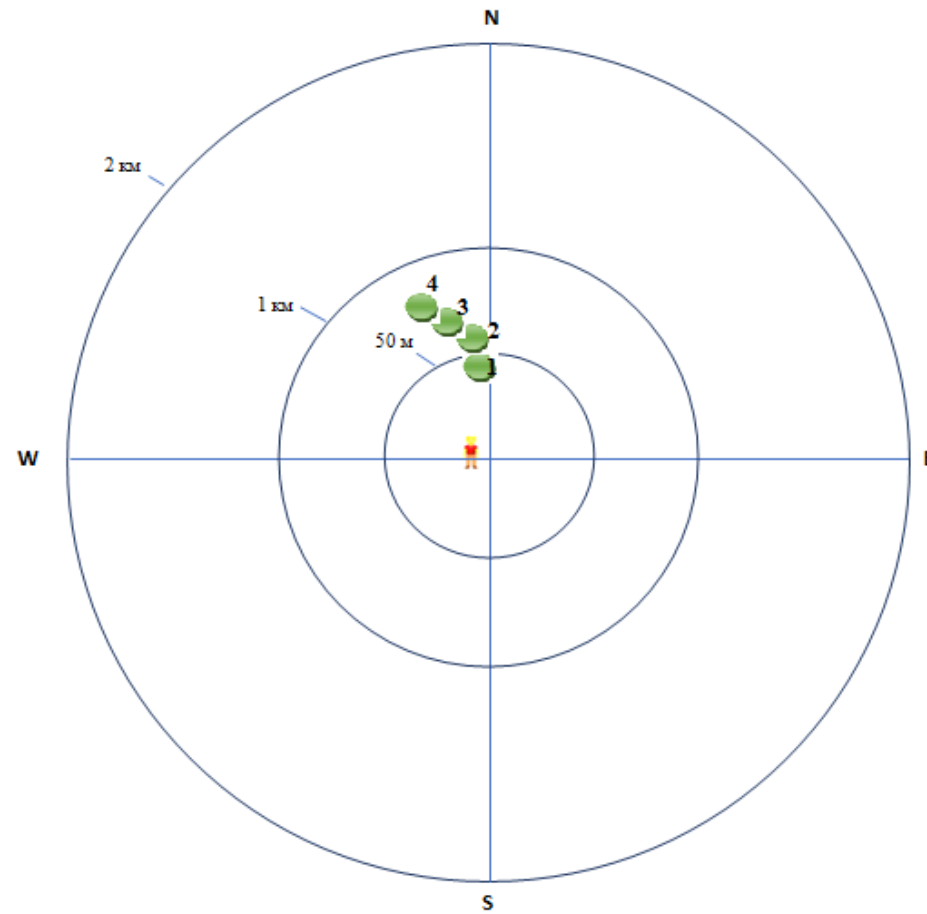


Fig.26 Flight path (VP 9), 22.04.2021

Table 109. Target species log (VP 10), 22.04.2021.

	<i>Chlamydotis macqueenii</i>	1 0 m	2 0 m	3 0 m	4 0 m
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Table 110. Secondary and other species (VP 9), 22.04.2021.

No	Latin names	English names	Amount	Flight altitude
<b>SECONDARY SPECIES</b>				
1.	<i>Falco tinnunculus</i>	Common Kestrel	1	10-15
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	8	0-15
2.	<i>Passer indicus</i>	Indian House Sparrow	12	1-4
3.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	14	0-5
4.	<i>Oenanthe isabellina</i>	Isabelline wheatear	4	0-3
5.	<i>Pterocles orientalis</i>	Black-bellied sandgrouse	4	0-15
6.	<i>Merops persicus</i>	Blue-cheeked Bee-eater	16	3-15
7.	<i>Motacilla citreola</i>	Citrine Wagtail	2	0
8.	<i>Motacilla personata</i>	Pied Wagtail	4	0-3
9.	<i>Motacilla alba</i>	White Wagtail	1	0-3

**VP. 5**

Date: 23.04.2021. Start and end time: 9:02 – 12:08

**Weather:**

The air temperature around 9°C end 16°C partly cloudy,  
Wind speed approx. (4-6 m/s) No precipitation

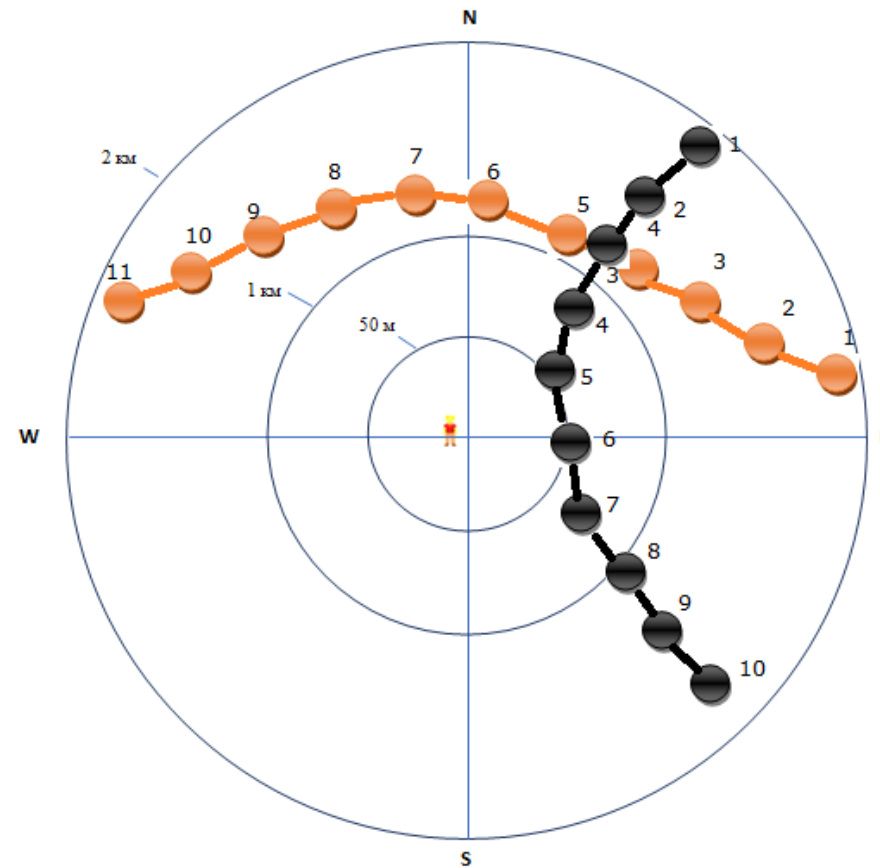


Fig.27 Flight path (VP 5), 23.04.2021

Table 111. Target species log (VP 5), 23.04.2021.

●	<i>Aquila chrysaetos</i>	1 180 m	2 160 m	3 165 m	4 190 m	5 195 m	6 185 m	7 185 m	8 180 m	9 185 m	10 180 m	
●	<i>Neophron percnopterus</i>	1 80 m	2 60 m	3 65 m	4 90 m	5 95 m	6 85 m	7 85 m	8 80 m	9 85 m	10 80 m	11 80 m

Table 112. Secondary and other species (VP 5), 23.04.2021.

No	Latin names	English names	Amount	Flight altitude
<b>SECONDARY SPECIES</b>				
1.	<i>Falco tinnunculus</i>	Common Kestrel	1	5-25
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	16	0-15
2.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	22	0-5
3.	<i>Pica pica</i>	Black-billed Magpie	2	1-5
4.	<i>Oenanthe isabellina</i>	Isabelline wheatear	3	0-3
5.	<i>Hirundo rustica</i>	Barn swallow	6	5-15
6.	<i>Scotocerca inquieta</i>	Streaked Scrub Warbler	1	1-4
7.	<i>Phalacrocorax pygmaeus</i>	Pygmy cormorant	5	0-6

**VP. 6**

Date: 23.04.2021. Start and end time: 13:10 – 16:13

**Weather:**

The air temperature around 26°C end 15°C partly cloudy,

Wind speed approx. (4-6 m/s) No precipitation

**Primary species not found**

Table 113. Secondary and other species (VP 6), 23.04.2021.

No	Latin names	English names	Amount	Flight altitude
<b>SECONDARY SPECIES</b>				
1	<i>Buteo rufinus</i>	Long-legged Buzzard	2	15-55
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	9	0-15
2.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	16	0-5
3.	<i>Passer indicus</i>	Indian House Sparrow	6	1-4
4.	<i>Coracias garrulus</i>	Eurasian Roller	1	3-6
5.	<i>Oenanthe finschii</i>	Black-necked Wheatear	3	0-3
6.	<i>Lanius excubitor</i>	Great (Gray) Shrike	1	3-4
7.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	1	0-4
8.	<i>Hirundo rustica</i>	Barn swallow	5	5-15

**VP. 3**

Date: 24.04.2021 Start and end time: 8:05 – 11:07

**Weather:**

The air temperature around 8°C end 16°C is sunny

Wind speed approx. (4-5 m/s) No precipitation

**Primary species not found**

Table 114. Secondary and other species (VP 3), 24.04.2021.

<b>№</b>	<b>Latin names</b>	<b>English names</b>	<b>Amount</b>	<b>Flight altitude</b>
		<b>SECONDARY SPECIES</b>		
1.	<i>Buteo rufinus</i>	Long-legged Buzzard	1	15-35
2.	<i>Circus cyaneus</i>	Hen (Northern) Harrier	1	15-35
		<b>OTHER SPECIES</b>		
1.	<i>Galerida cristata</i>	Crested lark	8	0-8
2.	<i>Columba livia</i>	Rock Dove	6	40
3.	<i>Oenanthe finschii</i>	Black-necked Wheatear	2	0-3
4.	<i>Corvus monedula</i>	Jackdaw	1	4-10
5.	<i>Motacilla personata</i>	Pied wagtail	3	0-6
6.	<i>Merops apiaster</i>	European bee-eater	5	3-6
7.	<i>Lanius pallidirostris</i>	Southern grey shrike	1	2-5



**VP.4**

Date: 24.04.2021. Start and end time: 13:04 – 16:04

**Weather:**

The air temperature around 26°C end 16°C is sunny

Wind speed approx. (3-4 m/s) No precipitation

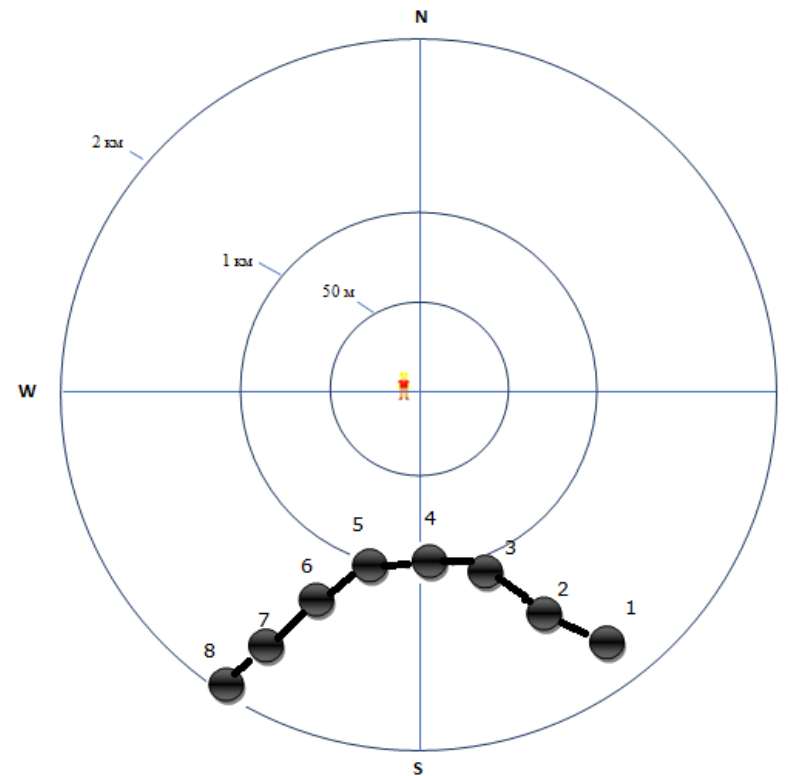


Fig.28 Flight path (VP 4), 24.04.2021

Table 115. Target species log (VP 4), 24.04.2021.


	<i>Aquila chrysaetos</i>	1	2	3	4	5	6	7	8
		160 m	170 m	165 m	180 m	185 m	165 m	175 m	175 m

Table 116. Secondary and other species (VP 4), 24.04.2021

No	Latin names	English names	Amount	Flight altitude
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	11	0-15
2.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	14	0-5
3.	<i>Lanius pallidirostris</i>	Southern grey shrike	1	1-5
4.	<i>Oenanthe isabellina</i>	Isabelline wheatear	3	0-3
5.	<i>Calandrella brachydactyla</i>	Short-toed lark	10	0-5
6.	<i>Motacilla personata</i>	Pied Wagtail	1	0-3
7.	<i>Merops persicus</i>	Blue-cheeked Bee-eater	6	5-9

**VP.8**

Date: 25.04.2021. Start and end time: 8:54 – 11:55

**Weather:**

The air temperature around 9°C end 16°C cloudy

Wind speed approx. (5-6 m/s) No precipitation

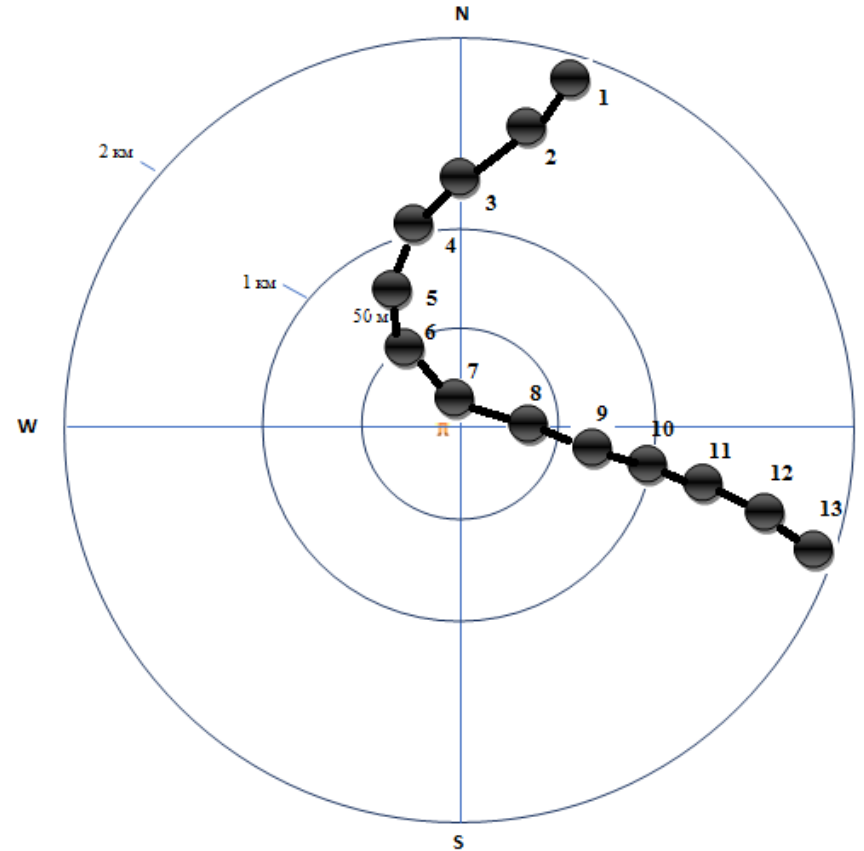


Fig.29 Flight path (VP 8), 25.04.2021

Table 117. Target species log (VP 8), 25.04.2021.

●	<i>Aquila chrysaetos</i>	1 120 m	2 120 m	3 135 m	4 150 m	5 165 m	6 165 m	7 175 m	8 170 m	9 150 m	10 165 m	11 165 m	12 175 m	13 170 m
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Table 118. Secondary and other species (VP 8), 25.04.2021.

No	Latin names	English names	Amount	Flight altitude
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	12	0-5
2.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	4	0-4
3.	<i>Oenanthe oenanthe</i>	Northern Wheatear	3	0-3
4.	<i>Pterocles orientalis</i>	Black-bellied sandgrouse	5	0-12
5.	<i>Merops persicus</i>	Blue-cheeked Bee-eater	5	3-15
6.	<i>Scotocerca inquieta</i>	Streaked Scrub Warbler	1	0
7.	<i>Lanius pallidirostris</i>	Southern grey shrike	1	0-15

# VP.7

Date: 25.04.2021. Start and end time: 8:25 – 11:25

## **Weather:**

The air temperature around 8°C end 16°C cloudy,

Wind speed approx. (4-6 m/s) No precipitation

## ***Primary species not found***

Table 119. Secondary and other species (VP 7), 25.04.2021

No	Latin names	English names	Amount	Flight altitude
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	4	0-15
2.	<i>Oenanthe isabellina</i>	Isabelline wheatear	2	0-3
3.	<i>Oenanthe oenanthe</i>	Northern Wheatear	1	0-3
4.	<i>Hirundo rustica</i>	Barn swallow	3	3-8

## VP.2

Date: 27.04.2021. Start and end time: 8:25 – 11:25

### **Weather:**

The air temperature around 8°C end 16°C is sunny

Wind speed approx. (4-5 m/s) No precipitation

### ***Primary species not found***

Table 120. Secondary and other species (VP 2), 27.04.2021

No	Latin names	English names	Amount	Flight altitude
<b>SECONDARY SPECIES</b>				
1.	<i>Circus aeruginosus</i>	Eurasian Marsh-Harrier	2	5-25
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	16	0-15
2.	<i>Oenanthe isabellina</i>	Isabelline wheatear	6	0-3
3.	<i>Athene noctua</i>	Little Owl	1	0-5
4.	<i>Oenanthe oenanthe</i>	Northern Wheatear	3	0-3
5.	<i>Hirundo rustica</i>	Barn swallow	6	3-8
6.	<i>Ardea purpurea</i>	Purple Heron	1	30

**VP. 1**

Date: 27.04.2021. Start and end time: 13:09 – 16:11

**Weather:**

The air temperature around 26°C end 16°C is sunny,

Wind speed approx. (3-4 m/s) No precipitation

***Primary species not found***

Table 121. Secondary and other species (VP 1), 27.04.2021

No	Latin names	English names	Amount	Flight altitude
<b>SECONDARY SPECIES</b>				
1	<i>Buteo buteo</i>	Common Buzzard	1	10-65
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested Lark	12	0-5
2.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	12	0-6
3.	<i>Oenanthe isabellina</i>	Isabelline wheatear	2	0-6
4.	<i>Oenanthe finschii</i>	Black-necked Wheatear	2	0-3
5.	<i>Pterocles orientalis</i>	Black-bellied sandgrouse	4	0-5
6.	<i>Hirundo rustica</i>	Barn swallow	2	3-8
7.	<i>Oenanthe oenanthe</i>	Northern Wheatear	1	1-3
8.	<i>Apus apus</i>	Northern Swift	2	3-8

**VP. 9**

Date: 28.04.2021 Start and end time: 8:17 – 11:18

**Weather:**

The air temperature around 10°C end 18°C is sunny,

Wind speed approx. (3-5 m/s) No precipitation

**Primary species not found**

Table 122. Secondary and other species (VP 9), 28.04.2021.

No	Latin names	English names	Amount	Flight altitude
<b>SECONDARY SPECIES</b>				
1	<i>Buteo rufinus</i>	Long-legged Buzzard	1	15-35
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested Lark	6	0-5
2.	<i>Merops persicus</i>	Blue-cheeked Bee-eater	5	3-8
3.	<i>Rhodospiza obsoleta</i>	Black-billed Desert Finch	3	3-6
4.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	3	0-2
5.	<i>Oenanthe isabellina</i>	Isabelline wheatear	3	0-3
6.	<i>Oenanthe finschii</i>	Black-necked Wheatear	1	0-3
7.	<i>Columba livia</i>	Rock Dove	6	5-20
8.	<i>Lanius pallidirostris</i>	Southern grey shrike	1	2-4



**VP. 10**

Date: 28.04.2021. Start and end time: 13:03 – 16:06

**Weather:**

The air temperature around 28 end 15°C is sunny,  
Wind speed approx. (3-5 m/s) No precipitation

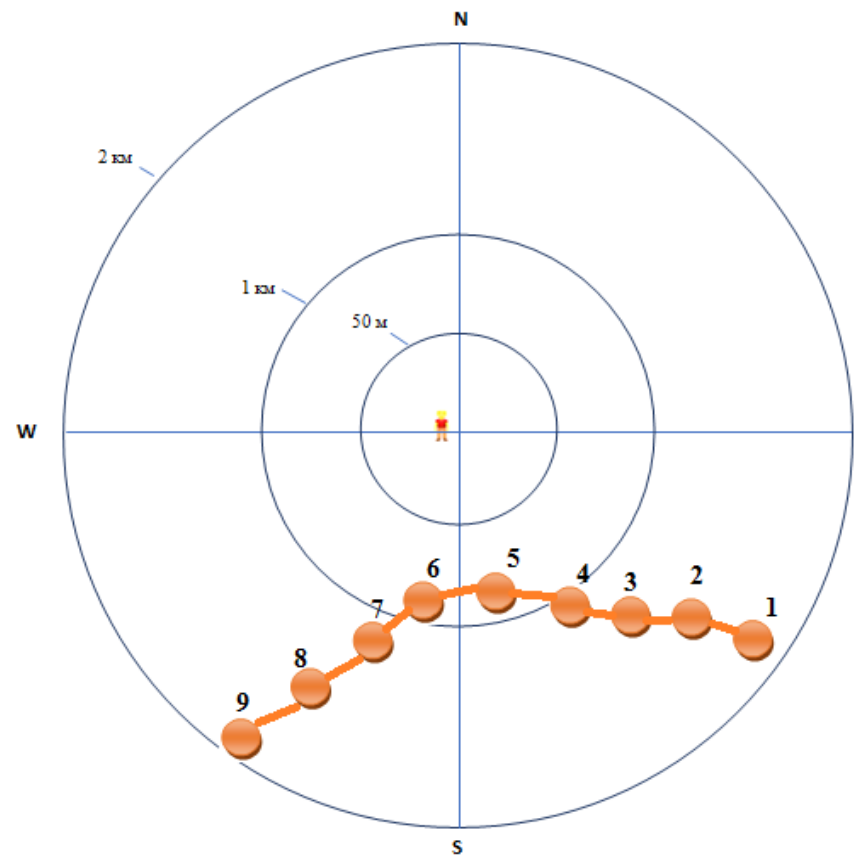


Fig.30 Flight path (VP 10), 28.04.2021

Table 123. Target species log (VP 10), 28.04.2021.


	<i>Neophron percnopterus</i>	1 50 m	2 70 m	3 95 m	4 110 m	5 115 m	6 135 m	7 135 m	8 150 m	9 155 m
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Table 124. Secondary and other species (VP 10), 28.04.2021.

No	Latin names	English names	Amount	Flight altitude
<b>SECONDARY SPECIES</b>				
1.	<i>Falco tinnunculus</i>	Kestrel	2	0-15
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	7	0-15
2.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	2	0-3
3.	<i>Hirundo rustica</i>	Barn swallow	3	3-8
4.	<i>Motacilla personata</i>	Masked wagtail	2	0
5.	<i>Corvus monedula</i>	Jackdaw	3	4-10
6.	<i>Apus apus</i>	Northern Swift	4	2-6

# VP. 5

Date: 29.04.2021. Start and end time: 8:12 – 11:13

## **Weather:**

The air temperature around 10°C end 19°C is sunny

Wind speed approx. (4-5 m/s) No precipitation

## **Primary species not found**

Table 125. Secondary and other species (VP 5), 29.04.2021.

No	Latin names	English names	Amount	Flight altitude
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	6	0-5
2.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	13	0-5
3.	<i>Hirundo rustica</i>	Barn swallow	5	3-6
4.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	2	0-3
5.	<i>Lanius pallidirostris</i>	Southern grey shrike	1	3-5

# VP.6

Date: 29.04.2021. Start and end time: 12:23 – 15:25

## **Weather:**

The air temperature around 26°C end 23°C is sunny

Wind speed approx. (4-5 m/s) No precipitation

## **Primary species not found**

Table 126. Secondary and other species (VP 6), 29.04.2021

No	Latin names	English names	Amount	Flight altitude
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	9	0-10
2.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	2	0-3
3.	<i>Oenanthe finschii</i>	Black-necked Wheatear	1	0-5
4.	<i>Pterocles orientalis</i>	Black-bellied sandgrouse	3	0-8
5.	<i>Hirundo daurica</i>	Red-rumped Swallow	5	3-10
6.	<i>Passer montanus</i>	Tree sparrow	4	0-4
7.	<i>Hirundo rustica</i>	Barn swallow	3	5-8
8.	<i>Corvus corax</i>	Northern Raven	2	0-4

**VP. 3**

Date: 30.04.2021. Start and end time: 8:12 – 11:16

**Weather:**

The air temperature around 10°C end 19 °C is sunny

Wind speed approx. (4-5 m/s) No precipitation

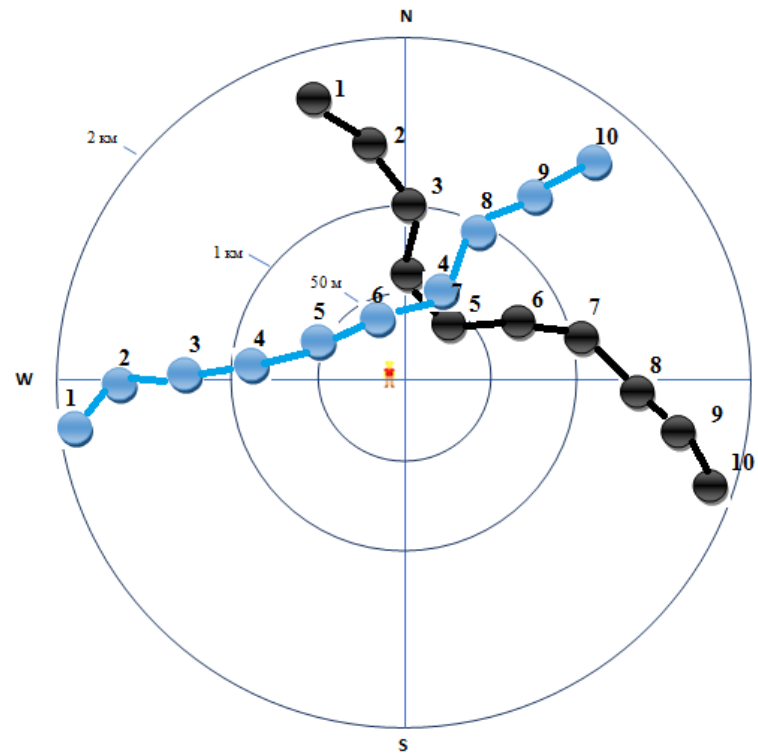


Fig.31 Flight path (VP 3), 30.06.2021

Table 127. Target species log (VP 3), 30.04.2021.



	<i>Aegypius monachus</i>	1 190 m	2 190 m	3 195 m	4 190 m	5 195 m	6 195 m	7 195 m	8 200 m	9 205 m	10 200 m
	<i>Aquila chrysaetos</i>	1 130 m	2 120 m	3 125 m	4 120 m	5 125 m	6 125 m	7 155 m	8 140 m	9 145 m	10 140 m

Table 128. Secondary and other species (VP 3), 30.04.2021

№	Latin names	English names	Amount	Flight altitude
<b>SECONDARY SPECIES</b>				
1,	<i>Falco tinnunculus</i>	Common Kestrel	1	0-25
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	7	0-15
2.	<i>Oenanthe isabellina</i>	Isabelline wheatear	2	0-3
3.	<i>Athene noctua</i>	Little Owl	1	0-5
4.	<i>Merops persicus</i>	Blue-cheeked Bee-eater	9	3-8
5.	<i>Hirundo rustica</i>	Barn swallow	2	3-5
6.	<i>Lanius minor</i>	Lesser Grey Shrike	1	1-4

# VP. 4

Date: 30.04.2021. Start and end time: 13:12 – 16:16

## **Weather:**

The air temperature around 28°C end 19 °C is sunny

Wind speed approx. (4-5 m/s) No precipitation

## **Primary species not found**

Table 129. Secondary and other species (VP 4), 30.04.2021

No	Latin names	English names	Amount	Flight altitude
<b>SECONDARY SPECIES</b>				
1.	<i>Falco tinnunculus</i>	Common Kestrel	1	0-25
2.	<i>Milvus migrans</i>	BlackKite	2	15-35
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	7	0-15
2.	<i>Oenanthe isabellina</i>	Isabelline wheatear	2	0-3
3.	<i>Hirundo daurica</i>	Red-rumped Swallow	3	3-8
4.	<i>Merops apiaster</i>	European bee-eater	6	5-15
5.	<i>Lanius minor</i>	Lesser Grey Shrike	1	1-3
6.	<i>Apus apus</i>	Northern Swift	2	4-9
7.	<i>Hirundo rustica</i>	Barn swallow	2	3-5

## VP survey results in May

### VP. 7

Date: 02.05.2021 Start and end time: 8:35 – 11:37

#### **Weather:**

The air temperature around 9°C end 16°C partly cloudy

Wind speed approx. (4-6 m/s) No precipitation

**Primary species not found**

Table 130. Secondary and other species (VP 7), 02.05.2021.

No	Latin names	English names	Amount	Flight altitude
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	2	0-8
2.	<i>Oenanthe finschii</i>	Black-necked Wheatear	1	0-3
3.	<i>Apus apus</i>	Northern Swift	3	6-15
4.	<i>Oenanthe pleschanka</i>	Pied Wheatear	2	0-4
5.	<i>Scotocerca inquieta</i>	Streaked Scrub Warbler	1	0-1
6.	<i>Merops apiaster</i>	European bee-eater	2	15-20
7.	<i>Hirundo daurica</i>	Red-rumped Swallow	3	0-6
8.	<i>Merops persicus</i>	Blue-cheeked Bee-eater	12	3-15



**VP.8**

Date: 02.05.2021. Start and end time: 13:09 – 16:10

**Weather:**

The air temperature around 29°C end 18°C partly cloudy

Wind speed approx. (4-6 m/s) No precipitation

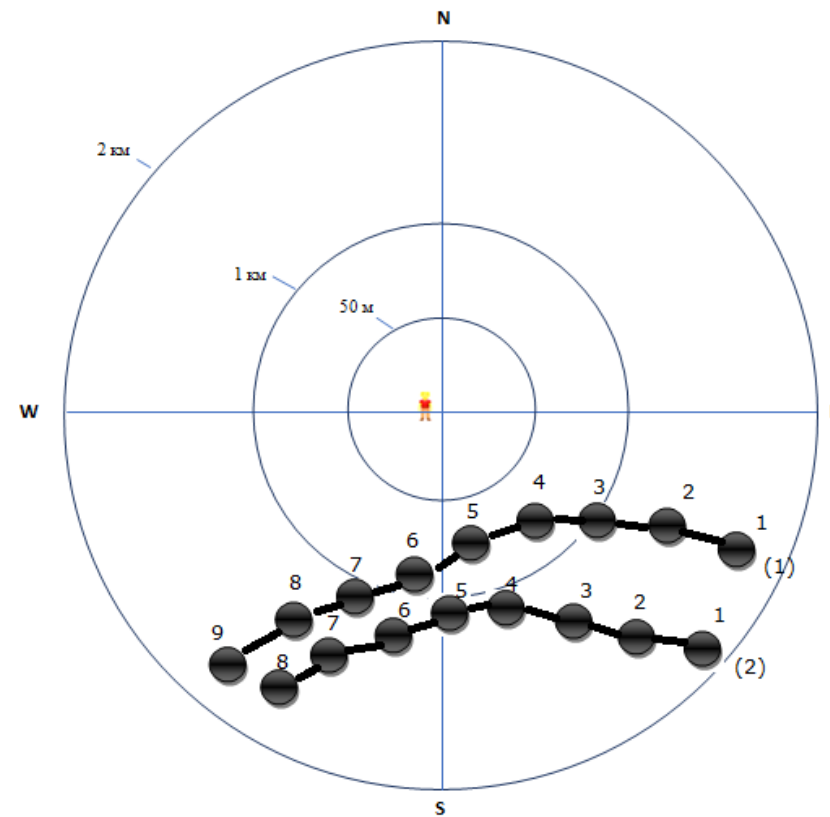


Fig.32 Flight path (VP 8), 02.05.2021

Table 131. Target species log (VP 8), 02.05.2021.



	<i>Aquila chrysaetos</i> (1)	1 120 m	2 130 m	3 125 m	4 80 m	5 85 m	6 165 m	7 175 m	8 170 m	9 170 m
	<i>Aquila chrysaetos</i> (2)	1 120 m	2 130 m	3 125 m	4 80 m	5 85 m	6 165 m	7 175 m	8 170 m	

Table 132. Secondary and other species (VP 8), 02.05.2021

№	Latin names	English names	Amount	Flight altitude
<b>SECONDARY SPECIES</b>				
1.	<i>Falco tinnunculus</i>	Common Kestrel	1	10-25
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	3	0-3
2.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	9	0-5
3.	<i>Oenanthe isabellina</i>	Isabelline wheatear	6	0-3
4.	<i>Merops persicus</i>	Blue-cheeked Bee-eater	6	5-20
5.	<i>Lanius pallidirostris</i>	Southern grey shrike	1	2-5

**VP. 10**

Date: 03.05.2021. Start and end time: 9:02 – 12:06

**Weather:**

The air temperature around 10°C end 18°C partly cloudy

Wind speed approx. (5-6 m/s) No precipitation

**Primary species not found**

Table 133. Secondary and other species (VP 10), 03.05.2021.

No	Latin names	English names	Amount	Flight altitude
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	5	0-15
2.	<i>Passer indicus</i>	Indian House Sparrow	26	1-4
3.	<i>Oenanthe isabellina</i>	Isabelline wheatear	2	0-3
4.	<i>Pterocles orientalis</i>	Black-bellied sandgrouse	5	0-15
5.	<i>Motacilla citreola</i>	Citrine Wagtail	3	0
6.	<i>Motacilla alba</i>	White Wagtail	2	0-3
7.	<i>Columba livia</i>	Rock Dove	8	12-15
8.	<i>Hirundo rustica</i>	Barn swallow	6	3-8
9.	<i>Merops persicus</i>	Blue-cheeked Bee-eater	16	5-15
10.	<i>Anas crecca</i>	Green-winged teal	6	15-35

**VP. 9**

Date: 03.05.2021. Start and end time: 13:13 – 16:15

**Weather:**

The air temperature around 28°C end 18°C sky half cloudy

Wind speed approx. (4-6 m/s) No precipitation

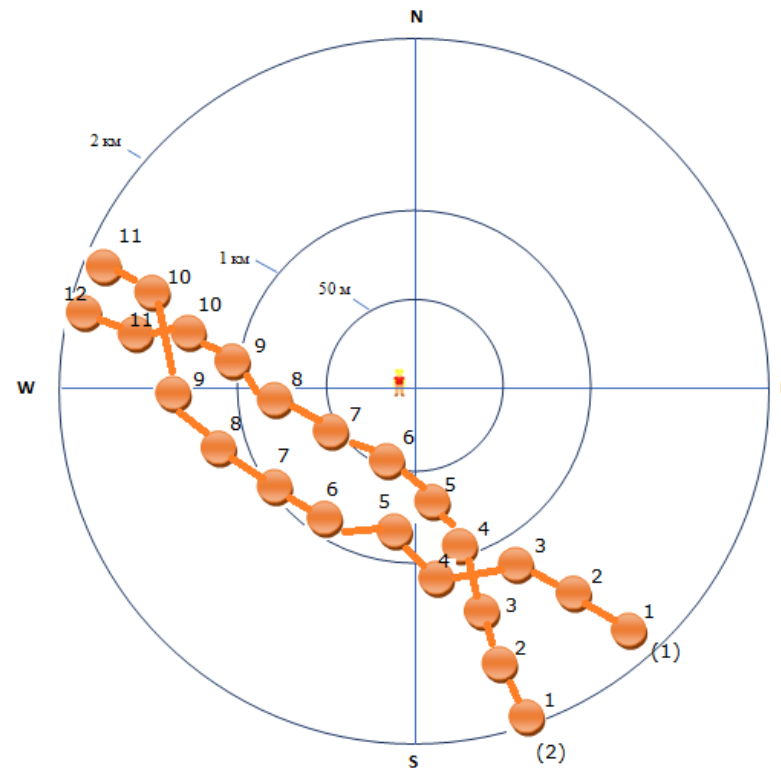


Fig.33 Flight path (VP 9), 03.05.2021

Table 134. Target species log (VP 9), 03.05.2021.



	<i>Neophron percnopterus</i> (1)	1 80 m	2 90 m	3 80 m	4 80 m	5 95 m	6 85 m	7 85 m	8 80 m	9 85 m	10 90 m	11 75 m	
	<i>Neophron percnopterus</i> (2)	1 60 m	2 90 m	3 95 m	4 90 m	5 95 m	6 85 m	7 90 m	8 80 m	9 85 m	10 90 m	11 90 m	12 90 m

Table 135. Secondary and other species (VP 9), 03.05.2021.

No	Latin names	English names	Amount	Flight altitude
<b>SECONDARY SPECIES</b>				
1.	<i>Falco tinnunculus</i>	Common Kestrel	3	10-25
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	3	0-15
2.	<i>Oenanthe isabellina</i>	Isabelline wheatear	5	0-3
3.	<i>Merops persicus</i>	Blue-cheeked Bee-eater	12	5-20
4.	<i>Hirundo rustica</i>	Barn swallow	8	5-15
5.	<i>Scotocerca inquieta</i>	Streaked Scrub Warbler	1	1-2
6.	<i>Pterocles orientalis</i>	Black-bellied sandgrouse	2	0-5

**VP. 5**

Date: 04.05.2021 Start and end time: 8:26 – 11:27

**Weather:**

The air temperature around 8°C end 16°C partly cloudy

Wind speed approx. (5-6 m/s) No precipitation

**Primary species not found**

Table 136. Secondary and other species (VP 5), 04.05.2021.

No	Latin names	English names	Amount	Flight altitude
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	5	0-8
2.	<i>Upupa epops</i>	Hoopoe	2	0-3
3.	<i>Columba livia</i>	Rock Dove	9	40
4.	<i>Oenanthe finschii</i>	Black-necked Wheatear	4	0-3
5.	<i>Merops persicus</i>	Blue-cheeked Bee-eater	2	12-15
6.	<i>Apus apus</i>	Northern Swift	4	6-15
7.	<i>Rhodospiza obsoleta</i>	Black-billed Desert Finch	5	0-6
8.	<i>Lanius minor</i>	Lesser Grey Shrike	1	1-3
9.	<i>Coracias garrulus</i>	Eurasian Roller	3	5-15

**VP.6**

Date: 04.05.2021. Start and end time: 13:02 – 16:02

**Weather:**

The air temperature around 29°C end 19°C partly cloudy

Wind speed approx. (4-6 m/s) No precipitation

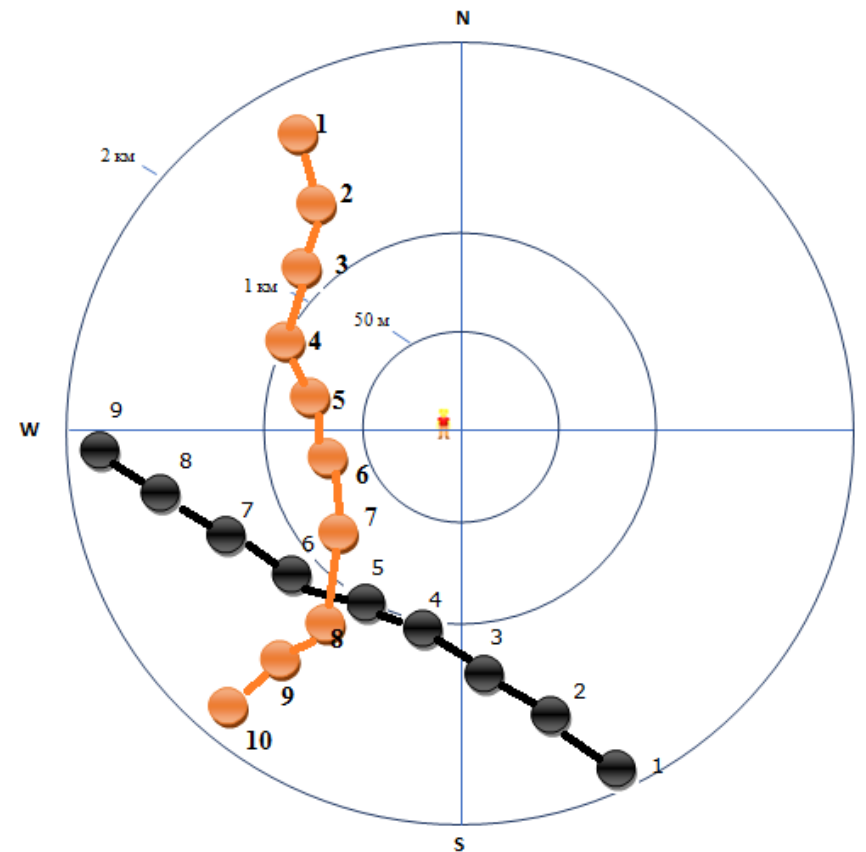


Fig.34 Flight path (VP 6), 04.05.2021

Table 137. Target species log (VP 6), 04.05.2021.



	<i>Neophron percnopterus</i>	1 90 m	2 90 m	3 95 m	4 90 m	5 85 m	6 65 m	7 75 m	8 70 m	9 70 m	10 90 m
	<i>Aquila chrysaetos</i>	1 120 m	2 130 m	3 135 m	4 130 m	5 135 m	6 135 m	7 135 m	8 130 m	9 130 m	

Table 138. Secondary and other species (VP 6), 04.05.2021

No	Latin names	English names	Amount	Flight altitude
<b>SECONDARY SPECIES</b>				
1.	<i>Falco tinnunculus</i>	Common Kestrel	2	0-15
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	5	0-15
2.	<i>Streptopelia decaocto</i>	Collared Turtle Dove	2	0-3
3.	<i>Oenanthe isabellina</i>	Isabelline wheatear	2	0-3
4.	<i>Upupa epops</i>	Hoopoe	1	0-3
5.	<i>Passer indicus</i>	Indish sparrow	5	0-5
6.	<i>Hirundo rustica</i>	Barn swallow	6	3-6
7.	<i>Hirundo daurica</i>	Red-rumped Swallow	3	5-15
8.	<i>Motacilla alba</i>	White Wagtail	1	0
9.	<i>Calandrella brachydactyla</i>	Short-toed lark	25	0-5



**VP. 1**

Date: 05.05.2021. Start and end time: 8:12 – 11:12

**Weather:**

The air temperature around 11°C end 19°C partly cloudy

Wind speed approx. (5-6 m/s) No precipitation

**Primary species not found**

Table 139. Secondary and other species (VP 1),05.05.2021.

No	Latin names	English names	Amount	Flight altitude
<b>SECONDARY SPECIES</b>				
1.	<i>Circus cyaneus</i>	Hen Harrier	1	10-25
2.	<i>Circus aeruginosus</i>	Eurasian Marsh-Harrier	1	15-25
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	8	0-15
2.	<i>Oenanthe isabellina</i>	Isabelline wheatear	1	0-3
3.	<i>Merops apiaster</i>	European bee-eater	6	3-12
4.	<i>Coracias garrulus</i>	Eurasian Roller	1	0-12
5.	<i>Athene noctua</i>	Little Owl	2	0-5
6.	<i>Oenanthe oenanthe</i>	Northern Wheatear	4	0-3
7.	<i>Ardea cinerea</i>	Grey Heron	2	25-35
8.	<i>Merops persicus</i>	Blue-cheeked Bee-eater	6	3-9

**VP.2**

Date: 05.05.2021. Start and end time: 13:06 – 16:09

**Weather:**

The air temperature around 30°C end 21°C partly cloudy

Wind speed approx. (4-5 m/s) No precipitation

***Primary species not found***

Table 140. Secondary and other species (VP 2), 05.05.2021

No	Latin names	English names	Amount	Flight altitude
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	6	0-5
2.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	2	0-4
3.	<i>Acridotheres tristis</i>	Indian Myna	2	15
4.	<i>Oenanthe oenanthe</i>	Northern Wheatear	6	0-3
5.	<i>Coracias garrulus</i>	Eurasian Roller	2	5-6
6.	<i>Pterocles orientalis</i>	Black-bellied sandgrouse	6	0-12
7.	<i>Motacilla personata</i>	Pied Wagtail	3	0-3
8.	<i>Passer indicus</i>	Indish sparrow	8	0-3
9.	<i>Lanius pallidirostris</i>	Steppe Grey Shrike shrike	2	3-5
10.	<i>Larus cachinnans</i>	Yellow-legged Gull	2	20-50

**VP. 3**

Date: 06.05.2021. Start and end time: 8:15 – 11:18

**Weather:**

The air temperature around 8 end 17°C partly cloudy,  
Wind speed approx. (5-6 m/s) No precipitation

***Primary species not found***

Table 141. Secondary and other species (VP 3), 06.05.2021

No	Latin names	English names	Amount	Flight altitude
<b>SECONDARY SPECIES</b>				
1	<i>Buteo rufinus</i>	Long-legged Buzzard	2	35-75
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested Lark	4	0-5
2.	<i>Hirundo rustica</i>	Barn swallow	5	3-8
3.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	10	0-6
4.	<i>Alauda arvensis</i>	Skylark	5	0-2
5.	<i>Oenanthe isabellina</i>	Isabelline wheatear	4	0-6
6.	<i>Hirundo daurica</i>	Red-rumped Swallow	4	3-8
7.	<i>Oenanthe finschii</i>	Black-necked Wheatear	1	0-3
8.	<i>Columba livia</i>	Rock Dove	6	3-16
9.	<i>Upupa epops</i>	Hoopoe	1	0

**VP. 4**

Date: 06.05.2021. Start and end time: 13:18 – 16:20

**Weather:**

The air temperature around 28°C end 19°C partly cloudy

Wind speed approx. (3-4 m/s) No precipitation

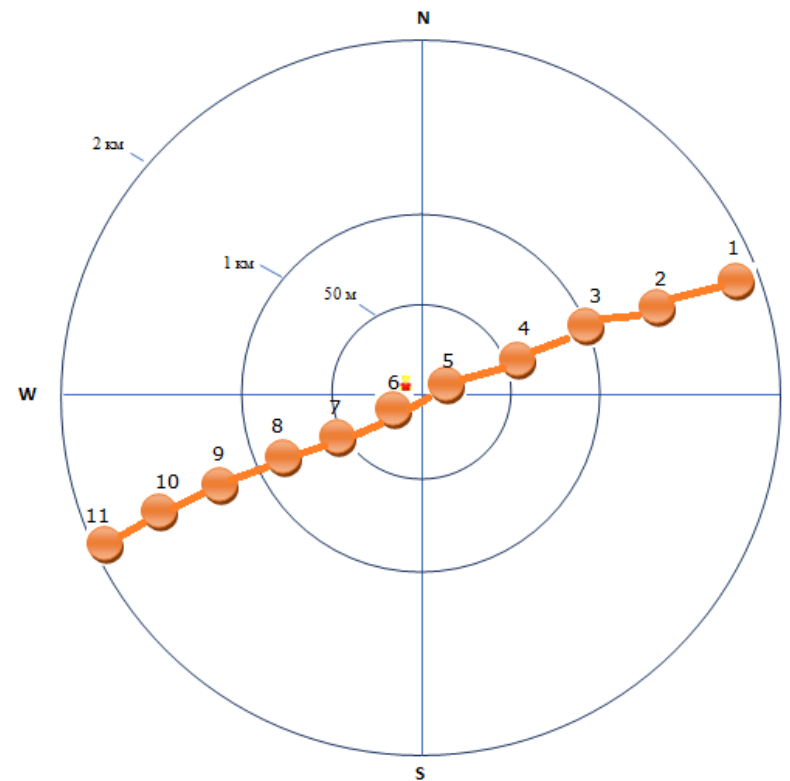


Fig.35 Flight path (VP 4), 06.05.2021

Table 142. Target species log (VP 4), 06.05.2021.


	<i>Neophron percnopterus</i>	1 50 m	2 50 m	3 65 m	4 60 m	5 75 m	6 85 m	7 95 m	8 90 m	9 95 m	10 50 m	11 50 m
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Table 143. Secondary and other species (VP 4), 06.05.2021.

No	Latin names	English names	Amount	Flight altitude
<b>OTHER SPECIES</b>				
1.	<i>Pterocles orientalis</i>	Black-bellied sandgrouse	2	0-5
2.	<i>Galerida cristata</i>	Crested lark	6	0-6
3.	<i>Oenanthe finschii</i>	Black-necked Wheatear	1	0-3
4.	<i>Oenanthe oenanthe</i>	Northern Wheatear	6	0-6
5.	<i>Hirundo rustica</i>	Barn swallow	9	5-15
6.	<i>Merops apiaster</i>	European bee-eater	16	5-25
7.	<i>Rhodospiza obsoleta</i>	Black-billed Desert Finch	12	0-8

**VP. 7**

Date: 07.05.2021 Start and end time: 8:17 – 11:18

**Weather:**

The air temperature around 9 °C end 19 °C is sunny,

Wind speed approx. (4-5 m/s) No precipitation

***Primary species not found***

Table 144. Secondary and other species (VP 7), 07.05.2021.

<b>№</b>	<b>Latin names</b>	<b>English names</b>	<b>Amount</b>	<b>Flight altitude</b>
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested Lark	9	0-5
2.	<i>Passer indicus</i>	Indian House Sparrow	8	1-4
3.	<i>Rhodospiza obsoleta</i>	Black-billed Desert Finch	2	3-6
4.	<i>Merops persicus</i>	Blue-cheeked Bee-eater	12	3-8
5.	<i>Oenanthe isabellina</i>	Isabelline wheatear	2	0-3
6.	<i>Oenanthe finschii</i>	Black-necked Wheatear	2	0-3
7.	<i>Columba livia</i>	Rock Dove	6	5-20

**VP. 8**

Date: 07.05.2021. Start and end time: 13:03 – 16:06

**Weather:**

The air temperature around 30°C end 23°C is sunny,  
Wind speed approx. (3-5 m/s) No precipitation

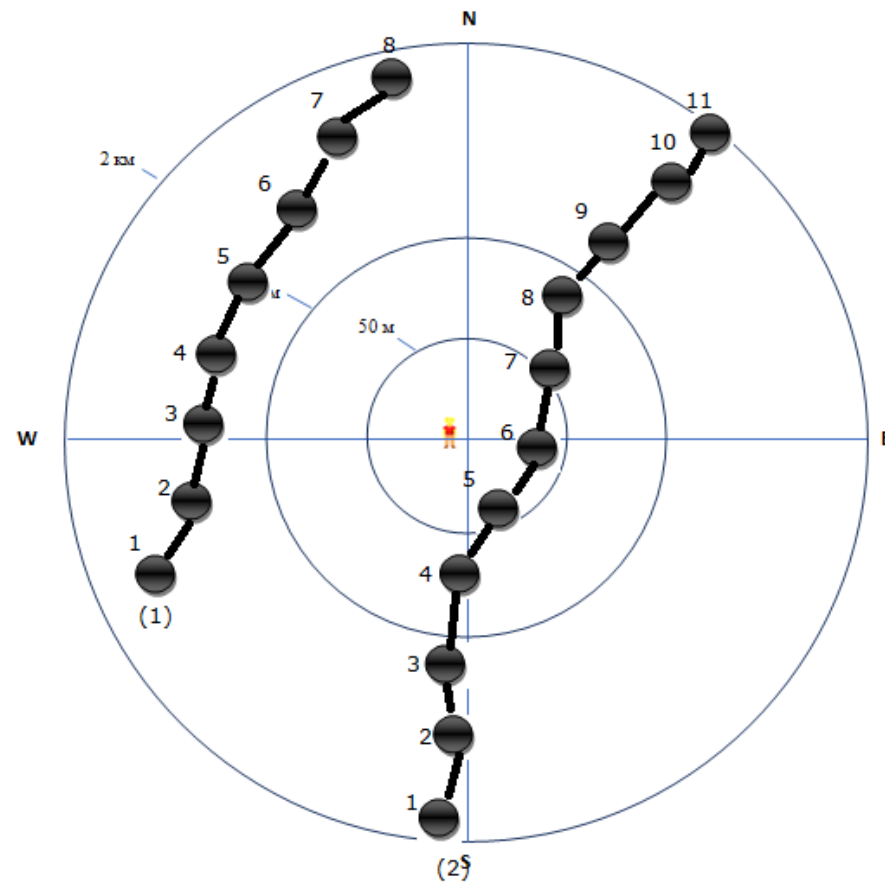


Fig.36 Flight path (VP 8), 07.05.2021

Table 145. Target species log (VP 8), 07.05.2021.



	<i>Aquila chrysaetos</i> (1)	1 130 m	2 130 m	3 135 m	4 110 m	5 115 m	6 135 m	7 135 m	8 150 m			
	<i>Aquila chrysaetos</i> (2)	1 150 m	2 170 m	3 195 m	4 190 m	5 195 m	6 185 m	7 185 m	8 190 m	9 185 m	10 190 m	11 180 m

Table 146. Secondary and other species (VP 8), 07.05.2021.

No	Latin names	English names	Amount	Flight altitude
<b>SECONDARY SPECIES</b>				
1.	<i>Falco tinnunculus</i>	Kestrel	1	0-25
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	3	0-15
2.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	6	0-5
3.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	5	0-3
4.	<i>Hirundo rustica</i>	Barn swallow	2	3-8
5.	<i>Merops persicus</i>	Blue-cheeked Bee-eater	3	5-15
6.	<i>Muscicapa striata</i>	Spotted Flycatcher	1	0
7.	<i>Apus apus</i>	Northern Swift	1	2-6



**VP. 10**

Date: 08.05.2021. Start and end time: 9:03 – 12:06

**Weather:**

The air temperature around 9°C end 19°C is sunny,

Wind speed approx. (3-5 m/s) No precipitation

***Primary species not found***

Table 147. Secondary and other species (VP 10), 08.05.2021.

<b>№</b>	<b>Latin names</b>	<b>English names</b>	<b>Amount</b>	<b>Flight altitude</b>
<b>SECONDARY SPECIES</b>				
1.	<i>Falco tinnunculus</i>	Kestrel	1	10-35
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	5	0-15
2.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	2	0-3
3.	<i>Hirundo rustica</i>	Barn swallow	2	3-8
4.	<i>Merops persicus</i>	Blue-cheeked Bee-eater	4	5-15
5.	<i>Muscicapa striata</i>	Spotted Flycatcher	2	0

**VP. 9**

Date: 08.05.2021. Start and end time: 13:12 – 16:13

**Weather:**

The air temperature around 30°C end 23°C is sunny

Wind speed approx. (4-6 m/s) No precipitation

**Primary species not found**

Table 148. Secondary and other species (VP 9), 08.05.2021.

No	Latin names	English names	Amount	Flight altitude
<b>SECONDARY SPECIES</b>				
1.	<i>Circus cyaneus</i>	Hen Harrier	1	15-25
2.	<i>Buteo buteo</i>	Common Buzzard	1	25-35
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	3	0-5
2.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	10	0-5
3.	<i>Alauda arvensis</i>	Skylark	3	1-3
4.	<i>Athene noctua</i>	Little Owl	1	0-3
5.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	1	0-3
6.	<i>Merops apiaster</i>	European bee-eater	8	5-25
7.	<i>Lanius minor</i>	Lesser Grey Shrike	1	0-3
8.	<i>Lanius pallidirostris</i>	Steppe Grey Shrike shrike	1	3-5

# VP.6

Date: 10.05.2021. Start and end time: 9:12 – 12:12

## **Weather:**

The air temperature around 8°C end 16°C is sunny

Wind speed approx. (4-5 m/s) No precipitation

## **Primary species not found**

Table 149. Secondary and other species (VP 6), 10.05.2021

No	Latin names	English names	Amount	Flight altitude
<b>SECONDARY SPECIES</b>				
1.	<i>Buteo buteo</i>	Common Buzzard	1	20-45
<b>OTHER SPECIES</b>				
1.	<i>Lanius excubitor</i>	Great (Gray) Shrike	1	2-4
2.	<i>Galerida cristata</i>	Crested lark	5	0-10
3.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	3	0-3
4.	<i>Rhodospiza obsoleta</i>	Black-billed Desert Finch	4	0-6
5.	<i>Pterocles orientalis</i>	Black-bellied sandgrouse	2	0-8
6.	<i>Hirundo daurica</i>	Red-rumped Swallow	6	3-10
7.	<i>Hirundo rustica</i>	Barn swallow	2	5-8

**VP. 5**

Date: 10.05.2021. Start and end time: 13:12 – 16:16

**Weather:**

The air temperature around 28°C end 21°C is sunny

Wind speed approx. (4-5 m/s) No precipitation

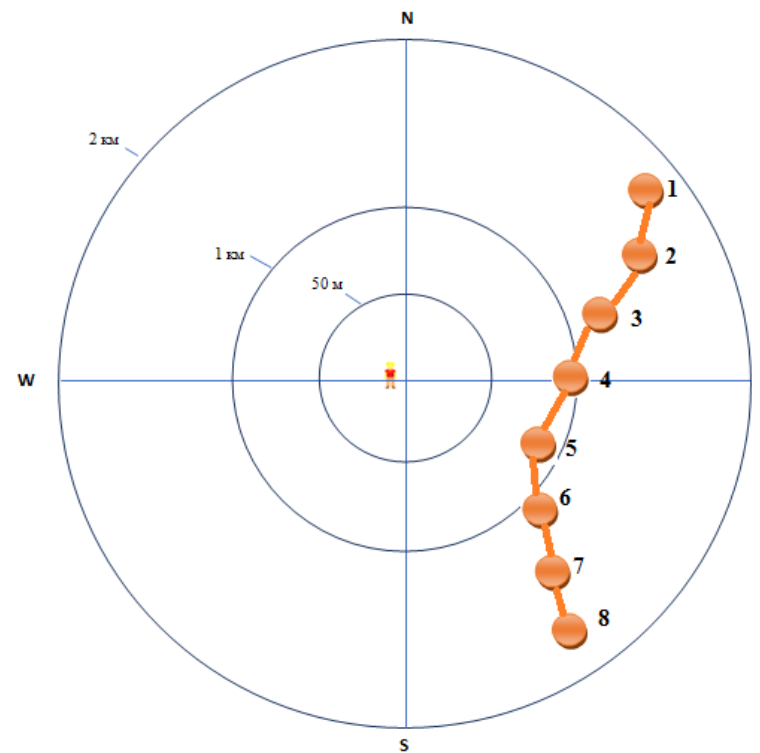


Fig.37 Flight path (VP 5), 10.05.2021

Table 150. Target species log (VP 5), 10.05.2021.


	<i>Neophron percnopterus</i>	1 60 m	2 60 m	3 65 m	4 60 m	5 75 m	6 75 m	7 85 m	8 90 m
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Table 151. Secondary and other species (VP 5), 10.05.2021

№	Latin names	English names	Amount	Flight altitude
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	3	0-15
2.	<i>Oenanthe isabellina</i>	Isabelline wheatear	4	0-3
3.	<i>Athene noctua</i>	Little Owl	1	0-5
4.	<i>Lanius excubitor</i>	Great (Gray) Shrike	1	0-3
5.	<i>Merops persicus</i>	Blue-cheeked Bee-eater	3	5-15
6.	<i>Hirundo rustica</i>	Barn swallow	2	3-5
7.	<i>Lanius minor</i>	Lesser Grey Shrike	1	1-4

**VP. 1**

Date: 11.05.2021 Start and end time: 8:17 – 11:18

**Weather:**

The air temperature around 9°C end 18°C is sunny

Wind speed approx. (4-5 m/s) No precipitation

***Primary species not found***

Table 152. Secondary and other species (VP 1), 11.05.2021.

<b>№</b>	<b>Latin names</b>	<b>English names</b>	<b>Amount</b>	<b>Flight altitude</b>
<b>SECONDARY SPECIES</b>				
1	<i>Buteo buteo</i>	Common Buzzard	1	15-45
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested Lark	5	0-5
2.	<i>Rhodospiza obsoleta</i>	Black-billed Desert Finch	2	0-6
3.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	6	0-2
4.	<i>Oenanthe isabellina</i>	Isabelline wheatear	2	0-3
5.	<i>Hirundo rustica</i>	Barn swallow	6	3-6
6.	<i>Merops persicus</i>	Blue-cheeked Bee-eater	3	5-15

**VP. 2**

Date: 11.05.2021. Start and end time: 13:12 – 16:13

**Weather:**

The air temperature around 26°C end 19°C is sunny

Wind speed approx. (4-5 m/s) No precipitation

***Primary species not found***

Table 153. Secondary and other species (VP 2), 11.05.2021.

No	Latin names	English names	Amount	Flight altitude
<b>SECONDARY SPECIES</b>				
1.	<i>Circus cyaneus</i>	Hen Harrier	1	10-25
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	3	0-5
2.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	6	0-5
3.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	1	0-3
4.	<i>Hirundo rustica</i>	Barn swallow	6	3-8
5.	<i>Anas crecca</i>	Green-winged Teal	4	5-15
6.	<i>Lanius pallidirostris</i>	Steppe Grey Shrike shrike	1	3-5

### VP.3

Date: 12.05.2021. Start and end time: 8:12 – 11:12

#### **Weather:**

The air temperature around 8°C end 19°C is sunny

Wind speed approx. (4-5 m/s) No precipitation

#### ***Primary species not found***

Table 154. Secondary and other species (VP 3), 12.05.2021

No	Latin names	English names	Amount	Flight altitude
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	4	0-5
2.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	1	0-3
3.	<i>Oenanthe finschii</i>	Black-necked Wheatear	1	0-5
4.	<i>Columba livia</i>	Rock Dove	4	12
5.	<i>Pterocles orientalis</i>	Black-bellied sandgrouse	3	0-8
6.	<i>Hirundo daurica</i>	Red-rumped Swallow	2	3-10
7.	<i>Hirundo rustica</i>	Barn swallow	1	5-8



**VP. 4**

Date: 12.05.2021. Start and end time: 13:12 – 16:16

**Weather:**

The air temperature around 28°C end 22 °C is sunny

Wind speed approx. (4-5 m/s) No precipitation

***Primary species not found***

Table 155. Secondary and other species (VP 4), 12.05.2021

<b>№</b>	<b>Latin names</b>	<b>English names</b>	<b>Amount</b>	<b>Flight altitude</b>
<b>SECONDARY SPECIES</b>				
1.	<i>Falco tinnunculus</i>	Common Kestrel	2	10-25
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	3	0-5
2.	<i>Oenanthe isabellina</i>	Isabelline wheatear	1	0-3
3.	<i>Athene noctua</i>	Little Owl	2	0-5
4.	<i>Lanius pallidirostris</i>	Steppe Grey Shrike shrike	1	0-4
5.	<i>Hirundo rustica</i>	Barn swallow	3	3-5

**VP. 8**

Date: 13.05.2021 Start and end time: 8:17 – 11:18

**Weather:**

The air temperature around 9°C end 20°C is sunny,

Wind speed approx. (5-6 m/s) No precipitation

***Primary species not found***

Table 156. Secondary and other species (VP 8), 13.05.2021.

<b>№</b>	<b>Latin names</b>	<b>English names</b>	<b>Amount</b>	<b>Flight altitude</b>
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested Lark	3	0-5
2.	<i>Lanius minor</i>	Lesser Grey Shrike	1	2-5
3.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	6	0-2
4.	<i>Oenanthe isabellina</i>	Isabelline wheatear	1	0-3
5.	<i>Hirundo rustica</i>	Barn swallow	3	3-6
6.	<i>Merops persicus</i>	Blue-cheeked Bee-eater	6	5-15

# VP. 7

Date: 13.05.2021. Start and end time: 13:02 – 16:02

## **Weather:**

The air temperature around 28°C end 21 °C is sunny

Wind speed approx. (4-5 m/s) No precipitation

## **Primary species not found**

Table 157. Secondary and other species (VP 7), 13.05.2021

No	Latin names	English names	Amount	Flight altitude
<b>SECONDARY SPECIES</b>				
1.	<i>Falco tinnunculus</i>	Common Kestrel	1	0-25
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	4	0-15
2.	<i>Oenanthe isabellina</i>	Isabelline wheatear	3	0-3
3.	<i>Athene noctua</i>	Little Owl	2	0-3
4.	<i>Corvus corax</i>	Northern Raven	2	0-15
5.	<i>Lanius excubitor</i>	Great (Gray) Shrike	1	0-3
6.	<i>Oenanthe finschii</i>	Black-necked Wheatear	2	0-3

**VP. 5**

Date: 14.05.2021 Start and end time: 8:45 – 11:47

**Weather:**

The air temperature around 10°C end 20°C partly cloudy,

Wind speed approx. (4-5 m/s) No precipitation

**Primary species not found**

Table 158. Secondary and other species (VP 5), 14.05.2021.

<b>№</b>	<b>Latin names</b>	<b>English names</b>	<b>Amount</b>	<b>Flight altitude</b>
		<b>SECONDARY SPECIES</b>		
1.	<i>Buteo rufinus</i>	Long-legged Buzzard	1	25-45
2.	<i>Circus cyaneus</i>	Hen (Northern) Harrier	1	15-25
		<b>OTHER SPECIES</b>		
1.	<i>Galerida cristata</i>	Crested lark	5	0-8
2.	<i>Columba livia</i>	Rock Dove	3	40
3.	<i>Oenanthe finschii</i>	Black-necked Wheatear	1	0-3
4.	<i>Corvus monedula</i>	Jackdaw	1	4-10
5.	<i>Scotocerca inquieta</i>	Streaked Scrub Warbler	1	0
6.	<i>Motacilla personata</i>	Pied wagtail	3	0-6

**VP.6**

Date: 14.05.2021. Start and end time: 13:14 – 16:14

**Weather:**

The air temperature around 34°C end 26°C partly cloudy,  
Wind speed approx. (3-4 m/s) No precipitation

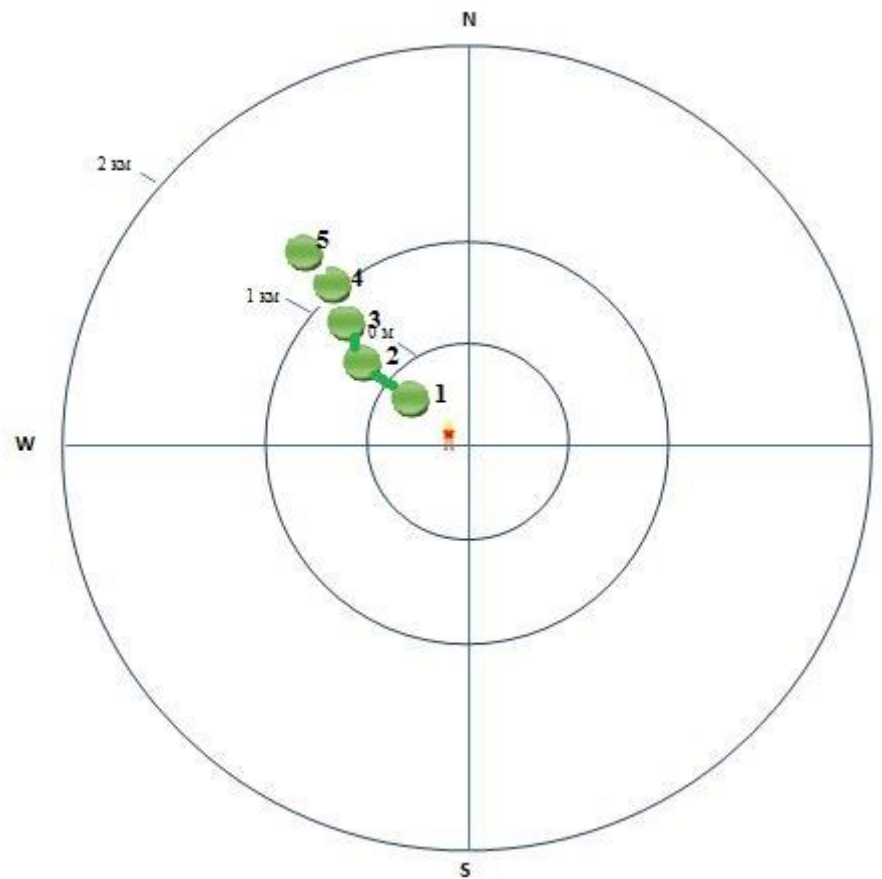


Fig.38 Flight path (VP 6), 14.05.2021

Table 159. Target species log (VP 6), 14.05.2021.


	<i>Chlamydotis macqueenii</i>	1 10 m	2 15 m	3 10 m	4 0 m	5 0 m
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Table 160. Secondary and other species (VP 6), 14.05.2021

No	Latin names	English names	Amount	Flight altitude
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	3	0-3
2.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	14	0-5
3.	<i>Oenanthe isabellina</i>	Isabelline wheatear	2	0-3
4.	<i>Calandrella brachydactyla</i>	Short-toed lark	10	0-5
5.	<i>Motacilla personata</i>	Pied Wagtail	1	0-3

**VP. 10**

Date: 15.05.2021. Start and end time: 8:54–11:55

**Weather:**

The air temperature around 9°C end 23°C cloudy

Wind speed approx. (5-6 m/s) No precipitation

***Primary species not found***

Table 161. Secondary and other species (VP 10), 15.05.2021.

No	Latin names	English names	Amount	Flight altitude
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	4	0-5
2.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	2	0-4
3.	<i>Oenanthe oenanthe</i>	Northern Wheatear	1	0-3
4.	<i>Pterocles orientalis</i>	Black-bellied sandgrouse	2	0-6
5.	<i>Upupa epops</i>	Hoopoe	1	0
6.	<i>Ardea purpurea</i>	Purple Heron	1	0

# VP.9

Date: 15.05.2021. Start and end time: 13:25 – 16:25

## **Weather:**

The air temperature around 31°C end 25°C cloudy

Wind speed approx. (4-5 m/s) No precipitation

## **Primary species not found**

Table 162. Secondary and other species (VP 9), 15.05.2021

No	Latin names	English names	Amount	Flight altitude
<b>SECONDARY SPECIES</b>				
1.	<i>Buteo buteo</i>	Common Buzzard	1	5-35
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	4	0-15
2.	<i>Oenanthe isabellina</i>	Isabelline wheatear	2	0-3
3.	<i>Athene noctua</i>	Little Owl	2	0-5
4.	<i>Oenanthe oenanthe</i>	Northern Wheatear	3	0-3
5.	<i>Scotocerca inquieta</i>	Streaked Scrub Warbler	2	0-3
6.	<i>Phalacrocorax pygmaeus</i>	Pygmy Cormorant	5	65-85



**VP. 7**

Date: 16.05.2021. Start and end time: 9:09 – 12:11

**Weather:**

The air temperature around 9 end 25°C cloudy

Wind speed approx. (3-4 m/s) No precipitation

***Primary species not found***

Table 163. Secondary and other species (VP 7), 16.05.2021

No	Latin names	English names	Amount	Flight altitude
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested Lark	3	0-5
2.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	8	0-6
3.	<i>Oenanthe isabellina</i>	Isabelline wheatear	2	0-6
4.	<i>Oenanthe oenanthe</i>	Northern Wheatear	1	1-3
5.	<i>Oenanthe pleschanka</i>	Pied Wheatear	1	0-3
6.	<i>Lanius excubitor</i>	Great (Gray) Shrike	1	0-15

**VP. 8**

Date: 16.05.2021 Start and end time: 13:17 – 16:18

**Weather:**

The air temperature around 32°C end 25°C is sunny,

Wind speed approx. (3-5 m/s) No precipitation

***Primary species not found***

Table 164. Secondary and other species (VP 8), 16.05.2021.

<b>№</b>	<b>Latin names</b>	<b>English names</b>	<b>Amount</b>	<b>Flight altitude</b>
<b>SECONDARY SPECIES</b>				
1	<i>Buteo rufinus</i>	Long-legged Buzzard	1	15-35
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested Lark	4	0-5
2.	<i>Rhodospiza obsoleta</i>	Black-billed Desert Finch	2	3-6
3.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	9	0-2
4.	<i>Oenanthe isabellina</i>	Isabelline wheatear	2	0-3
5.	<i>Merops apiaster</i>	European bee-eater	5	3-20
6.	<i>Oenanthe finschii</i>	Black-necked Wheatear	1	0-3
7.	<i>Acridotheres tristis</i>	Indian Myna	2	0-20

**VP. 5**

Date: 18.05.2021. Start and end time: 8:25 – 11:26

**Weather:**

The air temperature around 12 end 24°C is sunny,  
Wind speed approx. (3-5 m/s) No precipitation

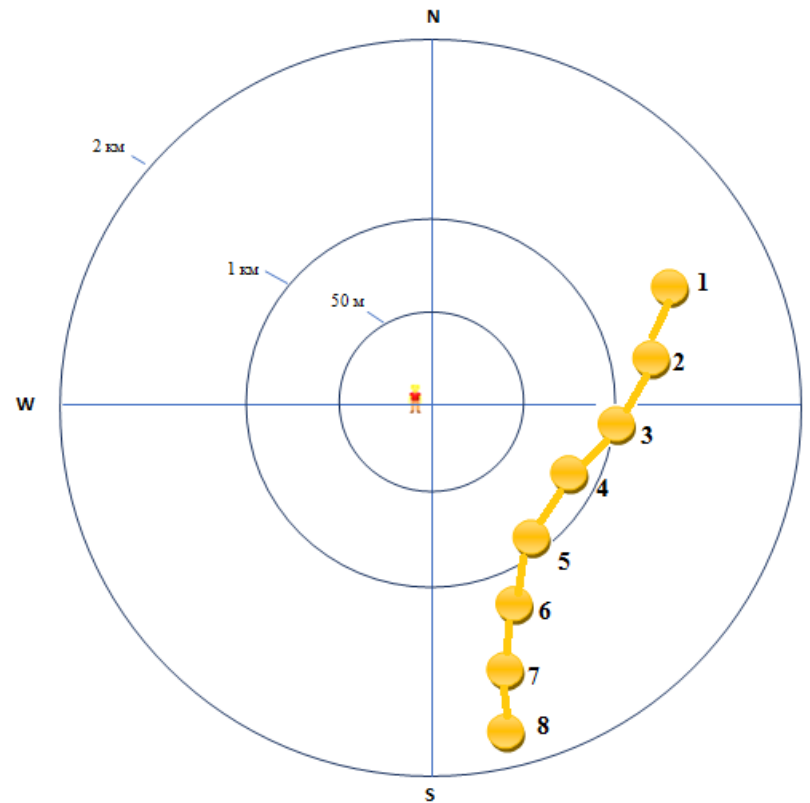


Fig.39 Flight path (VP 5), 18.05.2021

Table 165. Target species log (VP 5), 18.05.2021.


	<i>Neophron percnopterus</i>	1	2	3	4	5	6	7	8
		150 m	170 m	195 m	110 m	115 m	135 m	135 m	150 m

Table 166. Secondary and other species (VP 5), 18.05.2021.

No	Latin names	English names	Amount	Flight altitude
<b>SECONDARY SPECIES</b>				
1.	<i>Falco tinnunculus</i>	Kestrel	1	15-35
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	3	0-3
2.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	2	0-3
3.	<i>Hirundo rustica</i>	Barn swallow	3	3-8
4.	<i>Passer indicus</i>	Indian House Sparrow	6	0-5
5.	<i>Coracias garrulus</i>	Eurasian Roller	2	4-10
6.	<i>Apus apus</i>	Northern Swift	4	2-6

**VP. 6**

Date: 18.05.2021. Start and end time: 13:12 – 16:13

**Weather:**

The air temperature around 31°C end 23°C is sunny

Wind speed approx. (4-5 m/s) No precipitation

***Primary species not found***

Table 167. Secondary and other species (VP 6), 18.05.2021.

<b>№</b>	<b>Latin names</b>	<b>English names</b>	<b>Amount</b>	<b>Flight altitude</b>
<b>SECONDARY SPECIES</b>				
1.	<i>Buteo rufinus</i>	Long-legged Buzzard	2	20-45
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested lark	6	0-5
2.	<i>Athene noctua</i>	Little Owl	1	0-3
3.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	1	0-3
4.	<i>Hirundo rustica</i>	Barn swallow	3	3-8

### VP.9

Date: 19.05.2021. Start and end time: 9:12 – 12:12

**Weather:**

The air temperature around 9°C end 21°C is sunny

Wind speed approx. (4-5 m/s) No precipitation

***Primary species not found***

Table 168. Secondary and other species (VP 9), 19.05.2021

No	Latin names	English names	Amount	Flight altitude
<b>OTHER SPECIES</b>				
1.	<i>Alectoris chukar</i>	Chuckar partridge	3	0-5
2.	<i>Galerida cristata</i>	Crested lark	5	0-3
3.	<i>Oenanthe isabellina</i>	Isabelline Wheatear	1	0-3
4.	<i>Rhodospiza obsoleta</i>	Black-billed Desert Finch	3	0-6
5.	<i>Lanius excubitor</i>	Great (Gray) Shrike	1	0-3
6.	<i>Hirundo daurica</i>	Red-rumped Swallow	2	3-10
7.	<i>Hirundo rustica</i>	Barn swallow	2	5-8

**VP. 10**

Date: 19.05.2021 Start and end time: 13:17 – 16:18

**Weather:**

The air temperature around 30°C end 25°C is sunny

Wind speed approx. (4-5 m/s) No precipitation

***Primary species not found***

Table 169. Secondary and other species (VP 10), 19.05.2021.

<b>№</b>	<b>Latin names</b>	<b>English names</b>	<b>Amount</b>	<b>Flight altitude</b>
<b>SECONDARY SPECIES</b>				
1	<i>Buteo rufinus</i>	Long-legged Buzzard	2	20-45
<b>OTHER SPECIES</b>				
1.	<i>Galerida cristata</i>	Crested Lark	5	0-5
2.	<i>Lanius minor</i>	Lesser Grey Shrike	1	2-5
3.	<i>Rhodospiza obsoleta</i>	Black-billed Desert Finch	6	0-6
4.	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	6	0-2
5.	<i>Oenanthe isabellina</i>	Isabelline wheatear	1	0-3
6.	<i>Oenanthe finschii</i>	Black-necked Wheatear	3	0-3
7.	<i>Hirundo rustica</i>	Barn swallow	3	3-6
8.	<i>Merops persicus</i>	Blue-cheeked Bee-eater	5	5-15

ATTACHMENTS

	
<i>Neophron percnopterus</i> - Egyptian Vulture	
	
<i>Falco tinnunculus</i> - Kestrel	<i>Aquila chrysaetos</i> - Golden Eagle





*Oenanthe finschii* - Black-necked Wheatear



*Oenanthe isabellina* - Isabelline Wheatear



*Motacilla alba* - White Wagtail



*Columba livia* - Rock Dove



*Buteo rufinus* - Long-legged Buzzard



*Circus aeruginosus* - Marsh Harrier





*Grus grus* - Common (Eurasian) Crane



*Larus cachinnans* - Yellow-legged (Caspian) Gull



*Buteo buteo* - Common Buzzard



*Calandrella rufescens* - Lesser Short-toed Lark



*Buteo buteo* - Common Buzzard





*Alauda arvensis* - Skylark



*Oenanthe oenanthe* - Northern Wheatear



*Lanius pallidirostris* - Steppe Grey Shrike



*Oenanthe pleschanka* - Pied Wheatear



*Passer indicus* - Indian House Sparrow



*Ardea purpurea* - Purple Heron



*Vulpes vulpes karagan* - Turkestan Red Fox



*Varanus griseus* - Desert Monitor

## ASIAN HOUBARA MONITORING REPORT

<b>Report Title</b>	ASIAN HOUBARA MONITORING REPORT
<b>Scope</b>	BIRDS VP / BIRDS NESTING
<b>Areas Covered</b>	DZHANKELDY WF / BASH WF
<b>Seasons Covered</b>	SPRING 2020
<b>Notes</b>	



# **ASIAN HOUBARA MONITORING REPORT**

**Bash Wind Farm  
Dzhankeldy Wind Farm**

**Client: 5 Capitals**

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June 2021

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## Introduction

*This report is a statement of work made by Juru Energy` local senior ornithologists Anna Ten and Valentin Soldatov on the territory of Bash Windfarm; senior ornithologist Alisher Atakhodjaev and ornithologists Ramzjon Sohibnazarov on the territory of Dzhankeldy Windfarm. Anna Ten performed desktop study and analytical work. This report was reviewed by the international expert Caleb Gordon.*

Asian Houbara is one of the most characteristic representatives of the avifauna of Uzbekistan, occurring during the nesting and migration mainly on the territory of Kyzylkum and Ustyurt, and occasionally wintering in the southern regions of the country (Kreutzberg-Mukhina, 2003).

Due to the intensive development of desert areas since the mid-20th century in Uzbekistan, the area of Asian Houbara's habitat significantly decreased (Meklenburtsev, 1990). In addition, its number has significantly decreased through poaching, including falconry, both in the wintering areas and on flyways. Asian Houbara is included in the Red Data Book of the Republic of Uzbekistan (2019) as a vulnerable species with a declining population. The population of this species has been regularly declining over the past decades, and the habitat is highly fragmented. Consequently, as the Red List Authority for birds on the IUCN Red List, BirdLife has recommended to IUCN that the Asian Houbara be classified as Vulnerable under Criterion A4acd, owing to an estimated population reduction of between 30% and 49% across a period of three generations, starting in the past and projected into the future. Should more accurate trend data become available, future reassessment as Endangered may prove warranted. Conversely, potential population increases driven by expanding captive breeding and release programmes could alternatively necessitate future downlisting (BirdLife International 2014)

The creation of the Bash wind farm on the territory located to the east of the Ayakagytm depression and Dzhankeldy wind farm near Kuljuktai mountains range (the central part of the Kyzylkum desert) will create additional threats: habitat loss and the threat of collisions with turbines and with TL. A preliminary study of the distribution of this species in the project area will make it possible to identify key habitats of Asian Houbara, as well as reduce threats.

Information about Asian Houbara in Kyzylkum was first given by M. N. Bogdanov (1882), who obtained it during his expedition from Kazalinsk to the Khiva oasis in 1873. In his opinion, Asian Houbara nests everywhere in suitable places. N. A. Zarudny (1915) found Asian Houbara nesting in the northern and eastern extremities of the studied area of the Kyzylkum desert. At Tamdy's oasis, he considered Asian Houbara a common species. In the years before the Second World War, during the war, and for several years after it, T. Zahidov surveyed the Kyzylkum desert, and wrote (1971) that Houbara is distributed unevenly and is absent from most places in Central Kyzylkum. Much more often he observed it in the South-Western Kyzylkum. There, nesting grounds were also recorded by D.L. Lakhanov (1977). O. V. Mitropolsky regularly visited Kyzylkum from late 1972 to April 1985 and registered Asian Houbara in many places in Central Kyzylkum. Nesting was also reliably recorded in Ayakguzhumdy, the northern foothills of Tamdytau, Kurkuduk. The biology of Asian Houbara and the population were studied by O. S. Bakaev (1972), A. F. Alekseev (1980), T. S. Ponomareva (1979, 1983, 1985). In the 1980s the Ecocenter "Jeyran" studied the nesting biology and successfully bred Asian Houbara in captivity (Mukhina, 1988).

From 2011 to the present, Robert Burnside, Maxim Koshkin and other specialists from the University of East Anglia, with the financial support of The Ahmed bin Zayed Charitable Foundation, as well as The Emirates Bird Breeding Center for Conservation, have been studying Asian Houbara in the southern part of the Kyzylkum desert within the borders of Bukhara region, including the Navoi-Bash project area. It is worth noting that the study is independent, and these donors do not influence the results of the study. During this period, the number of Asian Houbara was specified on an area of more than 14,300 km<sup>2</sup>, the nesting biology, migration routes, threats (livestock, predators, power lines), adaptation of the captive-

bred Asian Houbara to natural conditions were studied, telemetry of captive-bred and wild birds was conducted, and many more other activities done. These studies were the basis for a number of publications by Burnside et al. 2017, Burnside et al. 2020, Koshkin et al. 2014, Koshkin et al. 2016a, Koshkin et al. 2016b, Guilherme et al. 2018.

Since 2008, in the southern part of the Kyzylkum desert, the Emirates Bird Breeding Center for Conservation (UAE) has been operating an Asian Houbara captive breeding, in total they have released 14 thousand captive-bred Asian Houbara (according to Gazeta.uz). Parallel work is carried out in the nursery located in Karnabchul.

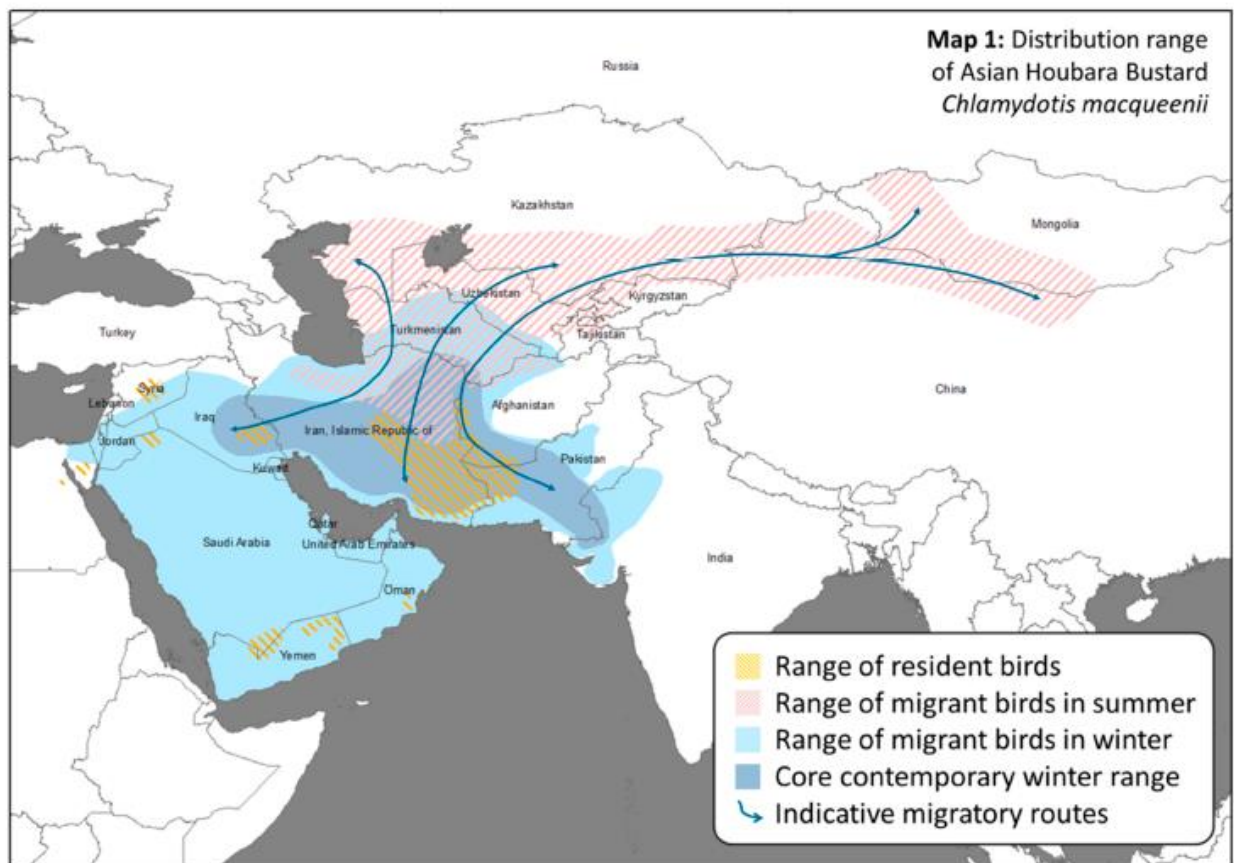
Thus, Asian Houbara is quite well studied within the Kyzylkum desert, and in particular, data are available on its density in the project area of Bash (Ayakagytma) (Koshkin et al. 2014), threats on TL (Burnside et al. 2015).

## Ecology

Asian Houbara is an iconic inhabitant of steppe and semi-desert in Central Asia and the Middle East. A highly terrestrial bird, capable of going long periods without taking flight, it is nonetheless a true long-distance migrant, with some individuals travelling more than 7,500 km over the course of a single year (Combreau *et al.* 2011).

All authors consider deserts to be the habitat of Asian Houbara. It seems that a good all-round view is important for this bird, so it prefers to nest in flat areas with sparse vegetation. At the same time, fairly dense soil is important. Asian Houbara can inhabit clay plains with sagebrush grass cover (Zahidov, 1971) and the extremities of takyr near solonchaks with scattered saltwort and camel thorn shrubs. Asian Houbara also lives on the clay-solonchak plains and Anabasis salsa takyr of the ancient delta of the Amu Darya (Alekseev, 1981). According to N. A. Zarudny (1915), Asian Houbara prefers slightly undulating spaces with sandified surface, covered with various low shrubs, alternating sagebrush communities and small solonchaks and takyr. O. V. Mitropolsky (oral report) repeatedly visited Kyzylkum in 1971-1985 and repeatedly encountered Asian Houbara, with only one record in each ridgy and blowout sand areas. The rest were found on piedmont plains, plateaus, takyr, i.e. on open flat areas with more or less dense vegetation. All authors confidently point out that Asian Houbara is absent in loose sand dunes, as well as in landscapes transformed by humans even to a smallest degree (Meklenburtsev, 1990). Asian Houbara abandons areas where roads appear or the number of livestock increases (Alekseev, 1981).

During migrations, Asian Houbara practically does not go beyond the nesting area. In northern Kyzylkum, it flies in a widely spread flock, in central Kyzylkum, according to R. N. Meklenburtsev (1990), the migration starts in the last third of March, in April the flight still continues, but at the end of April, only pairs remain. The autumn migration is most thoroughly studied for north-western Kyzylkum, where birds begin flying noticeably from the last third of September and continue to fly until late October, with rare individuals recorded on November 15 and 19. The main direction of the flight is south-west (Alekseev, 1980). Asian Houbara is active during the day; apparently, it migrates during the day as well. In this respect, its behaviour is similar to that of Great Bustard and opposite to that of Little Bustard, which is a nocturnal migrant (Meklenburtsev, 1990). Asian Houbara winters, but not regularly. Local residents of the Tamdy oasis in Kyzylkum reported to Zarudny N. A. (2015) about rare encounters in winter. According to N. A. Asimov (2020, oral report), in the Pistaltau area, poachers shot 2 ringed Asian Houbaras. Further study of this question showed that the birds were most likely from the breeding center.



**Figure 1** Asian Houbara is a locally common summer visitor and passage migrant and an occasional over-winterer in Uzbekistan. A large proportion of the population, numbering tens of thousands, migrates through Uzbekistan biannually, and birds can be encountered in most lowland regions each spring and autumn. Northward migration peaks in the second and third weeks of March, whilst southbound birds mostly pass through in mid-October (O. Combreau in litt. 2014). Birds have been observed across much of the country in the summer months, and Goriup (1997) estimated a breeding population of between 6,000 and 9,000 individuals. Overwintering has been reported in the Uzbek part of the Kyzylkum desert (O. Combreau in litt. 2014). (BirdLife International 2014).

Male Asian Houbara attract their mates with an extravagant courtship display, which they perform at the same site each year. The display begins with a period of strutting and culminates with the male retracting his head within an ornamental shield of erected neck feathers and then running at speed in either a straight or curved line. The display is often accompanied by a series of low frequency booming calls (Gaucher et al. 1996). In the Bukhara breeding center of rare animals "Jeyran", males began to display courtship behaviour immediately after arrival. There, 7-9 males display courtship behaviour. Each occupies a certain area, which the other males do not enter. Females appear in these areas about 10 days later, but they do not constantly stay on them, but only visit them (Mukhina, 1990).

Males play no part in rearing the young, and a brood may contain young sired by several different individuals. Females create a shallow scrape in the ground in which they typically lay 3-4 eggs, and occasionally up to six eggs in long-distance migrants (Collar 1996, Combreau et al. 2002).

After tracing the incubation process from beginning to end, S. O. Bakaev (1972) found out that the female incubates the clutch for 21 days. The chicks hatch within one day. According to O. Combreau (BirdLife International 2014), the incubation period is typically 23 days, whilst fledging takes around 30 to 35 days. The growth of chicks was traced by T. S. Ponomareva (1980). According to her, they become mature by 2 months of age, i.e. by the end of July, if the eggs are laid in early April. Most chicks fledge by the end of June. Then broods break up and every bird stays alone. This is also confirmed by modern telemetry data. Satellite tracking has

revealed that females and their young separate after three to four months and that pre-migration groups in autumn comprise birds of all ages and sexes (O. Combreau 2014).

In late August 1992, an aggregation of 1,500 migrating Asian Houbaras was observed in the Karnabchul steppe area (A. Nuridjanov, private message, acc. to Kreutzberg-Mukhina 2003). Similar large aggregations of migratory birds were observed in 1994 in Bukhara region (O. Nazarov, personal message, acc. to Kreutzberg Mukhina 2003) - in total, there were about 1,000 birds in the aggregation, which formed sparse groups of several dozen individuals. In recent years, such aggregation are no longer observed and Asian Houbaras are more often recorded in small groups - from 3-5 to 10-15 individuals. According to E. A. Kreutzberg-Mukhina (2003), the passage aggregations were impacted by the increasing trophy hunting organized within the nesting area, when groups of hunters from Arab countries come to the countries of Central Asia in September-October and spend about a month there, departing in late November and sometimes in early December.

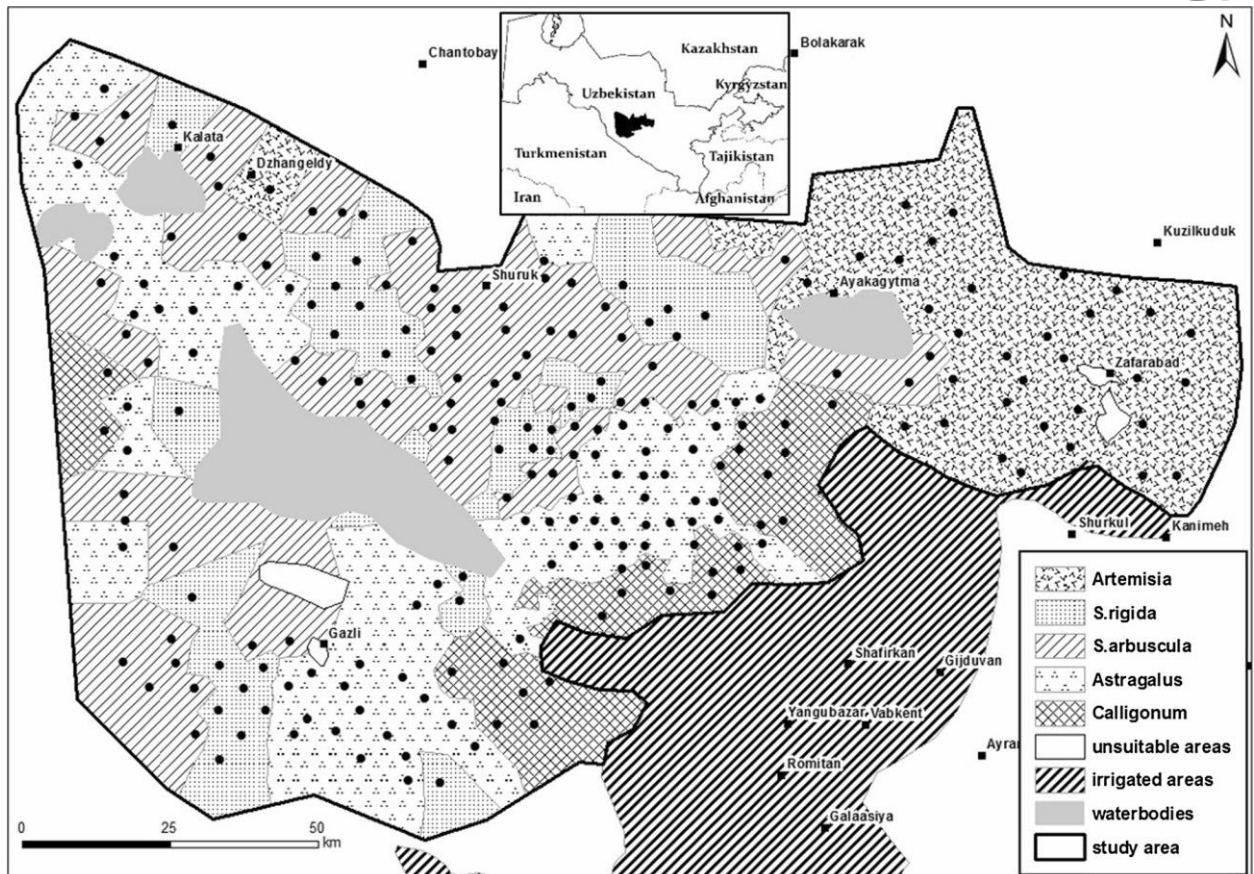
## Density

Between 1956 and 1979, the Asian Houbara was regularly monitored by A. F. Alekseyev (1980). The obtained figures show that from 1956 to 1967, the numbers were decreasing but slightly, and the average remained at a level of 1 individual per 45 km of transect; in 1968-1979, the numbers dropped to one record per 132 km. That is, the population decreased 3 times. This applies to nesting birds. During the spring migration, in the first period, 1 bird was recorded on 29 km of the transect, in the second - 1 bird on 241 km. That is, the number dropped 8 times. During the autumn migration, it decreased 2.6 times. The author ascribes this to changing environmental conditions – economic development of the desert, boring of artesian wells and the growing number of sheep. The construction of a number of car roads contributes to an increase in poaching.

The surveys conducted by T. S. Ponomareva on April 19-20 and May 24-25, 1981 (Meklenburtsev, 1990) in Kyzylkum showed that the numbers vary depending on the area. In the southern foothills of Kuldjuktau, the density is one individual per an area of 9 to 24km<sup>2</sup>. Only one individual was recorded in the north-western foothills of Tamdytau. In the Mingbulak depression, the density was 1 individual per 27km<sup>2</sup>. In the northern foothills of Bukantau – one bird per 10.8 km<sup>2</sup>, and in places with the largest number - 1 individual per 3.6 km<sup>2</sup>. In the southern Kyzylkum the decline was attributed to agricultural intensification and expansion, increased disturbance, local poaching and 'large-scale hunting on wintering grounds' (Ponomareva 1985). Goriup (1997), citing an unpublished report suggesting 2,200–2,700 breeding females in the country, extrapolated a national total of 6,000–9,000 birds; Allinson (2014) speculated that 10% of this estimate overwinter. Recent surveys in 14,300 km<sup>2</sup> of south-east Kyzylkum produced an initial estimate of 1,824 (1,645–2,030) breeding males (Koshkin et al. 2016a), suggesting roughly 4,000 breeding birds (Burnside et al. 2015) in a relatively small part of the available habitat; further refinement of survey data indicates 2,350 breeding females in the study area (Dolman et al. submitted by Collar et al. 2017). The species is common in an adjacent similar-sized area of the Karnabchul steppe (Martin et al. 2014). Nevertheless, demographic modelling based on field parameters suggests that the population is declining at 9.4% a year, owing to unsustainable winter mortality (Dolman et al. submitted by Collar et al. 2017).

As is described above, experts from the University of East Anglia estimate the bustard population at 1,824 (1,645–2,030) breeding males on a site located in the southern part of the Kyzylkum desert (39.34–40.56°N 62.21-65.20°E), with an area of 14,300 km<sup>2</sup> (Fig.2). For the past 10 years, since 2011 they have monitored the population in this area, counting birds at 231 locations (Fig.2 by Koshkin et al. 2016a).





**Figure 2** Study area of specialists from University of East Anglia, within Bukhara District of Uzbekistan, Southern Kyzylkum Desert, showing point count locations (black dots) in relation to five shrub assemblages classified during the study: *Artemisia*, *Salsola rigida*, *S. arbuscula*, *Astragalus* and *Calligonum* (Koshkin et al. 2016a).

As we can see on Fig 2, *Artemisia* desert is main habitat to the east from Ayakagytm, the place where Bash windfarm is planned. Density of this species according to data of M. Koshkin and his colleagues (2016) on *Artemisia* is 0.090 (0.081-0.1) birds (males)/km<sup>2</sup> (95% CI) (see table 1). *Artemisia* and *S. arbuscula* desert is main habitat on the territory of Dzhankeldy windfarm. Density of this species according to data of M. Koshkin and his colleagues (2016) on *Artemisia* is 0.090 (0.081-0.1) birds (males)/km<sup>2</sup> (95% CI) and on *S. arbuscula* desert is 0.146 (0.131-0.162) birds (males)/km<sup>2</sup> (95% CI) (see table 1).

**Table 1** Comparison of density and population estimates of male Asian Houbara on point counts (including observations of unsexed birds and adjusting for proportion of males among sexed birds) from conventional distance sampling (CDS) models (not including detectability covariates) and alternate unstratified and stratified multi-covariate distance sampling (MCDS) models that included visit and time categorical detectability covariates (Koshkin et al. 2016a).

Model (strata)	AICc	Goodness of fit (Cramer von Mises)	Density estimate (birds/km <sup>2</sup> , 95 % CI)	Total population estimate (birds, 95 % CI)
CDS (null model)	3109.3	0.0798	0.135 (0.111–0.164)	1886 (1698–2089)
MSDC	3103.7	0.0618	0.140 (0.126–0.155)	
MSDC (5 Strata)	3103.7	0.0618		1824 (1645–2030)
<i>Artemisia</i>			0.090 (0.081–0.100)	243 (218–270)
<i>Astragalus</i>			0.150 (0.136–0.167)	532 (483–594)
<i>Calligonum</i>			0.041 (0.037–0.046)	61 (55–69)
<i>Salsola arbuscula</i>			0.146 (0.131–0.162)	529 (477–588)
<i>Salsola rigida</i>			0.223 (0.200–0.248)	457 (410–509)

For all models, observations were truncated at a 1.4-km distance

## Threats

According to IUCN threats classification (BirdLife International 2014), the most commonly identified threat is biological resource use, and more specifically hunting. Agriculture, in particular grazing, is the next most widespread threat. Other threats include energy production and mining, human disturbance, climate change and severe weather, residential and commercial development, transportation and service corridors, pollution and natural system modifications.

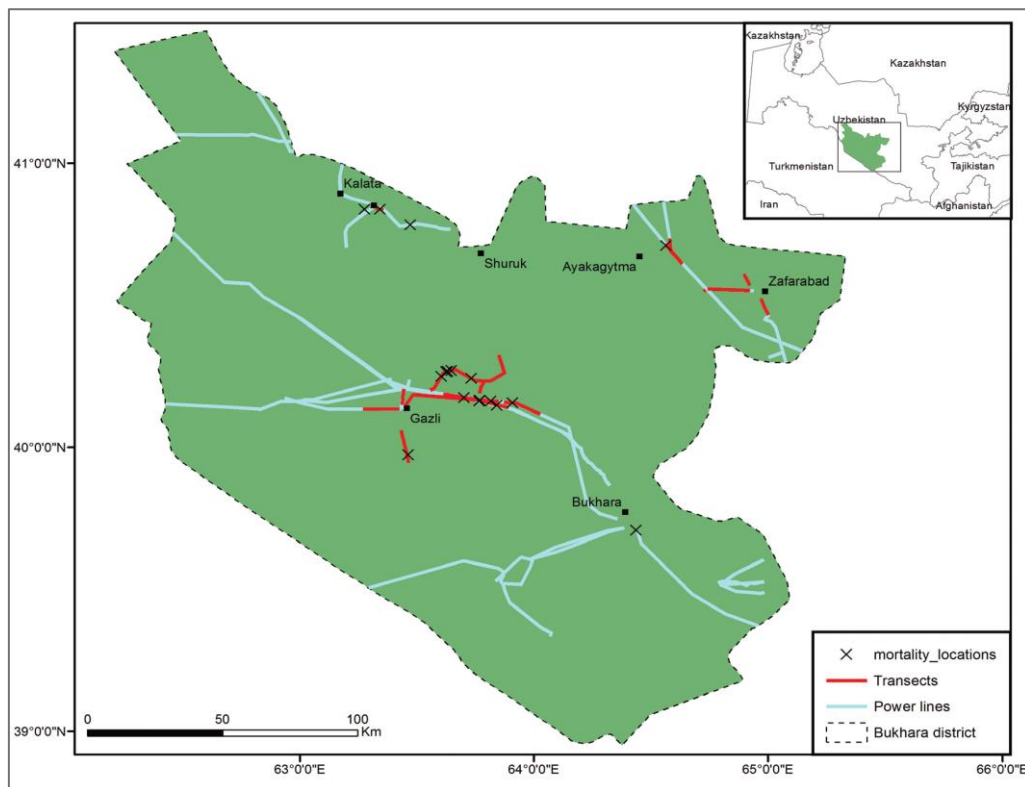
The impact of livestock on the successful nesting of Asian Houbara in Bukhara region was studied by specialists from the University of East Anglia (Koshkin et al. 2016), this study showed the absence of any detectable effects of livestock density on houbara nest success or hatchability in successful nests. They suggest that Asian Houbara in the southern Kyzylkum have good nest success while tolerating current levels of sheep grazing and human disturbance. Thus, maintaining the grazing level, which they assess as moderate, is an important measure to conserve the species on the nesting site.

The explanations for the reasons for the falling numbers of Asian Houbara, mentioned above by A. F. Alexeev (1980) - the economic development of the desert, the boring of artesian springs and the increase in the numbers of livestock - are that in the Soviet period the cattle breeding developed on a large scale, for which purpose roads were built and farms created, power and water supply networks were built (in places where boring wells was not advisable). Currently, the farms are self-dependent and do not have the support they had 30 years ago.

The authors also identified the dependence of successful nesting on the state of migration sites and wintering grounds. From this, they are forced to conclude that the scale of anthropogenic mortality during migration and winter needs to be reduced by controlling poaching and regulating hunting (Combreau et al. 2005; Burnside et al. 2016) in order to reduce the scale of and need for captive-bred releases and to render hunting sustainable in the long term.

The study of the death of an Asian Houbara on a transmission line conducted by a group of specialists from University of East Anglia in Kyzylkum in 2014 (Burnside et al. 2015) showed that Asian Houbara is susceptible to collision with both high-and low - voltage powerlines and that the monthly probability of an adult colliding with a powerline was non-trivial, with the possibility of 30 out of every 1000 individuals perishing in this way per season in Uzbekistan (Fig.3). They estimated the mortality at 120 birds lost/year (95% CI: 0–350 birds). Powerline collisions caused the deaths of at least three adult birds in the 2014 breeding season, and at least during the April–May fieldwork this was the only confirmed source of adult mortality in our study area over two consecutive years, although other sources of mortality like poaching and hunting occur in autumn (unpublished data). After hunting and poaching, therefore, powerlines are likely to be an important additional cause of mortality in the Asian Houbara.



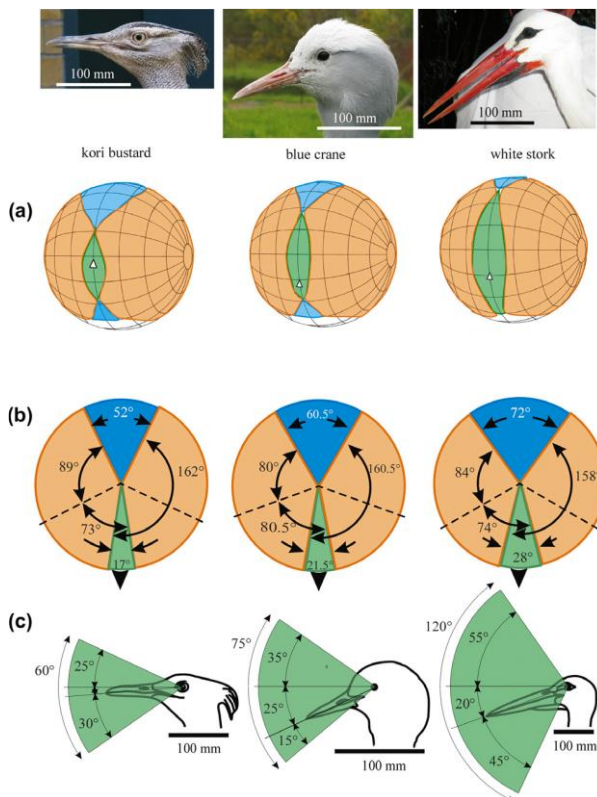


**Figure 3** Map of study area showing digitised and field-recorded powerlines (blue lines, total length 1289 km) in Bukhara district, Uzbekistan. The location of powerline transects is overlaid in red and covers 240 km. Locations of mortalities are marked with x (Burnside et al, 2015).

Research on the causes of collisions between birds and various anthropogenic objects (wind turbines, power lines) has been carried out and published in the article «Bird collisions with power lines: Failing to see the way ahead?». Authors G.R. Martin, J.M. Shaw (2010) surveyed the visual fields, blind areas which were determined in three bird species representative of families known to be subject to high levels of mortality associated with power lines; Kori bustards *Ardeotis kori*, *Otididae*, Blue cranes *Anthropoides paradisea*, *Gruidae* and White storks *Ciconia ciconia*, *Ciconiidae*. Vulnerability to collision depends on many factors, including bird behaviour and manoeuvrability, topography, weather and power line design and placement (Bevanger, 1994). The data of G.R. Martin, J.M. Shaw (2010) show that vision is probably a key aspect of this problem.

Measures to reduce the probability of collisions have usually involved marking obstructions with devices designed to increase the probability of detection from a greater distance, the assumption being that the obstruction is below the limit of visual resolution within the flight avoidance distance of many bird species. For example, power lines have been marked with objects such as reflective balls, flapping flags, and wire coils (Bevanger, 1994; Janss and Ferrer, 1998). However, despite more than 30 years of using such devices the probability of mortality caused by power line collisions remains high for certain species (Drewitt and Langston, 2008; Janss and Ferrer, 2000). A key aspect which could have a direct impact on collision susceptibility is visual fields. This is because regardless of the ways in which visual information is processed, visual fields determine what part of an animal's environment can influence its behaviour at any one instant (Martin, 2007). Especially important will be the characteristics of that section of a bird's visual field which projects forward and hence normally "looks" in the direction of travel (Martin, Shaw 2010).

Bustards and cranes are also thought to be visually guided in their foraging, they take a broader array of items than storks. These include a wide range of stationary vegetable matter (seeds, berries, bulbs) and animal resources which are not necessarily evasive such as snails, orthoptera, small rodents, lizards, snakes, and bird eggs and nestlings (Ellis et al., 1996; Johnsgard, 1991). That birds can, and should, maintain visual coverage of the region ahead of them when in flight would seem a reasonable assumption. However, our data provides evidence



that this may not always be the case. In bustards and cranes there are extensive blind regions in the frontal hemisphere and movements of the head downwards (forward pitch) by greater than 25 and 35° respectively would bring these blind areas to project forwards in the direction of flight. Under these circumstances any object directly ahead of the flying bird could not be detected regardless of the visual capacities of the bird's eyes or the size and contrast of the object (Martin, Shaw 2010).

**Figure 4** Visual fields in kori bustards, blue cranes, and white storks. Green areas, binocular sectors; pink areas, monocular sectors; blue areas, blind sectors; downward pointing black arrowheads in row b, direction of the bill; white triangle direction of bill projection in row a; white pentagon direction of optic axes in row a (Martin, Shaw 2010).

In a group of birds known to be vulnerable to collisions with power lines, aspects of their visual fields, especially the extent of blind areas that project in the frontal hemisphere above the binocular field, mean that the birds may frequently be unable to see what lies ahead of them (Martin, Shaw 2010). This will occur if the birds are searching the area below them (for conspecifics, foraging and roosting sites) and pitching their head downwards. Inability to see power lines may also occur as these birds fly upwards, either from the ground close to a power line array or in trying to avoid collision with conductors which lie directly ahead. In these situations lines may fall within the upward and forward projecting blind portion of the visual field above the binocular area. These considerations are likely to apply in other birds with similarly small binocular fields and extensive blind areas above them (Martin, Shaw 2010).

Thus visual field topographies which have evolved primarily to meet visual challenges associated with foraging may render certain bird species particularly vulnerable to collisions with human artefacts, such as power lines and wind turbines, that extend into the otherwise open airspace above their preferred habitats. For these species placing devices upon power lines to render them more visible may have limited success since no matter what the device the birds may not see them. This may help to explain why line marking appears to be ineffective for bustards (Janss, 2000; Jenkins et al., 2010). G.R. Martin, J.M. Shaw (2010) suggest that in certain situations it may be necessary to distract birds away from the obstacles, or encourage them to land nearby (for example by the use of decoy models of conspecifics, or the provision of sites attractive for roosting) since increased marking of the obstacle cannot be guaranteed to render it visible if the visual field configuration prevents it being detected. Perhaps most importantly, their results indicate that collision mitigation may need to vary substantially for different collision prone species, taking account of species specific behaviours, habitat and

foraging preferences, since an effective all-purpose marking device is probably not realistic if some birds do not see the obstacle at all.

## Methods and materials

Optical instruments – binoculars x8, telescope x20-60 Optolite and laser rangefinder – were used. Birds were registered on video and photo with mobile phone using dj-scoping and a Nikon D20 digital camera with a 300mm lens. Photos and videos from the surveys on the territory of Bash Windfarm are stored in Yandex Disc cloud storage  
<https://disk.yandex.ru/d/Syg8CqvKQYaFHw>

Maps in the report were conducted in QGIS 3.0 on base of kmz files presented by Juru, and prepared by Dr. Natalya Beshko.

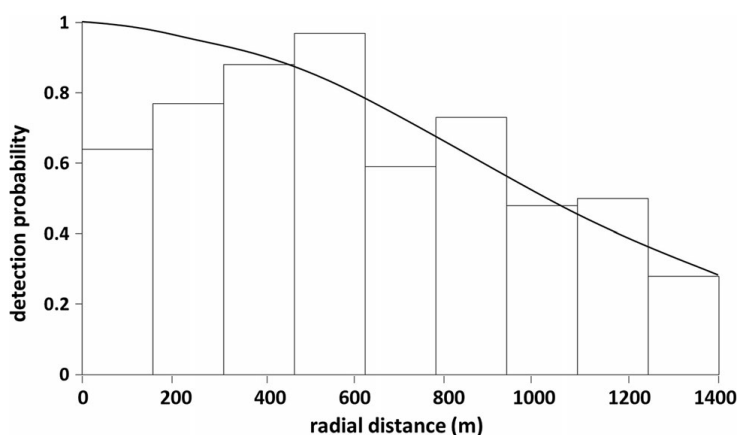
Surveys on the territory of Bash Windfarm by Anna Ten and Valentin Soldatov were conducted during 19-22 April and 27-29 May 2021 during morning and evening hours from 6-10AM and 16-20 PM.

Surveys on the territory of Dzhankeldy Windfarm were conducted by Alisher Atakhodjaev and Ramzjon Sohobnazarov on April 5, 7, 10, 11, 14, 16, 22, 23 and May 10, 12, 13, 14, 15, 16, 19 during morning and evening hours from 6-10AM and 16-20 PM.

The spring count of males is most optimal methods of counting this species, as Houbara are shy and difficult to see. However, during the breeding season (March–May) displaying males (and also floating males) are conspicuous and can be apparent from long distances. This provides an opportunity for male population assessment with a relatively high degree of accuracy (Koshkin et al, 2016a) (Fig.5).

On the territory of Bash Windfarm in April we chose 15 points located mainly on the top of relief and on a distance 3 km between each other. But during field work we found that at least half of the site is hilly and relief is steeper than expected. We had to changed locations of some points as they were unsuitable for count (Fig.10).

And in May we expected that the male detection will be low, and that data will be not comparable with April data. We increased number of count points to 24, and chose them randomly, with distance at least 2-2.5 km from each other (Fig.6, 8). The points did not intersect each other, as according to M. Koshkin (Koshkin et al. 2016a), the distance of detection Asian Houbara is 1400 m (Fig.5). Our observation shows maximum distance to the bird as 1000 m. So the distance at least 2 km from each other point will avoid double count.



**Figure 5** Probability of detection of male houbara on point counts, based on the best MCDS model (including visit and time categorical as detectability covariates), with half-normal detection function (with cosine adjustment) fitted to visit-specific count data, truncated at 1400-m distance from the observer (Koshkin et al. 2016a).

The habitats of Bash site were described by Dr. Natalya Beshko and used for analysis of Asian Houbara distribution on site (Fig.17). The main habitat on the site is sagebrush desert (Artemisia) (Fig.16), which covered sandy desert plain, sandy loamy desert plain, ridge of fixed

and semifixed sands and relic hills. The total area of potential habitat is 264 km<sup>2</sup>. Cliffs and outcrops were not used in analysis as they are not suitable habitat of Asian Houbara.

Several linear objects are located in the Bash site: railway, transmission line, gaz pipeline. Farms and quarry are located there also. The preparation stage on windfarm is already started and about 20 met masts were installed on the site. (Fig.6)



**Figure 6** *Transmission line locates in Artemisia desert*



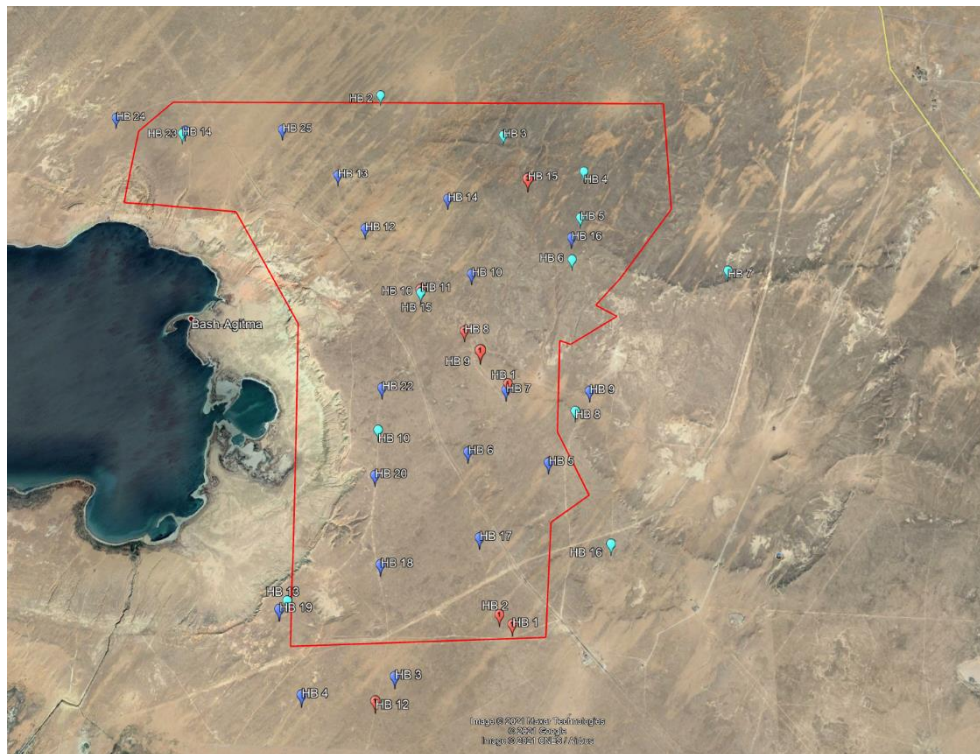


**Figure 7** Asian Houbara: 1) female with 2 chicks (top left), 2) displaying male (top right), 3) bird observed under TL (down left) and 4) feathers (down right)

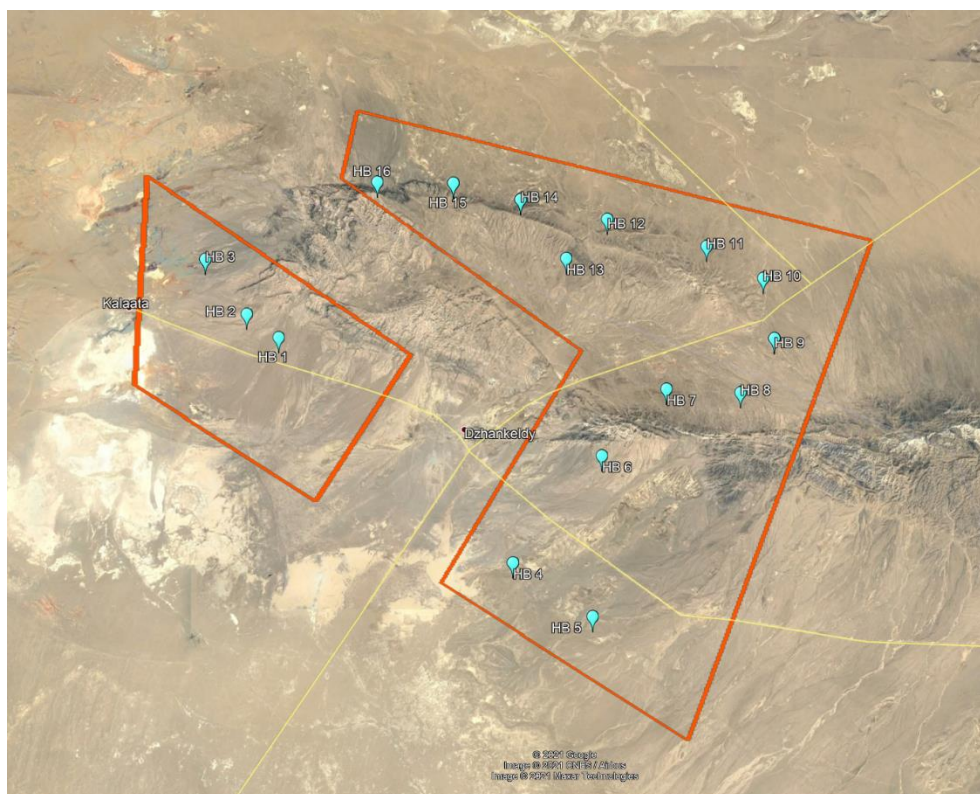
The habitats of Dzhankeldy site were described by Dr. Natalya Beshko and used for analysis of Asian Houbara distribution on site (Fig. 19). There are a variety of plant communities there, but the main habitat of Asian Houbara on the site is sagebrush desert (*Artemisia*) and *S. arbuscula* desert (Fig.12, 13, 15). Cliffs and outcrops were not used in analysis as they are not suitable habitat of Asian Houbara.

Several linear objects are located in the Dzhankeldy site: road and transmission lines. Two villages are located nearby – Dzhankeldy and Kalaata. There are also mining areas on the site (Fig.14). A few met masts were installed on the site.

16 observation point were used for Asin Houbara survey in April and in May (Fig. 9).



**Figure 8** HB observation points on the Bash site



**Figure 9** HB observation points on the Dzhankeldy site





**Figure 10** Morning observation on Dzhankeldy site



**Figure 11** Asian houbara on April 14, 2021 on Dzhankeldy site (N 40°52'52.25", E 63°14'26.96")



**Figure 12** Observation point HB3 on Dzhankeldy site



**Figure 13** Observation point HB13 on Dzhankeldy site



**Figure 14** Rubble mining on HB4 on Dzhankeldy site



**Figure 15** Observation point HB11 on Dzhankeldy site

## Results

On the territory of Bash Windfarm Anna Ten and Valentin Soldatov observed 15 points in April, and 24 points - in May. The results of the observations in April and May 2021 on the territory of Bash Windfarm are presented in Tables 2 and 3. As total 3 displaying males were found in April and 1 - in May; no females in April and 1 female with 2 chicks in May; and 2 birds (unknown gender) in May. Also 1 bird was disturbed near TL, another bird fled from asphalt road. (Fig. 7)

**Table 2** Point count in April 2021 on Bash WF (Ayakagytma)

№	Data	Time	N	E	biotope	Asian Houbara	Behaviour
1	17.04.2021	18:56	40.60933	64.70947	Artemisia	1	male fly away under TL
2	19.04.2021	16:48-17:23	40.704059	64.656041	Sands Artemisia Calligonum Ferula	0	
3	19.04.2021	18:10-18:25	40.689679	64.707517	Sandy hills Artemisia	0	
4	20.04.2021	8:30-8:50	40.677021	64.740699	Sandy hills Artemisia	0	
5	20.04.2021	9:12-9:22	40.661679	64.738852	Clay gentle hills Artemisia	0	
6	20.04.2021	9:27-9:42	40.648043	64.735239	Clay gentle hills Artemisia	0	
7	20.04.2021	10:55-11:20	40.644069	64.797569	Clay hills Artemisia	0	
8	20.04.2021	16:14-16:35	40.600877	64.735512	Clay hills Artemisia	0	
9	20.04.2021	16:52-17:08	40.618707	64.69866	Clay, Artemisia	1	male displaying
10	20.04.2021	17:20-17:33	40.637839	64.674684	Clay, Artemisia	0	
11	21.04.2021	17:39-17:55	40.595597	64.659451	Artemisia	0	
12	21.04.2021	18:23-18:39	40.519677	64.661534	Artemisia	1	male displaying
13	21.04.2021	18:47-19:00	40.546837	64.627838	hills Artemisia	0	
14	22.04.2021	7:47-8:03	40.691196	64.57417	Artemisia	0	
15	22.04.2021	8:20-8:35	40.637839	64.674684	Artemisia	0	
16	22.04.2021	8:53-9:10	40.562046	64.748135	Artemisia	0	

**Table 3** Point count in May 2021 on Bash WF (Ayakagytma)

№	Data	Time	N	E	biotope	Asian Houbara	Behaviour
1	27.05.2021	5:51	40.539952	64.711097	Artemisia desert	1	Flew from road
2	27.05.2021	5:57-6:35	40.542612	64.706327	Artemisia desert	1	probably female with chicks
3	27.05.2021	6:49-7:14	40.526118	64.668382	Artemisia desert	0	
4	27.05.2021	7:36-8:09	40.521395	64.634745	Artemisia desert	0	
5	27.05.2021	17:52-18:00	40.585593	64.724998	thick bushes of Saxaul	0	
6	27.05.2021	18:05-18:16	40.588915	64.69417	thick bushes of Saxaul	0	
7	27.05.2021	18:20-18:33	40.60736	64.70876	Open Artemisia desert	0	
8	27.05.2021	18:49-19:16	40.625695	64.692307	Open Artemisia desert	1	Displaying male
9	28.05.2021	19:29-19:52	40.606953	64.741303	Open Artemisia desert	0	
10	28.05.2021	6:06-6:36	40.643687	64.69494	Open Artemisia desert	0	
11	28.05.2021	6:58-7:15	40.63785	64.674762	Artemisia desert	1	shortly seen
12	28.05.2021	7:25-7:41	40.658707	64.65166	Artemisia desert	0	
13	28.05.2021	7:52-8:15	40.676567	64.639658	Artemisia desert	0	



14	28.05.2021	18:15-18:39	40.66821	64.684958	Artemisia desert	0	
15	28.05.2021	18:45-18:59	40.673797	64.717645	Artemisia desert	3	Female with 2 chicks
16	28.05.2021	19:17-19:41	40.655163	64.735157	Artemisia desert	0	
17	29.05.2021	7:00-7:22	40.564073	64.698827	Artemisia desert	0	
18	29.05.2021	7:35-7:57	40.556668	64.661958	Artemisia desert	0	
19	29.05.2021	8:06-8:25	40.5445	64.625045	Artemisia desert	0	
20	29.05.2021	8:35-8:54	40.582227	64.65882	Artemisia desert	0	
21	29.05.2021	17:25-17:46	40.60827	64.660457	Artemisia desert	0	
22	29.05.2021	18:12-18:37	40.675535	64.592762	Open Artemisia desert	0	
23	29.05.2021	18:49-19:00	40.692137	64.575255	observation bad - hills, high bushes	0	
24	29.05.2021	19:07-19:20	40.696683	64.54599	observation bad - hills	0	
25	29.05.2021	19:25-19:43	40.692242	64.615732	observation bad - hills	0	

On the territory of Dzhankeldy Windfarm Alisher Atakhodjaev and Ramzjon Sohibnazarov observed 16 points both in April and in May (Fig. 9). The results of the observations in April and May 2021 on the territory of Dzhankeldy Windfarm are presented in Tables 4 and 5. During the observations in this area in the spring of 2021, the 5 Houbara Bustard were seen. No displaying males were identified.

**Table 4** Point count in April 2021 on Dzhankeldy WF

Data	№ HB	Time	N	E	Biotop	Asian Houbara	Behaviour
05.04.2021	HB 10	17:10-17:43	40°53'56.75"	63°28'3.38"	Dry slopes slightly overgrown with bushes	0	
07.04.2021	HB 15	07:20-07:45	40°55'56.74"	63°19'30.70"	Plains with gorges, Artemisia	0	
07.04.2021	HB 16	08:03-08:35	40°55'57.98"	63°17'25.24"	Rocky slopes with dry riverbeds	0	
10.04.2021	HB 4	07:30-08:05	40°48'1.82"	63°21'7.86"	Clay hills and plains, Artemisia, Ferula	0	
10.04.2021	HB 5	08:15-08:45	40°46'54.55"	63°23'19.49"	Stony and clay plains, Artemisia, Ferula	0	
11.04.2021	HB 6	07:23-07:52	40°50'15.55"	63°23'35.37"	Clay gentle hills Artemisia	0	
12.04.2021	HB 2	18:08-18:43	40°53'13.55"	63°13'46.84"	Plain Artemisia, Ferula	1	first ran, then flew away
14.04.2021	HB 1	08:55-09:34	40°52'44.16"	63°14'39.91"	Clay hills Artemisia	2	ran away in different directions
16.04.2021	HB 11	06:49-07:15	40°54'37.09"	63°26'29.67"	Slopes overgrown with shrubs of Artemisia	0	
16.04.2021	HB 12	07:30-08:02	40°55'11.37"	63°23'45.40"	Artemisia	0	
16.04.2021	HB 13	08:14-08:45	40°54'30.45"	63°22'37.35"	Plains, Artemisia	0	
22.04.2021	HB 3	06:15-06:45	40°54'22.40"	63°12'37.51"	Clay gentle hills Artemisia	1	didn't fly away, just left
23.04.2021	HB 7	07:02-07:34	40°51'38.79"	63°25'22.36"	Clay hills Artemisia	0	
23.04.2021	HB 8	07:55-08:20	40°51'33.99"	63°27'24.57"	Clay hills Artemisia	0	
23.04.2021	HB 9	08:32-09:05	40°52'41.58"	63°28'20.94"	Dry riverbeds, Artemisia, Ferula	0	

Table 5 Point count in May 2021 on Dzhanakeldy WF

Data	№ HB	Time	N	E	Biotop	Asian Houbara	Behaviour
10.05.2021	HB 8	17:30-08:02	40°51'33.99"	63°27'24.57"	Clay hills Artemisia	0	
12.05.2021	HB 6	18:10-18:40	40°50'15.55"	63°23'35.37"	Clay gentle hills Artemisia	0	
13.05.2021	HB 13	05:25-05:55	40°54'30.45"	63°22'37.35"	Plains, Artemisia	0	
13.05.2021	HB 14	06:15-06:45	40°55'35.97"	63°21'22.04"	Plains with gorges, Artemisia	0	
13.05.2021	HB 15	07:00-07:33	40°55'56.74"	63°19'30.70"	Plains with gorges, Artemisia	0	
14.05.2021	HB 9	06:20-06:50	40°52'41.58"	63°28'20.94"	Dry riverbeds, Artemisia, Ferula	0	
14.05.2021	HB 11	07:08-07:35	40°54'37.09"	63°26'29.67"	Slopes overgrown with shrubs of Artemisia	1	Flying 10 meters above the ground
14.05.2021	HB 12	07:55-08:10	40°55'11.37"	63°23'45.40"	Artemisia	0	
15.05.2021	HB 1	06:15-06:45	40°52'44.16"	63°14'39.91"	Clay hills Artemisia	0	
15.05.2021	HB 2	07:04-07:35	40°53'13.55"	63°13'46.84"	Plain Artemisia, Ferula	0	
15.05.2021	HB 7	17:15-17:45	40°51'38.79"	63°25'22.36"	Clay hills Artemisia	0	
15.05.2021	HB 10	17:58-18:30	40°53'56.75"	63°28'3.38"	Dry slopes slightly overgrown with bushes	0	
16.05.2021	HB 4	06:40-07:10	40°48'1.82"	63°21'7.86"	Clay hills and plains, Artemisia, Ferula	0	
16.05.2021	HB 5	07:25-07:55	40°46'54.55"	63°23'19.49"	Stony and clay plains, Artemisia, Ferula	0	
19.05.2021	HB 3	17:45-18:15	40°54'22.40"	63°12'37.51"	Clay gentle hills Artemisia	0	

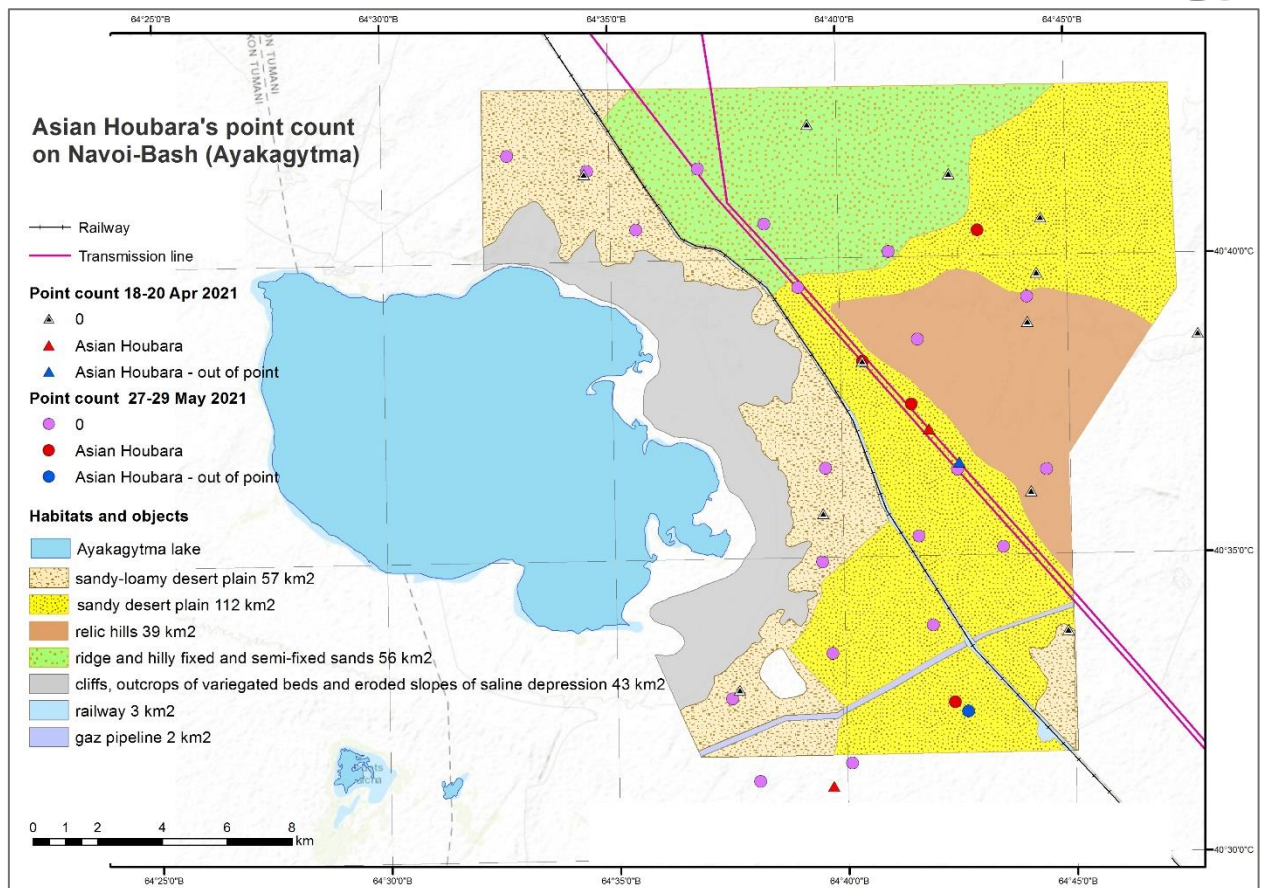
Density of this species according to data of M. Koshkin and his colleagues (2016) on Artemisia is 0.090 (0.081-0.1) birds (males)/km<sup>2</sup> (95% CI). The total area of this type of desert on Bash site is 264 km<sup>2</sup>, so extrapolated male population in the study site is estimated 21-26 individuals, which when extrapolated to include females if the sex ratio was 1:1 (Combreau et al 2002) would give a total population of 42-52 breeding individuals.



*Figure 16 Artemisia (sagebrush) desert is main habitat for Asian Houbara in Bash*

The density of detected males according to our April survey is 0.022 males/km<sup>2</sup> (2 adult males on 15 points) at least in 4 times less than expected. And density of all birds in May 2021 is 0,027 birds/km<sup>2</sup> (4 adult bird on 24 points) which is in 5 times less. The calculation of population density based on surveys of the 1 season cannot be compared with the density calculated from the data of large-scale work carried out by University of East Anglia specialists during 10 years.

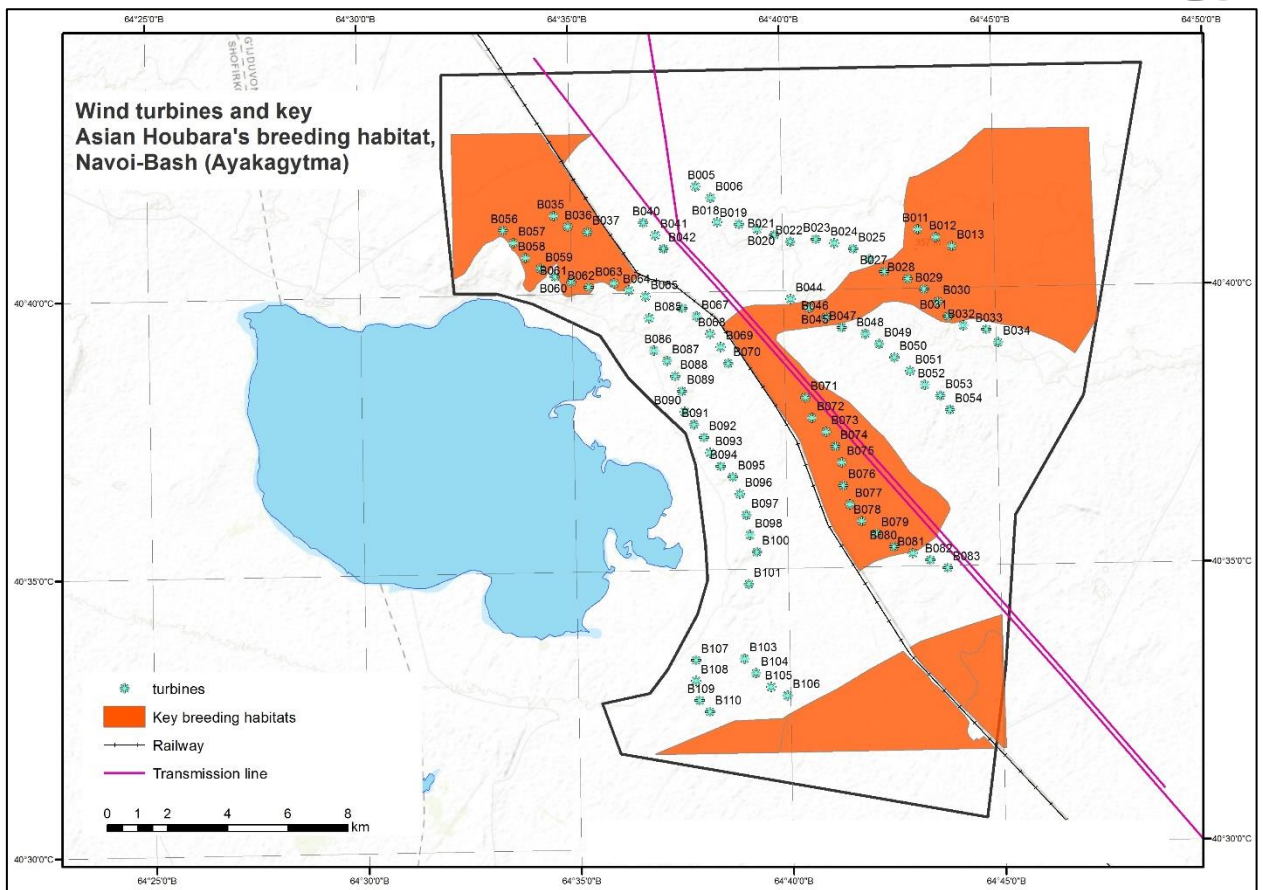
During analysis we found that all records of Asian Houbara in Bash are located in sandy desert plain, except the part with thick saxaul forest (yellow habitat, fig. 17). Also during observation in May we found that sandy loamy desert plain (especially in north western part of Bash site) covered with more thick low bushes of sagebrush (beige color habitat, fig. 17), this area has great food resource - with different lizards, Steppe agama and etc. So we propose that this site will be very attractive for Asian Houbara's broods during summer time.



**Figure 17** Navoi Bash habitats and distribution of count points in April-May 2021

This data allowed to define key breeding sites for Asian Houbara on Bash WF site. The comparing data of Asian Houbara records and locations of turbines (Fig 18) shows that there are 31 turbines located in key for Asian houbara sites during breeding season.





**Figure 18** Planned locations of wind turbines showed that key habitat for Asian Houbara

The Asian Houbara's records (total 4 birds) under and near TL in Bash show that this TL is located in key breeding habitat. That mean that Asian Houbara annually lost here 3% of breeding population, according to R. Burnside (Burnside et al, 2015).

The density calculated from the data of University of East Anglia density varies greatly for the territory of Dzhankeldy Windfarm, because unlike Bash site, there are a lot of plant communities there: for example, the density on Artemisia desert is 0.090 (0.081-0.1) birds (males)/km<sup>2</sup> (95% CI) and on S. arbuscula desert is 0.146 (0.131-0.162) birds (males)/km<sup>2</sup> (95% CI) (see table 1). Besides, the study area of University of East Anglia covers only the part of Dzhankeldy Windfarm near Kalaata village, and not to the north of it. All the Asian Houbara recorded on Dzhankeldy Windfarm this Spring were found on Artemisia desert and according to N. Beshko mapping the Artemisia desert is the main habitat on Dzhankeldy project site now (Fig. 19). The total area of this type of desert on Dzhankeldy site is 317 km<sup>2</sup>. So extrapolated male population in the study site is estimated 29 individuals, which when extrapolated to include females if the sex ratio was 1:1 (Combreau et al 2002) would give a total population of 58 breeding individuals. All the Asian Houbara recorded in Dzhankeldy were startled birds. Generally startled birds are not taken into account for density calculation, but the calculation was made based on April data and the density turned out to be 0.04 individuals per km<sup>2</sup>, since there is no data on whether these were males or females, we assumed that they were both. This equals about 12.68 individuals for the entire Artemisia desert habitat on Dzhankeldy project site. Thus 21.8% of the potential Asian Houbara population was recorded.

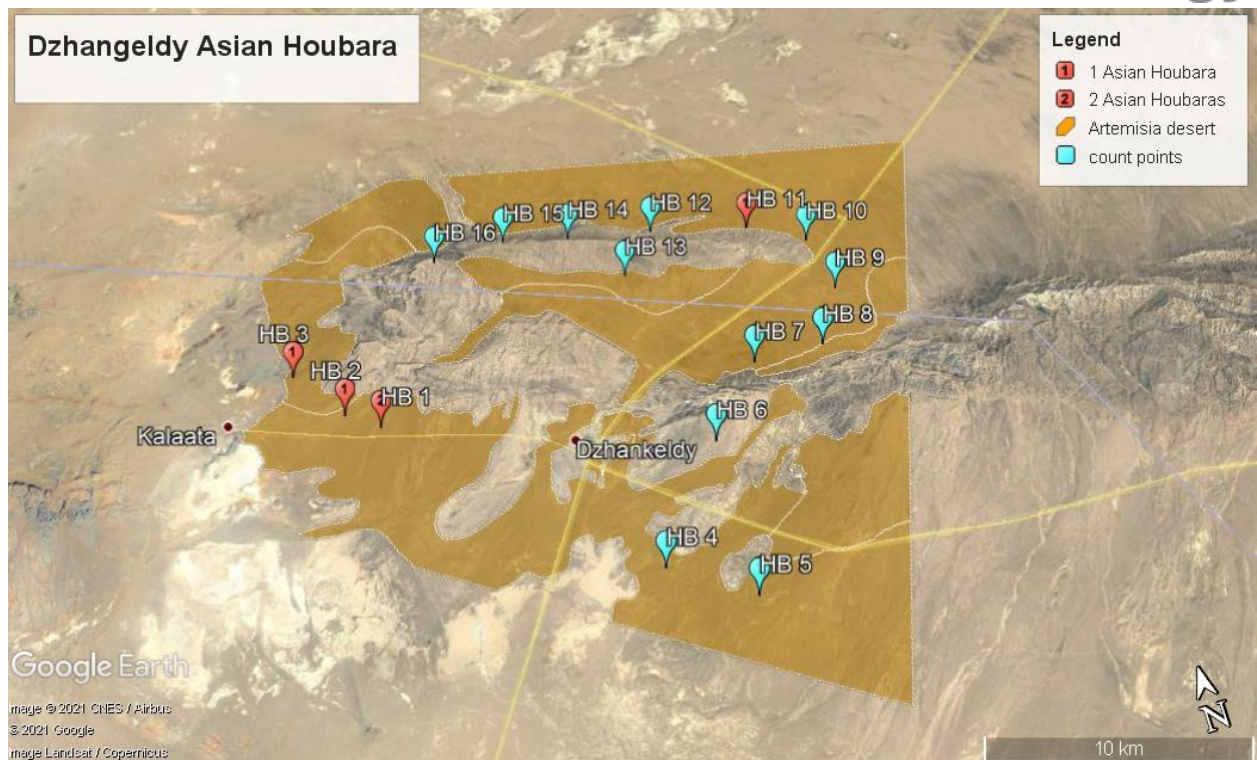


Figure 19 Dzhankeldy habitats and distribution of count points in April-May 2021

## Summary

Asian Houbara is a highly terrestrial bird, capable of going long periods without taking flight, it is nonetheless a true long-distance migrant, with some individuals travelling more than 7,500 km over the course of a single year (Combreau et al. 2011).

Spring migration in frames of Kyzylkum desert starts in February (in warm winters), but usually in March and lasts till the end of April. The main direction of the flight is south-west. Autumn migration starts in September and lasts until mid-November. Asian Houbara is a rare wintering bird in southern Kyzylkum.

Asian Houbaras are often recorded as single bird or in small groups - from 3-5 to 10-15 individuals during migration. In Ecocenter "Djeyran" (Bukhara region), for instance, we observed the flock of 12 individuals in the 1st decade of October 2015.

Breeding season starts with males displaying in mid-March and goes till the end of July when broods break up and every bird stays on its own. The hatching of chicks usually starts from the beginning of May. The females often feed with chicks near roads where they collect insects and reptiles. In Ecocenter "Djeyran" (Bukhara region) a female fed chicks till July 21 (chicks hatched on April 30) (Gubin, 2004). So the end of July could be also the end of breeding season.

Asian Houbaras are active during the day; apparently, it migrates during the day as well. In hot summer time they could feed also in moonlight nights and active only early morning and late evening (Gubin, 2004).

There is no information about the flight altitude of Asian Houbara, but it is well known that this bird fly low. Usually we observed Asian Houbaras flying away from the disturbance at the altitude of 30-50 m. In October 2015 in Ecocenter "Djeyran" (Bukhara region) the flight altitude of the flying flock of 12 Asian Houbaras that we observed was about 50-70m. During migration the altitude of flying birds is higher, it is known from literature that Asian Houbaras could fly above low mountains on altitude about 1500-2000 m (Combreau et al 2011).

1. The Asian Houbara is a species difficult to study due to its secretive lifestyle, on the one side, and one of the most vulnerable bird species to wind turbines and power lines collisions, on the other.
2. The bustard is a common non-numerous breeding and migrating species on the Bash site. Research in April and May 2021 confirmed the importance of the area for breeding, incubation and feeding of chicks. We could define the key breeding habitats for Asian Houbara on Bash site (fig.18).
3. Density of this species according to data of M. Koshkin and his colleagues (2016) on Artemisia is 0.090 (0.081-0.1) birds (males)/km<sup>2</sup> (95% CI). The total area of this type of desert on Bash site is 264 km<sup>2</sup>, so extrapolated total population could be estimates as 42-52 breeding adults. The total area of this type of desert on Dzhankeldy site is 317 km<sup>2</sup>. so extrapolated total population could be estimates as 58 breeding individuals.
4. The study of the death on a transmission line (Burnside et al. 2015) showed that Asian Hobaras were susceptible to collision with both high-and low - voltage powerlines and that the mortality estimated in 120 birds lost/year for Uzbekistan (95% CI: 0–350 birds). After hunting and poaching, therefore, powerlines are likely to be an important additional cause of mortality in the Asian Houbara. The analysis shows that TL on Bash site lies in key habitat and that mortality could be 3% every year.
5. This report is presented data analysis on breeding season of Asian Houbara and do not include information about migrating. However, well known that this site is lies on the main migration route of Asian Houbara (Fig.1).

## Recommendations

1. Analysis showed that 31 wind turbines are planned to be built in key breeding habitat on Bash site. We suggest to provide protected alternative breeding habitat for Houbara Bustard as a compensatory measure.
2. Incorporate rigorous, operations-phase impact monitoring programs (for both collision and displacement impacts), as well as a flexible, “adaptive” biodiversity management program that includes a contingency to implement mitigation for Houbara Bustard, should unacceptable impact levels be detected during the Project’s operations phase. One benefit of this latter approach is that it could serve to fill a current scientific knowledge gap regarding whether or not HB is adversely impacted by the installation of wind turbines.
3. All existing power lines and planned turbines on both project sites need to be fitted with the appropriate insulation and bird flight deflectors, diverters and other which help birds to detect powerlines and turbines.
4. Taking into account research of the visual fields and blind spots of birds, including bustards, and the importance of vision in detecting obstacles conducted by G. R. Martin and J. M. Shaw (2010), and their main conclusion that in addition to visualization of obstacles on power lines or turbines there should be other methods of behavior management of birds, we suggest the modification of the habitat. The creation of the zone of thick bushes (saxaul and others) around turbines and power lines would not allow bustards to takeoff close to the obstacles and problem of blind zones will be solved as bird collisions mainly happen during takeoff and landing. This proposal need to be discussed among experts.
5. Reduce rubbish on sites. During the installation of met masts, household waste was left on the sites. Bustards can swallow trash and die.
6. Use existing roads, create new roads only when needed.
7. The construction of turbines on both project sites should not cover breeding season, especially in key habitats.

8. The future works of conservation Asian Houbara in Bash and Dzhankeldy windfarms should be planned with close contribution with leading experts (John Burnside) from University of East Anglia. As they have more deep and wide knowledge of ecology, behaviour, threats and migration measures for this vulnerable species.



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## Bird Collision Risk Modeling Analysis

<b>Report Title</b>	<u>Bird Collision Risk Modeling Analysis</u>
<b>Scope</b>	BIRDS VP
<b>Areas Covered</b>	DZHANKELDY WF
<b>Seasons Covered</b>	SPRING 2020 / SUMMER 2020 / AUTUMN 2020 / WINTER 2021
<b>Notes</b>	

## Bird Collision Risk Modeling Analysis for the Dzhankeldy Wind Energy Project

### Introduction

Collision Risk Modeling (CRM) using the model developed and refined by William Band, has become a standard method in international industry practice for obtaining quantitative predictions of estimated fatality rates of birds at wind farms, where suitable field observation data from Vantage Point (VP) surveys have been collected, conforming to the data input assumptions of the Band (2012) model, and following the guidance for such surveys and subsequent CRM promulgated by Scottish Natural Heritage (SNH 2017). The Band CRM predicts the expected collision rates of particular bird species or species groups at a given wind farm based on the specific dimensions and physical characteristics of the rotors, the birds, the wind farm, and the density of bird flights recorded in the wind farm area. The latter parameter is termed “bird density” and is derived from the VP survey data, further differentiated with regard to the altitude of the birds’ flights relative to the rotor swept altitudes of the rotors. While the basic mechanism of the Band model does not incorporate the ability or tendency of birds to alter their flight paths in response to the presence of wind turbines (avoidance), such behavior is believed to be a very important dynamic influencing actual bird collision rates at wind farms (Cook et. al. 2012), hence a “collision avoidance rate” parameter is typically applied for each bird species or species group when conducting CRM for wind farms using the Band model (Whitfield and Madders 2006a, 2006b, Garvin et al. 2011, Band 2012, SNH 2014, Whitfield and Urquhart 2015).

We conducted CRM using the Band (2012) model for the purpose of obtaining quantitative predictions of collision risk during migratory, breeding, and winter seasons for target bird species, as well as selected additional species, based on their observed patterns of seasonal abundance and use of airspace at the site, as described by observations gathered during VP surveys. We performed this analysis separately for each of four seasons in the continuous year of monitoring that spanned 2020 and 2021, based on VP survey data gathered at the DWEP site during the corresponding season. Seasons were defined based on general timing of migratory and breeding periods for target bird species within the region as follows:

Spring (migration): March 16-May 15

Summer (breeding): May 16-August 31

Autumn (migration): September 1-November 15

Winter: November 16 – March 15

The VP survey protocol was developed with guidance from Xenops, and intended to conform with SNH (2017) recommendations, in order to provide input data suitable for performing CRM with the Band (2012) model. In addition to guidance in the form of an initial set of recommendations, Xenops also reviewed and commented on a draft workplan, geospatial information regarding the selection and placement of a suitable number of VP survey locations, and quarterly VP survey summary reports. Furthermore, Xenops also provided templates for the VP field survey data sheet and a data compilation spreadsheet, and instructions for monthly and quarterly VP survey reporting for use by the local

ornithology team, which was led by Alisher Atakhodjaev and Yakub Ametov, with support from Ramzjon Sohibnazarov and Asilbek Sokhibnazarov. The local ornithologists provided some additional species-specific data inputs necessary for the CRM, based on their field observations and expert judgment, as requested by Xenops. While this communication provides some assurance that the input data used for this CRM effort conform to SNH guidance and the model's input assumptions, the reliability of the results of this CRM is ultimately dependent on the qualifications and diligence of the field observers, as well as the veracity of their results, as they were reported to Xenops by the local ornithology team.

The species for which CRM was conducted included all primary and secondary "target" bird species, as defined within the DWEP bird and bat baseline survey workplan, for which at least one observation occurred during the VP surveys. The list of such species was developed by Xenops with input from regional bird experts, and was intended to include all potentially high- or moderate- sensitivity bird species that could occur at the site, including all species of raptors and vultures, and all species with any elevated conservation status at the national (Uzbekistan Federal Government 2019) or international (IUCN Red List of Threatened Species) levels. The target species list was revised over the course of the study to accommodate incidence of species not initially expected to occur at the site. Furthermore, one target species that was not observed during the VP survey effort (Saker Falcon, *Falco cherrug*) was, nonetheless, modeled using a hypothetical scenario in which one individual was observed flying within rotor swept altitudes during each season (four total). The purpose of this modeled hypothetical scenario was to generate an upper bound collision risk estimate or "worst case" scenario for this high-sensitivity species, given the observed result of zero observations in the actual VP Survey effort. Finally, we also modeled collision risk for selected non-target species of large-bodied water birds that were observed at least one time during the VP survey effort. The species included within the CRM for the DWEP are shown in Table 1, along with their national and international conservation status, their Project-specific priority level<sup>1</sup>, and the total number of VP survey observations that were included within the CRM analysis for each season<sup>2</sup>.

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<sup>1</sup> Project-specific priority levels are defined in the Project's workplan, and are based on consideration of likely susceptibility to wind farm impacts and likelihood of occurrence at the site, as well as national and international conservation (protected) status.

<sup>2</sup> Observations that were recorded outside of the maximum reliable observation radius were regarded as "incidental" observations, and were excluded from the CRM analysis.

## Bird Collision Risk Modeling Analysis for the Dzhankeldy Wind Energy Project

**Table 1:** Summary of conservation/sensitivity status and numbers of VP survey observations in each season for each bird species included within the Collision Risk Modeling analysis for the Dzhankeldy Wind Energy Project. Conservation/protected status are as follows: EN = Endangered; VU = Vulnerable; NT = Near Threatened; (blank) = Least Concern (IUCN) or not-listed nationally. Color-coding of species' project-sensitivity classification is as follows: pink = tier 1 target species; yellow = tier 2 target species; green = other (non-target) modeled species.

Scientific Name	English Common Name	Uzbek status <sup>3</sup>	IUCN status <sup>4</sup>	VP Observations			
				Spring	Summer	Autumn	Winter
<i>Chlamydotis macqueenii</i>	Houbara Bustard	VU	VU	1			
<i>Microcarbo pygmaeus</i>	Pygmy Cormorant	NT		17		22	7
<i>Pelecanus onocrotalus</i>	Great White Pelican	VU				16	
<i>Neophron percnopterus</i>	Egyptian Vulture	VU	EN	12	31	1	
<i>Aegypius monachus</i>	Cinereous Vulture	NT	NT	3	3	14	6
<i>Gyps fulvus</i>	Eurasian Griffon	VU	NT		4		
<i>Circaetus gallicus</i>	Short-toed Snake-Eagle	VU				1	
<i>Aquila nipalensis</i>	Steppe Eagle	NT	EN		2	9	6
<i>Aquila heliaca</i>	Imperial Eagle	VU	VU			2	
<i>Aquila chrysaetos</i>	Golden Eagle	VU		6			3
<i>Haliaeetus albicilla</i>	White-tailed Eagle	VU		1			8
<i>Falco naumanni</i>	Lesser Kestrel	NT			5	1	
<i>Falco cherrug</i> <sup>5</sup>	Saker Falcon	NT	EN	0 (1)	0 (1)	0 (1)	0 (1)
<i>Grus grus</i>	Common Crane			11			
<i>Circus aeruginosus</i>	Eurasian Marsh-Harrier			11	12	16	2
<i>Circus cyaneus</i>	Hen Harrier			19	7	16	21
<i>Milvus migrans</i>	Black Kite			2		4	
<i>Accipiter nisus</i>	Eurasian Sparrowhawk				3		
<i>Buteo buteo</i>	Common Buzzard			6	6	27	3
<i>Buteo rufinus</i>	Long-legged Buzzard			37	15	51	11
<i>Falco tinnunculus</i>	Eurasian Kestrel			51	19	54	47
<i>Tadorna ferruginea</i>	Ruddy Shelduck					30	
<i>Anas strepera</i>	Gadwall			27		31	
<i>Anas platyrhynchos</i>	Mallard					110	
<i>Anas crecca</i>	Green-winged Teal			42		7	6
<i>Chroicocephalus ridibundus</i>	Black-headed Gull			18		23	6
<i>Larus cachinnans</i>	Caspian Gull			31			6
<i>Phalacrocorax carbo</i>	Great Cormorant					24	
<i>Ardea cinerea</i>	Gray Heron			13		5	6
<i>Ardea purpurea</i>	Purple Heron			1			
<i>Ardea alba</i>	Great Egret					2	
<i>Nycticorax nycticorax</i>	Black-crowned Night-Heron					6	

<sup>3</sup> Uzbekistan Federal Government, 2019. Uzbekistan Red List of Threatened Species

<sup>4</sup> IUCN Red List of Threatened Species, accessed 1 July, 2021

<sup>5</sup> Saker Falcon was included in the CRM in spite of zero in-flight observations during the VP survey effort because of the high level of Project-specific priority for this species. It was modeled under the hypothetical assumption that a single bird was seen flying within rotor swept height during the VP survey observations in each season.

### Model Input Data

Data inputs for the CRM analysis were derived from the results of the VP surveys, as well as various additional sources, depending on the type of information needed. Specific sources and pertinent assumptions for each type of input data used in the CRM are described further below.

#### Turbine and wind farm data

Specific physical parameters of the turbines, towers, and wind farm used for the CRM are based on the specifications and layout provided by Juru in June, 2021, and are detailed and explained in Table 2.

Table 2: Model input data on physical characteristics of the turbines, towers, and wind farm configuration used in the Collision Risk Modeling for the Dzhankeldy Wind Energy Project, along with notes and explanations of each.

Parameter	Value(s) used in Modeling	Explanation
Turbine model	Envision EN 171/6.5	Provided by developer
# blades	3	from manufacturer's specifications
Rotation speed (rpm)	7.5	Average value calculated from manufacturer's specifications for similarly-sized turbine (GW 165)
Rotor radius (m)	85.5	from manufacturer's specifications
Hub height (m)	100	Provided by developer
Percent of time operational	Monthly values ranging from 63.8% to 84.6%	Project specific data not available, representative values taken from SOSS example
Maximum blade width (m)	4.5	From manufacturer's specifications
Pitch (degrees)	47.5	Mean value from manufacturer's specifications
# turbines	79	Provided by developer
latitude	40.8	Approximate midpoint of DWEP area
Rotor swept altitude range (risk height, m)	14.5-185.5	Based on rotor diameter and hub height

#### Data on Physical and Observational Characteristics of Birds

In addition to bird densities derived from VP survey data, CRM using the Band model requires certain data on the physical and observational characteristics of each modeled species of bird. Input values used in the CRM analysis are presented in Table 3. As a general rule, data on physical dimensions of birds were derived from Cornell Lab of Ornithology's Birds of the World<sup>6</sup>, while information specific to the VP survey observations, such as typical flight speeds, flight styles, and maximum effective radius of observation/identification were generated using input from the local ornithologist, Alisher Atakhodjaev, based on his observations at the site and expert judgment.

<sup>6</sup> <https://birdsoftheworld.org/bow/home>, accessed 5-9 August, 2020 and 4-14 January, 2021



## Bird Collision Risk Modeling Analysis for the Dzhankeldy Wind Energy Project

**Table 3:** Physical and observational characteristics of each bird species included within the Collision Risk Modeling analysis for the Dzhankeldy Wind Energy Project. Color-coding of species' project-sensitivity classification is as follows: pink = tier 1 target species; yellow = tier 2 target species; green = other (non-target) modeled species.

Scientific Name	English Common Name	Length (m)	Wingspan (m)	Flight type <sup>7</sup>	Flight speed (m/sec) <sup>8</sup>	Detection distance (km) <sup>9</sup>
<i>Chlamydotis macqueenii</i>	Houbara Bustard	0.65	1.5	flapping	11.10	0.5
<i>Microcarbo pygmaeus</i>	Pygmy Cormorant	0.5	0.85	flapping	15.20	0.5
<i>Pelecanus onocrotalus</i>	Great White Pelican	1.56	2.93	flapping	15.60	2
<i>Neophron percnopterus</i>	Egyptian Vulture	0.62	1.6	gliding	13.90	2
<i>Aegypius monachus</i>	Cinereous Vulture	1.1	2.73	gliding	19.40	1
<i>Gyps fulvus</i>	Eurasian Griffon	1.01	2.52	gliding	19.40	1
<i>Circus gallicus</i>	Short-toed Snake-Eagle	0.66	1.77	gliding	11.30	0.5
<i>Aquila nipalensis</i>	Steppe Eagle	0.70	1.9	gliding	18.06	0.5
<i>Aquila heliaca</i>	Imperial Eagle	0.71	1.9	gliding	18.06	0.5
<i>Aquila chrysaetos</i>	Golden Eagle	0.77	2.03	gliding	18.06	0.5
<i>Haliaeetus albicilla</i>	White-tailed Eagle	0.83	2.19	Gliding	13.60	0.5
<i>Falco naumanni</i>	Lesser Kestrel	0.31	0.66	flapping	13.90	0.2
<i>Falco cherrug</i>	Saker Falcon	0.51	1.12	flapping	22.20	0.4
<i>Grus grus</i>	Common Crane	1.08	1.9	flapping	16.67	0.5
<i>Circus aeruginosus</i>	Eurasian Marsh-Harrier	0.48	1.3	gliding	11.10	0.8
<i>Circus cyaneus</i>	Hen Harrier	0.46	1.1	gliding	11.10	0.5
<i>Milvus migrans</i>	Black Kite	0.55	1.37	gliding	11.7	0.5
<i>Accipiter nisus</i>	Eurasian Sparrowhawk	0.34	0.67	flapping	19.40	0.2
<i>Buteo buteo</i>	Common Buzzard	0.46	1.23	gliding	16.67	0.4
<i>Buteo rufinus</i>	Long-legged Buzzard	0.53	1.3	gliding	16.67	0.4
<i>Falco tinnunculus</i>	Eurasian Kestrel	0.31	0.68	flapping	13.90	0.2
<i>Tadorna ferruginea</i>	Ruddy Shelduck	0.66	1.3	flapping	22.20	1
<i>Anas strepera</i>	Gadwall	0.52	0.9	flapping	22.20	0.4
<i>Anas platyrhynchos</i>	Mallard	0.58	0.88	flapping	22.20	0.4
<i>Anas crecca</i>	Green-winged Teal	0.37	0.61	flapping	22.20	0.4
<i>Chroicocephalus ridibundus</i>	Black-headed Gull	0.4	1.02	flapping	11.9	0.5
<i>Larus cachinnans</i>	Caspian Gull	0.63	1.41	flapping	11.9	0.5
<i>Phalacrocorax carbo</i>	Great Cormorant	0.9	1.45	flapping	15.20	1
<i>Ardea cinerea</i>	Gray Heron	0.94	1.85	flapping	11.2	0.5
<i>Ardea purpurea</i>	Purple Heron	0.84	1.35	flapping	10.8	0.5
<i>Ardea alba</i>	Great Egret	0.92	1.55	flapping	10.2	0.5
<i>Nycticorax nycticorax</i>	Black-crowned Night-Heron	0.62	1.09	flapping	13.90	0.5

<sup>7</sup> The model does not permit inclusion of multiple flight styles, hence only the most prevalent flight type was used for each species, based on the observations of A. Atakhodjaev

<sup>8</sup> Estimated for some species by A. Atakhodjaev, based on his observations during the VP survey effort. Some species flight speeds derived from Alerstam et. Al. (2007).

<sup>9</sup> Maximum reliable detection distance estimated for each species by A. Atakhodjaev based on his observations during the VP survey effort, and accounting not only for the distance at which each species could be reliably observed, but also the distance at which each species could be reliably distinguished from other species (identified)

## Bird Collision Risk Modeling Analysis for the Dzhankeldy Wind Energy Project

### VP Survey Data Used to Derive Bird Density

Bird density inputs in CRM analysis represent the density of birds flying within the surveyed area at any given moment in time. These values are calculated based on the observations gathered during the VP surveys, and then further differentiated based on the percent of such flights that occurred within “risk height” equivalent to the range of altitudes swept by the turbines to be installed. The instantaneous survey area is based on the species-specific maximum effective detection radius at a single VP (Table 3). For most tier 1 target species, the paths and altitudes of each individual birds’ flights were plotted every 15 seconds while the birds were inside of the specified observation radius (up to 2 km from the observer). For these species, the bird density was calculated by dividing the total number of fractional minutes of the birds’ presence flying within the specified observation radius, by the total number of minutes of VP survey observation for the period, and then dividing that by the instantaneous survey area, as a function of the species-specific maximum reliable detection radius. For some tier 1 target species and all tier 2 target species and “other” species, only a single, representative flight height was recorded for each observation of an individual or flock observed flying within the specified observation radius during the VP surveys. In order to calculate the number of “observation minutes” for such species, we estimated representative observation durations by calculating the time it would take a bird to transit the entire diameter of the surveyed area, defined by species-specific detection distances, at species-specific flight speeds (Table 3). Summaries of the VP survey data used to calculate bird density values in each season are presented in Tables 4-7. Note that these tables show cumulative values for each season, but in the CRM analysis, the data are broken down further by month.

**Table 4:** Observational data from the Vantage Point surveys used to derive bird density inputs for the **spring** season Collision Risk Modeling analysis for the Dzhankeldy Wind Energy Project. For all species, the total duration of observations was equivalent to the total of 330.5 hours, or 19,829 minutes of VP survey effort conducted at the Project during the spring season. Color coding of species by project-specific priority level follows that of Table 1.

Scientific Name	English Common Name	Number of observations <sup>10</sup>	% at rotor swept height <sup>11</sup>	Total bird minutes	Effective survey area (km <sup>2</sup> )
<i>Chlamydotis macqueenii</i>	Houbara Bustard	1	100	0.25	0.785
<i>Microcarbo pygmaeus</i>	Pygmy Cormorant	17	58.7	9.32	0.785
<i>Neophron percnopterus</i>	Egyptian Vulture	12	100	30.8	12.6
<i>Aegypius monachus</i>	Cinereous Vulture	3	96.3	3	3.14
<i>Aquila chrysaetos</i>	Golden Eagle	6	100	3	0.785
<i>Haliaeetus albicilla</i>	White-tailed Eagle	1	100	0.75	0.785
<i>Falco cherrug</i> <sup>12</sup>	Saker Falcon	0 (1)	(100)	(0.30)	0.503
<i>Grus grus</i>	Common Crane	11	0	5.50	0.785
<i>Circus aeruginosus</i>	Eurasian Marsh-Harrier	11	97.6	13.2	2.01
<i>Circus cyaneus</i>	Hen Harrier	19	100	14.3	0.785
<i>Milvus migrans</i>	Black Kite	2	100	1.42	0.785
<i>Buteo buteo</i>	Common Buzzard	6	88.1	2.40	0.503

<sup>10</sup> Observations of birds that were further from the observer than the maximum detection distance are regarded as incidental observations, and were not included in the CRM analysis

<sup>11</sup> Aggregate annual values of % in rotor swept zone (“Q2R” parameter) were calculated from the data and applied to the CRM analysis for each month, in order to ameliorate small sample size artifacts.

<sup>12</sup> There were zero observations of Saker Falcon in the VP data set. However, a hypothetical scenario was modeled for this species in which a single observation of a bird flying at rotor swept height was recorded in each season.

## Bird Collision Risk Modeling Analysis for the Dzhankeldy Wind Energy Project

Scientific Name	English Common Name	Number of observations <sup>10</sup>	% at rotor swept height <sup>11</sup>	Total bird minutes	Effective survey area (km <sup>2</sup> )
<i>Buteo rufinus</i>	Long-legged Buzzard	37	95.6	14.8	0.503
<i>Falco tinnunculus</i>	Eurasian Kestrel	51	99.4	12.2	0.126
<i>Anas strepera</i>	Gadwall	27	100	8.11	0.503
<i>Anas crecca</i>	Green-winged Teal	42	100	12.6	0.503
<i>Chroicocephalus ridibundus</i>	Black-headed Gull	18	51.1	12.6	0.785
<i>Larus cachinnans</i>	Caspian Gull	31	100	21.7	0.785
<i>Ardea cinerea</i>	Gray Heron	13	100	9.67	0.785
<i>Ardea purpurea</i>	Purple Heron	1	100	0.772	0.785

**Table 5:** Observational data from the Vantage Point surveys used to derive bird density inputs for the **summer** season Collision Risk Modeling analysis for the Dzhankeldy Wind Energy Project. For all species, the total duration of observations was equivalent to the total of 414.3 hours, or 24,857 minutes of VP survey effort conducted at the Project during the summer season. Color coding of species by project-specific priority level follows that of Table 1.

Scientific Name	English Common Name	Number of observations <sup>13</sup>	% at rotor swept height <sup>14</sup>	Total bird minutes	Effective survey area (km <sup>2</sup> )
<i>Neophron percnopterus</i>	Egyptian Vulture	31	100	77.8	12.6
<i>Aegypius monachus</i>	Cinereous Vulture	3	96.3	2.5	3.14
<i>Gyps fulvus</i>	Eurasian Griffon	4	75.0	7	3.14
<i>Aquila nipalensis</i>	Steppe Eagle	2	100	1.25	0.785
<i>Falco naumanni</i>	Lesser Kestrel	5	100	1.20	0.126
<i>Falco cherrug</i> <sup>15</sup>	Saker Falcon	0 (1)	(100)	(0.30)	0.503
<i>Circus aeruginosus</i>	Eurasian Marsh-Harrier	12	97.6	14.4	2.01
<i>Circus cyaneus</i>	Hen Harrier	7	100	5.26	0.785
<i>Accipiter nisus</i>	Eurasian Sparrowhawk	3	100	0.515	0.126
<i>Buteo buteo</i>	Common Buzzard	6	88.1	2.40	0.503
<i>Buteo rufinus</i>	Long-legged Buzzard	15	95.6	6.00	0.503
<i>Falco tinnunculus</i>	Eurasian Kestrel	19	99.4	4.56	0.126

<sup>13</sup> Observations of birds that were further from the observer than the maximum detection distance are regarded as incidental observations, and were not included in the CRM analysis

<sup>14</sup> Aggregate annual values of % in rotor swept zone ("Q2R" parameter) were calculated from the data and applied to the CRM analysis for each month, in order to ameliorate small sample size artifacts.

<sup>15</sup> There were zero observations of Saker Falcon in the VP data set. However, a hypothetical scenario was modeled for this species in which a single observation of a bird flying at rotor swept height was recorded in each season.

## Bird Collision Risk Modeling Analysis for the Dzhankeldy Wind Energy Project

**Table 6:** Observational data from the Vantage Point surveys used to derive bird density inputs for the **autumn** season Collision Risk Modeling analysis for the Dzhankeldy Energy Project. For all species, the total duration of observations was equivalent to the total of 338.8 hours, or 20,327 minutes of VP survey effort conducted at the Project during the autumn season. Color coding of species by project-specific priority level follows that of Table 1.

Scientific Name	English Common Name	Number of observations <sup>16</sup>	% at rotor swept height <sup>17</sup>	Total bird minutes	Effective survey area (km <sup>2</sup> )
<i>Microcarbo pygmaeus</i>	Pygmy Cormorant	22	58.7	12.1	0.785
<i>Pelecanus onocrotalus</i>	Great White Pelican	16	100	34.2	12.6
<i>Neophron percnopterus</i>	Egyptian Vulture	1	100	2.5	12.6
<i>Aegypius monachus</i>	Cinereous Vulture	14	96.3	12.0	3.14
<i>Circus gallicus</i>	Short-toed Snake-Eagle	1	100	0.737	0.785
<i>Aquila nipalensis</i>	Steppe Eagle	9	100	5.00	0.785
<i>Aquila heliaca</i>	Imperial Eagle	2	100	1.00	0.785
<i>Falco naumanni</i>	Lesser Kestrel	1	100	0.240	0.126
<i>Falco cherrug</i> <sup>18</sup>	Saker Falcon	0 (1)	(100)	(0.30)	0.503
<i>Circus aeruginosus</i>	Eurasian Marsh-Harrier	16	97.6	19.2	2.01
<i>Circus cyaneus</i>	Hen Harrier	16	100	12.0	0.785
<i>Buteo buteo</i>	Common Buzzard	27	88.1	10.8	0.503
<i>Buteo rufinus</i>	Long-legged Buzzard	51	95.6	20.4	0.503
<i>Falco tinnunculus</i>	Eurasian Kestrel	54	99.4	12.9	0.126
<i>Tadorna ferruginea</i>	Ruddy Shelduck	30	90.0	22.5	3.14
<i>Anas strepera</i>	Gadwall	31	100	9.31	0.503
<i>Anas platyrhynchos</i>	Mallard	110	100	33.0	0.503
<i>Anas crecca</i>	Green-winged Teal	7	100	2.10	0.503
<i>Chroicocephalus ridibundus</i>	Black-headed Gull	23	51.1	16.1	0.785
<i>Phalacrocorax carbo</i>	Great Cormorant	24	100	26.3	3.14
<i>Ardea cinerea</i>	Gray Heron	5	100	3.72	0.785
<i>Ardea alba</i>	Great Egret	2	100	1.63	0.785
<i>Nycticorax nycticorax</i>	Black-crowned Night-Heron	6	100	3.60	0.785

<sup>16</sup> Observations of birds that were further from the observer than the maximum detection distance are regarded as incidental observations, and were not included in the CRM analysis

<sup>17</sup> Aggregate annual values of % in rotor swept zone ("Q2R" parameter) were calculated from the data and applied to the CRM analysis for each month, in order to ameliorate small sample size artifacts.

<sup>18</sup> There were zero observations of Saker Falcon in the VP data set. However, a hypothetical scenario was modeled for this species in which a single observation of a bird flying at rotor swept height was recorded in each season.

## Bird Collision Risk Modeling Analysis for the Dzhankeldy Wind Energy Project

**Table 7:** Observational data from the Vantage Point surveys used to derive bird density inputs for the **winter** season Collision Risk Modeling analysis for the Dzhankeldy Wind Energy Project. For all species, the total duration of observations was equivalent to the total of 380.2 hours, or 22,810 minutes of VP survey effort conducted at the Project during the spring season. Color coding of species by project-specific priority level follows that of Table 1.

Scientific Name	English Common Name	Number of observations <sup>19</sup>	% at rotor swept height <sup>20</sup>	Total bird minutes	Effective survey area (km <sup>2</sup> )
<i>Microcarbo pygmaeus</i>	Pygmy Cormorant	7	58.7	3.84	0.785
<i>Aegypius monachus</i>	Cinereous Vulture	6	96.3	5.29	3.14
<i>Aquila nipalensis</i>	Steppe Eagle	6	100	3.25	0.785
<i>Aquila chrysaetos</i>	Golden Eagle	3	100	1.25	0.785
<i>Haliaeetus albicilla</i>	White-tailed Eagle	8	100	4.47	0.785
<i>Falco cherrug</i> <sup>21</sup>	Saker Falcon	0 (1)	(100)	(0.30)	0.503
<i>Circus aeruginosus</i>	Eurasian Marsh-Harrier	2	97.6	2.40	2.01
<i>Circus cyaneus</i>	Hen Harrier	21	100	15.0	0.785
<i>Buteo buteo</i>	Common Buzzard	3	88.1	1.20	0.503
<i>Buteo rufinus</i>	Long-legged Buzzard	11	95.6	5.10	0.503
<i>Falco tinnunculus</i>	Eurasian Kestrel	47	99.4	11.8	0.126
<i>Anas crecca</i>	Green-winged Teal	6	100	1.80	0.503
<i>Chroicocephalus ridibundus</i>	Black-headed Gull	6	51.1	4.20	0.785
<i>Larus cachinnans</i>	Caspian Gull	6	100	4.20	0.785
<i>Ardea cinerea</i>	Gray Heron	6	100	4.46	0.785

### Collision Avoidance Parameter

Published, validated collision avoidance (CA) parameters are not available for most of the target species we modeled at the DWEP, yet the CA parameter is well-known to be a very important parameter in Band CRM analysis, with outcomes very sensitive to slight variation in CA (Cook et. al., 2012). For each species included within the CRM analysis for the DWEP, we developed a “most realistic” CA parameter value, bounded by a “conservative” low parameter estimate, and a high estimate, reflecting an upper bound, based on a comprehensive review of available literature, interpreted with species- and site-specific information. The values used for each species are presented in Table 8, and then a brief explanation/justification is presented for each species or species group below.

<sup>19</sup> Observations of birds that were further from the observer than the maximum detection distance are regarded as incidental observations, and were not included in the CRM analysis

<sup>20</sup> Aggregate annual values of % in rotor swept zone (“Q2R” parameter) were calculated from the data and applied to the CRM analysis for each month, in order to ameliorate small sample size artifacts.

<sup>21</sup> There were zero observations of Saker Falcon in the VP data set. However, a hypothetical scenario was modeled for this species in which a single observation of a bird flying at rotor swept height was recorded in each season.

## Bird Collision Risk Modeling Analysis for the Dzhankeldy Wind Energy Project

**Table 8:** Collision avoidance parameters used in the bird Collision Risk Modeling analysis for the Dzhankeldy Wind Energy Project (see text for explanation and justification). Color coding of species by project-specific sensitivity categories follows that of previous tables.

Scientific Name	English Common Name	Lower bound value	Most realistic value	Upper bound value
<i>Chlamydotis macqueenii</i>	Houbara Bustard	0.95	0.99	0.995
<i>Microcarbo pygmaeus</i>	Pygmy Cormorant	0.95	0.99	0.995
<i>Pelecanus onocrotalus</i>	Great White Pelican	0.95	0.99	0.995
<i>Neophron percnopterus</i>	Egyptian Vulture	0.99	0.9958	0.999
<i>Aegypius monachus</i>	Cinereous Vulture	0.98	0.99	0.995
<i>Gyps fulvus</i>	Eurasian Griffon	0.98	0.99	0.995
<i>Circetus gallicus</i>	Short-toed Snake-Eagle	0.981	0.9958	0.999
<i>Aquila nipalensis</i>	Steppe Eagle	0.981	0.9958	0.999
<i>Aquila heliaca</i>	Imperial Eagle	0.981	0.9958	0.999
<i>Aquila chrysaetos</i>	Golden Eagle	0.981	0.9958	0.999
<i>Haliaeetus albicilla</i>	White-tailed Eagle	0.95	0.975	0.99775
<i>Falco naumanni</i>	Lesser Kestrel	0.873	0.969	0.999
<i>Falco cherrug</i>	Saker Falcon	0.995	0.998	0.999
<i>Grus grus</i>	Common Crane	0.95	0.99	0.995
<i>Circus aeruginosus</i>	Eurasian Marsh-Harrier	0.95	0.99	0.999
<i>Circus cyaneus</i>	Hen Harrier	0.95	0.99	0.999
<i>Milvus migrans</i>	Black Kite	0.98	0.992	0.9985
<i>Accipiter nisus</i>	Eurasian Sparrowhawk	0.99	0.995	0.999
<i>Buteo buteo</i>	Common Buzzard	0.978	0.995	0.999
<i>Buteo rufinus</i>	Long-legged Buzzard	0.978	0.995	0.999
<i>Falco tinnunculus</i>	Eurasian Kestrel	0.873	0.969	0.999
<i>Tadorna ferruginea</i>	Ruddy Shelduck	0.95	0.99	0.995
<i>Anas strepera</i>	Gadwall	0.95	0.99	0.995
<i>Anas platyrhynchos</i>	Mallard	0.95	0.99	0.995
<i>Anas crecca</i>	Green-winged Teal	0.95	0.99	0.995
<i>Chroicocephalus ridibundus</i>	Black-headed Gull	0.98	0.992	0.995
<i>Larus cachinnans</i>	Caspian Gull	0.98	0.992	0.995
<i>Phalacrocorax carbo</i>	Great Cormorant	0.95	0.99	0.995
<i>Ardea cinerea</i>	Gray Heron	0.95	0.98	0.99
<i>Ardea purpurea</i>	Purple Heron	0.95	0.98	0.99
<i>Ardea alba</i>	Great Egret	0.95	0.98	0.99
<i>Nycticorax nycticorax</i>	Black-crowned Night-Heron	0.95	0.99	0.995

### *Eagles (genera Aquila, Circaetus, and Haliaeetus)*

The Golden Eagle (*Aquila chrysaetos*) has been the subject of several empirical research studies designed toward the objective of defining the most appropriate Collision Avoidance (CA) parameters for use with this species in modeling its risk of colliding with wind turbines, using the Band CRM. The low bound CA parameter value of 0.981 selected for the present analysis, corresponds to the lowest CA value estimated for Golden Eagles in Whitfield and Madders (2006a), based on their analysis of data from wind farms in California. This value is likely to be conservative, underestimating the true extent of Golden Eagles' avoidance of collisions with wind turbines, as Whitfield and Madders (2009) suggested that a CA parameter of 0.99 is "precautionary" for this species. The CA value selected as "most likely"

for the present analysis, 0.9958, corresponds to the mean adjusted CA estimate for Golden Eagles at the Altamont Wind Facility in California, USA, presented by Whitfield and Madders (2009), and is very close to the median CA value for this species of 0.995, presented by Whitfield and Madders (2006a). The upper bound CA value of 0.999 for Golden Eagles was selected based on the upper bound of 100% CA presented for Golden Eagles by Whitfield and Madders (2006a). No published estimates of CA were available for Steppe Eagle (*Aquila nipalensis*), or Imperial Eagle (*Aquila heliaca*), so we used the same CA values for this species as we did for Golden Eagle, based on the similarity of these congeneric species in terms of size, shape, behavior, and flight morphology. Although the Short-toed Snake-Eagle (*Circaetus gallicus*) is in a different genus and is smaller than *Aquila* eagles, we also used the same CA values for this species in the absence of published CA estimates specific to Short-toed Snake-Eagles. This choice was justified both based on the generally similar ecology and flight morphology of *Aquila* and *Circaetus* eagles, and also based on a similar proportion of wind turbine collision events for Short-toed Snake-Eagles in relation to numbers of flights, and “at risk” flights, in a three year aggregate dataset from 13 wind farms in northern Spain, discussed in Whitfield and Madders (2006a). For the White-tailed Eagle, a species whose behavior around, and risk of collisions with wind turbines has been extensively studied at the Smøla Wind Farm in coastal Norway, we used the value of 0.95 CA recommended by SNH<sup>22</sup> as a lower bound, with values of 0.975 and 0.99775 for the most realistic, and upper bound CA values, respectively, based on empirically derived CA parameter values presented in May et. al. (2011) on the basis of satellite telemetry studies.

#### *Egyptian Vulture*

No published CA values were available for this species. However, the aggregate dataset from northern Spain discussed in Whitfield and Madders (2006a) indicates that this species has a strong tendency to avoid collisions with wind turbines, as zero collisions were detected in datasets containing 134 observations of Egyptian Vultures at wind farms, including 30 “at risk” flights. Based on this evidence, and the overall similar size and flight morphology between Egyptian Vulture and *Aquila* eagles, we applied the same CA values for Egyptian Vulture as we did for the *Aquila* eagles, with the exception of applying the slightly higher lower bound value of 0.99, described as a “precautionary” CA value for Golden Eagles by Whitfield and Madders (2009).

#### *Eurasian Griffon and Cinereous Vulture*

To represent the CA values for these two closely-related, morphologically and ecologically similar species, we used a range of values following the recommendations of Vasilakis et. al. (2016), who generated empirically-based estimates of 0.99 and 0.995 CA parameters for Cinereous Vulture in a study comparing flight behaviors and wind farm collision fatality rates at wind farms in eastern Mediterranean Europe. We used these two values as the median and upper bound CA values, respectively for these two species. Vasilakis et. al. (2016) also suggested that the CA value for Cinereous Vulture could be as low as 0.98 taking into account potential sources of error and uncertainty in their analysis, hence we used this as our lower bound CA parameter value for these two vulture species.

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<sup>22</sup> <https://www.nature.scot/doc/wind-farm-impacts-birds-use-avoidance-rates-naturescot-wind-farm-collision-risk-model> accessed 20 June, 2021



## Bird Collision Risk Modeling Analysis for the Dzhankeldy Wind Energy Project

### *Saker Falcon*

No published CA values were available for this species. To fill this gap, we used values empirically derived by Whitfield and Madders (2006a) for the ecologically similar congeneric species, Prairie Falcon (*Falco mexicanus*), with 0.995 representing the low bound, 0.998 representing the median CA value, and 0.999 substituted for 1 (100% avoidance) as the upper bound.

### *Eurasian and Lesser Kestrels*

We represented these two kestrel species in the model using a range of CA values developed for the congeneric American Kestrel (*Falco sparverius*) based on the analysis of Whitfield and Madders (2006a), with 0.873 representing the lower bound CA value, 0.969 representing the median value, and 0.999 substituted for 1 (100% avoidance), as the upper bound CA value.

### *Harriers (genus Circus)*

We used published CA values empirically derived for the Hen Harrier (*Circus cyaneus*) to represent the collision avoidance tendencies of both of the *Circus* species observed during the spring VP surveys at the DWEP. In their review of wind farm impacts to Hen Harriers, Whitfield and Madders (2006b) concluded that a CA value of 0.95, used by some authors for this species, was “too low,” suggesting that a value of 0.99 was “more realistic.” Accordingly, we used the value of 0.95 as a lower bound CA value, and 0.99 as our most likely value. We used a CA value of 0.999 as the upper bound for modeling harrier collision risk in our analysis, corresponding to the median CA value for *Circus cyaneus* presented in Whitfield and Madders (2006a).

### *Eurasian Sparrowhawk*

No published CA values were available for the Eurasian Sparrowhawk (*Accipiter nisus*). For the purpose of the modeling effort, we based our hypothesized CA values for these species on very limited data on susceptibility of *Accipiter* species (including *Accipiter nisus*) to wind farm collisions presented in Whitfield and Madders (2006a), as well as the results of Garvin et al. (2011), which indicated a very strong tendency for *Accipiter* hawks to avoid collisions with wind turbines (100% avoidance), selecting CA values of 0.99, 0.995, and 0.999 to represent the low bound, most likely, and upper bound parameter estimates, respectively.

### *Long-legged and Common Buzzards*

No published CA values were available for these two species, hence we relied on CA values empirically derived for a congener, the Red-tailed Hawk (*Buteo jamaicensis*) by Whitfield and Madders (2006a), as follows: lower bound – 0.978; median value (or “most likely” in our analysis) – 0.995; upper bound – 0.999 (substituted for the value of 1, or 100% avoidance, presented as the upper bound CA value by Whitfield and Madders [2006a]).

### *Black Kite*

To represent the CA parameter for the Black Kite (*Milvus migrans*), we used a series of published parameter estimates and recommendations that have been developed for the congeneric, and morphologically similar Red Kite (*Milvus milvus*). SNH (2010) recommends a CA value of 0.98 for Red Kite, and we used this as the lower bound CA value for Black Kite in our analysis. The value of 0.992 that we used as the most realistic CA parameter value is based on the empirical result of Urquhart and Whitfield (2016) for Red Kite. The upper bound value of 0.9985 is based on the data presented in Whitfield and Madders (2006a) regarding fatality rate in proportion to passage rates of Red Kites at wind farms.



## Bird Collision Risk Modeling Analysis for the Dzhankeldy Wind Energy Project

### *Bustards and large-bodied water birds*

No published CA values were available for the bustards, cranes, ducks, pelicans or cormorants included within our analysis, hence we based our hypothesized CA values for these species on the recommendations of Cook et. al. (2012), who suggested using 0.95, 0.99, and 0.995 as a range of CA values to represent species for which no species-specific information is available. We note that all of these birds are large-bodied birds, and that this set of CA values is generally similar to, and a bit conservative in relation to CA values that have been empirically derived for a variety of morphologically similar species, such as swans, geese, and cormorants (Cook et. al. 2012). We also used these same values for Black-crowned Night-Heron. However, for the other three species of herons, we used slightly more conservative values of 0.95, 0.98, and 0.99, which were generated for these species in an analysis by Arcus Renewable Energy Consulting, Ltd. (2010).

### *Gulls (genera *Chroicocephalus* and *Larus*)*

For the two species of gulls documented during the VP survey effort, we selected CA values based on the findings of Furness (2019), who reviewed an extensive body of empirical studies from Europe and recommended a CA value of 0.992 for small gulls and 0.995 for large gulls. The Caspian Gull (*Larus cachinnans*) is larger than the Black-headed Gull (*Chroicocephalus ridibundus*). However, we used the values of 0.992 and 0.995 to represent the most realistic, and upper bound CA values, respectively for both of these species, as they are both intermediate in size relative to other gulls. We used 0.98 as the lower bound value, as this is the older recommended CA value for gulls by SNH, supplanted by the more recent review by Furness (2019).

## Results and Conclusions

The results of the CRM analysis for the DWEP are summarized in Tables 9-13. Tables 9-12 present each of the single season CRM results for each modeled species, and Table 13 presents the cumulative collision risk predictions of the CRM analysis for the entire, year-long survey period. The cumulative results were generated by adding the values for the four seasons together for each species, hence preserving the natural between-season variation in risky flight behavior deriving from the empirical data.

Overall, the results of the CRM analysis indicate that the DWEP has a low-moderate level of collision risk for sensitive bird species. No tier 1 target bird species are predicted to experience an annual collision frequency greater than one fatality per 2 years under the most likely collision avoidance rate scenarios modeled, and none of the collision rate predictions for any tier 2 target species or any other species modeled indicate a high likelihood of any severe risk issues for the Project. Nonetheless, a wide variety of bird species, including 13 species classified as “tier 1” target species does occur at the site, and will be exposed to some degree of collision risk from the Project. Furthermore, the predicted collision rates from the present CRM analysis, though supported by a robust, year-long VP survey effort, are subject to the inherent uncertainties and limitations of any CRM, in this case compounded by the scarcity of existing information on the susceptibility of Uzbekistan’s avifauna to collisions with wind turbines, given the relative newness of wind energy development in the country. More detailed discussions of bird collision risk for species in each of the Project’s sensitivity categories are presented below.

### *Collision Risk in Tier 1 Target Species*

The CRM analysis predicts that none of the tier 1 target species are likely to experience collision frequencies greater than 1 per 2 years (Lesser Kestrel and White-tailed Eagle, Table 13), based on the

CRM results for empirical scenarios using the most likely CA parameter values. *At this level of predicted collision risk, we conclude that the DWEP has a low likelihood of generating severe, or population-level impacts to any of these species.* However, we note that predicted fatality rates greater than one fatality per 10 years (Cinereous Vulture, Steppe Eagle, White-tailed Eagle) or per 20 years (Egyptian Vulture, Golden Eagle, Table 13) may be considered a significant concern, particularly for slow-reproducing, highly sensitive species that are known to be, or suspected of being susceptible to collisions with wind turbines, such as the five species named above. The strength and certainty of this conclusion are limited by the uncertainties inherent in predicting bird fatality rates using CRM, compounded in this case by the fact that species-specific CA parameter values have not been published for many of the high sensitivity bird species that could occur within the DWEP area.

The results for the hypothetical modeled scenario for Saker Falcon illustrate the overall strength of the analysis, largely owing to the very large number of total VP survey hours (1463.7) that were conducted over the course of the year-long survey period. In the actual VP data set, no observations of Saker Falcon were recorded, hence the actual modeled collision risk for Saker Falcon based on the empirical data set is zero. The hypothetical scenario modeled for this species (one observation of a single bird flying across the entire diameter of the observation circle within rotor swept height in each season) yielded a prediction of one collision every 62 years for the most realistic CA parameter value, and one collision every 24 years for the lower bound, or “worst case” CA parameter value (Table 13). This scenario was included to provide an upper bound to possible collision risk for this species, given the strength of the sampling effort in the VP survey data set, and this result indicates that the data set provides a positive indication that collision risk is truly very low for this species. To illustrate this point with another hypothetical example, if zero observations of a species had been similarly recorded for a species, but only a small number of VP survey hours had been conducted, then the addition of one observation could lead to a prediction of a moderate or high collision rate, because in that case, the actual data set would not contain a sufficiently robust level of effort to eliminate the possibility of high collision risk for the species, even though no observations of the species had been obtained.

Although the predicted collision rates are low, below one collision per 2 years, for all thirteen tier 1 target species that were documented during the VP surveys (Table 13), the presence of these species within the area does indicate some level of risk, and it must be noted that the predictions of any CRM analysis contain significant residual uncertainty, due largely to uncertainties in the species-specific behavioral tendencies that are known to exert an important influence on collision susceptibility. As a result of this uncertainty, the predictions of the CRM can only be validated with a robust impact monitoring program during the Project’s operational phase. It is also worth noting that the effective survey area modeled for Egyptian Vulture was very large, roughly 16x larger than it was for *Aquila* eagles (Tables 4-7). This difference resulted from the difference in maximum reliable observation (and identification) radius, which was 2km for Egyptian Vulture, compared with 0.5 km for *Aquila* eagles, based on input provided by the local ornithologist who led the survey effort. This difference had the effect of neutralizing the effect of the considerably larger number of observations of Egyptian Vultures (44 observations) compared with other tier 1 target species with smaller maximum reliable observation radius (e.g. Steppe Eagle [17 observations], Golden Eagle [9 observations] and Imperial Eagle [2 observations], Table 1). While we do not discount the difference in maximum observation radius among these species reported by the local ornithologist, we note that in light of the inherent residual uncertainty in CRM, the raw observational data (Table 1) can be interpreted to provide an alternative,

qualitative indication of seasonal collision risk in target species, and suggests a few patterns worth noting, such as relatively high abundance of Egyptian Vulture during summer and spring seasons, and possible light migratory passage of some tier 1 target species through the site in spring and fall seasons, including Steppe Eagle, Cinereous Vulture, Pygmy Cormorant, and Great White Pelican.

Finally, it is worth highlighting the somewhat surprising presence of certain water-affiliated bird species among the tier 1 target species documented during the VP survey effort at the site, and included within the CRM analysis (White-tailed Eagle, Great White Pelican, Pygmy Cormorant). These species were not initially expected to occur at the site due to the Project's location in a dry, upland area, with no significant wetlands or water bodies in close proximity. The most likely explanation for this result is that these water bird species utilize the site on an occasional basis, possible during migratory transits, as they fly to or from the Karakyr Lakes wetland complex, located a minimum of 20 km to the south of the DWEP area (see "other species" discussion for more detail).

### Collision Risk in Tier 2 Target Species

For tier 2 target species, the CRM analysis also predicts generally low-moderate collision rates, though the results for Eurasian Kestrel, a common and widespread species that does not have elevated conservation status at either the national or international levels, stand out as distinct from the rest, with a predicted collision fatality rate of 16.2 per year under the most realistic collision avoidance parameter value modeled (Table 13). By contrast, no other species modeled had a collision rate higher than one fatality per year under the most realistic collision avoidance scenarios, and only four other tier 2 species had predicted collision rates greater than once per 10 years under the most realistic collision avoidance scenarios (Table 13). This result for Eurasian Kestrel is not surprising in light of the known susceptibility of closely-related American Kestrels to wind turbine collisions at wind energy facilities in North America (AWWI 2019), as the collision avoidance parameters derived for American Kestrels were used to represent Eurasian Kestrel in the CRM analysis. The similarity in flight styles, behavior, and ecology of these two species, and the fact that Eurasian Kestrels were observed in abundance at the site in all four seasons (Table 1), explain this predicted result. Nonetheless, it does not necessarily represent a serious biodiversity risk, as the Eurasian Kestrel is a very common, widespread species for which the predicted level of fatality would not likely exert a population-level impact.

Aside from Eurasian Kestrels, other tier 2 species with moderate levels of predicted fatality included Eurasian Marsh-Harrier, abundant at the site during migration and breeding seasons, Hen Harrier, abundant at the site during migration and wintering seasons, Long-legged Buzzard, a year-round resident at the site showing peaks in abundance during migratory seasons, and Common Buzzard, a species that is only abundant at the site during autumn migration. *At the level of predicted collision risk for tier 2 target species, the DWEP does not raise serious concerns for potential impacts to any of these species.* It should be noted that all of these species are very abundant, widespread species with very large global populations, and none are classified with an elevated protected/conservation status at either the national or international levels. As with tier 1 target species, the conclusion of low-moderate collision risk for tier 2 target species resulting from the present analysis must be tempered by acknowledgment of the inherent limitations and uncertainties of predicting collision fatality rates using CRM, compounded in this case by a lack of published CA parameter value estimates for many of the tier 2 target species modeled. For this reason, the possibility that some tier 2 species could experience troublesome levels of collision fatality from the Project cannot be eliminated. As with tier 1 target species, the raw observational data summarized in Table 1 contains an indication that some raptor

migration activity passes through the site in both spring and autumn migratory seasons, though the data indicate that such activity is not particularly concentrated at the site in either season for any species (Table 1).

### Collision Risk in Other Species

For other (non-target) modeled bird species, the CRM analysis predicts collision rates as high as 1.05 collisions per year for Mallard under the most realistic CA parameter values, and collision rates more frequent than once per 5 years for five additional species of water bird (Gray Heron – 0.907 collisions per year, Gadwall – 0.597 collisions per year, Green-winged Teal – 0.585 collisions per year, Caspian Gull – 0.684 collisions per year, and Black-headed Gull – 0.271 collisions per year). For all other species, collision rates are predicted to be once every 6 years or rarer under the most realistic CA values. *At this level of predicted collision risk, the DWEP does not raise significant concerns for potential impacts to any of these species.* As with collision rate predictions for target species, it must be noted here that the collision rates predicted for the non-target species we included within our analysis are subject to the uncertainties inherent to the enterprise of predicting collision risk using CRM, and can only be validated through operations-phase fatality monitoring, as very little is currently known about the susceptibility of birds to wind turbine collisions in Uzbekistan.

Another noteworthy result of the VP survey effort and associated CRM was the presence of a significant diversity and abundance of water birds, including pelicans, cormorants, ducks, and herons (Tables 1, 13). This result was somewhat surprising, as the DWEP area, itself, does not contain any aquatic habitat or wetlands, nor are any such habitats present within close proximity. The most likely explanation is that the Project's location directly 20 km to the north of the Karakyr Lakes results in a relatively small, but notable passage of various water bird species through the site, particularly during migration seasons. The Karakyr Lakes is a major oasis for a wide variety of water birds, and is classified as an Important Bird Area by BirdLife International (site UZ012), as well as a Ramsar site, and a state reserve. While the Project's location 20 km from this area generally provides a sufficient buffer against generating significant risk of impacts to water birds, the diversity and abundance of water birds recorded at the site during the VP survey effort indicate that the Project does have some risk of collision impact to water bird species, in spite of its upland location.

## Bird Collision Risk Modeling Analysis for the Dzhankeldy Wind Energy Project

**Table 9:** Estimated rates of collisions per **spring** season for bird species at the Dzhankeldy Wind Energy Project, predicted by Band Collision Risk Modeling analysis, under a range of Collision Avoidance (CA) parameter values (see Table 8 for specific CA values for each species, and see text for explanation and justification of each). Color coding of species by project-specific sensitivity level follows that of other tables. Only the species observed during the spring VP survey effort are included in the table.

English Common Name	Using lower bound CA value		Using most realistic CA value		Using upper bound CA value	
	Collisions/ spring	Years to 1 spring collision	Collisions/ spring	Years to 1 spring collision	Collisions/ spring	Years to 1 spring collision
Houbara Bustard	0.0294	34	0.00589	169	0.00294	340
Pygmy Cormorant	0.471	2	0.0943	10	0.0471	21
Egyptian Vulture	0.0370	27	0.0155	64	0.00370	270
Cinereous Vulture	0.0426	23	0.0213	46	0.0107	93
Golden Eagle	0.127	7	0.0280	35	0.00666	150
White-tailed Eagle	0.0634	15	0.0317	31	0.00285	350
Saker Falcon <sup>23</sup>	0.00747	133	0.00299	334	0.00149	671
Common Crane	0	N/A	0	N/A	0	N/A
Eurasian Marsh-Harrier	0.464	2	0.0925	10	0.00925	108
Hen Harrier	1.49	<1	0.298	3	0.0298	33
Black Kite	0.0423	23	0.0169	59	0.00317	315
Common Buzzard	0.158	6	0.0360	27	0.00720	138
Long-legged Buzzard	1.02	<1	0.233	4	0.0467	21
Eurasian Kestrel	18.9	<1	4.69	<1	0.148	6
Gadwall	1.52	<1	0.303	3	0.152	6
Green-winged Teal	2.17	<1	0.434	2	0.217	4
Black-headed Gull	0.245	4	0.0978	10	0.0610	16
Caspian Gull	1.43	<1	0.572	1	0.357	2
Gray Heron	1.14	<1	0.458	2	0.229	4
Purple Heron	0.0645	15	0.0258	38	0.0129	77

<sup>23</sup> Results presented in the table for Saker Falcon are based on hypothetical scenario in which a single individual was observed during the spring VP survey effort, flying at rotor swept height. There were zero observations of Saker Falcon in the actual VP survey data set, hence the empirical prediction of collision risk is zero.

## Bird Collision Risk Modeling Analysis for the Dzhankeldy Wind Energy Project

**Table 10:** Estimated rates of collisions per **summer** season for bird species at the Dzhankeldy Wind Energy Project, predicted by Band Collision Risk Modeling analysis, under a range of Collision Avoidance (CA) parameter values (see Table 8 for specific CA values for each species, and see text for explanation and justification of each). Color coding of species by project-specific sensitivity level follows that of other tables. Only the species observed during the summer VP survey effort are included in the table.

English Common Name	Using lower bound CA value		Using most realistic CA value		Using upper bound CA value	
	Collisions/s summer	Years to 1 summer collision	Collisions/s summer	Years to 1 summer collision	Collisions/s summer	Years to 1 summer collision
Egyptian Vulture	0.105	9	0.0442	22	0.0105	95
Cinereous Vulture	0.0291	34	0.0145	64	0.00728	137
Eurasian Griffon	0.0646	15	0.0323	30	0.0162	61
Steppe Eagle	0.0447	22	0.00987	101	0.00235	425
Lesser Kestrel	1.41	<1	0.343	2	0.0110	90
Saker Falcon <sup>24</sup>	0.0113	88	0.00452	221	0.00226	442
Eurasian Marsh-Harrier	0.513	1	0.102	9	0.0102	98
Hen Harrier	0.434	2	0.0869	11	0.00869	115
Eurasian Sparrowhawk	0.134	7	0.0670	14	0.0134	74
Common Buzzard	0.132	7	0.0301	33	0.00601	166
Long-legged Buzzard	0.396	2	0.0898	11	0.0180	55
Eurasian Kestrel	5.52	<1	1.35	<1	0.0435	22

**Table 11:** Estimated rates of collisions per **autumn** season for bird species at the Dzhankeldy Wind Energy Project, predicted by Band Collision Risk Modeling analysis, under a range of Collision Avoidance (CA) parameter values (see Table 8 for specific CA values for each species, and see text for explanation and justification of each). Color coding of species by project-specific sensitivity level follows that of other tables. Only the species observed during the autumn VP survey effort are included in the table.

English Common Name	Using lower bound CA value		Using most realistic CA value		Using upper bound CA value	
	Collisions/autumn	Years to 1 autumn collision	Collisions/autumn	Years to 1 autumn collision	Collisions/autumn	Years to 1 autumn collision
Pygmy Cormorant	0.560	1	0.112	8	0.0560	17
Great White Pelican	0.299	3	0.0598	16	0.0299	33
Egyptian Vulture	0.00206	485	0.000863	1160	0.000206	4850
Cinereous Vulture	0.155	6	0.0778	12	0.0389	25
Short-toed Snake-Eagle	0.0184	54	0.00406	246	0.000970	1030
Steppe Eagle	0.202	4	0.0446	22	0.0106	94
Imperial Eagle	0.0389	25	0.00859	116	0.00205	487
Lesser Kestrel	0.221	4	0.0539	18	0.00173	578

<sup>24</sup> Results presented in the table for Saker Falcon are based on hypothetical scenario in which a single individual was observed during the summer VP survey effort, flying at rotor swept height. There were zero observations of Saker Falcon in the actual VP survey data set, hence the empirical prediction of collision risk is zero.

## Bird Collision Risk Modeling Analysis for the Dzhankeldy Wind Energy Project

English Common Name	Using lower bound CA value		Using most realistic CA value		Using upper bound CA value	
	Collisions/autumn	Years to 1 autumn collision	Collisions/autumn	Years to 1 autumn collision	Collisions/autumn	Years to 1 autumn collision
Saker Falcon <sup>25</sup>	0.00338	295	0.00136	735	0.000676	1470
Eurasian Marsh-Harrier	0.580	1	0.117	8	0.0117	85
Hen Harrier	0.872	1	0.174	5	0.0170	58
Black Kite	0.0715	13	0.0286	34	0.00537	186
Common Buzzard	0.576	1	0.131	7	0.0262	38
Long-legged Buzzard	0.961	1	0.218	4	0.0436	22
Eurasian Kestrel	19.4	<1	4.74	<1	0.154	6
Ruddy Shelduck	0.560	1	0.112	8	0.0560	17
Gadwall	1.47	<1	0.294	3	0.147	6
Mallard	5.28	<1	0.987	1	0.528	1
Green-winged Teal	0.306	3	0.0612	16	0.0306	32
Black-headed Gull	0.303	3	0.121	8	0.0758	13
Great Cormorant	0.715	1	0.143	6	0.0715	13
Gray Heron	0.411	2	0.164	6	0.0823	12
Great Egret	0.172	5	0.0688	14	0.0344	29
Black-crowned Night-Heron	0.706	1	0.142	7	0.0707	14

**Table 12:** Estimated rates of collisions per **winter** season for bird species at the Dzhankeldy Wind Energy Project, predicted by Band Collision Risk Modeling analysis, under a range of Collision Avoidance (CA) parameter values (see Table 8 for specific CA values for each species, and see text for explanation and justification of each). Color coding of species by project-specific sensitivity level follows that of other tables. Only the species observed during the winter VP survey effort are included in the table.

English Common Name	Using lower bound CA value		Using most realistic CA value		Using upper bound CA value	
	Collisions/winter	Years to 1 winter collision	Collisions/winter	Years to 1 winter collision	Collisions/winter	Years to 1 winter collision
Pygmy Cormorant	0.357	2	0.0715	13	0.0357	28
Cinereous Vulture	0.0717	13	0.0359	27	0.0180	55
Steppe Eagle	0.221	4	0.0487	20	0.0116	86
Golden Eagle	0.0613	16	0.0136	73	0.00326	306
White-tailed Eagle	0.630	1	0.318	3	0.0285	35
Saker Falcon <sup>26</sup>	0.0181	55	0.00724	138	0.00362	276
Eurasian Marsh-Harrier	0.139	7	0.0277	36	0.00277	361
Hen Harrier	1.68	<1	0.337	2	0.0337	29

<sup>25</sup> Results presented in the table for Saker Falcon are based on hypothetical scenario in which a single individual was observed during the autumn VP survey effort, flying at rotor swept height. There were zero observations of Saker Falcon in the actual VP survey data set, hence the empirical prediction of collision risk is zero.

<sup>26</sup> Results presented in the table for Saker Falcon are based on hypothetical scenario in which a single individual was observed during the winter VP survey effort, flying at rotor swept height. There were zero observations of Saker Falcon in the actual VP survey data set, hence the empirical prediction of collision risk is zero.

## Bird Collision Risk Modeling Analysis for the Dzhankeldy Wind Energy Project

English Common Name	Using lower bound CA value		Using most realistic CA value		Using upper bound CA value	
	Collisions/winter	Years to 1 winter collision	Collisions/winter	Years to 1 winter collision	Collisions/winter	Years to 1 winter collision
Common Buzzard	0.122	8	0.0277	36	0.00554	180
Long-legged Buzzard	0.369	2	0.0839	11	0.0168	59
Eurasian Kestrel	22.9	<1	5.60	<1	0.180	5
Green-winged Teal	0.452	2	0.0907	11	0.0452	22
Black-headed Gull	0.129	7	0.0516	19	0.0322	31
Caspian Gull	0.279	3	0.111	9	0.0698	14
Gray Heron	0.702	1	0.281	3	0.140	7

**Table 13:** Estimated rates of collisions per **year** for bird species at the Dzhankeldy Wind Energy Project, predicted by Band Collision Risk Modeling analysis, under a range of Collision Avoidance (CA) parameter values (see Tables 9-12 for predicted seasonal collision rates; see Table 8 for specific CA values for each species, and see text for explanation and justification of each). Color coding of species by project-specific sensitivity level follows that of other tables.

English Common Name	Using lower bound CA values for each season		Using most realistic CA values for each season		Using upper bound CA values for each season	
	Collisions/year	Years to 1 collision	Collisions/year	Years to 1 collision	Collisions/year	Years to 1 collision
Houbara Bustard	0.0294	34	0.00589	169	0.00294	340
Pygmy Cormorant	1.39	<1	0.277	3	0.139	7
Great White Pelican	0.299	3	0.0598	16	0.0299	33
Egyptian Vulture	0.145	6	0.0606	16	0.0145	68
Cinereous Vulture	0.299	3	0.150	6	0.0748	13
Eurasian Griffon	0.0646	15	0.0323	30	0.0162	61
Short-toed Snake-Eagle	0.0184	54	0.00406	246	0.000970	1030
Steppe Eagle	0.467	2	0.103	9	0.0246	40
Imperial Eagle	0.0389	25	0.00859	116	0.00205	487
Golden Eagle	0.217	4	0.0479	20	0.0115	86
White-tailed Eagle	0.698	1	0.349	2	0.0314	31
Lesser Kestrel	1.62	<1	0.397	2	0.0127	78
Saker Falcon <sup>27</sup>	0.0402	24	0.0161	62	0.00805	124
Common Crane	0	N/A	0	N/A	0	N/A
Eurasian Marsh-Harrier	1.71	<1	0.340	2	0.0340	29
Hen Harrier	4.48	<1	0.896	1	0.0896	11
Black Kite	0.114	8	0.0455	21	0.00854	117
Eurasian Sparrowhawk	0.134	7	0.0670	14	0.0134	74
Common Buzzard	0.987	1	0.224	4	0.0450	22
Long-legged Buzzard	2.75	<1	0.625	1	0.125	8
Eurasian Kestrel	66.7	<1	16.2	<1	0.526	1

<sup>27</sup> Results presented in the table for Saker Falcon are based on hypothetical scenario in which a single individual was observed during the VP survey effort in each season (4 total hypothetical observations), all flying at rotor swept height. There were zero observations of Saker Falcon in the actual VP survey data set, hence the empirical prediction of collision risk is zero.



## Bird Collision Risk Modeling Analysis for the Dzhankeldy Wind Energy Project

English Common Name	Using lower bound CA values for each season		Using most realistic CA values for each season		Using upper bound CA values for each season	
	Collisions/year	Years to 1 collision	Collisions/year	Years to 1 collision	Collisions/year	Years to 1 collision
Ruddy Shelduck	0.560	1	0.112	8	0.0560	17
Gadwall	2.99	<1	0.597	1	0.299	3
Mallard	5.28	<1	1.05	<1	0.528	1
Green-winged Teal	2.93	<1	0.585	1	0.293	3
Black-headed Gull	0.678	1	0.271	3	0.170	5
Caspian Gull	1.71	<1	0.684	1	0.427	2
Great Cormorant	0.715	1	0.143	6	0.0715	13
Gray Heron	2.24	<1	0.907	1	0.452	2
Purple Heron	0.0645	15	0.0258	38	0.0129	77
Great Egret	0.172	5	0.0688	14	0.0344	29
Black-crowned Night-Heron	0.706	1	0.142	7	0.0707	14

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## Summer-Autumn Bats Monitoring Report

<b>Report Title</b>	Summer-Autumn Bats Monitoring Report
<b>Scope</b>	BAT ACOUSTIC MONITORING
<b>Areas Covered</b>	DZHANKELDY WF
<b>Seasons Covered</b>	SPRING 2020 / SUMMER 2020 / AUTUMN 2020 /SUMMER 2021
<b>Notes</b>	

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# Summer-Autumn Bats Monitoring Report

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**DZHANKELDY WIND FARM:**

**BIRD AND BAT MONITORING**

**CLIENT: 5 CAPITALS**

Date: December 2020

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## Introduction

Wind farms can affect bats in the following ways:

- I. Collision mortality, barotrauma and other injuries (although it is important to consider these in the context of other forms of anthropogenic mortality)
- II. Loss or damage to commuting and foraging habitat, (wind farms may form barriers to commuting or seasonal movements, and can result in severance of foraging habitat);
- III. Loss of, or damage to, roosts;
- IV. Displacement of individuals or populations (due to wind farm construction or because bats avoid the wind farm area).

Bat surveys are required to quantify the impact of the project on key *Chiroptera* species to:

- inform final turbine layout;
- develop additional mitigation (e.g. turbine shut down, cutting speeds, habitat/species management plan); and
- form the baseline for any future required supplementary surveys and operational monitoring.

To ensure that bats are protected by minimising the risk of collision, an assessment of impact at a site requires a detailed appraisal of:

- The level of activity of all bat species recorded at the site assessed both spatially and temporally.
- The risk of turbine-related mortality for all bat species recorded at the site during bat activity surveys.
- The effect on the species' population status if predicted impacts are not mitigated.

The bat acoustic survey sampling effort in Uzbekistan is restricted to encompass 7-month warm season, extending from the beginning of April through the end of October, based on a lack of bat activity expected within the region during the colder months. It was proposed to conduct at least 3 complete nights of bat acoustic recording per location using Wildlife Acoustics Song Meter SM4 recoder, encompassing various locations spread throughout the Project area. We note that there is only a single species of bat occurring in Uzbekistan with an elevated conservation status according to IUCN, the Giant Noctule (*Nyctalus lasiopterus*, IUCN "Vulnerable"), and this species is unlikely to occur at the Navoi Bash wind farm site, as it is primarily a species of forested habitats, and primarily occurs to the west of the Caspian Sea<sup>1</sup>. Nonetheless, the risk of bat fatalities is typically a concern of international lenders, and bat acoustic surveys are typically recommended for wind-wildlife baseline surveys, as bat fatality rates are typically higher than bird fatality rates at wind energy facilities worldwide. As detectors were first installed only August 14, surveys for bats may need to resume in spring 2021 to fill in the gap in the active season.

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<sup>1</sup> IUCN redlist of threatened species, accessed 27 March, 2020

## Bat calls recording

We used the static bat detectors Wildlife Acoustics Song Meter SM4 to monitor bats activity in Summer and Autumn at five locations within the project's area (Table 1).

Table 1. Detector locations

№ location	Coordinates	
	°N	°E
1	40.863240	63.382458
2	40.906448	63.430447
3	40.844369	63.375156
4	40.876365	63.287573
5	40.936270	63.307306

One detector recorded data in Summer: from August 14 to September 2 in three locations (Table 2).

Table 2 Relative abundance and frequency of occurrence of bats' calls in Summer

Species	Summer locations					
	1	2	3	All	Relative abundance, %	Frequency of occurrence, %
<i>Eptesicus bottae</i>	9	2	1	12	30,8	100
<i>Eptesicus serotinus</i>	3	0	1	4	10,3	66,7
<i>Nyctalus noctula</i>	1	0	0	1	2,6	33,3
<i>Pipistrellus pipistrellus</i>	0	0	1	1	2,6	33,3
<i>Rhinolophus sp.</i> (CF 101 kHz)	1	1	1	3	7,7	100
<i>Vespertilio murinus</i>	2	8	8	18	46,2	100
Total:	16	11	12	39	100,0	
Dates of work	14-23.08	24-28.08	29.08-02.09			
Days of work	10	5	5	20		
Acoustic activity index (AI)	1,6	2,2	2,4	2		

In autumn two detectors recorded data from September 14 to October 14 on five locations (Table 3).

Usually, the detector worked at one location for several days (from 5 to 17 days) before it was moved to another location.

We identified bat calls to species whenever it was possible (the term "bat call" refers to one file with any bat species signals). After that, for all bat calls we calculated "Relative abundance", "Frequency of occurrence" and acoustic activity index (AI). Relative abundance is the frequency at which calls of some species are recorded among all types of signals (excluding noise, social calls and unidentified calls).

Table 3 Relative abundance and frequency of occurrence of bats' calls in Autumn

Species	Autumn locations (primarily October)						Relative abundance**, %	Frequency of occurrence, %
	1	2	4	5	3*	All		
<i>Eptesicus bottae</i>	0	0	0	0	0	0	0,0	0
<i>Eptesicus serotinus</i>	5	1	10	3	1	20 (19**)	51,4	100
<i>Nyctalus noctula</i>	0	1	1	0	0	2	5,4	40
<i>Pipistrellus pipistrellus</i>	0	1	0	0	0	1	2,7	20
<i>Rhinolophus</i> sp. (CF 101 kHz)	1	0	1	1	0	3	8,1	60
<i>Vespertilio murinus</i>	1	3	5	3	1	13 (12**)	32,4	100
Total:	7	6	17	7	2	39 (37**)	100,0	
Dates of work	27-31.10	15-19.10	14-21.10	22-26.10	14-30.09			
Days of work	5	5	8	5	17*	40 (23**)		
Acoustic activity index (AI)	1,4	1,2	2,1	1,4	0,12*	1,6**		

Notes: \* - These data are not included in the calculation of average values, since the detector was "unstable" (probably due to a weak battery charge); \*\* - without data from location № 3.

The frequency of occurrence is the relative number of locations (100% is 5 locations) where signals of some species were registered. Acoustic activity index (AI) is the average number of calls registered on one location for one day of monitoring. The detector installed at location № 3, worked "unstable" (probably due to a weak battery charge) during autumn, so its data was not used in calculating the Relative abundance, Frequency of occurrence and acoustic activity index (AI).



## Bat calls identification

According to the literature data on bats of Uzbekistan (Bogdanov, 1953; Benda et al., 2011; Gritsina et al., 2013) and semi-arid ecosystems, 9 species of bats are most likely to inhabit Dzhankeldy project area: *Rhinolophus bocharicus*, *Eptesicus bottae*, *Eptesicus gobiensis*, *Eptesicus serotinus*, *Hypsugo savii*, *Myotis davidii*, *Nyctalus noctula*, *Pipistrellus pipistrellus*, *Vespertilio murinus*. Another 11 species known for Uzbekistan and neighboring countries may be found in Navoi Bash also (Benda et al., 2011; Benda et al., 2012; Dietz, Kiefer, 2016): *Rhinolophus ferrumequinum*, *Rhinolophus hipposideros*, *Plecotus* sp. (Gritsina et al., 2013), *Myotis buharensis*, *Myotis emarginatus*, *Myotis blythii*, *Myotis capaccinii*, *Barbastella caspica*, *Pipistrellus kuhlii*, *Otonycteris leucophaea*, *Tadarida teniotis*.

Some of bat species inhabiting Uzbekistan are found in Europe also, and the parameters of ultrasound calls are known for the European populations of these species (Barataud, 2015; Dietz, Kiefer, 2016). For some bats of Uzbekistan, the parameters of ultrasonic calls are not known. Determination of these species according ultrasonic calls is a complex process since manual identification is required. We used the Kaleidoscope Pro Auto Analysis program with "preloaded" parameters of ultrasonic calls from "European" bats found in Uzbekistan for the primary processing of audio recordings. After that, we used the BatSound 4 program to measure the signal parameters and check the identification of bat calls made by the Kaleidoscope Pro Auto Analysis program. We used bat calls parameters known for European bat populations (Barataud, 2015) and bat species from neighboring countries for Uzbekistan (Benda et al., 2012).

## Results

The detectors recorded 297 files in summer (1.25 GB) and 338 files in autumn (1.4 GB) during the entire operation period. Among the summer files, 249 were noise sounds; 9 were social calls and unidentified calls and 39 were bat calls. Among the autumn files, 297 were noise; 2 were social calls and unidentified calls and 39 were bat calls. We analyzed audio recordings and found calls of 6 bat species in summer and 5 bat species in autumn.

**All the bat species, which calls were detected on the project area, are classified as LC ("Least concern", IUCN) are not considered threatened and are not included in the Red Book of the Republic of Uzbekistan (Uzbekistan ..., 2019).**

Table 4. Relative abundance and frequency of occurrence of bats' calls

Species	Summer and Autumn**		
	All	Relative abundance, %	Frequency of occurrence, %
<i>Eptesicus bottae</i>	12	15,8	60
<i>Eptesicus serotinus</i>	23	30,3	100
<i>Nyctalus noctula</i>	3	3,9	60
<i>Pipistrellus pipistrellus</i>	2	2,6	40
<i>Rhinolophus sp.</i> (CF 101 kHz)	6	7,9	100
<i>Vespertilio murinus</i>	30	39,5	100
Total:	76	100,0	
Days of work	43		
Acoustic activity index (AI)	1,77		

Note: \* - This data does not include autumn data from location № 3.

Calls of 6 bats species were found on the project's area (Table 2-3): *Eptesicus bottae*, *Eptesicus serotinus*, *Nyctalus noctula*, *Pipistrellus pipistrellus*, *Rhinolophus sp.* (CF-calls), *Vespertilio murinus*. CF-signals of horseshoe bats (Barataud, 2015) had FME (Frequency of maximal energy) = 100.5-101.5 kHz. This is probably *Rhinolophus bocharicus*. This species is common in Uzbekistan, but absent in Europe, and parameters of ultrasound calls are not known for this species. The misidentification of calls from *Eptesicus serotinus* and *Eptesicus bottae* is possible because these species have similar and, probably, overlapping parameters of ultrasound signals (Benda et al., 2012). The frequencies of occurrence of calls of different species are shown in the Table 4.

**Calls of the genus *Eptesicus* and *V. murinus* are dominant on the project's area** (calls *E. bottae* and *E. serotinus* are not always well separated). Calls of these species dominate in both summer and autumn. Calls of the other three species (*N. noctula*, *P. pipistrellus*, *Rhinolophus sp.*) are much less common. A low density of the bats population is typical for the project's area (total AI = 1.77 signals per day). AI differs between different locations no more than twofold (from 1.2 to 2.4). Bat signals were recorded in all locations where detectors were installed. Signals of three bat species recorded in all locations: *E.*

*serotinus*, *Rhinolophus sp.* and *V. murinus*. The signals of *E. bottae*, *N. noctula* and *P. pipistrellus* recorded only in some locations (locations №2-3).




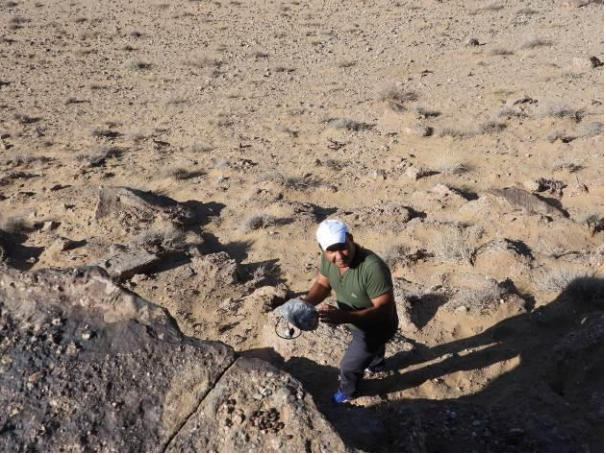
***Rhinolophus sp.* has the least threat from wind generators compared to other found species, because, most likely, it hunts from perches at a low height, like other species of the genus. There is some risk of injury to other found bat species from wind generators, because they can use high altitudes for feeding and transit flights.**

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Attachments

	
<p>Static bat detector installation on the project territory in August (40.863240 63.382500)</p>	
	
<p>The project territory landscape view from the static bat detector installation point</p>	<p>Saving coordinates of the location</p>
	
<p>The project territory landscape opposite the static bat detector installation point</p>	<p>Static Bat Detector deinstallation from the same location</p>



*Static bat detector installation on the project territory in September (40.871472 63.327222)*



*The project territory landscape opposite the static bat detector installation point*





*Static bat detector installation on the project territory in autumn*

# Bat Monitoring Report

<b>Report Title</b>	<u>Bat Monitoring Report</u>
<b>Scope</b>	BAT ACOUSTIC MONITORING
<b>Areas Covered</b>	DZHANKELDY WF
<b>Seasons Covered</b>	SPRING 2021 / SUMMER 2021
<b>Notes</b>	



# Bat Monitoring Report

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**DZHANKELDY WIND FARM:**

**BIRD AND BAT MONITORING**

**CLIENT: 5 CAPITALS**

Date: August 2021

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## Introduction

Wind farms can affect bats in the following ways:

- I. Collision mortality, barotrauma and other injuries (although it is important to consider these in the context of other forms of anthropogenic mortality)
- II. Loss or damage to commuting and foraging habitat, (wind farms may form barriers to commuting or seasonal movements, and can result in severance of foraging habitat);
- III. Loss of, or damage to, roosts;
- IV. Displacement of individuals or populations (due to wind farm construction or because bats avoid the wind farm area).

Bat surveys are required to quantify the impact of the project on key *Chiroptera* species to:

- inform final turbine layout;
- develop additional mitigation (e.g. turbine shut down, cutting speeds, habitat/species management plan); and
- form the baseline for any future required supplementary surveys and operational monitoring.

To ensure that bats are protected by minimising the risk of collision, an assessment of impact at a site requires a detailed appraisal of:

- The level of activity of all bat species recorded at the site assessed both spatially and temporally.
- The risk of turbine-related mortality for all bat species recorded at the site during bat activity surveys.
- The effect on the species' population status if predicted impacts are not mitigated.

The bat acoustic survey sampling effort in Uzbekistan is restricted to encompass 7-month warm season, extending from the beginning of April through the end of October, based on a lack of bat activity expected within the region during the colder months. It was proposed to conduct at least 3 complete nights of bat acoustic recording per location using Wildlife Acoustics Song Meter SM4 recoder, encompassing various locations spread throughout the Project area. We note that there is only a single species of bat occurring in Uzbekistan with an elevated conservation status according to IUCN, the Giant Noctule (*Nyctalus lasiopterus*, IUCN "Vulnerable"), and this species is unlikely to occur at the Dzhankeldy wind farm site, as it is primarily a species of forested habitats, and primarily occurs to the west of the Caspian Sea<sup>1</sup>. Nonetheless, the risk of bat fatalities is typically a concern of international lenders, and bat acoustic surveys are typically recommended for wind-wildlife baseline surveys, as bat fatality rates are typically higher than bird fatality rates at wind energy facilities worldwide.

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<sup>1</sup> IUCN redlist of threatened species, accessed 27 March, 2020

## Materials and methods

### Study area and bat calls recording

We used the stationary bat detectors Wildlife Acoustics Song Meter SM4 to monitor bats activity in Spring and Summer 2021 at seven locations within or near the project's area (Table 1, Fig. "Locations of bat detectors" in Attachments).

*Table 1. Detector locations*

№ location	Location name	Work days	Coordinates	
			°N	°E
1	St_Det_1-1_2021	5-14 April	40.894312	63.441857
2	St_Det_1-2_2021	15-23 April	40.896349	63.243392
3	St_Det_1-3_2021	24-27 April	40.892886	63.178319
4	St_Det_5-1_2021	14 April	40.876365	63.287573
5	St_Det_5-2_2021	15-27 April	40.936270	63.307306
6	MM-1 (met mast 13)	28 April – 31 May and 6-14 June	40.932164	63.320189
7	MM-6 (met mast 15)	28 April – 6 June	40.859143	63.392653

The detectors were installed on two weather masts the location of which was agreed with 5Capitals at an altitude of 45 meters by professional climbers for the period from April 28 to July 6. On June 6, the detectors were collected for data download and battery replacement and were returned to the 45 meters height the same day. After collecting the detectors on July 6 and analyzing the data, it was revealed that the first detector stopped recording data from June 15, and the second detector - from June 7. The cause of this phenomenon is unknown. However, the following reasons are possible: due to the fact that the weather masts vibrate and make a lot of noise, the detectors worked without pause and they recorded a large number of files with noise, this could lead to premature battery discharge. The second possible reason for the shutdown of the detectors could be extremely high temperatures in desert conditions, especially at high altitude. The temperature could reach 60 degrees Celsius, which could affect both the operation of the detectors themselves and the operation of the batteries.

One detector (No. 1) recorded data on April 4-27 (from buildings and ground surface) at three points (1, 2, 3) from 18:00 to 7:00 every night. Further, this detector recorded data at an altitude of 45 m at meteorological mast 1 (another number 13) from April 28 to May 31 and from June 6 to 14. Second detector (№5) recorded data on April 14 to 28 at two locations (4, 5) from 18:00 to 7:00 every night. Usually, the detector worked at one location for several nights (from 4 to 40 nights) before it was moved to another location. Detector worked for 1 night only in location 4 (Tabl. 1).

Bats activity accounting by ultrasound calls was carried out by two methods in 2021. The first method consists in counting bats ultrasound calls by detectors installed at low height (ground surface or human buildings). This is a traditional technique. It was also applied at the first stage of the project in the second half of 2020 (Vasenkov, 2020). The

second technique differs greatly in the height of the detector position. Ultrasound detectors were installed on meteorological masts at a height of 45 meters from the ground. Unfortunately, the results obtained by two differing methods cannot be correctly compared with each other. Therefore, we consider these data separately. The second method is better suited for assessing the activity of bats during feeding and migrations in the air at an altitude (50-150 m) at which wind turbines operate (Rodrigues et al., 2015; Voigt et al., 2021). The first technique is less suitable for these purposes, especially when the registration bats ultrasound calls is carried out by detectors installed on human buildings. The main problem is that human buildings are often bats roosts in the desert zone, including on the territory of the planned Dzhankeldy wind farm (Gritsina, 2021). Unfortunately, due to technical reasons, bats ultrasound calls registration in Summer and Autumn 2020 and April 2021 could not be carried out according to the second method, and it was done by first method only. Details are described in the Results section.

## Bat calls identification

According to the literature data on bats of Uzbekistan (Bogdanov, 1953; Benda et al., 2011; Gritsina et al., 2013) and semi-arid ecosystems, 9 species of bats are most likely to inhabit Dzhankeldy project area (Tabl. 2): *Rhinolophus bocharicus*, *Eptesicus bottae*, *Eptesicus gobiensis*, *Eptesicus serotinus*, *Hypsugo savii*, *Myotis davidii*, *Nyctalus noctula*, *Pipistrellus pipistrellus*, *Vespertilio murinus*.

Table 2. Species that were more likely to be found in the vicinity of Dzhankeldy (semi-arid ecosystems).

Species	IUCN Red List	Red Book of the Republic of Uzbekistan (2019)	Parameters of ultrasound calls (references)	Basic flight information (flight height; presence of migrations)	Level of collision risk (Rodrigues et al., 2015)
<i>Rhinolophus bocharicus</i>	LC (Least concern)	absent	no data (CF-type calls)	Most likely, <i>R. bocharicus</i> is a sedentary species, foraging low from the ground (like other horseshoe bats (Bogdanov, 1953; Rodrigues et al., 2015)).	low
<i>Eptesicus bottae</i>	LC	absent	Benda et al. (2012); Hackett et al. (2016)	<i>E. bottae</i> ranks among small- to medium-sized bats hunting its prey mostly in a slow hawking flight (Benda et al., 2012); probably sedentary.	medium
<i>Eptesicus gobiensis</i>	LC	absent	no data	no data	medium

<i>Eptesicus serotinus</i>	LC	absent	Benda et al. (2012)	Medium height (Roemer et al., 2017); usually sedentary (Dietz, Kiefer, 2016)	medium
<i>Hypsugo savii</i>	LC	absent	Benda et al. (2012)	Medium height (Roemer et al., 2017); no data on migration (Dietz, Kiefer, 2016)	high
<i>Myotis davidii</i>	LC	absent	no data	Low height (Roemer et al., 2017); probably sedentary	low
<i>Nyctalus noctula</i>	LC	absent	Barataud (2015)	High height (Roemer et al., 2017); migrate (Dietz, Kiefer, 2016)	high
<i>Pipistrellus pipistrellus</i>	LC	absent	Benda et al. (2012)	Medium height (Roemer et al., 2017; Wellig et al., 2018); sedentary (Bogdanov, 1953; Dietz, Kiefer, 2016)	high
<i>Vespertilio murinus</i>	LC	absent	Barataud (2015)	High height (Roemer et al., 2017); usually migrate (Dietz, Kiefer, 2016)	high

Another 11 species known for Uzbekistan and neighboring countries (Tabl. 3) may be found in Dzhankeldy also (Benda et al., 2011; Benda et al., 2012; Dietz, Kiefer, 2016): *Rhinolophus ferrumequinum*, *Rhinolophus hipposideros*, *Plecotus sp.* (Gritsina et al., 2013), *Myotis buharensis*, *Myotis emarginatus*, *Myotis blythii*, *Myotis capaccinii*, *Barbastella caspica*, *Pipistrellus kuhlii*, *Otonycteris leucophaea*<sup>2</sup>, *Tadarida teniotis*.

Table 3. The bat species that inhabiting in Uzbekistan and neighboring countries and can be found in the vicinity of Dzhankeldy.

Species	IUCN Red List	Red Book of the Republic of Uzbekistan (2019)	Parameters of ultrasound calls	Basic flight information (flight height; presence of migrations)	Level of collision risk (Rodriguez et al., 2015)
<i>Rhinolophus</i>	LC	absent	Benda et	Low height (Roemer et al., 2017); sedentary (Dietz,	low

<sup>2</sup> *Otonycteris hemprichi* does not inhabit Uzbekistan (Benda et al., 2011). It was indicated for Uzbekistan in the 20th century (Bogdanov, 1953), when the species *Otonycteris hemprichi* and *Otonycteris leucophaea* were not distinguished. Only *Otonycteris leucophaea* lives in Uzbekistan according to the modern concepts of taxonomists. From a formal point of view, this is a different species. Most likely, the authors of the essays in the Red Book of Uzbekistan (2019), have not being familiar with modern data (for example, Benda et al., 2011), and wrote down an "outdated" name that currently refers to other animals found, for example, in Iran (Benda et al., 2012). Both of these species are found in Iran.

<i>ferrumequinum</i>			al. (2012)	Kiefer, 2016)	
<i>Rhinolophus hipposideros</i>	LC	Vulnerable, declining 2(VU:D)	Benda et al. (2012)	Low height (Roemer et al., 2017); sedentary (Dietz, Kiefer, 2016)	low
<i>Plecotus sp.</i> (Gritsina et al., 2013)	?	absent	Barataud (2015), Benda et al. (2012)	Low height (Roemer et al., 2017); sedentary	low
<i>Myotis bucharensis</i>	DD (data deficient )	Critically Endangered 1(CR)	no data	Low height (Roemer et al., 2017); probably sedentary	low
<i>Myotis emarginatus</i>	LC	absent	Barataud (2015)	Low height (Roemer et al., 2017); sedentary (Dietz, Kiefer, 2016)	low
<i>Myotis blythii</i>	LC	absent	Benda et al. (2012)	Low height (Wellig et al., 2018); sedentary (Dietz, Kiefer, 2016)	low
<i>Myotis capaccinii</i> (?)	VU (vulnerable)	absent	Benda et al. (2012)	Low height; short to middle-range migrant (Dietz, Kiefer, 2016)	low
<i>Barbastella caspica</i> ( <i>Barbastella leucomelas</i> )	LC	absent	Benda et al. (2012); Hackett et al. (2016)	Probably low height; probably sedentary	medium
<i>Pipistrellus kuhlii</i>	LC	absent	Benda et al. (2012)	Low height (Roemer et al., 2017); sedentary (Dietz, Kiefer, 2016)	high
<i>Otonycteris leucophaea</i>	DD	Vulnerable, naturally rare 2(VU:R)	no data	Low height (Benda et al., 2012), probably sedentary	unknown
<i>Tadarida teniotis</i>	LC	Vulnerable, naturally rare 2(VU:R)	Benda et al. (2012)	High height (Wellig et al., 2018); no seasonal migration, foraging area up to 100 km distant from summer roost (Dietz, Kiefer, 2016)	high

Some of bat species inhabiting Uzbekistan are found in Europe also, and the parameters of ultrasound calls are known for the European populations of these species (Barataud, 2015; Dietz, Kiefer, 2016). For some bats of Uzbekistan, the parameters of ultrasonic calls are not known (Tabl. 2, 3). Determination of these species according ultrasonic calls is a complex process since manual identification is required.

Identification of bats from the acoustic recordings gathered during this study was performed by Dr. Denis Vasenkov, a professional bat biologist affiliated with the A. N. Severtsov Institute of Ecology and Evolution of the Russian Academy of Sciences. Dr. Vasenkov's experience includes studying bats for about 20 years, including 10 years working with time expansion and real-time bat detectors. Dr. Vasenkov worked with bats and their ultrasonic calls from various regions of Russia (European and Asian parts), Ethiopia and Vietnam. Dr. Vasenkov has experience in analyzing bats ultrasound calls using **BatSound**, **SonoBat** and **Kaleidoscope** software. We used the Kaleidoscope Pro Auto Analysis program with "preloaded" parameters of ultrasonic calls from "European" bats found in Uzbekistan for the primary processing of audio recordings. After that, we used the BatSound 4 program to measure the call parameters and check the identification of bat calls made by the Kaleidoscope Pro Auto Analysis program. We used bat calls parameters known for European bat populations (Barataud, 2015) and bat species from neighboring countries for Uzbekistan (Benda et al., 2012).

Additionally, we used bat calls parameters of *Rhinolophus bocharicus* and *Eptesicus bottae ognevi* recorded during fieldwork in the vicinity of Dzhankeldy (Gritsina, 2021). Colleagues searched for bats' roosts in the vicinity and on the territory of Dzhankeldy Wind Farm in the spring and summer of 2021 (Gritsyna, 2021). Two species of bats, the Bokhara horseshoe bat (*Rhinolophus bocharicus*) and the Ognev's serotine bat (*Eptesicus bottae ognevi*), have been found as a result of these fieldwork. The "reference" calls of these two manually identified species were recorded.

We identified bat calls to species whenever it was possible (the term "bat call" refers to one file with any bat species calls). After that, for all bat calls we calculated "Relative abundance" and acoustic activity index (AI). Relative abundance is the frequency at which calls of some species are recorded among all types of calls (excluding noise, social calls and unidentified calls).

Acoustic activity index (AI) is the average number of calls registered on one location for one day of monitoring. We used data of ultrasound detectors from meteorological masts on days with average activity of bats to calculate the "Relative abundance" and acoustic activity index (AI) (Table 5). The activity of bats on days with unusual high activity is discussed separately (see below).



## Results

The detectors recorded 31943 files (167.2 GB) during the entire operation period (Tabl. 4). Most of the files contained noises, not bats ultrasound calls. Therefore, an automatic filtering of calls from noise was carried out. Noisy files were excluded from work.

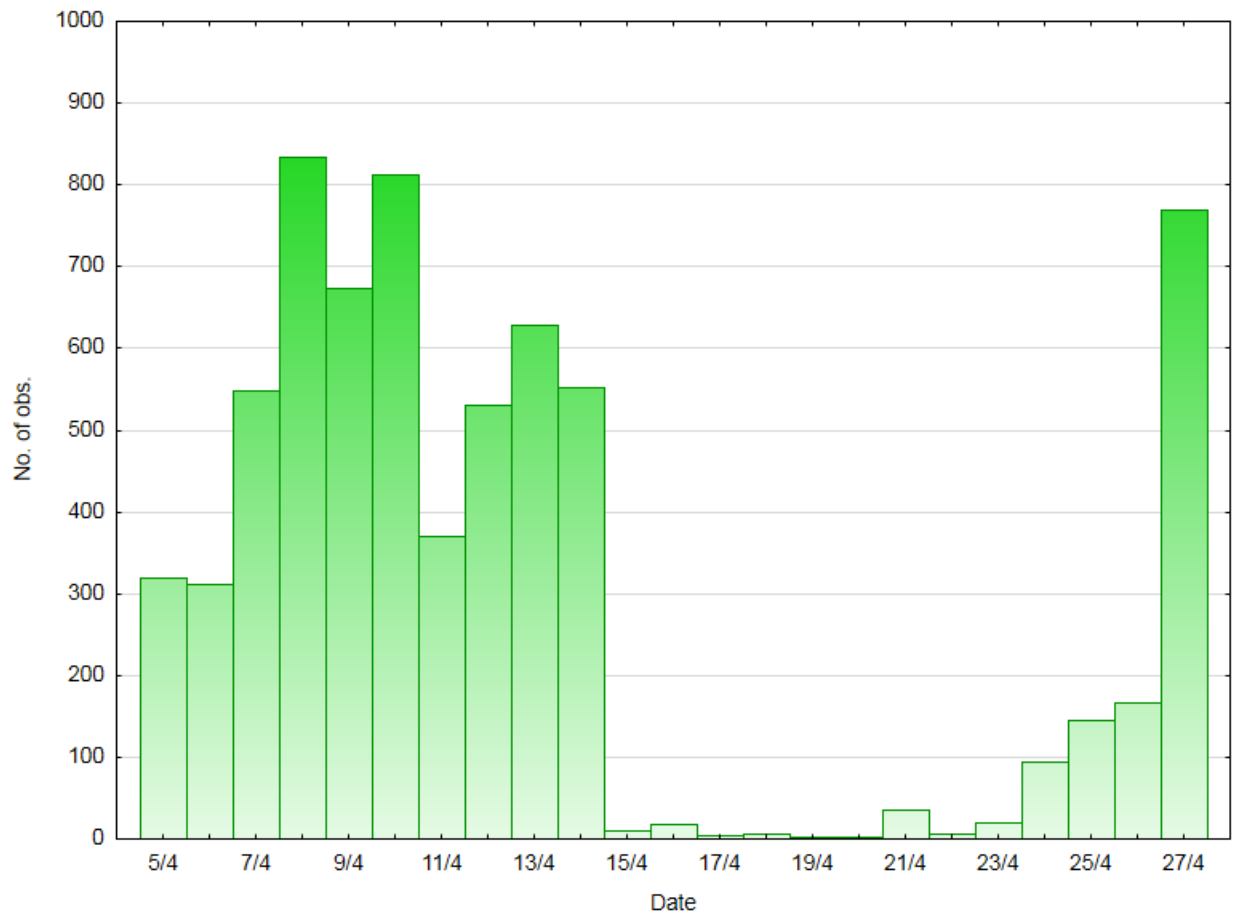
*Table 4. The total number of files recorded by passive detectors in locations.*

Location name	Amount	
	files	Gb
St_Det_1-1_2021	8228	70
St_Det_1-2_2021	151	0,9
St_Det_1-3_2021	2576	14,4
St_Det_5-1_2021	163	0,4
St_Det_5-2_2021	1351	5,5
MM-1 (meteomast 13)	13202	60,2
MM-6 (meteomast 15)	6272	15,8
<b>Total:</b>	<b>31943</b>	<b>167,2</b>

We analyzed bats calls number change at all locations during the period of operation of the detectors. The activity of bats varied greatly in different locations.

### **Bats activity according to the data collected "from the ground"**

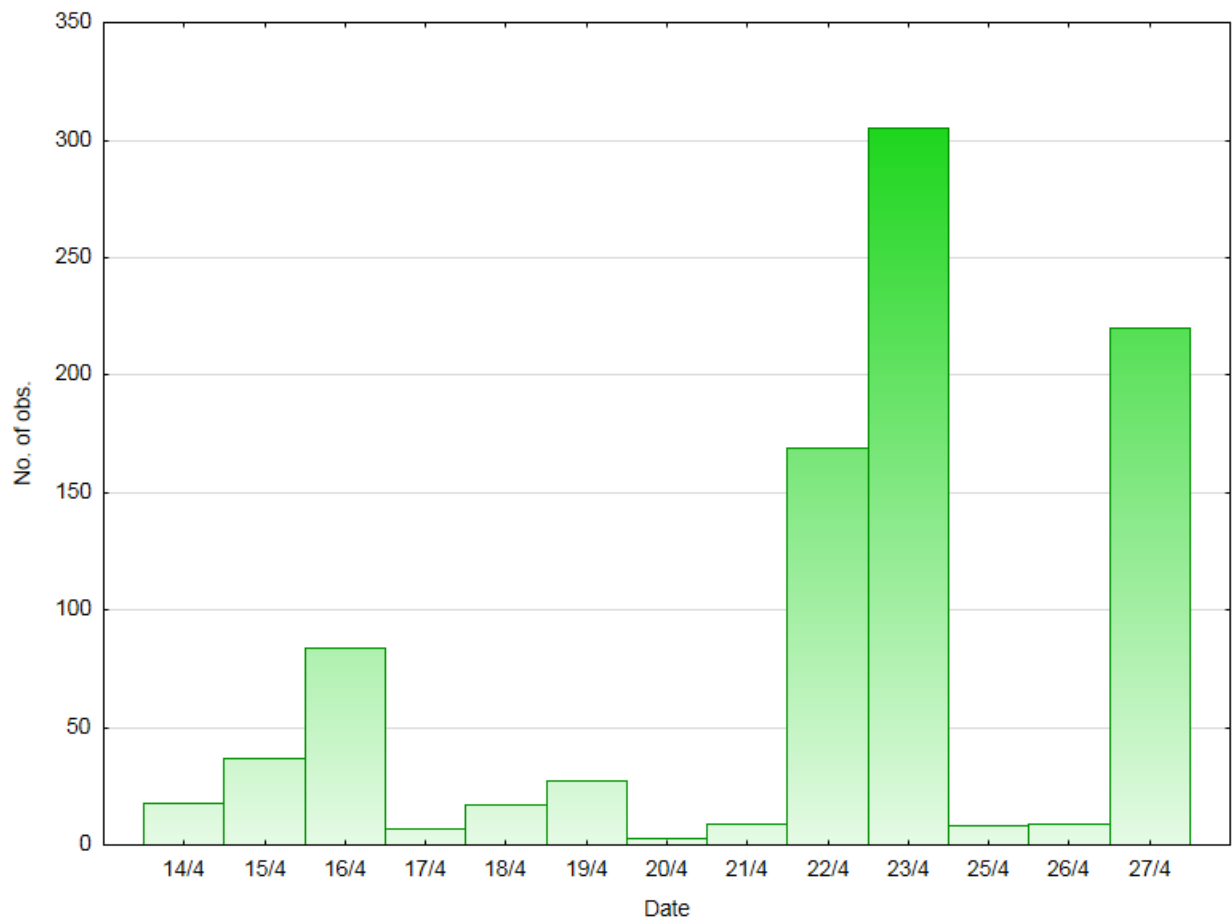
The activity of bats was very high and relatively uniform (Fig. 1) at location St\_Det\_1\_1 in April (5-14 April). This result is probably due to the fact that the detector was installed in a building that was a roost for bats. Therefore, a high activity of bats was recorded. On the contrary, bats activity in location St\_Det\_1\_2 (15-23 April) was low. This level of bats activity probably corresponds to the usual activity of bats at a distance from the "points of attraction" (shelters, reservoirs, "feeding points"). In the location St\_Det\_1\_3 (24-27 April), the activity of bats was significantly higher than in the location St\_Det\_1\_2, but lower than in the location St\_Det\_1\_1. Location St\_Det\_1\_3 is located in the Kalaata village and, most likely, is located near bats colony, or near the "feeding point". The bats activity during the last night of detector operation in this location is comparable to the maximum recorded bats activity in the location St\_Det\_1\_1. Then detector was moved to the meteorological masts (MM-1 and MM-6) after the end of its work in the locations St\_Det\_1\_1, St\_Det\_1\_2, St\_Det\_1\_3. Detectors installed on meteorological masts register true activity in feeding and transit areas of bats, because they are removed by points of attraction (potential roosts, bodies of water or feeding points).



*Fig. 1. Bats activity (number of calls for a full night of counting) in April. Accounting in three locations: St\_Det\_1-1 (5-14 April), St\_Det\_1-2 (15-23 April), St\_Det\_1-3 (24-27 April).*

Detector operated only 1 night (April 14) at the St\_Det\_5\_1 location and showed a relatively low bats activity - 18 calls per night (Fig. 2). After that, it was installed in the location St\_Det\_5\_2, where it worked continuously for 12 nights (15-27 April).

Bats activity recorded in April at location St\_Det\_5\_2 was variable and varied strongly from 3 to 305 call registrations per night (Fig. 2). Such variable dispersion of bats activity can be due to different reasons: a small distance from a potential unknown roost, changing feed attraction, or the passage of migratory species in the vicinity of the location. Detector was moved to the MM-6 meteorological mast after working in locations St\_Det\_5\_1, St\_Det\_5\_2.

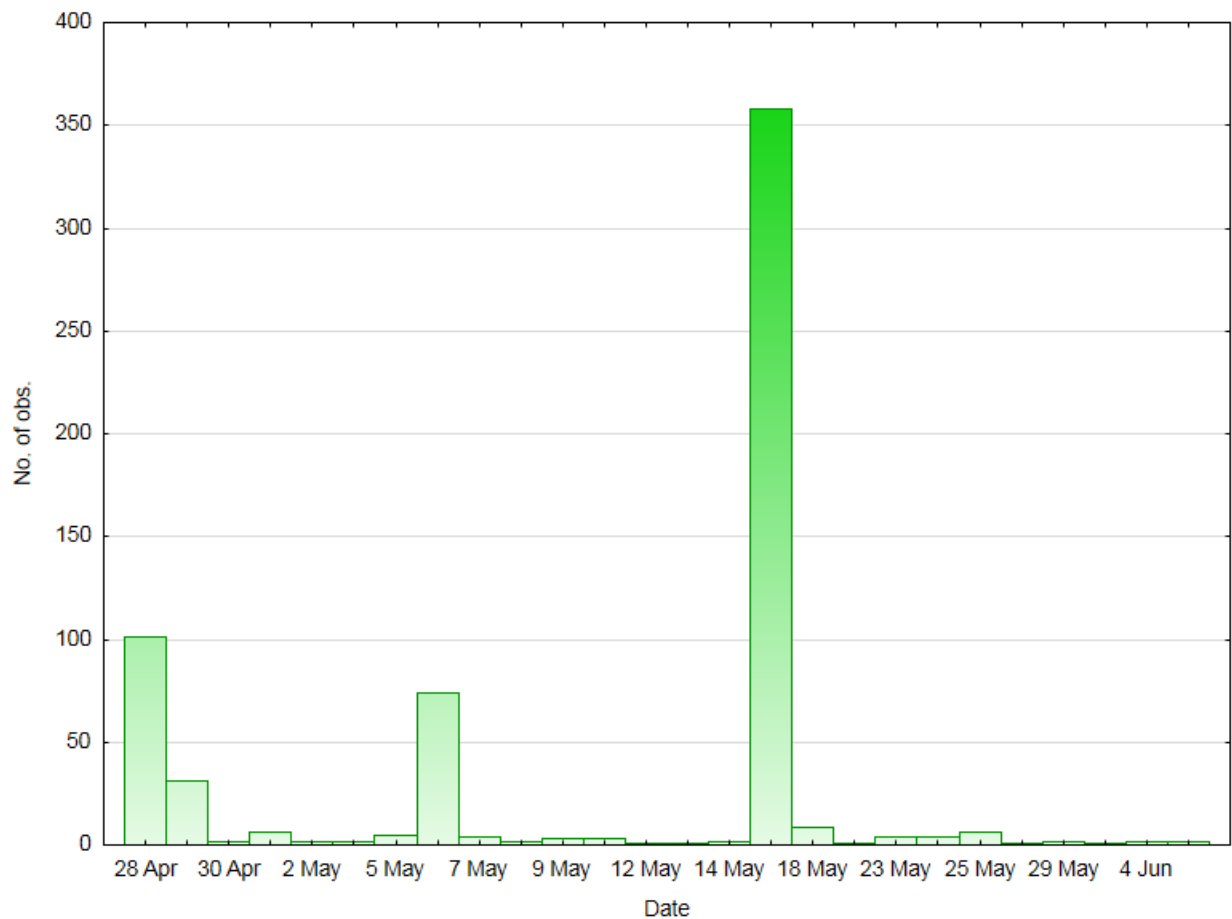


*Fig.2. Bats activity (number of calls for a full night of counting) in April. Accounting at two points: St\_Det\_5-1 (14 April), St\_Det\_5-2 (15-27 April).*

### **Bats activity according to the data collected from meteorological masts (from a height of 45 m)**

Detectors registered true activity in places of feeding and flights during work on meteorological masts, because they are distant from potential roosts, water bodies, or "spot" feeding sites that can serve as points of attraction for bats. The detectors were installed at two meteorological masts at a height of 45 meters in the territory of the projected Dzhankeldy wind farm and recorded bats ultrasound calls in the lower height of wind turbines (Voigt, 2021).

First detector was installed on meteorological mast 1 (Table 1, Fig. "Locations of bat detectors" in Attachments). Bats activity near this meteorological mast was variable in time according to ultrasound monitoring data. Bats activity peak occurred on the night of May 17-18 (Fig. 3), when 358 bats calls were recorded. This is a rare event. There were only four nights during the entire detector operation period at meteorological mast 1 (34 nights from April 28 to May 31), when bats activity exceeded 30 calls per night. Typically, bats activity varied within 0-10 calls per night. Activity data calculated for 3 common nights are given in Table 5. The average bats activity will be almost 10 times higher if we include in the analysis data for 4 days of unusual activity of bats.



*Fig.3. Bats activity (number of calls for a full night of count) in May in the vicinity of meteorological mast 1 (MM-1).*

The second detector was installed on meteorological mast 6 (Table 1, Fig. "Locations of bat detectors" in Attachments). Bats activity near this meteorological mast was also variable in time according to ultrasound monitoring data. The peak of bats activity occurred on the night of April 28-29 (Fig. 4), when 355 bats calls were recorded. This is also a rare event. There were only four nights during the entire detector operation period at meteorological mast 6 (40 nights from April 28 to June 6), when bats activity exceeded 30 flights per night. Typically, bats activity varied within the range of 0-25 calls per night. Activity data calculated for 3 common nights are shown in Table 5. The average bats activity will be almost 10 times higher in the vicinity of the second meteorological mast (MM-6), if we include in the analysis data for 4 days of unusual bats activity.

It should be noted that peak of bats activity falls on the close dates, when the detectors worked at both meteorological masts (fig. 3 and fig. 4). We assume that such anomalous peaks in bats activity may be due to bats migration through the project area, or due to temporary attractiveness of the vicinity of meteorological masts for some feed objects, which in turn attract bats.

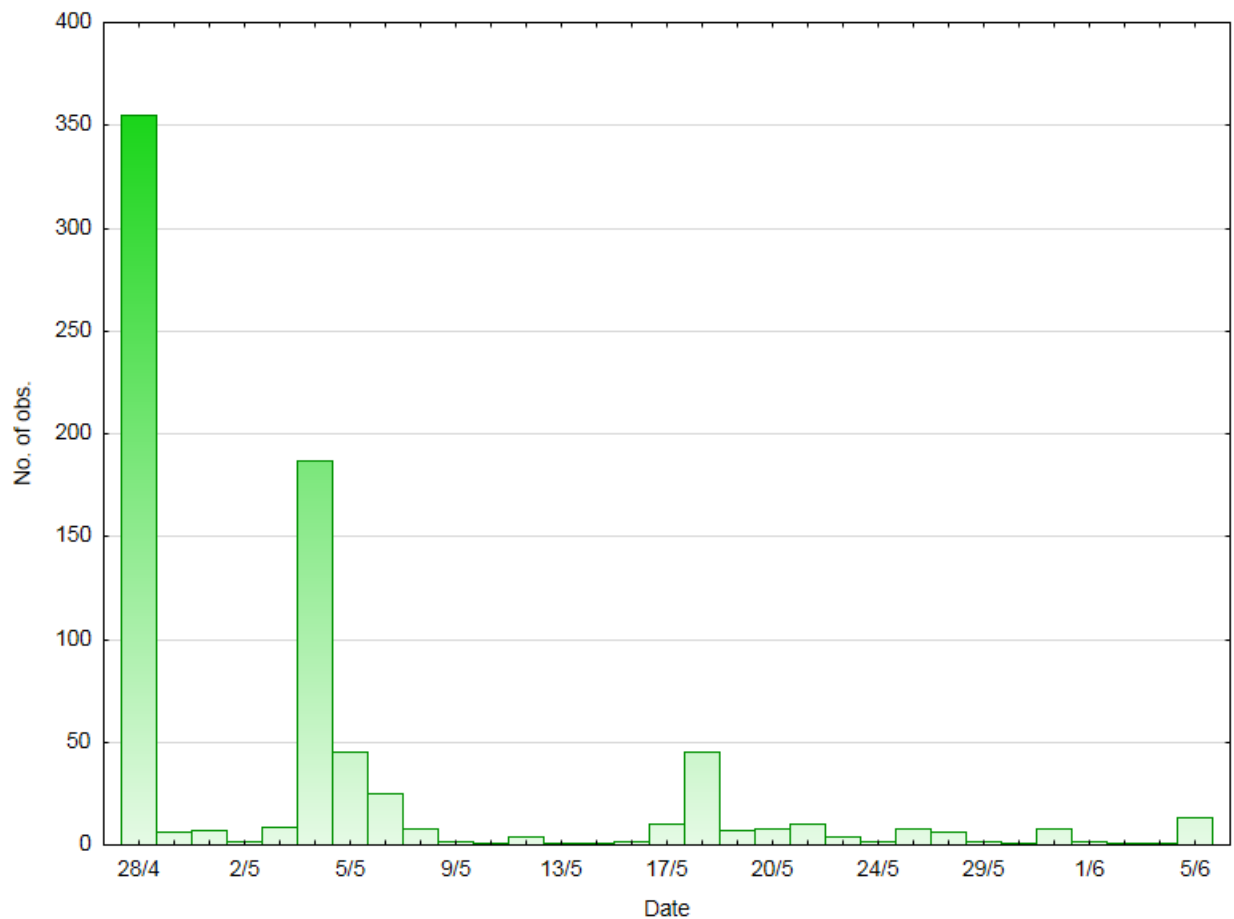


Fig. 4. Bats activity (number of calls for a full night of count) in May in the vicinity of meteorological mast 6 (MM-6).

Only data obtained from meteorological masts were used for bats activity calculating (calls per night (AI) and relative abundance (RA)). This makes it possible to avoid overestimating of results of counting bats activity due to potential closely spaced bats colonies. We chose two periods of normal bats activity, three nights of counting from both meteorological masts. The first is from April 29th to May 1st. These days fall on the period of spring migration, when bats can fly through the territory of the planned wind farm from hibernating sites to summer habitats. The second is from May 23rd to 25th. These days fall on the period of reproductive activity of bats, when the females are in the breeding sites and are either pregnant or can begin dairy feeding of the cubs.

Calls of 5 bats species were found on the project's area: *Eptesicus sp.* (*Eptesicus bottae* and *Eptesicus serotinus*), *Pipistrellus pipistrellus*, *Rhinolophus bocharicus*, *Vespertilio murinus*. CF-calls of horseshoe bats (Barataud, 2015) had FME (Frequency of maximal energy) = 100.5-101.5 kHz. This is *Rhinolophus bocharicus*. This species is common in Uzbekistan. Ultrasound calls of *Rhinolophus bocharicus* were recorded from bats of this species found during checking of potential bats' roost search (Gritsina, 2021).

Table 5. Bats activity (calls per night) and relative abundance (RA) at the meteorological masts at the height of 45 m.

Species	29 April - 1 May				23-25 May				Total, calls	Avg Bat Calls/Night (AI)
	MM-1 (meteomast 13)		MM-6 (meteomast 15)		MM-1 (meteomast 13)		MM-6 (meteomast 15)			
	call pass	RA, %	call pass	RA, %	call pass	RA, %	call pass	RA, %		
<i>Eptesicus</i> sp. ( <i>E. bottae</i> + <i>E. serotinus</i> )	3	7,7	6	46,2	6	42,9	5	35,7	20	1,7
<i>Vespertilio murinus</i>	36	92,3	7	53,8	8	57,1	9	64,3	60	5
Total:	39		13		14		14		80	6,7

Other horseshoe bats from Uzbekistan (*Rhinolophus ferrumequinum*, *Rhinolophus hipposideros*) have different FME (~80 kHz, ~110 kHz, respectively; Benda et al., 2011; Benda et al., 2012) compared to our data (~101 kHz (100-102 kHz)). The misidentification of calls from *Eptesicus serotinus* and *Eptesicus bottae* is possible because these species have similar and, probably, overlapping parameters of ultrasound calls (Benda et al., 2012).

Only calls of the genus *Eptesicus* and *V. murinus* were recorded on meteorological masts on the project's area (calls *E. bottae* and *E. serotinus* are not separated). Calls of the other two species (*P. pipistrellus*, *Rhinolophus bocharicus*) were found only from "near ground" locations, not from meteorological masts.

## Discussion

Ultrasonic calls of 5 species of bats were found in the project area. The habitation of 2 species (*E. bottae* and *R. bocharicus*) was confirmed by field studies during the search for bats' roosts (Gritsina, 2021).

All bat species, which calls were detected on the project area, are classified as LC ("Least concern", IUCN) and are not considered threatened. The Red Book of the Republic of Uzbekistan (2019) include four bat species: *Rhinolophus hipposideros* (VU), *Tadarida teniotis* (VU), *Otonycteris hemprichi* (VU)<sup>3</sup>, *Myotis bucharensis* (CR). The fact that none of these listed species was detected during the acoustic monitoring effort provides an indication that the Project is not likely to generate impacts to any protected species of bats.

But bats, whose calls have been recorded at the site, have a risk of collision with the wind turbine. Low-flying species *Rhinolophus bocharicus* have the lowest risk of such a collision (Tabl. 2). *Rhinolophus bocharicus* has the least threat from wind turbines compared to other found species, because, most likely, it hunts from perches at a low height, like other species of the genus (Rodrigues et al., 2015). There is some risk of injury to other found bat species from wind turbines, because they can use high height for feeding and transit flights. Ultrasonic calls from this bat species were not detected by detectors installed at an height of 45 m on meteorological masts.

The two medium-flying species of the genus *Eptesicus* (7,7- 46% abundance) have the medium risk of collisions (Roemer et al., 2017). Another species with a high risk of collision with wind turbines is high-flying *Vespertilio murinus* (Roemer et al., 2017). The abundance of its calls is от 53,8 до 92,3%. Ultrasound calls from the other species (*P. pipistrellus*) were rarely recorded, although these species have medium collision risks (Roemer et al., 2017; Wellig et al., 2018).

According to the bats activity data obtained in the second half of August and the second half of October (Vasenkov, 2020), bats activity on the site at this time is small and evenly distributed over the site.

But the data obtained in 2021 indicate very large fluctuations in bats activity in the project area, from 0 to 358 registrations of flights per night. Nights with high activity of bats (more than 50 registrations per night) are very rare - approximately once every 10 days. Without these "nights of high activity" the average activity of bats in the project area is rather low - about 6,7 registrations per night. The reasons for the bursts of bats activity are not known. This may be an activity associated with bats migration through

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<sup>3</sup> *Otonycteris hemprichi* does not inhabit Uzbekistan (Benda et al., 2011). It was indicated for Uzbekistan in the 20th century (Bogdanov, 1953), when the species *Otonycteris hemprichi* and *Otonycteris leucophaea* were not distinguished. Only *Otonycteris leucophaea* lives in Uzbekistan according to the modern concepts of taxonomists. From a formal point of view, this is a different species. Most likely, the authors of the essays in the Red Book of Uzbekistan (2019), have not being familiar with modern data (for example, Benda et al., 2011), and wrote down an "outdated" name that currently refers to other animals found, for example, in Iran ( Benda et al., 2012). Both of these species are found in Iran.

the project area, or due to the temporary attractiveness of the vicinity of the meteorological masts for some feed objects, which in turn attract bats.

The potential negative impact of wind turbines on bats (death from collisions, barotrauma) in the project area can be minimized if use automated ultrasonic detectors to estimate the activity and identity of bats in the zone of highest mortality risk at wind turbine in order to formulate mitigation schemes, such as increased curtailment speeds to prevent casualties (Voigt et al., 2021). The economic damage from such stops will be minimal, because high bats activity in the project area occurs once every 10 days and most likely occurs at nights with low wind speed, when the efficiency of power generation is low (Arnett et al., 2011). As known, increase of the cut-in wind speed and / or feathering of blades during low wind speed conditions reduces bat mortality (Arnett et al., 2011). Cut-in wind speed and / or feathering of blades can be especially important in days when a high activity of bats is registered. This will prevent massive death of bats and the associated risks of "environmental" damage.



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## Attachments



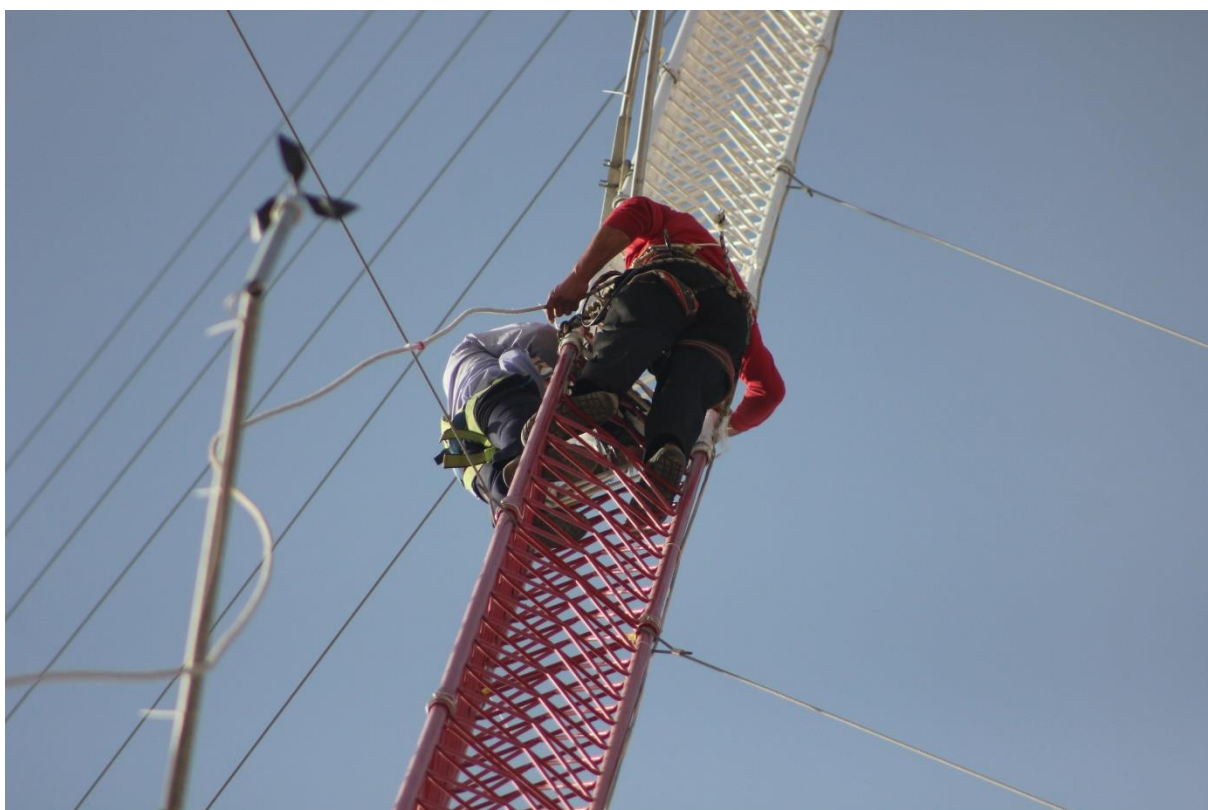
Locations of bat detectors in Dzhankeldy project area



Bat detector installation on weather mast in Dzhankeldy project area



Bat detector reinstallation on weather mast in Dzhankeldy project area on June 6



Bat detector reinstallation on weather mast in Dzhankeldy project area on June 6



Bat detector collection from weather mast in Dzhankeldy project area



Data transfer from bat detector from the weather mast in Dzhankeldy project area



## Bat roost search report

<b>Report Title</b>	<u>Bat roost search</u>
<b>Scope</b>	BAT ROOST SEARCH
<b>Areas Covered</b>	DZHANKELDY WF/ DZHANKELDY TO BASH OHTL
<b>Seasons Covered</b>	SPRING 2021 / SUMMER 2021
<b>Notes</b>	

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# Bat roost search

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**DZHANKELDY WIND FARM PROJECT:**

**CLIENT: 5 CAPITALS**

Date: July 2021

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## INTRODUCTION

Bats (*Chiroptera*) are the second largest order of mammals in Uzbekistan. At the moment, there are 21 species of Bats known in Uzbekistan, however, this order is the least studied, especially in remote desert areas.

This report contains the results of two expeditions carried out on territory of Dzhankeldy Wind Farm on the residual mountains of Kulzhuktau and Beltau. Field visits were carried out in the period from April 15-17 and June 25-27, 2021. The main purpose of the expeditions was to confirm the presence/absence of Bats in potential roosting places identified based on topographic and literary material. In case of bats location, it was planned to determine the species, their number and reproductive status (breeding/non-breeding individuals), the presence of brood colonies. In addition to measuring and photographing the detected species, it was planned to use mobile bat detectors to make "reference" recordings of ultrasonic signals for the manually identified species. These "reference" signals will be used for further improvement of analysis of ultrasonic signals collected by stationary bat detectors and on transects, since some bats species of Uzbekistan are absent in Europe and the parameters of their ultrasonic signals are not known.



## MATERIALS AND METHODS

The survey methodology consisted of two stages:

**Desktop preparation**, which was an analysis of detailed topographic maps of the area (scale: 1:100 000, 1:200 000) and Google Earth satellite images. The maps identified the locations (GPS coordinates) of potential bat roosts – caves, mines/tunnels, human buildings, wells, cattle cotes. Those locations were then transferred to the LocusPro smartphone application for further use in the field. A total of 16 places were identified for the survey at this stage.

**Field work** included a survey of potential roosts identified during the desktop stage. When a roost was found, it was thoroughly examined, both for the presence of bats themselves, and for signs of their presence – excrement, food remains (insect wings, legs, etc.). In addition to pre-identified roosts, during the field survey the most used bats roosts were found – the draining tunnels under the roads. These are concrete or iron structures (the latter are not used by Bats) of various sizes and shapes, laid under highways or railway tracks, in order to divert mudflows from the residual mountains during seasonal precipitation.

Each surveyed object was mapped, photographed, its brief description was made, including notes on the suitability of the objects for bats as either a temporary roost or a permanent one, notes on the potential degree of disturbance/threat. Where necessary the height, width and length of the roost were measured. In case of detection of Bats, the surface temperature was measured. All the draining tunnels examined in spring were re-examined in summer. We also examined areas that go beyond the project territory, because bats fly long distances (up to several kilometres) from their roosts in search of food.

When Bats were detected, their species, gender, age and number were determined. Species identification was carried out according to generally accepted methods (Kuzyakin, 1950; Bogdanov, 1953; Dietz, von Helversen 2004). The captured bats were examined, photographed and immediately released in the places of capture. For two discovered species – the Bokhara horseshoe bat (*Rhinolophus bocharicus*) and the Ognev's serotine bat (*Eptesicus bottae ognevi*), measurements were taken confirming the species identity and recordings of echolocation signals were made. In April records of the Bokhara

horseshoe bats were carried in hands and in June - during the bat emergence survey (quantitative assessment of individuals flying out of the mine tunnel for feeding) from 20:25 to 21:30. Recordings of Ognev's serotine bats were carried out during the bat emergence survey near the draining tunnel from 20:10 to 21:10.

In total, 845 km (Spring and Summer expeditions) were covered by survey transects, 54 potential roost places were examined.

## **Equipment**

To navigate the terrain and record tracks, a smartphone (*BV9900E*) was used with the *LocusPro* application installed, with preloaded *Google Hybrid* and *Marshruty.ru* maps. Two binoculars were used to view the area: *Nikon Aculon 10x42* and *Nikon Prostaff 7S 10x42*.

Photographing was carried out using smartphones (*BV9900E*) and *MIUI REDME 5+*, as well as two SLR cameras: *Nikon D3200* with a *Nikkor 18:200* lens and *Nikkon D3200* with a *Nikkor 50 mm* lens.

The following equipment was used for the examination of bat roosts: a torch (*Fenix HP30R*) (2), cloth bags (2), thick gloves (2), forceps (2), a tape measure (1), a surface electronic thermometer *TFA* (1), an electronic scale *SF-400* (1), a *Digital caliper 0-150 mm* caliper (1), a mist net (1), and the radiation level in the mine galleries/ mine shafts was measured by a *Geiger counter ZGKPDQ*. Recordings of ultrasonic signals were carried out using *Echo Metr Touch 2 Pro for Android wildlife Acoustics*.

All the collected information was recorded in a notebook, the surveyed roosts and bats registration locations were mapped in the *LocusPro* smartphone application.

## GEOGRAPHICAL FEATURES OF THE STUDIED AREA

The Kuldzhuktau and Beltau mountains, as well as the adjacent plain, are located in the Kuldzhuktau-Tamdytau district of the Kyzylkum district of the plain sub-province of the Turan province (Fig. 1).



*Figure 1 Location of the Kuldzhuktau and Beltau residual mountains in the context of Uzbekistan*

The total length of the Kulzhuktau residual mountains is about 100 km, the width is 15 km, the maximum height is 785 m. The southern slopes are gentle, dissected by dry canyons; the northern slopes are rocky and steep.

The Kuldzhuktau mountains are composed mainly of crystalline shists and limestones; along the outskirts there are Jurassic, Cretaceous and Paleogene sedimentary strata, on the surface of which there are sifted sands.

There is no rain in the summer. The springs are few. On the foothill plain there is a gravelly desert with wells and artesian boreholes, the water is usually brackish or bitterly salty.

The project area is located in the western part of the Kulzhuktau ridge, and quite densely covers the southern and northern parts of the Beltau outlier, with a total length of about 17 km and the highest point of 483 m above the sea level (Fig. 2).

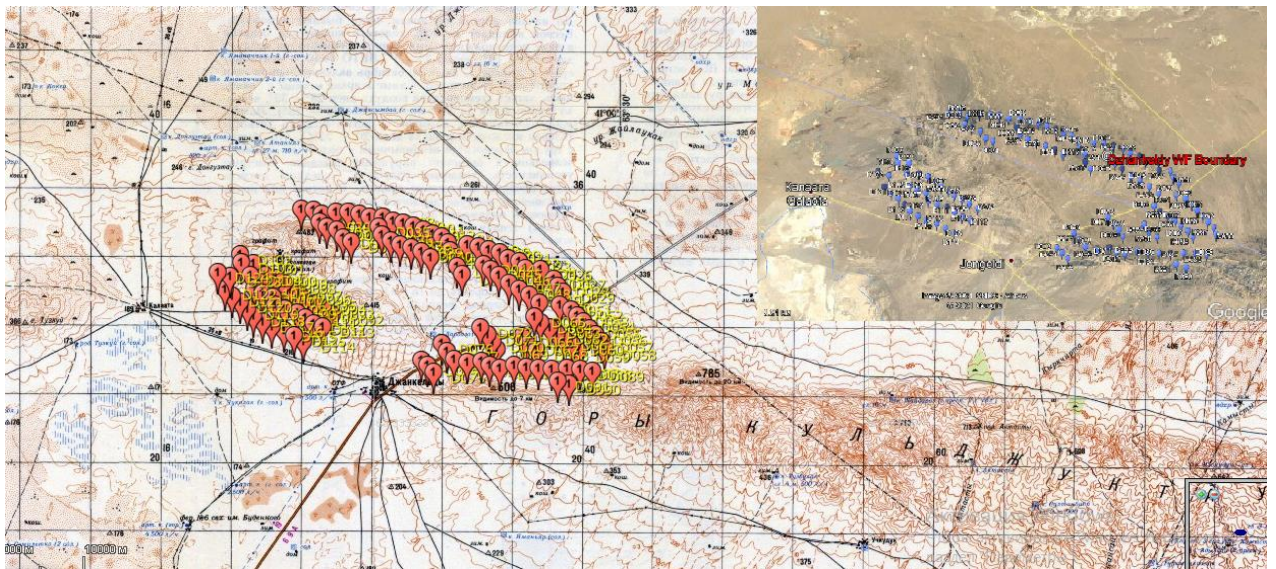


Figure 2 Dzhankeldy WF project territory



## RESULTS

Potential bat roosts in the studied region can be divided into the following categories: **anthropogenic** – the draining tunnels under the roads, mine galleries (horizontal or inclined mining that has direct access to the surface), wells, sheep cotes, abandoned buildings (farms, small settlements), residential buildings in villages; and **natural** – grottos, crevices, caves.

A total of 54 potential habitats were visited, some of which were a complex consisting of an abandoned house and a hut, a house and a well, etc. Thus, 61 potential roosts were examined, including draining tunnels under the roads (45), mine gallery (1), wells (6), shepherd huts/houses (4), sheep cotes/cattle pens (4) of abandoned settlements (1) (Fig.3).

In Appendix 1, all the potential roosts visited during the field trip are described in detail.

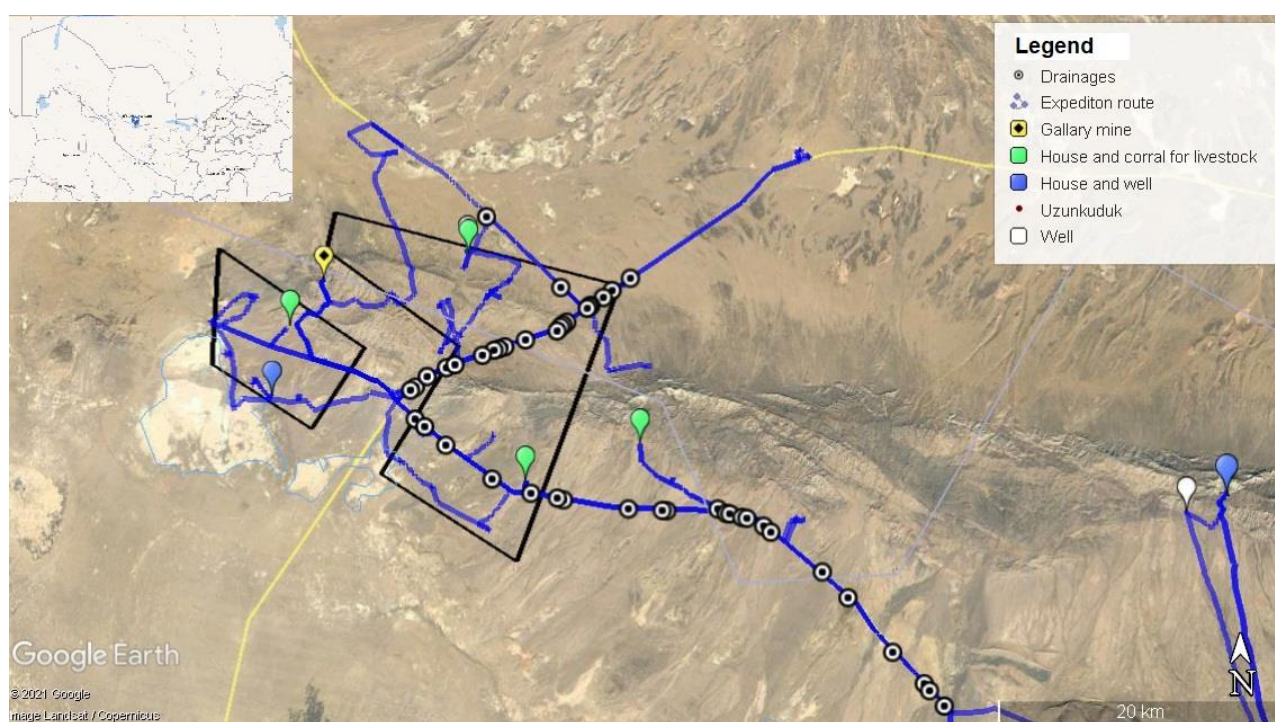


Figure 3 Surveyed locations

All the examined potential roosts were divided according to the degree of suitability for bats (Table 1):

1. 15 potential roost locations are **completely unsuitable** – these include metal draining tunnels under the roads that are heated under the sun in summer, and are excessively cooled if used in winter; as well as monolithic concrete draining tunnels without any cracks or the with cracks smoothed after repair work.

2. **Potentially used as short-term roosts:** these are mainly houses, wells and draining tunnels with shallow crevices (19 locations).

3. **Roosts suitable for breeding** offspring (17 locations) are draining tunnels with deep crevices where bats were found or can potentially be inhabited by them in the future, as well as the mine gallery, which is the only place on the project territory that is reliably suitable for wintering. Two draining tunnels could not be examined. It is not known how much draining tunnels bats use in winter, but most likely, because of low temperatures, the concrete cools down significantly, which is not an acceptable condition for wintering.

Thus, 36 roosts turned out to be actually suitable for bats.

The level of existing anthropogenic threats in the studied territory is generally quite low, which determines the bat roosting in places rarely visited by humans. The most significant threat is the planned repair work in the draining tunnels under the roads, when the cracks that are used by the Ognev's serotine bat would be smoothed.

*Table 1 Assessment of the suitability of the surveyed roosts for bats\*\*\**

Roost №	The degree of suitability for bats*	Degree of distress**
1	2	1
2	2	1
3	3	1
4	3	1
5	1	1
6	2	1
7	2	1
8	3	1
9	3	1
10	2	1
11	2	1
12	5	5
13	1	4
14	1	4
15	3	1
16	2	1
17	1	1
18	3	1
19	2	1
20	3	1
21	3	1
22	3	1
23	2	1

24	2	1
25	1	1
26	1	1
27	1	1
28	1	1
29	1	1
30	1	1
31	1	1
32	1	1
33	1	1
34	2	1
35	1	1
36	2	1
37	2	1
38	2	1
39	2	1
40	1	1
41	5	5
42	3	2
43	3	1
44	2	1
45	1	4
46	3,4	2
47	2	3
48	2	3
49	3	3
50	3	2
51	3	2
52	3	2
53	2	1
54	3	2

Notes:

\*1 – not suitable; 2 - places potentially used as temporary roosts; 3 - roosts suitable for breeding offspring; 4 – roosts suitable for wintering; 5 – absence/ presence is not known.

\*\* 1-absent; 2-low; 3-average; 4-high; 5 - not known (given at the time of the survey).

\*\*\* The numbering in table 2 corresponds to the number of roosts in Appendix 1.

More detailed information on two species of bats recorded in the project territory: Bokhara horseshoe bat (*Rhinolophus bocharicus*) and the Ognev's serotine bat (*Eptesicus bottae ognevi*) is presented below.

## Bokhara horseshoe bat (*Rhinolophus bocharicus*)

**Bokhara horseshoe bat** (LC, IUCN) is a Central Asian endemic inhabiting Afghanistan, Iran, Kazakhstan, Kyrgyzstan, Tajikistan (Benda et al, 2019) (Fig. 4). Bokhara horseshoe bat is listed in the Red Book of Tajikistan (2015).

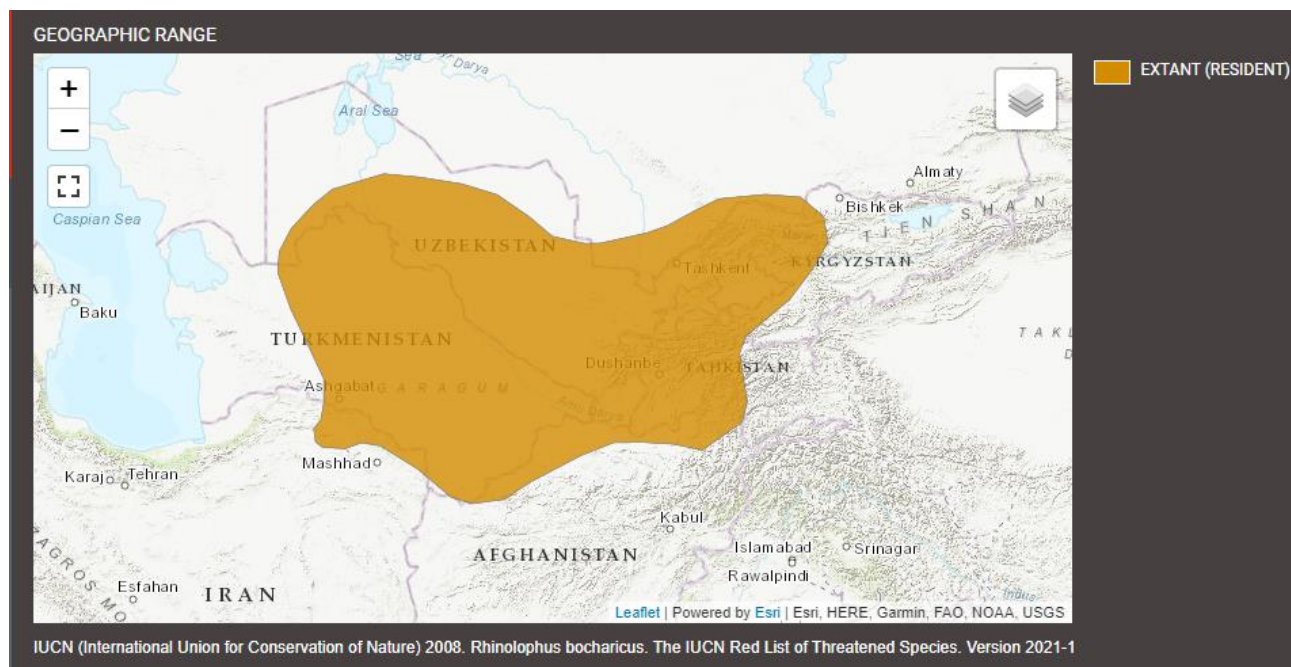


Figure 4 The world habitat areal of the Bokhara horseshoe bat

During our first visit to the gallery in spring (17.04.2021), a male Bokhara horseshoe bat was caught, it was in a state of daytime sleep at the time of the examination. In addition to this individual, two more were visually marked. The male was measured (Table 2), its ultrasonic signals were recorded and it released back into the gallery.

Table 2 Measurements of male Bokhara horseshoe bat

Measurements	(mm)
Body length	45
Tail length	28
Forearm length	50
Ear Length	18
Wing length	125
Horseshoe Width	9
Gender	♂





*Figure 5 Accumulations of bat excrement in one of the corridors of the mine gallery (photo by A. Atakhodzhaev)*

During our second visit to the gallery in summer (21.06.2021), we already knew about the presence of two entrances, in this regard, for the quantitative accounting of individuals, one of the entrances was completely covered with a mist net, and the second remained free. Quantitative accounting was started at dusk and was carried out from 20:10 to 21:30. The first Bokhara horseshoe bat left the gallery at 20:25, after that bats were leaving the gallery by one or two individuals at a time until 21:10, after that time bats were not recorded. In total, 12 Bokhara horseshoe bats left the gallery. In addition to accounting, we made recordings of their ultrasounds. No other bat species were observed in this gallery. The ultrasound recordings were provided to the international bat expert Dr. Vasenkov D. N.

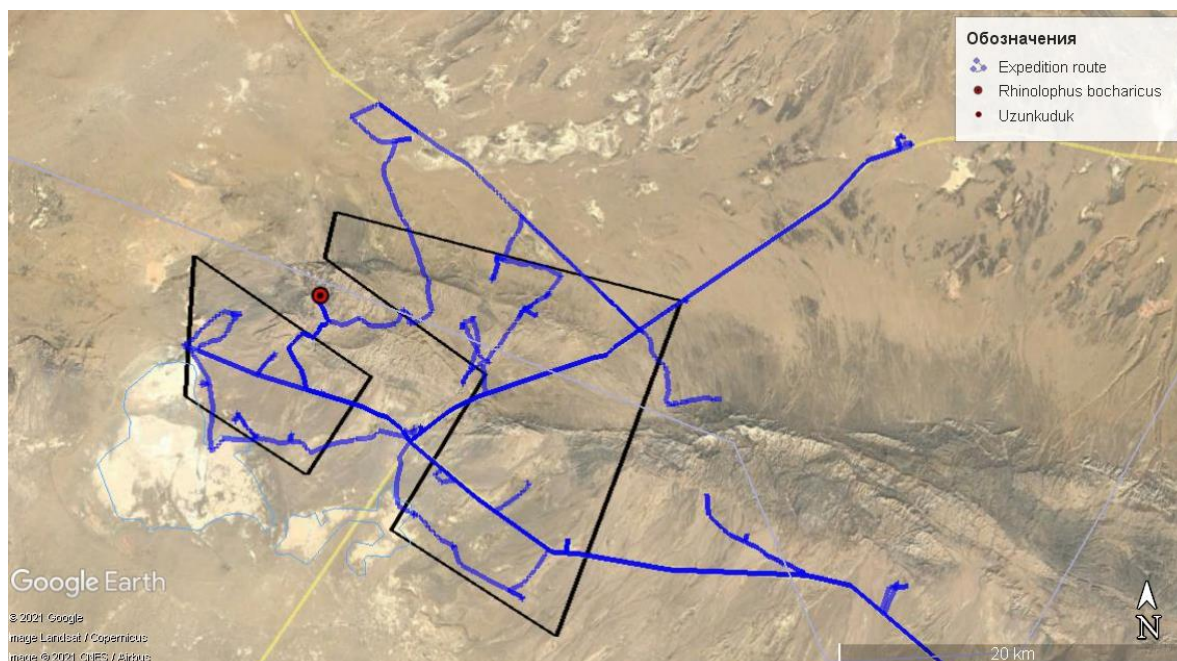


Figure 6. The location of the mine gallery with a colony of Bokhara horseshoe bats

In the morning, we attempted to conduct a visual examination of the Bokhara horseshoe bats in order to determine the gender, age and presence of offspring, but the animals, despite a thorough inspection of the gallery, were not found. Numerous accumulations of excrement were observed (Fig. 5). In connection with the unsuccessful attempt, we conducted a second inspection on 22.06.2021, and we found only one Bokhara horseshoe bat that was not sleeping, showed anxiety, which made it impossible to catch it.

People do obviously not visit the gallery, even if there are rare visits; they are most likely limited to the entrance hall. This is because it is necessary to overcome descents and ascents quite laboriously throughout the entire length of the gallery. In addition, there are numerous, completely inaccessible manholes that serve as an excellent roosts. In this regard, the threat of extinction of the colony is minimal.

Thus, the Bokhara horseshoe bat is a rare species for the territory, which needs suitable roosts, mainly caves, mine galleries and mine shafts. However, occasionally it can inhabit shepherds huts with a ceiling (Bogdanov, 1953). Such suitable roosts are very limited in the area, which makes this species limited for the region.



### Ognev's serotine bat (*Eptesicus bottae ognevi*)

**Ognev's serotine bat** (LC, IUCN) is a widespread, but naturally small in numbers species in the studied region. Ognev's serotine bat is listed in the Red Book of Tajikistan (2015). Ognev's serotine bat was observed only in the draining tunnels under the roads in the surveyed territory, however, according to the literature data (Bogdanov, 1953), it is possible that there are also natural roosts – cracks and crevices in the rocks, which were not examined by us due to difficult accessibility and time constraints.

We examined a total of 45 draining tunnels under the roads (Fig. 7), bats were found in 5 tunnels, excrement in 5 tunnels, 15 tunnels appeared to be not suitable due to the lack of cracks and the metal structure (heated under the high temperatures). The remaining tunnels were suitable for bats, but apparently due to the naturally low density of these species are not yet inhabited (Fig. 7) (**more detailed information on each tunnel is given in Appendix 1**).

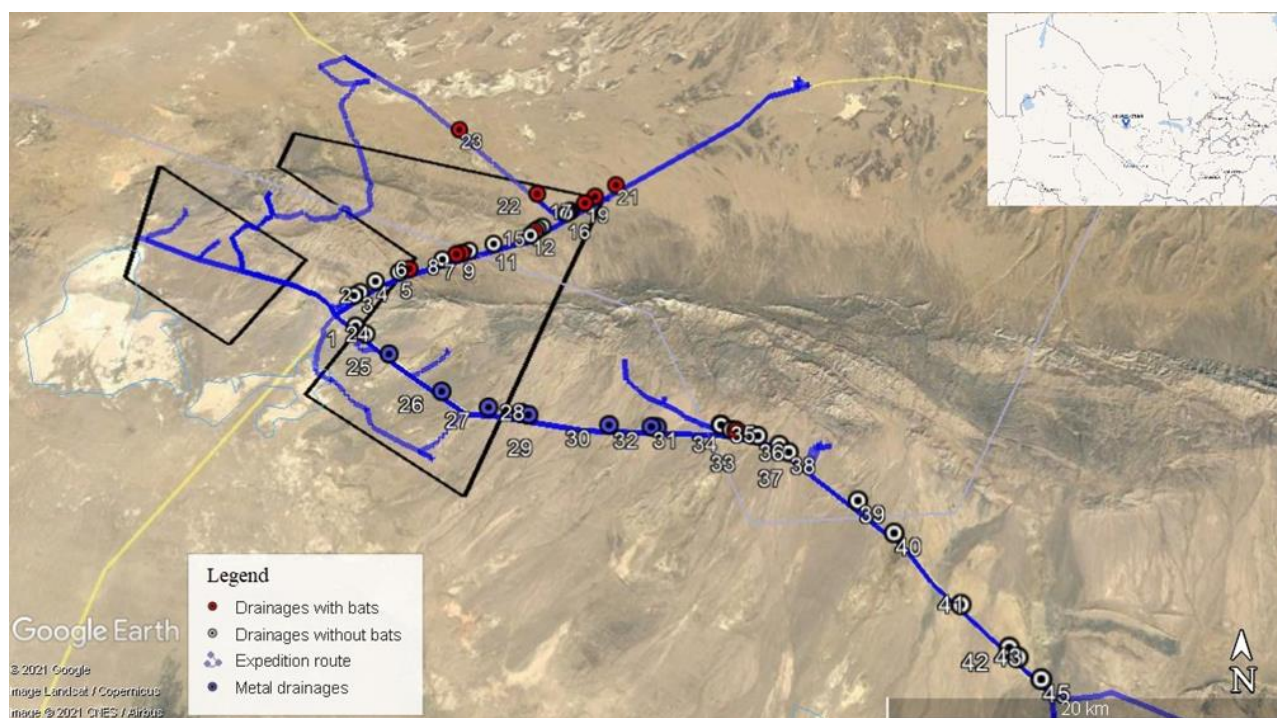


Figure 7. Locations of the tunnels under the roads, their suitability for bats and the population of the Ognev's serotine bat

In total, 40 Ognev's serotine bats were recorded, including 32 females, 3 males and 5 individuals, which could not be examined to identify gender. Each draining tunnels was numbered by us (Fig. 7, Appendix 1). Table 3 shows the data on the gender and age composition of bats in each draining tunnel. From the collected data, it becomes obvious that breeding females keep separate colonies, males keep alone. The surface temperature inside the draining tunnels, even on the hottest days (up to 45° C), remains within the range of 31-35°C.

Table 3 Gender and age composition of Ognev's serotine bats in each surveyed draining tunnel

Draining tunnel №	♂	♀	Gender is not known	The presence of excrement	The surface temperature t°C	Comments
6	1	-		+	31	
8	-	-		+	32	
9	1	-		+	31	
13			5	+		Bats are deep in the cracks
18	-	-		+	33	Social signals of several animals
19	-	-		+	32	
20	1	-		+	34	Numerous excrements, possibly the roost of several individuals
21	-	-		+	34	
22	-	32		+	33	The females were pregnant, which was determined by palpation of the captured individuals
23	-	-		+	32	
34	-	-		+	31	

Measurements of two individuals (male and female) of bats were obtained (Table. 4), and the echolocation signals were recorded. The male (draining tunnel No. 6) was released when recording the signals, the female bat from draining tunnel No. 22 was examined and placed back in the roost. In the evening, recordings of Ognev's serotine bats' signals were carried out during the bat emergence survey near the draining tunnel from 20:10 to 21:10. The ultrasound recordings were provided to the international bat expert Dr. Vasenkov D. N.

Table 4 Measurements of male and female Ognev's serotine bats

Measurements	♂ (mm)	♀ (mm)
Body length	43	44
Tail length	37	38
Forearm length	44	44
Ear Length	11	11
Tragus	5	4
Wingspan	112	132
Weight	14 gr	12 gr

An obvious anthropogenic threat to Ognev's serotine bats is the regular repair work of draining tunnels, as a result of which the cracks inhabited by this species are smoothed. In particular, when visiting the draining tunnel No. 13 in April, we recorded 5 individuals of Ognev's serotine bats, in June the same tunnel was examined again, the cracks were smoothed and no bats were recorded. It is not known if the bats managed to leave the roost during the repair work. No other obvious anthropogenic threats were noted.

The natural enemy of Ognev's serotine bats, confirmed during the survey, is the Little owl (*Athene noctua*). The bones, presumably of the Ognev's serotine bats, were found in the pellets of the Little owl living in one of the draining tunnels.

In general, the Ognev's serotine bat is a regularly occurring but naturally small in numbers species on the studied territory.

## CONCLUSIONS

Our survey of the Dzhankeldy WF project territory, as planned, was carried out first during the migration period (Spring), and then during the most important period in bats' life – pregnancy and breeding (Summer). This allowed us to obtain information on the biology of two species present in the project area – Ognev's serotine bat and Bokhara horseshoe bat. With the help of mobile detectors, the ultrasonic signals of these two species were recorded for future use in bat signals analysis.

As a result of two field visits, a significant area with 54 potential roosts was surveyed. 36 roosts turned out to be suitable for bats, most of which were draining tunnels under the roads. 15 of the surveyed roosts were identified as completely unsuitable for bats.

The level of existing anthropogenic threats in the studied territory is generally quite low, which determines the bat roosting in places rarely visited by humans. The most significant threat is the planned repair work in the draining tunnels under the roads, when the cracks that are used by the Ognev's serotine bats would be smoothed.

In general, the bats population density on the project territory is quite low, which is due to the harsh desert conditions and limited places of permanent roosts, which are mostly human buildings. Thus, the development of the desert territory and the development of infrastructure significantly affected the bats population. This issue needs to be studied in more detail.

## RECOMENDATIONS



1. Conduct a survey of residential buildings in the village of Dzhankeldy (with support from the mahalla committee), in which additional bat species can be identified;
2. Conduct a winter survey for the presence/absence of bats;
3. Organize a separate field survey aimed at examining the rocky areas of the Beltau and Kuldzhuktau mountains, both during seasonal migrations and during the breeding season;
4. Conduct operational bat monitoring after the completion of the construction of the wind farm, especially during the period of seasonal migrations and breeding;
5. During operational monitoring, it is necessary to organize the collection of bat genetic material. For this purpose, it is necessary to obtain all permits from the State Committee of Ecology and the Academy of Sciences of the Republic of Uzbekistan.


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**Appendix 1. The results of the potential bat roosts survey on the Dzhankeldy WF project territory (on the Kuldzhuktau, Beltau ridges and in adjacent areas)**




№	N	E	Type of roost	Description	Presence/absence of bats	Photo
1	40,83426	63,34865	Concrete draining tunnel under the road	Length 10 m, height 1 m. There are cracks, however, not particularly deep. Can be used as a temporary roost, not suitable for breeding and colonies.	Not detected	
2	40,85246	63,34482	Concrete draining tunnel under the road	Length 12 m, height 1.15 m. There are suitable cracks, for temporary roost, not suitable for breeding and colony.	Not detected	

3	40,85445	63,34890	Concrete draining tunnel under the road	<p>Length 12 m, height 115 m.</p> <p>There are suitable deep cracks, suitable for breeding and colony. The draining tunnel under the road is surrounded by masonry, in which there are also cracks</p>	Not detected	
4	40,86101	063,35874	Concrete draining tunnel under the road	<p>Half-filled with debris flow. Length 13 m, height 80 cm.</p> <p>There are suitable deep cracks, suitable for breeding and colony.</p>	Not detected	







5	40,86660	63,37482	Concrete draining tunnel under the road	Filled with debris flow. Length 12 m, height 68 cm. There are almost no cracks. The existing ones are very narrow. <b>Not suitable as a roost.</b>	Not detected	
6	40,86844	063,38194	Concrete draining tunnel under the road	Filled with debris flow. Length 13 m, height 93 cm. Suitable cracks for roost.	In spring excrements were found. In summer 1♂ <i>Eptesicus bottae</i> .	 

7	40,87438	63,40488	Concrete, monolithic draining tunnel under the road	<p>Half-filled with debris flow. Length 12 m, height 70 cm.</p> <p>There are suitable cracks at the joints of the blocks. The draining tunnel under the road is surrounded by masonry, which also has cracks.</p>	Not detected		
8	40,87760	63,41453	Concrete draining tunnel under the road	<p>Length 8 m, height 150 cm. Very deep cracks, possible presence of bats, as the cracks are not seen all the way through. Good roost, suitable for breeding.</p>	Based on the amount of excrement bats were deep in the cracks.	 	

9	40,87843	63,41849	Concrete draining tunnel under the road	Length 8 m, height 125 cm. Very deep cracks.	1♂ <i>Eptesicus bottae</i>	 
10	40,87972	63,42350	Concrete draining tunnel under the road	Length 8 m, height 130 cm. Suitable cracks for roost.	Not detected	









11	40,88407	63,44077	Concrete, monolithic draining tunnel under the road	Length 8 m, height 93 cm. There is one suitable crack for roost	Not detected	 
12	40,88967	63,46703	Concrete draining tunnel under the road	Length 8 m, height 77 cm. Very low, it is not possible to fully survey.	Not detected	



13	40,89217	63,46993	Concrete draining tunnel under the road	Length 9 m, height 120 cm. <b>The cracks were covered</b> with plaster during the repair work. However, the plaster has already fallen off in places and several cracks have formed suitable roosts.	In April there were 5 specimens of <i>Eptesicus bottae</i> . In June, the cracks were already covered and no bats were found.		
14	40,89353	63,47197	Concrete draining tunnel under the road	Length 13.5 m, height 1.50. All cracks covered. <b>Not suitable as a roost.</b>	Not detected		

15	40,89524	63,47513	Concrete draining tunnel under the road	Length 12 m, height 120 cm. There are numerous cracks, some of them deep and can serve as roost	Not detected	
16	40,90385	63,49206	Concrete draining tunnel under the road	Length 12 m, height 130 cm. There are suitable cracks for temporary roost.	Not detected	






17	40,90493	63,49377	Concrete draining tunnel under the road	<b>Not suitable for bats</b>	Not detected		
18	40,90575	63, 49516	Iron and Concrete draining tunnels under the road	Length 12 m, height 150 cm. Very deep cracks, not viewable. Suitable for breeding.	There are excrements of bats and social signals of several individuals could be recorded.		

19	40,91068	63,50550	Concrete, monolithic draining tunnel under the road	Length 12 m, height 90 cm. There are cracks between the joints	Excrement, probably of a single bat	 
20	40,91511	63,51283	Concrete draining tunnel under the road	Length 16 m, height 150 cm. Very deep cracks, poorly visible. Suitable for breeding.	One ♂ <i>Eptesicus bottae</i> in April and one in June. The presence of another bat is possible, which is indicated by a sufficiently large amount of excrement of different freshness	


21	40, 922764	63.528022	Concrete draining tunnel under the road	Length 18 m, height 90 cm. Very deep cracks, poorly visible. Suitable for breeding.	Excrement. Bats were not visible, due to the depth of the cracks.	
22	40,91698	63,47007	Concrete draining tunnel under the road	Length 14 m, height 2 m. Very deep cracks.	In April and June a colony of females <i>Eptesicus bottae</i> was found	



23	40,96154	63,40802	Concrete draining tunnel under the road	Length 12 m, height 1 m. Suitable but not deep cracks. Suitable as a temporary roost.	Single bat excrement Probably a rare visit. Bats were not visible.	
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24	40,82949	63,35663	Concrete draining tunnel under the road	Length 12 m, height 1 m. Suitable but not deep cracks. Suitable as a temporary roost.	Not detected	
25 25	40,81785	63,37424	Metal draining tunnel under the roads	<b>Not suitable for bats</b>	Not detected	
26	40,79662	63,41280	Metal draining tunnel under the road	<b>Not suitable for bats</b>	Not detected	Similar to the photo above



27	40,78771	63,44517	Metal draining tunnel under the road	<b>Not suitable for bats</b>	Not detected	//-//-
28	40,78471	63,46713	Metal draining tunnel under the road	<b>Not suitable for bats</b>	Not detected	//-//-
29	40,78357	63,47225	Metal draining tunnel under the road	<b>Not suitable for bats</b>	Not detected	//-//-
30	40,77792	63,52614	Metal draining tunnel under the road	<b>Not suitable for bats</b>	Not detected	//-//-
31	40.776959	63.554285	Metal draining tunnel under the road	<b>Not suitable for bats</b>	Not detected	//-//-
32	40,77679	63,55802	Metal draining tunnel under the road	<b>Not suitable for bats</b>	Not detected	//-//-



33	40,77514	63,60726	Concrete, monolithic draining tunnel under the roads	Length 9.5 m, height 120 cm. One joint, with a shallow crack. <b>Not suitable for roost.</b>	Not detected	//-//-//
34	40,77481	63,61034	Concrete double draining tunnels under the road	Length 11.20 m, height 1.5 m. (each of them). Not deep cracks. More suitable as a temporary roost. Masonry of stones creates potential roosts.	Single bat excrement. Probably a rare visit. No bats visible	





35	40,77257	63,62044	Concrete, monolithic draining tunnel under the roads	Length 9.5 m, height 62 cm. One joint, with a small crack. <b>Not suitable for roost.</b>	Not detected	
36	40,77201	63,62448	Concrete, monolithic draining tunnel under the road	Length 10 m, height 120 cm. There is a crack between concrete blocks, suitable as a roost	Not detected	







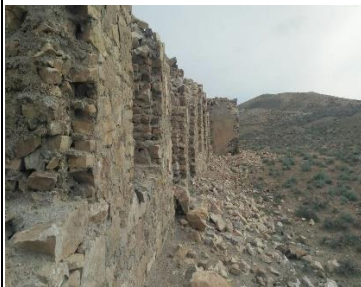
37	40,76711	63,63838	Concrete, monolithic draining tunnel under the road	Length 10 m, height 90 cm. One joint, with a suitable crack between concrete blocks	Not detected	
38	40,76325	63,64437	Concrete, monolithic draining tunnel under the road	Length 10 m, height 70 cm. One joint, with a suitable crack between concrete blocks	Not detected	

39	40,73816	63,6870837	Concrete, monolithic draining tunnel under the road	Length 10 m, height 110 cm. One joint, with a suitable crack between concrete blocks	Not detected	
40	40,72192	63,70837	Concrete, monolithic draining tunnel under the road	Length 10 m, height 60 cm. Significantly covered with sand. <b>Probably not a roost.</b>	Not detected	






41	40,68747	63,74542	Concrete, monolithic draining tunnel under the road	Not surveyed, due to the numerous dead cattle	Unknown	
42	40,66764	63,77164	Concrete, draining tunnel under the road	Length 11 m, height 100 cm. A bat pelvic bone was found in very deep crack. Presumably, the food object of the Little owl living here.	Not detected	

43	40,66318	63,77600	Concrete, draining tunnel under the road	Length 12 m, height 100 cm. Very deep cracks, suitable for breeding	Not detected	
44	40,77787	63,60038	Concrete, monolithic draining tunnel under the road	Length 10 m, height 115 cm. One joint, with a suitable crack between concrete blocks	Not detected	

45	40.653450	63.788250	Concrete, draining tunnel under the road	Length 10 m, height 1,5 m. <b>There are no cracks available for bats.</b>	Not detected		
46	40,92076	63,27153	The mine gallery and nearby ruins of the mining village	The height is 2,20 m, width - 8 m. The mine galleries are divided into two passages. The total length is about 250 m. The buildings were examined, there are many cracks, however no bats were found	A colony of Bokhara horseshoe bat ( <i>Rhinolophus bocharicus</i> ) in mine galleries		



47	40,81827	63,53490	Residential buildings and sheep cotes	The residential building has suitable cracks both between the masonry stones and in the roof. Seasonally used by shepherds. Suitable as a roost	Not detected	 
48	40,78463	64,02139	Two wells and two drinkers for livestock	Both wells have cracks that can be used as a temporary roost	Not detected	

## Appendix 2. Photos



**Bokhara horseshoe bat in a mine gallery on Beltau. April, 2021 (photo by M. Gritsina)**



**Bokhara horseshoe bat in a mine gallery on Beltau. April, 2021 (photo by M. Gritsina)**





**Female Ognev's serotine bats in the crevice of a concrete draining tunnel (photo by M. Gritsina)**



**Male Ognev's serotine bat in surveyor's hands for examination (photo by Gritsina M.)**





**Habitat of the Bokhara horseshoe bat on the Beltau ridge (photo by M. Gritsina)**



**Habitat of the Ognev's serotine bat in the foothill part of the Kuldzhuktau and Beltau ridges (photo by M. Gritsina)**





**Before the examination of the mine gallery on Beltau (photo by A. Atakhodzhaev)**



**Examination of the mine gallery on Beltau (photo by Yu. Mun)**





**Examination of the mine gallery on Beltau (photo by A. Atakhodzhaev)**



**Examination of the mine gallery on Beltau (photo by A. Atakhodzhaev)**





**Blocking the entrance with a mist net on the Beltau outlier (photo by A. Atakhodzhaev)**



**Recording of ultrasonic signals near the Ognev's serotine bat colony (photo by Mun Yu.)**





**Examination of a draining tunnel and record keeping (photo by A. Atakhodzhaev)**



**Taking measurements of Ognev's serotine bat (photo by Yu. Mun)**





**Taking measurements of Ognev's serotine bat (photo by A. Atakhodzhaev)**



**Examination of a draining tunnel (photo by A. Atakhodzhaev)**





**Examination of the ruined house (photo by M. Gritsina)**



**Examination of cracks in a draining tunnel (photo by M. Gritsina)**

## MAMMAL SURVEY REPORT

<b>Report Title</b>	<u>MAMMAL SURVEY</u>
<b>Scope</b>	MAMMALS
<b>Areas Covered</b>	DZHANKELDY WF
<b>Seasons Covered</b>	SPRING 2021 / SUMMER 2021
<b>Notes</b>	



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# MAMMAL SURVEY

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**DZHANKELDY WIND FARM PROJECT**

**CLIENT: 5CAPITALS**

Date: July 2021

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## INTRODUCTION

The survey for terrestrial mammals (excluding bats) was **aimed** to establish the presence/absence, status and distribution of mammal species within the Dzhankeldy project territory and its surrounding areas. In order to accomplish this the following steps were taken:

- Conducting a ground survey on mammal species (except for bats) throughout the study area including Aol and EAAA in Spring and Summer;
- Collecting data from camera traps (from April to June 2021) installed in the most suitable locations and collecting data from camera traps to get information about mammal species presence, distribution, seasonal dynamic and behavior;
- Collecting questionnaire data from local people on mammal species presence/absence, status and threats;
- Analysis of the preliminary field data including number of species and distribution; and
- Compiling a mammal species list based on field data, questionnaire data and data from literature sources, including endangered and non-endangered species.

The field surveys within the Dzhankeldy project territory and its surrounding areas were conducted twice: in Spring (on April 15-18, 2021) and Summer (June 26-28, 2021).

## LITERATURE REVIEW

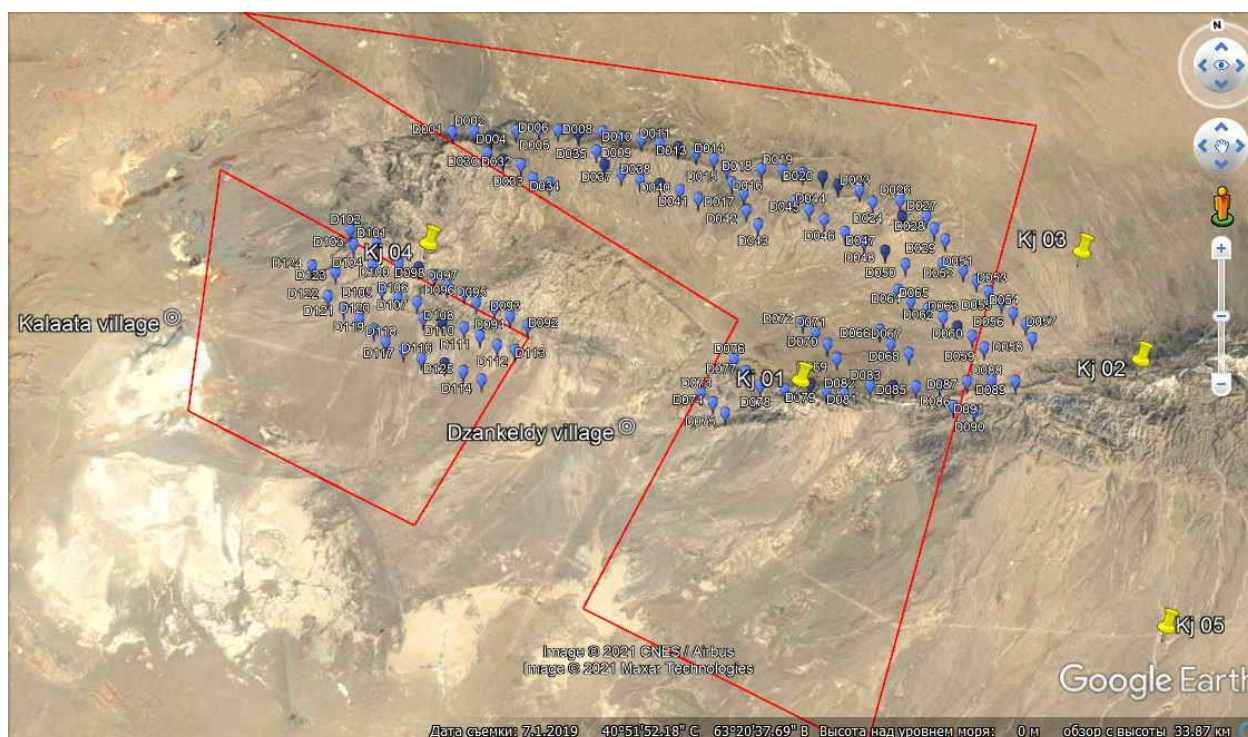
The mammal fauna of the Central Kyzyl Kum, particularly within the area of the residual Kuldzhuktau mountains and foothills (where the Dzhankeldy wind farm project territory is situated) is fragmentarily described in the fundamental works of I.I. Kolesnikov (1953) and G.I. Ishunin (1961, 1987), where the information on the distribution and biology of rodents, carnivores and ungulates is provided. In the monograph by T.Z. Zakhidov (1971) there is a description of the ecosystems of the Kyzyl Kum desert, and specific information about animals - vertebrates, including mammals of the Central Kyzyl Kum. In the encyclopedic reference book by O.P. Bogdanov (1992) and the Red Book of the Republic of Uzbekistan (2019) the basic information on the status of endangered species, general data on their biology, distribution, abundance and threats is given. These literature sources as well as scientific articles on distribution and ecology of several mammal species (Pavlenko & Davletshina, 1968; Volozheninov, 1981; Marmazinskaya & Gritsina, 2017; Gritsina et al, 2017; Gritsina, 2019; Bykova et al, 2020), supplemented by our own data collected during two field expeditions in April and June 2021 give us sufficiently enough data on the mammalian fauna in area of the Dzhankeldy WF project and adjacent territories, as well as the basis to develop recommendations for the conservation of threatened mammalian species.

Totally, the list of mammals (except for bats) of the study area includes 24 species of 5 orders: *Insectivora*, *Lagomorpha*, *Rodentia*, *Carnivora* and *Artiodactula*, 5 of 24 species (Brandt's hedgehog, Marbled polecat, Caracal, Sand cat and Goitered gazelle) are included in the Red Book of Uzbekistan (2019) and the IUCN Red List. <https://www.iucnredlist.org> (Table 1), the presence of two more endangered species - Corsac fox and Steppe polecat requires confirmation.



## MATERIAL AND METHODS

The survey was carried out in the Central Kyzylkum desert, in area of residual Kuldjuktai mountains (Northern, Southern, Northwest slopes, mountain foothills and low lands) (Fig. 1)



**Figure 1 Map of the survey area (yellow points –camera traps locations, blue points - wind turbines)**

During our survey, we used two basic methods:

1. Ground transect survey;
2. Camera trapping

During ground transect survey we studied the mammalian species number and species composition in walking transect survey. The length of each walking transect was 3 km in each monitoring point, with total length of 42 km (Tables 2, 3).

During the field survey, non-invasive approach was implemented, not related to the capture and killing of wild animals, including:

- visual observation of mammals both by eye and using 10x binoculars;
- registration of tracks of the vital activity of wild mammals, including animal tracks (paw footprints on the ground), feces, diggings, burrows, dead animals, etc.;

- taking photos of the animals, their tracks and traces of their vital activity, typical habitats.

Five standard Bushnell 119936C camera traps were installed from April 15-17 to June 26-28, 2021. Camera traps were installed for 2.5 months at 5 locations in various types of biotopes in the places of the most probable visit of wild animals (trails, watering points, animal marking places, and places of natural constrictions of relief) (Fig 1). In total we collected data of camera trapping for 265 camera traps/days. As a result 10673 captures were made including 1150 effective captures with animal records (Table 4, 5). In addition, we interviewed local people – citizens from Dzhankeldy and Kalaata villages, and shepherds.

## RESULTS AND DISCUSSION

### Mammal species review

The **Order Insectivora** is represented by 4 species: **Long-eared hedgehog**, **Brandt's hedgehog**, **Lesser white-toothed shrew** and **Piebald shrew** (Table 1.).

The **Long-eared hedgehog** is a eurytopic species inhabiting all types of ecosystems from foothills to deserts; it does not avoid anthropogenic landscapes. We recorded it in the foothills of Northern Kuldzhuktau.

**Brandt's hedgehog**, near threatened (NT) species included in the Red Data Book of Uzbekistan (2019) was recorded in the project area - in degraded mountains of Central Kyzyl Kum (Pavlenko & Davletshina, 1953; Zakhidov, 1971; Volozheninov, 1981). The Brandt's hedgehog inhabits the foothills of the Kuldzhuktau, saline depressions with sandy hillocks, as well as clay and stony deserts. Brandt's hedgehog prefers to live in ravines and dry riverbeds. According to Nikolay Volozheninov number of this species on Kulzhuktau is 0.01 individuals/ha. We recorded Brandt's hedgehogs (black form) on camera traps (19 captures in three locations) (Table 4, 5) in the Northern Kulzhuktau (southern slope, the channel of a dried stream on the border between a sandy desert and a rock; rocky bottom of a mountain stream) and Southern Kulzhuktau (foothills clay desert) (Table 2, 3). Also, two dead hedgehogs (white form) were found on the road along the South Kuldzhuktau ridge. In addition, Timur Abduraupov (herpetologist for the project) made two records of this species in the western part of Kulzhuktau between Kalaata and Dzhankeldy villages at a distance of 3.7 km from wind turbine D116 (June 22, 2021) and in the North-West of Kulzhuktau at a distance 1.8 km from turbine D001 and 2.3 km from turbine D101 (July 4, 2021).





**Figure 2 Brandt's hedgehog (white form) killed on the road in Southern Kuldzhuktau (at the left) and black form of Brandt's hedgehog captured by camera trap in Northern Kuldzhuktau**

**Lesser white-toothed shrew** is a hydrophilic species, and usually it inhabits the banks of water reservoirs, near wells, in oases. Lesser white-toothed shrew was recorded by Volozheninov (1981) in Central Kulzhuktau near the Tumbulak well. Another species - **Piebald shrew**, on the contrary, is psamophilous and lives in fixed and semi-fixed sands. We didn't find it, but both Zakhidov (1971) and Volozheninov (1981) wrote about its habitation in the Central Kyzylkum.

**Tolai hare** is the only representative of the **Order Lagomorpha** in the project area (Table 1). It is a typical inhabitant of river forests and reed thickets, it also occurs in the foothills and deserts. We recorded two young hares that died on the road in the vicinity of the Karakata depression (planned Dzhankeldy-Bash OHTL) and near Dzhankeldy village. Also hares were recorded by a camera trap in South Kuldzhuktau (one location, 9 captures) (Table 4, 5). In addition, shepherds informed us that Tolai hare is a common inhabitant of the foothills in Northern Kuldzhuktau.



**Figure 3 Tolai hare killed on the road in the vicinity of Dzhankeldy village (24.06.2021). Photo by Elena Bykova.**

10 **rodents** were recorded in the project area (Table 1). The rodent community includes the synanthropic species - **House mouse**, as well as common inhabitants of the clay desert - **Small five-toed jerboa**, **Severtsov's jerboa**, **Yellow ground squirrel**. **Zaisan mole vole**, **Grey dwarf hamster**, and three species of gerbils, including **Great gerbil**, the **Libyan** and **Midday jirds** were also recorded in project area. Colonies of these species were observed in the survey area. It is interesting to note that many colonies of the Great gerbil were uninhabited, because of the natural depression of this rodent. Camera traps that we installed near the colonies of Great gerbil indicated that the uninhabited burrows were occupied by another species - Libyan jird, which is quite consistent with the theory of out-of-phase fluctuations in the abundance of Great gerbils and Gerbils of the genus *Meriones*. We made 16 captures of Libyan jird in the foothills of the Northern Kuldzhuktau (Table 4, 5). Such inhabitants of desert and semi-desert zones, psamophiles - **Long-clawed ground squirrel** and Midday jird inhabit the sandy massifs in the vicinity of the Karakata depression.





**Figure 4 Libyan jird captured by camera trap in foothills of Northern Kuldzhuktau on the territory of the colony of Great gerbil**

**Red fox** and **Asiatic wildcat** are the most common predators in desert biotopes and residual mountains in the survey area. Both species are widespread throughout the territory. We have recorded them by footprints, feces, and by camera traps. The fox was recorded in 4 locations in North and South Kuldzhuktau, in total 9 captures were made, a steppe cat - in 2 locations in North Kuldzhuktau - 4 captures were made (table 4, 5). In addition, the Asiatic wildcat was visually noted in the North-Western Kuldzhuktau in the vicinity of Kalaata (we found sleeping cat in a burrow), numerous feces of this species were found in shelters arranged in a rocky ridge located on the foothill plain in Southern Kuldzhuktau.



**Figure 5 Asian wildcat during the day rest in a burrow in Northwest Kuldzhuktau. Photo by Alexander Esipov.**



**Figure 6 Toilet of Asian wildcat in foothills of the Southern Kuldzhuktau. Photo by Elena Bykova**

The project area is inhabited by two more endangered cats - the **Caracal** and the **Sand cat** (Table 1). Turkmen Caracal is one of the rarest vertebrates in Central Asia (Heptner & Sludskii 1972). It is included as Critically Endangered (1CR) in the Red Data Books of Uzbekistan (2019), listed in Appendix I of the CITES. The classical faunistic works don't report about the presence of the caracal in Central Kyzyl Kum. The first data on this species for this territory, moreover, directly from the area of the planned project



(the vicinity of Dzhankeldy and Kalaata villages) were collected by Mariya Gritsina and co-authors based on questionnaire surveys of local residents (245 respondents from 40 locations) (Gritsina, 2016, 2019). So, villagers of Kalaata in central Kyzylkum reported a caracal killed by herders on 20 March 2014 about 20km southwest of the village. Later, we found the carcass of a young female in the place indicated by the local people. The cat was caught in a leg-snare near a sheep pen. Also, villagers informed about another caracal killed by herders in 2012, which used to attack lambs in the calving period, killing up to 10 lambs at one time but leaving them uneaten. This information was confirmed by herders from the village of Dzhankeldy. They told us that people from Kalaata killed three individual caracals between 2012 and 2013. An official of the Bukhara Regional Department of the State Committee for Nature Protection F. Salimov, observed caracals several times near the above-mentioned village of Dzhankeldy and on the shore of lake Zamonbobo in the past 10–15 years. Unfortunately, we were not able to confirm these data using camera traps, but we also received data from shepherds about caracal sightings in the vicinity of the Kalaata (Table 2). Main threats of caracal are habitat degradation due to human development, severe winters, high snow level, decreasing of prey species (desert rodents and birds), persecution by humans and dogs.

Information about the presence of another endangered species in the Central Kyzyl Kum - **Sand cat** is found in the works of a number of authors (Bobrinsky et al., 1944; Gromov et al., 1963; Geptner, Sludsky, 1972; Gritsina, 2016). Sand cat listed in Red Data Book of Uzbekistan as Near threatened species (3NT) and Appendix II CITES. The status of the sand cat on the territory of the Republic of Uzbekistan needs to be clarified. Literature sources give very little data about findings of this species in the project area. For example, one adult sand cat was recorded to the south of Kalaata village on April 15, 2013. One more recording of sand cat was made by camera trap installed north of the village of Kalaata (northern Beltau Mountains, which are the western end of the Kuldzhuktau Mountains) on November 16, 2014 (Gritsina, 2016). The main threats are severe and snowy winters, habitat loss and degradation due to economic development (road construction, geodetic development and exploration) and watering of habitats for agricultural needs. The food competitors of the sand cat are the red fox and Asiatic wildcat.

We didn't found such a rare species as **Marbled polecat**, despite the efforts made. However, the presence of this species, whose biology is associated with the presence of prey species - colonial rodents - gerbils and ground squirrels, is indicated in the literature (Zakhidov, 1971). We also recorded marbled polecat in the adjacent territory in the

Karakata depression in early 1990s. There are some data from Central Kyzylkum about two more representatives of the Canidae family - the **Common wolf** and the **Corsac** (Zakhidov, 1981). Corsac listed in the Red Book of Uzbekistan. Wolf listed as a game species. However, during our survey and according to local people, the presence of these species was not confirmed. We also didn't confirmed the presence of the **Steppe polecat**, a rare species included in the Red Book of Uzbekistan (2019).

**Table 1** - Characteristics of non-bat mammals in the project area and adjacent areas of Central Kyzylkum (Kuldzhuktau ridge, Navoi province, Dzhankeldy project site)

№ п/п	Species	Conditional population estimate	Status of threat IUCN RedList/Uzbekis tan RDB	Sources
1	Long-eared hedgehog <i>Hemiechinus auritus</i> Gmelin, 1770	O-M	LC/-	Ground survey; Zakhidov, 1971; Volozeninov, 1981
2	Brandt's hedgehog <i>Paraechinus hypomelas</i> (Brandt, 1836)	P-E	LC/3NT	Camera trapping; road accident (Zafarabad); Pavlenko & Davletshina, 1953; Zakhidov, 1971; Volozeninov, 1981
3	Lesser white-toothed shrew <i>Crocidura suaveolens</i> Pallas, 1811	O-H	LC/-	Zakhidov, 1971; Volozeninov, 1981
4	Piebald shrew <i>Diplomesodon pulchellum</i> (Lichtenstein, 1823)	P-E	LC/-	Zakhidov, 1971; Volozeninov, 1981
5	Tolai hare <i>Lepus totai</i> Pallas, 1778	O-M	-	Ground survey, camera trapping, road accident (OHTL 115 km); Zakhidov, 1971
6	Long-clawed ground squirrel <i>Spermophilopsis leptodactylus</i> (Lichtenstein, 1823)	O-H	LC/-	Ground survey (OHTL 115 km); Kolesnikov, 1953; Zakhidov, 1971
7	Yellow ground squirrel <i>Spermophilus fulvus</i> (Lichtenstein, 1823)	O-M	LC/-	Ground survey; Zakhidov, 1971
8	Small five-toed jerboa <i>Allactaga elater</i> (Lichtenstein, 1825)	O-M	-	Ground survey; Zakhidov, 1971

9	Severtzov's jerboa <i>Allactaga severtzovi</i> Vinogradov, 1925	O-H	LC/-	Zakhidov, 1971
10	Great gerbil <i>Phomomys opimus</i> (Lichtenstein)	O-M	LC/-	Ground survey; Zakhidov, 1971
11	Libyan jird <i>Meriones libycus</i> Lichtenstein, 1823	O-M	LC/-	Ground survey; camera trapping; Zakhidov, 1971
12	Midday jird <i>Meriones meridianus</i> (Pallas, 1773)	O-M	LC/-	Ground survey; Zakhidov, 1971
13	Grey dwarf hamster <i>Cricetulus migratorius</i> Pallas, 1773	O-H	LC/-	Zakhidov, 1971
14	Zaisan Mole Vole <i>Ellobius tancrei</i> Blasius, 1884	O-M	LC/-	Ground survey; camera traps Zakhidov, 1971
15	<i>Mus musculus</i> Linnaeus, 1758	O-H	-/-	Ground survey; Zakhidov, 1971
16	Grey wolf <i>Canis lupus</i> (Linnaeus, 1758)	P-E	LC/-	Zakhidov, 1971 need to be confirmed
17	Corsac Fox <i>Vulpes corsac</i> (Linnaeus, 1768)	P-E	LC/2(VU:D)	Zakhidov, 1971; Red data book of Uzbekistan, 2019; need to be confirmed
18	Red fox <i>Vulpes vulpes</i> Linnaeus, 1758	O-M	LC/-	Ground survey; camera trapping; Zakhidov, 1971
19	Marbled Polecat <i>Vormela peregusna</i> (Güldenstädt, 1770)	P-E	VU/2(VU:D)	Zakhidov, 1971; Red data book of Uzbekistan, 2019
20	Steppe Polecat <i>Mustela eversmanii</i> Lesson, 1827	P-E	LC/2(VU:D)	Zakhidov, 1971; Red data book of Uzbekistan, 2019
21	Asiatic wildcat <i>Felis sylvestris ornate</i> Gray, 1830	O-M	-	Ground survey, camera trapping; Ishunin, 1961, 1987; Zakhidov, 1971
22	Sand cat <i>Felis margarita</i> Loche, 1858	P-E	LC/3NT	Ishunin, 1961, 1987; Zakhidov, 1971; Gritsina, 2016. 2019
23	Caracal <i>Caracal caracal</i> (Schreber, 1776)	P-E	LC/1(CR)	Ishunin, 1961, 1987; Zakhidov, 1971; Gritsina et al., 2016; Gritsina, 2019
24	Goitered Gazelle <i>Gazella subgutturosa</i> (Güldenstädt, 1780)	P-H	VU/3(VU)	Ground survey; questionnaire data; Marmazinskaya & Gritsina, 2017; Gritsina et al, 2017; Red data



				book of Uzbekistan, 2019; Bykova et al, 2020
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**Notes:** Conditional estimate of the number: E - single, H - few, M - Numerous; O - common, R - rare. IUCN Red List categories: Extinct (EX); Extinct in the Wild (EW); Critically Endangered (CR); Endangered (EN); Vulnerable (VU); Near Threat (NT); Least concern (LC); Data Deficient (DD); Categories of the Red Data Book of the Republic of Uzbekistan (2019): Extinct 0 (EX); Extinct in the Wild 0 (EW); Critically Endangered 1 (CR); Endangered 1 (EN); Vulnerable 2 (VU: D); Naturally Rare 2 (VU: R); Near Threat 3 (NT); Data Deficient (DD).

The project area of the Dzhankeldy WF is inhabited by the only species of wild ungulates - the **Goitered gazelle**. The animals inhabiting the foothills and desert plains of Kuldzhuktau ridge belong to the Central Kyzylkum population, the total number of which is about 3000-5000 individuals (Gritsina et al., 2016; Marmazinskaya, Gritsina, 2017; Bykova et al., 2020). According to Natalia Marmazinskaya (Red Data Book of Uzbekistan, 2019), 150-180 individuals inhabit Kulzhuktau area. During our survey, we recorded single individual of Goitered gazelle in the foothills of Northern Kuldzhuktau. We also obtained questionnaire data from local shepherds on the constant records of small groups of gazelles – groups of 2-5 individuals, the last of which was observed in April 15, 2021. In addition, gazelle droppings were found by Maria Gritsina (bat expert for the project) on the watershed line of Kuldzhuktau ridge in 100 m from the turbine D067. According to our expert assessment, about 50 individuals are found in the project area. Since the presence of a wolf has not been confirmed in the project area, it seems that Goitered gazelle has no natural predators. The main threats are poaching, habitat loss, habitat degradation and fragmentation due to economic development of the region, lack of forage in snowy winters, shepherd's dogs' depredation of calves, and human disturbance.

## Ground transect survey

In April, 15-18 we conducted ground transect survey to collect spring data with focus on seasonal species (ground squirrels). Additionally, we used information about animals accidentally killed on the road in project area, particularly roads in the vicinity of Dzhankeldy village. Also we used questionnaire data collected from local people. Totally 10 mammals have been registered visually and by the tracks of the vital activity (Table 2, 3), including 2 insectivores, 1 hare, four rodents, two carnivores and one ungulate

species. Two species - Brandt's hedgehog and Goitered gazelle are listed species. We also got questionnaire data on one more endangered species – Caracal as well as addition information about gazelles.

**Table 2** – Mammals recorded on monitoring locations during field survey in the project area (Kuldzhuktau ridge, Navoi province, Dzhankeldy project area) in April, 2021

# Monitoring site	Coordinates, WGS-84, grade/min/sec	Data	Biotope	Mammals recorded in monitoring site	Notes
Kj01  Northern Kuldzhuktau, 'Little Kuldzhuktau'	40°51'17.7" 63°24'02.8"	15.04.21	Foothills of Kuldzhuktau ridge, stepped hills, rocks turning into ridges, dry stream beds, separate sites of vegetation sandy deserts	<i>Phombomys opimus</i> <i>Meriones libycus</i> <i>Ellobius tancrei</i> <i>Hemiechinus auritus</i> <i>Vulpes vulpes</i>	livestock (domestic sheep) – 2 stocks (500+200 indi), sheep's traces, vegetation looks degraded, there is not watering places
				<i>Vulpes corsac</i> – a few <i>Felis silvestris ornate</i> – common <i>Vulpes vulpes</i> - common <i>Lepus tolai</i> – a few <i>Caracal caracal</i> – rare (Kalaata village vicinity) <i>Gazella subgutturosa</i> - a few, usually observer 2-5 individuals, last record was made 15.04. 2021, 2 gazelles observed in "Big Kuldzhuktau"	Questionnaire data from the local shepherd
Kj02  Northern Kuldzhuktau, 'Big Kuldzhuktau'	40°51'02.9" 63°31'33.8"	16.04.2021	Stony mountain steppe, stepped hills, rocks, dry stream beds, 540 m asl	<i>Meriones libycus</i> <i>Ellobius tancrei</i> <i>Vulpes vulpes</i>	Livestock: domestic goats (20), sheep (500), camels (scats)
Kj03	40°52'44.8'	16.04.2021	Mountain foothill clay semi desert	<i>Phombomys opimus</i>	

Northern Kuldzhuktau, 'Big Kuldzhuktau'	63°30'29.7"			<i>Meriones libycus</i> <i>Ellobius tancrei</i> <i>Gazella subgutturosa</i>	
Kj04 Western Kuldzhuktau Dzhankeldy, Kalaata vill vicinity, lead mine, 'Cat's canyon'	40°54'12.2" 63°16'11.1"	17.04.2021	Dry gorge, rocks, gullies	<i>Meriones libycus</i> <i>Ellobius tancrei</i> <i>Felis silvestris ornate</i> <i>Mus musculus</i>	
Kj05 Southern Kuldzhuktau, Botanic station vicinity	40°46'34.5" 63°31'30.7"	18.04.2021	Foothill clay plain, dry stream bed, salsola & saxaul shrubs	<i>Phombomys opimus</i> <i>Paraechinus [Hemiechinus] hypomelas</i> <i>Felis silvestris ornate</i>	Camels scats and tracks

**Table 3** – Number and species composition on walking transects, in April, 2021

##	Species	Monitoring location	route length (km) / surveyed area (ha)	Number, individuals/colonies/ burrows	Number assessment
Mammals					
1	<i>Hemiechinus auritus</i>	Kj01	3 km	1 skin	A few
2	<i>Paraechinus hypomelas</i> (white form)	Kj05	NA	2 killed on the road	A few
3	<i>Lepus totai</i>	Kj01	NA	2 ind. accidentally killed on the road; questionnaire data	Common
4	<i>Ellobius tancrei</i>	Kj01, Kj02, Kj03, Kj04	3+3+3 km	3+10 +2 + 5 inhabited colonies	Common

5	<i>Phombomys opimus</i>	Kj01, Kj03, Kj05	3+3 +3 km	2 (inhabited) + 6 (3 inhabited +3 uninhabited colonies)+ 2 (inhabited)	Common
6	<i>Meriones libycus</i>	Kj01, Kj02, Kj04	3+3 +3 km	2+5 + 4 inhabited colonies	Common
7	<i>Mus musculus</i>	Kj04	NA	3 ind. in pellets of little owl	Common
8	<i>Vulpes vulpes</i>	Kj01, Kj02	3+3 km	1 ind. visually +1 ind. by feces	Common
9	<i>Felis silvestris ornate</i>	Kj01, Kj04, Kj5	3 km	Questionnaire data, 1 ind. visually, feces	Common
10	<i>Gazella subgutturosa</i>	Kj03	3 km	1 ind. (track)	A few

## Camera trapping

Camera trapping was conducted from April, 15-17 to June, 24-25 in different biotopes of Northern, Southern and Northwest Kuldzhuktau region in Dzhankeldy project area, including mountain rocks and caves, stony dry streams, rocky canyons, clay foothill plains, saxaul shrub lands. During the installation of the camera traps we faced some challenges. Almost all project area is used by humans (grazing, mining, settlements, roads etc.). This level of development leads, firstly, to very limited number of places with good condition for wild animals, and secondly to a real threat for camera traps themselves to be stolen by local people. It took a lot of effort and ingenuity to hide the camera traps, and often it was impossible.

However, despite the difficulties, the camera traps recorded 7 species of wild mammals, including 1 bat, which was not possible to identify (Table 4, 5).

**Table 4** - List of mammals captured by camera traps in the Dzhankeldy WF project area (Kuldzhuktau ridge) from April 15 to June 25, 2021

##	Species	Number of captures					
		Kj 01	Kj 02	Kj 03	Kj 04	Kj 05	Total
1	Brandt's hedgehog <i>Paraechinus hypomelas</i>	3	-	4	-	5	12
2	Bat unidentified	1	-	-	-	-	1
3	Tolai hare <i>Lepus totai</i>	-	-	-	-	6	6
4	Libyan jird <i>Meriones libycus</i>		16	-	-	-	16
5	Zaisan Mole Vole <i>Ellobius tancrei</i>	1	-	-	-	-	1
6	Red fox <i>Vulpes vulpes</i>	3	3	1	-	2	9
7	Asiatic wildcat <i>Felis sylvestris ornate</i>	3	1	-	-	-	4

The total number of captures of wild mammals was 49. The number of captures of wild mammals per camera trap ranged from 0 (Kj 04, where only livestock was recorded) to 20 (Kj 02). The number of wild mammal species recorded by one camera trap ranged from 0 to 5 (Kj 01).

The largest number of records was made of **Libyan jird** but all the records were made only on one location. Once there were two animals in the shot. Brandt's hedgehog was captured 12 times by three cameras. The fox was recorded 9 times by four cameras.

Tolai hare was recorded 6 times by one camera trap. Wildcat was recorded 4 times by two cameras. Finally, the mole vole was captured once.

In addition, camera traps recorded a large number of livestock (sheep, goats, horses, camels), people (on foot and on motorcycles), as well as birds (e.g. Houbara bustard *Chlamydotis undulata*), reptiles (e.g. Desert monitor *Varanus griseus* and Russian tortoise *Agrionemys horsfieldii*) and invertebrates.

This confirms that camera trapping is a very good method for capturing species like Brandt's hedgehog, and such species as wildcat and species with secretive nocturnal lifestyle, like wild cats. Our research also showed that cameras are very successful in registering foxes, hares and a number of animals that use shelters in the summer time (see photos from camera traps in Appendix).



**Table 5** – Camera trap locations, nearest wind turbines and mammals recorded by camera traps in the Dzhankeldy WF project area (Kuldzhuktau ridge) from April 15 to June 25, 2021

# Monitoring loc	Coordinates, WGS-84, (N E A)	## Turbine / distance (km)	Biotop	Start /finish records	Camera traps / days	total captures/ effective captures	Mammals recorded on monitoring location	Number of records / max number of individuals
Kj 01	40°51'17.7" 63°24'02.8" 374	D079 / 0.41 D080 / 0.44 D081 / 0.94	Foothills of Kuldzhuktau ridge. stepped hills, rocks turning into ridges, dry stream beds, separate sites of vegetation sandy deserts	15.04 / 24.06	71	1500 / 281	Brandt's hedgehog Bat undefined Zaisan Mole Vole Red fox Asian wildcat	3 1 1 3 3
Kj 02	40°51'02.9" 63°31'33.8" 528	D058 / 3.17 D057 / 3.45 D089 / 3.66	Stony mountain steppe, stepped hills, rocks, dry stream beds, 540 m asl	16.04 / 25.06	40	5096 / 109	Libyan jird Red fox Asian wildcat	16 / 2 3 1
Kj 03	40°52'56.5" 63°30'30.9" 397	D056 / 2.55 D057 / 2.56 D058 / 2.83	Foothill maintain clay semi desert	16.04 / 30.06	15	2613 / 130	Brandt's hedgehog Red fox	4 1
Kj 04	40°54'12.2" 63°16'11.1" 285	D099 / 0.68 D100 / 0.94 D098 / 0.97	Dry gorge, rocks, gullies	17.04 / 24.06	69	696 / 53	Only domestic animals	-
Kj 05	40°46'34.1" 63°31'30.7" 312	D090 / 8.83 D089 / 8.90 D088 / 9.24	Foothill clay plain, dry stream bed, salsola & saxaul shrubs	17.04 / 25.06	70	768 / 577	Brandt's hedgehog Tolai hare Red fox	5 6 2

## Ground transect survey along planned Dzhankeldy WF-Bash WF OHTL

On April, 14 and June 20-22 we conducted ground transect survey to collect data about mammal species along planned Dzhankeldy WF-Bash WF OHTL in Navoi region.

We used a method of ground transect survey with walking transects each 10 km. We stopped each 10 km and walked approximately 1 km from the planned OHTL line, to gather information about mammals (and other animals) including:

- visual observation of mammals both by eye and using 10x binocular;
- registration of tracks of the vital activity of wild mammals, including animal tracks (paw foot prints on the ground), feces, digging, burrows, dead animals, etc.;
- taking photo of the animals, their tracks and traces of their vital activity, typical habitats.

We also collected data during driving between transects where it was possible along planned Dzhankeldy WF-Bash WF OHTL. Totally we conducted 10 walked transects at Dzhankeldy WF-Bash WF with total length 10 km (table 6). The length of the vehicle transects between walking ones at Dzhankeldy WF-Bash WF was 50 km. In addition, we used data kindly provided by our colleagues, particularly by Timur Abduraupov who get information about nocturnal mammals during his nocturnal reptilian survey with headlight.



**Figure 7 Typical view of the wormwood-ferula steppe in spring (Dzhankeldy WF-Bash WF OHTL)**

Table 6. Data on mammals (and other vertebrates) inhabited along planned OHTLs collected along planned Dzhankeldy WF-Bash WF OHTL in April, June 2021

# transect	Biotop	Mammals	Other wild and domestic animals
Transect 1	Wormwood <i>Artemisia terrae-albae</i> and <i>Ferula assa-foetida</i> steppe with single saxaul <i>Haloxylon</i> spp.	Great gerbil (1 inhabited colony) Libyan jird (1 inhabited colony) Yellow ground squirrel (1 indi) Zaisan Mole Vole (1 inhabited colony)	Steppe Agama <i>Trapelus sanguinolentus</i> (1 indi) Domestic sheep tracks and droppings
Transect 2	<i>Tamarix</i> spp. shrub land in a dry clay bed	Great gerbil (1 inhabited colony) Libyan jird (1 inhabited colony)	Steppe Agama <i>Trapelus sanguinolentus</i> (1 indi)
Transect 3	Wormwood <i>Artemisia terrae-albae</i> and saxaul <i>Haloxylon</i> spp. plain with <i>Calligonum</i> spp.	Great gerbil (1 inhabited colony) Libyan jird (1 inhabited colony) Yellow ground squirrel (3 indi) Zaisan Mole Vole (1 inhabited colony)	
Transect 4	Sandy desert with wormwood <i>Artemisia terrae-albae</i> with <i>Salsola</i> spp., <i>Ferula assa-foetida</i> and <i>Tulipa lehmanniana</i>	Libyan jird (1 inhabited colony) Zaisan Mole Vole (1 inhabited colony)	Central Asian tortoise <i>Testudo horsfieldii</i> (3 indi) Sunwatcher <i>Phrynocephalus helioscopus</i> (1 indi) Domestic sheep tracks and droppings
Transect 5	Sandy desert with wormwood <i>Artemisia terrae-albae</i> with <i>Salsola</i> spp., <i>Ferula assa-foetida</i>	Midday jird (1 inhabited colony) Small five-toed jerboa (1 indi, tracks and diggings) Tolai hare (1 indi, scats)	
Road 1 10 km		Great gerbil (1 inhabited colony) Zaisan Mole Vole (1 inhabited colony)	Central Asian tortoise <i>Testudo horsfieldii</i> (6 indi) Desert monitor <i>Varanus griseus caspius</i> (1 indi)

Transect 6	Sandy desert with wormwood <i>Artemisia terrae-albae</i> with <i>Salsola</i> spp., <i>Ferula assa-foetida</i>	Red fox (2 indi, tracks and scats) Mustella spp. (tracks and scats)	Central Asian tortoise <i>Testudo horsfieldii</i> (7 indi)
Road 2 10 km		Long-clawed ground squirrel (1 indi) Zaisan Mole Vole (3 inhabited colony)	Central Asian tortoise <i>Testudo horsfieldii</i> (45 indi) Camels
Transect 7	Sandy desert with wormwood <i>Artemisia terrae-albae</i> with <i>Ferula assa-foetida</i>	Long-clawed ground squirrel (1 indi, diggings) Small five-toed jerboa (1 indi, tracks) Zaisan Mole Vole (1 inhabited colony) Midday jird (1 inhabited colony) Red fox (1 indi, tracks)	Central Asian tortoise <i>Testudo horsfieldii</i> (1 indi)
Road 3 10 km		Zaisan Mole Vole (1 inhabited colony)	Central Asian tortoise <i>Testudo horsfieldii</i> (17 indi)
Transect 8	Sandy desert with wormwood <i>Artemisia terrae-albae</i> and <i>Tulipa lehmanniana</i>	Zaisan Mole Vole (8 inhabited colony) Small five-toed jerboa (1 indi, tracks)	Central Asian tortoise <i>Testudo horsfieldii</i> (1 indi) Steppe Agama <i>Trapelus sanguinolentus</i> (1 indi)
Road 4 10 km		Tolai hare (1 indi, killed on the road)	Central Asian tortoise <i>Testudo horsfieldii</i> (8 indi)
Transect 9	Sandy desert with wormwood <i>Artemisia terrae-albae</i> , saxaul <i>Haloxylon</i> spp and <i>Peganum harmala</i>	Long-clawed ground squirrel (1 indi, tracks, diggings) Midday jird (1 inhabited colony) Red fox (1 indi, tracks)	Central Asian tortoise <i>Testudo horsfieldii</i> (tracks), Central Asian Racrunner <i>Eremias velox</i> (1 indi) Sand grouse <i>Pterocles</i> spp. (tracks)
Road 5 10 km		Long-clawed ground squirrel (1 indi)	Central Asian tortoise <i>Testudo horsfieldii</i> (30 indi)

Transect 10	Clay desert on the foothill plain of Kuldzhuktau	Tolai hare (1 indi, killed on the road) Yellow ground squirrel (1 indi) Libyan jird (1 inhabited colony)	Central Asian tortoise <i>Testudo horsfieldii</i> (4 indi)





**Figure 8 Zaisan Mole Vole's colony (left); Red fox scats (right), Dzhankeldy WF-Bash WF OHTL.  
Photo by Elena Bykova**



**Figure 9 Tolai hare scats (left) and hare killed on the road (right), Dzhankeldy WF-Bash WF OHTL.  
Photo by Elena Bykova**





**Figure 10 Desert monitor near great gerbil burrow. Photo by Alexander Esipov**

## CONCLUSION

As a result of the survey (Table 7), 10 mammalian species were recorded in the Dzhankeldy project area, including 5 species listed in the Red Data Book of Uzbekistan and IUCN Red List: Brandt's hedgehog (NT, UzRB/LC, IUCN), Marbled polecat (VU, UzRB/VU, IUCN), Caracal (CR, UzRB/LC, IUCN), Sand cat (NT, UzRB/LC, IUCN) and Goitered gazelle (VU, UzRB/VU, IUCN). In addition, according to literature data two endangered species - Corsac (VU, UzRB/LC, IUCN) and Steppe Polecat (LC, IUCN) can be found in this area, but this information requires confirmation.

Table 7. Summary list on the mammals recorded in area of the Dzhankeldy WF project (ground survey April/June, 2021; camera trapping, April- June, 2021)

	NAME OF SPECIES		IUCN /RDB STATUS	TOTAL NO. OBSERVED
	LATIN	ENGLISH		
1	<i>Hemiechinus auritus</i>	Long-eared hedgehog	LC/-	1 individuals
2	<i>Paraechinus hypomelas</i>	Brandt's hedgehog	LC/3NT	4 individuals/12 camera trap captures
3	<i>Lepus totai</i>	Tolai hare	-	2 individuals/6 camera trap captures
4	<i>Ellobius tancrei</i>	Zaisan Mole Vole	LC/-	20 inhabited colonies/1 camera trap capture
5	<i>Phomobomys opimus</i>	Great gerbil	LC/-	7 inhabited colonies
6	<i>Meriones libycus</i>	Libyan jird	LC/-	11 inhabited colonies/16 camera trap captures
7	<i>Mus musculus</i>	House mouse		3 individuals
8	<i>Vulpes vulpes</i>	Red fox	LC/-	2 individuals/9 camera trap captures
9	<i>Felis silvestris ornate</i>	Asiatic wildcat	-	1 individuals/4 camera trap captures
10	<i>Gazella subgutturosa</i>	Goitered Gazelle	VU/3(VU)	2 individuals

Critical habitats for Goitered gazelles are foothills of Northern Kulzhuktau. Main threats for Goitered Gazelle are: habitat loss, degradation and fragmentation, water deficiency, competition with domestic livestock for pastures, poaching by local people and human disturbance.

Critical habitats for felids (Caracal and Sand cat) are the areas of Western slopes of Kuldzhuktau ridge located in the vicinity of Dzhankeldy and Kalaata villages. Main threats for these species are severe winters, decreasing number of prey, habitat loss,

degradation and fragmentation due to human development, human disturbance, severe winters, high snow level, persecution by humans and dogs.

Critical habitats for Brandt's Hedgehog are located in mountains and foothills of Northern and Southern Kuldzhuktau. Main threats for this species are habitat fragmentation and road accidents.

Table 8. Summary list on the mammals recorded in area of the Dzhanakeldy WF-Bash WF OHTL (ground transect survey, each 10 km 1 km transect, April/June 2021\*

	NAME OF SPECIES		IUCN /RDB STATUS	TOTAL NO. OBSERVED
	LATIN	ENGLISH		
1	<i>Paraechinus hypomelas</i>	Brandt's hedgehog	LC/3NT	2 individuals**
2	<i>Lepus totai</i>	Tolai hare	-/game sp	3 individuals
3	<i>Spermophilus fulvus</i>	Yellow ground squirrel	LC/-	5 individuals
4	<i>Spermophilopsis leptodactylus</i>	Long-clawed ground squirrel	LC/-	4 individuals
5	<i>Ellobius tancrei</i>	Zaisan Mole Vole	LC/-	17 inhabited colonies
6	<i>Phomomys opimus</i>	Great gerbil	LC/-	4 inhabited colonies
7	<i>Meriones libycus</i>	<i>Libyan jird</i>	LC/-	5 inhabited colonies
8	<i>Meriones meridianus</i>	<i>Midday jird</i>	LC/-	3 inhabited colonies
9	<i>Allactaga elater</i>	Small five-toed jerboa	-	3 individuals + 2 individuals**
10	<i>Allactaga severtzovi</i>	Severtzov's jerboa	LC/-	2 individuals**
11	<i>Mustela sp.</i>	-	-	1 individual (species unidentified)
12	<i>Vulpes vulpes</i>	Red fox	LC/-	4 individuals
13	<i>Gazella subgutturosa</i>	Goitered Gazelle	VU/3(VU)	4 individuals**

Notes:

\*10 transects and road between transects

\*\* data received outside of transects during walking transect survey with headlight, data provided by Timur Abduraupov

Our observations (Table 8) has shown that the project area (OHTL Dzhankeldy WF-Bash WF) is inhabited by at least 13 mammals including 2 Insectivores, 1 hare, 8 rodents, 2 carnivores and 1 ungulate. This list includes two endangered species – Brant's hedgehog and Goitered gazelle. But also could include one more threatened species – Marbled Polecat *Vormela peregusna* that we recorded in this area in the past. Currently we found scats of unidentified *Mustelidae* species that could be an evidence of the presence of rare Mustelid. All this records were made in area of Karakata depression and surrounded area, which can be identified as a critical habitat for mammals. In addition, we recorded two more endangered reptiles – Desert monitor and Russian tortoise that supported our conclusion.

In fact, we developed basis for continuous monitoring in the area of Dzhankeldy project (zero monitoring). We recommend continuing monitoring of mammals both during the construction period and after commissioning of the Dzhankeldy wind farm. Since the territory of the planned project is inhabited by threatened species, including globally threatened species – Goitered gazelle, it is necessary to develop measures to maintain populations of this species at a stable level or better through creating micro-reserves, public awareness and strengthening the capacity building of the regional biodiversity rangers to combat poaching.

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## Appendix: Records from camera traps



Tolai hare (Kj 05 site) in shade of a small cave in Southern Kuldzhuktau

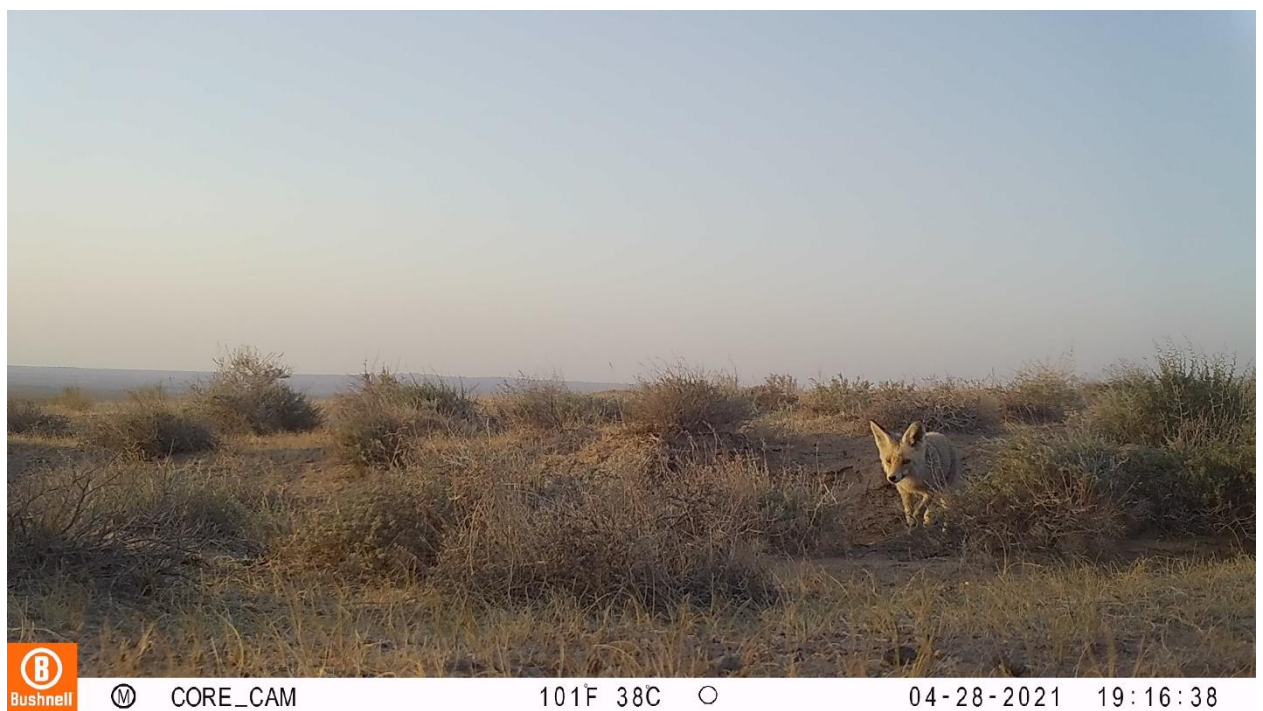


Asian wildcat marks the individual territory, foothills on Northern Kuldzhuktau (Kj2 site)





Asiatic wildcat captured by camera traps in Northern Kuldzhuktau (Kj1 site)



Red fox hunt at the colony of great gerbil, foothills on Northern Kuldzhuktau (Kj2 site)



Brandt hedgehog in Northern Kuldzhuktau (Kj3 site)



Zaisan Mole Vole in Northern Kuldzhuktau (Kj1 site)



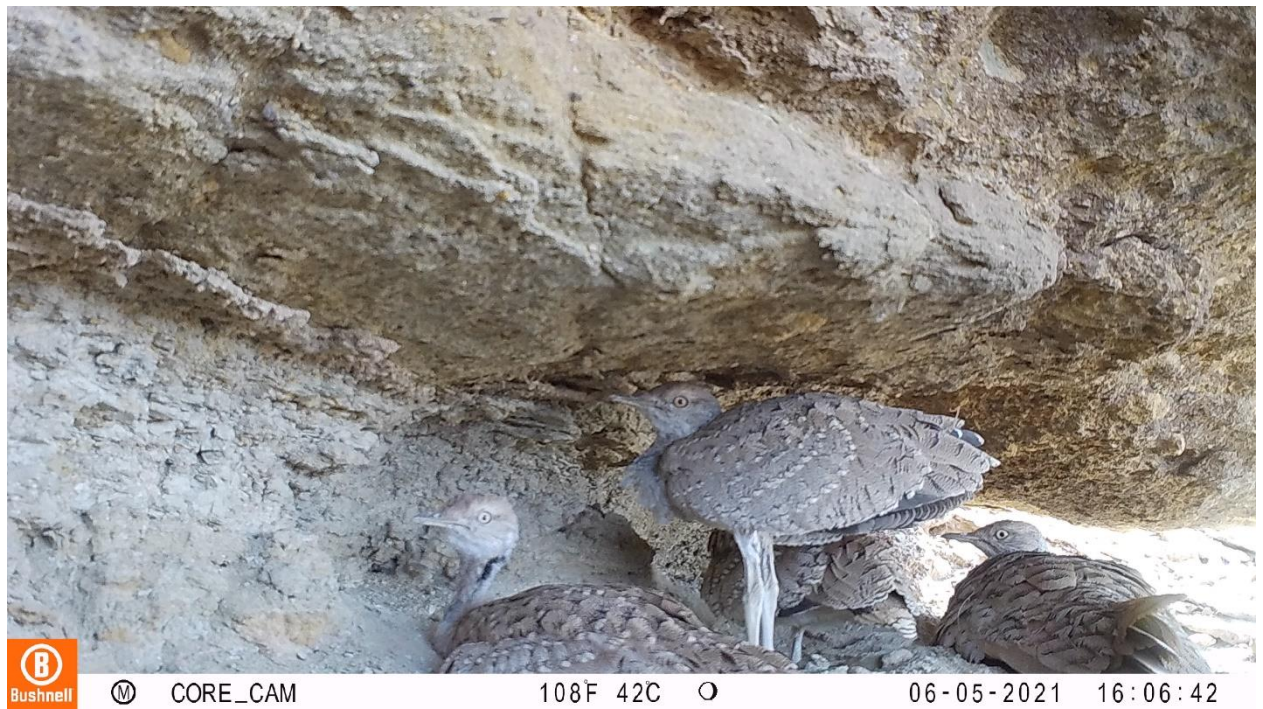


Russian tortoise in Northern Kuldzhuktau (Kj3 site)



Desert monitor in Southern Kuldzhuktau (Kj 05 site)





Houbara bustard chicks in shade of small cave in Southern Kuldzhuktau (Kj 05 site)



Chukars (*Alectoris chukar*) in Northern Kuldzhuktau (Kj1 site)





Domestic goat captured by camera trap in NW Kuldzhuktau (Kj4 site)



Domestic sheep captured by camera trap in Northern Kuldzhuktau (Kj3 site)

## HERPETHOLOGICAL SURVEY REPORT

<b>Report Title</b>	<u>HERPETHOLOGICAL SURVEY</u>
<b>Scope</b>	HERPETOFAUNA
<b>Areas Covered</b>	DZHANKELDY WF / DZHANKELDY TO BASH OHTL / BASH WF / BASH TO KARAKOL OHTL
<b>Seasons Covered</b>	SPRING 2021 / SUMMER 2021
<b>Notes</b>	



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# HERPETHOLOGICAL SURVEY

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**BASH WIND FARM PROJECT**  
**DZHANKELDY WIND FARM PROJECT**  
**CLIENT: 5CAPITALS**  
Date: July 2021

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## INTRODUCTION

Uzbekistan is located in the central part of Central Asia and has common borders with five countries - Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Afghanistan in the south. This geographical location at the junction of a number of biogeographic regions determines the antiquity, diversity, origin and complex genetic relationships of flora and fauna. The gene pool of wild animals inhabiting the territory of the Republic of Uzbekistan is unique. Our country is an important habitat for endemic species and subspecies of animals of Central Asian origin. Most of it is represented by native fauna (Yunusov et al., 2015).

Nowadays, it becomes increasingly clearer that sustainable nature management is the only right way for the further development of humanity.

One of such sustainable approaches is the introduction and use of alternative energy sources.

It should be noted that Resolution No. UP-5544 "On Approval of the Strategy of Innovative Development of the Republic of Uzbekistan for 2019-2021" (President of the Republic of Uzbekistan, 21 September 2018) prescribes an increase in the portion of electric energy production using renewable energy sources to the level of at least 20% by 2025.

In addition, Resolution No. PP-4422 "On accelerated measures to improve the energy efficiency of economic and social sectors, introduce energy-saving technologies and develop renewable energy sources" (President of the Republic of Uzbekistan, 22 August 2019) approves long-term target parameters for the development of renewable energy sources and organisational and practical measures for further development of renewable energy sources.

This resolution prescribes an increase in the portion of electricity production using renewable energy sources to at least 25% by 2030.

To achieve these targets, the government has developed a plan to build almost 10 GW of new renewable energy facilities, including 5 GW of solar (excluding the capacity of individual households), 3 GW of wind and 1.9 GW of hydroelectric power plants.

At the same time, the construction of new renewable energy facilities with a total capacity of more than 10 GW and the modernization of existing hydroelectric power plants will ensure the production of more than 37 billion kWh of electricity by renewable energy facilities (in 2018 – 5.9 billion kWh), as well as expected annual savings of more than 8.1 billion m<sup>3</sup> of natural gas.

This report presents a faunal overview of the territories designed for the construction of wind power plants in the Bukhara region: Dzankeldy (in the western foothills of the Kuldzhuktau residual mountains) and Bash (near the northern chinks of the Ayak-Agitma depression). The report also contains the results of a survey of the projected power transmission lines that will connect Dzankeldy and Bash wind farms and OHTL that will connect Bash wind farm with Karakul substation.

## HISTORY OF THE STUDY OF THE REGION

The history of the study of reptiles inhabiting the territory of Uzbekistan, as was the case with other vertebrates in Central Asia, began with the trip of E. A. Eversmann and K. Pander from Orenburg to Bukhara (October 1820 – April 1821). The few and occasional collections of E. A. Eversmann, transferred to the University of Berlin, were processed by Prof. G. Lichtenstein and published in 1823 as an appendix to the work of E. A. Eversmann (Bogdanov, 1960).

A. P. Khoroshkhin left Jizzakh in April 1872 and drove along the foot of the Nuratau Range and past the Aristan-Beltau mountains, and arrived in Tamdy, from where he travelled to the Aktau and Bukantau mountains. However, A. P. Khoroshkhin was not a specialist and did not collect reptiles, and in the book published in 1876 he mentioned only a tortoise, monitor lizard and sand racer.

G. Ye. Grum-Grzhimailo travelled across Uzbekistan with his expedition in 1885 (see Fauna of the Uzbek SSR, vol. II). His collections were processed by A. M. Nikolsky (1915).

The book by A. M. Nikolsky 'Reptiles and amphibians of the Turkestan general-governorship' is a complete literary summary of that time, was published in 1899. The author processed the materials of A. P. Fedchenko and others who collected them in Central Asia. The paper provides information on the distribution of 7 species of amphibians, 3 species of tortoises, 42 species of lizards and 28 species of snakes. Of these, 2 species of amphibians, 1 tortoise species and more than half of the species of lizards and snakes were caught in the territory of Uzbekistan (Sultanov, Persianova, 1982).

In 1933, 1934 and 1935 A. M. Andrushko collected in the central part of Kyzylkum more than 700 individuals of reptiles. Her article published in 1953 lists 23 species and specifies their distribution across biotopes. 7 species of reptiles (Transcaspian bent-toed gecko, Turkestan thin-toed gecko, Reticulated toad-headed agama, Striped racerunner, Tatory sand boa, Spotted whip snake, Diadem snake) were for the first time discovered in this part of the desert.

O. P. Bogdanov in his work "Fauna of the Uzbek SSR. Amphibians and reptiles" (1960) provides data that he collected in Central Kyzylkum in 1949, 1950, 1954 and 1955.

N. N. Shcherbak (1974) studied racerunners (genus *Eremias*) throughout their habitat, including the central part of Kyzylkum, in particular, in the area near the towns of Zaravshan and Uchkuduk.

The publication of D. A. Bondarenko and E. A. Peregontseva (2017) describes the spatial distribution of the Russian tortoise *Testudo horsfieldii* in Uzbekistan, mostly in the central part of the Kyzylkum desert.

Also, this report presents the author's personal data collected during field studies of the area in 2012, 2014, 2015, 2018 and 2019.

The list of reptiles is given according to the latest updated reptile database

([http://www.reptile-database.org/data/Reptile\\_checklist\\_2019\\_07.xlsx](http://www.reptile-database.org/data/Reptile_checklist_2019_07.xlsx).)

## PHYSIOGRAPHICAL DESCRIPTION OF THE RESEARCH AREA

The Kyzylkum physiographical region (Fig. 1) is located almost in the very center of the flat part of Central Asia, which is associated with truly desert landscape. It includes the western part (belonging to Uzbekistan) of the Kyzylkum Desert (its northern and eastern parts are on the territory of Kazakhstan). In the north lies the border of the region with Kazakhstan, in the south-west – with Turkmenistan, in the east is the Mirzachul area, in the south-east – the Zarafshan area and in the west – the lower Amudarya area (Gulomov et al., 2013).

The surface of the area slopes slightly down from south-east to north-west. The average altitude above sea level is 200-300 m, in the south-east the heights reach 350-400 m, in the north-west – only 100 m. The lowest point is the Mingbulak depression 12 m below sea level. The highest point is Aktau peak (922 m) in the Tamdytau Mountains (Gulomov et al., 2013).

The Kyzylkum Desert in the north-west is bordered by the Aral Sea, in the north-east by the Syr Darya, in the east by the spurs of the Tien Shan and Pamir Alai, in the south-west by the Amu Darya. The area of the desert is about 300 thousand square kilometers (Yugai, 1964).



**Figure 1** Satellite image with the territory of the Kyzylkum desert highlighted (Wikipedia, source file: Whole world – land and oceans.jpg)

The Kyzylkum Desert is a plain generally sloping to the north-west (altitudes above sea level range from 300 meters in the south-east to 53 meters in the northwest); it has a



number of closed depressions and highly dissected isolated residual (island) mountains – Bukantau (764 m), Kuldzhuktau (up to 785 m), Tamdytau (922 m) and others, composed of strongly dislocated and metamorphosed Paleozoic shales, hornstones, limestones, granites. (Yugai, 1964). The mountains are barren and mostly have levelled peaks and rocky, heavily cut slopes. Between these mountains are the Mingbulak, Karakata, Mullali and Ayakagitma depressions. The lower parts of these depressions are occupied by *solonchaks*, *takyrs* and sands (Gulomov et al., 2013).

Most of the desert is occupied by extensive sandy areas composed of semi-fixed sands. The most widespread are meridionally-oriented sandy ridges. The relative height of the ridges is from 3 to 30 m, with a maximum of up to 75 m. The flat portions are composed of Cenozoic clays and sandstones, in the north and north-west – loamy and mixed sandy and loamy river sediments. A characteristic feature of the Kyzylkum desert is the existence in its central and south-western parts of isolated low mountains – residual (island) mountains. These are Bukantau, Dzhetytau, Tamdytau, Kuldzhuktau, as well as Sultanuzdag in the west. All of them are remnants of Paleozoic (Hercynian) folded chains located on the continuation of the structures of the northern chains of the Pamir-Alai (Turkestan and Nuratau Ranges) and formed by the latest tectonic processes. The elevations are composed of highly dislocated and metamorphosed Paleozoic slates, limestones and granites. The tops and crests of many of the residual (island) mountains have levelled surfaces used for unirrigated farming. The slopes of the residual (island) mountains are strongly dissected; at the feet there are aprons composed of pebbly and sandy accumulations, which often contain fresh groundwater and in some places feed the springs that supply mining villages with water. The area of the residual (island) mountains also features flat hilly elevations and plateaus of the cuesta type, composed of slightly disturbed Cretaceous and Paleogene sedimentary rocks (marls, sands, clays). Another characteristic feature is the existence of extensive closed basins (the Karakat and Ayakagytm basins) in the central and south-western parts of the desert (Gulomov et al., 2013).

Loose sand dunes are found near human settlements and around wells. In most cases, the exposure of the sands is the result of excessive grazing and trampling of vegetation by livestock near watering holes, as well as the use of shrubs and saxaul for fuel (Gulomov et al., 2013).

Sheep and goats, as well as camels and horses and, to a lesser extent, cattle graze in the Kyzylkum desert. The organization of pasture use and the creation of new wells made it possible to significantly increase the livestock population (Gulomov et al., 2013).

Large artesian basins were discovered in the central and south-western parts of the desert. Agriculture is beginning to develop near artesian wells in depressions, where melons and pumpkins are cultivated and experimental stations are established to provide livestock with additional feed (Gulomov et al., 2013).

## CLIMATE, WATER, SOIL AND VEGETATION

The climate of the Kyzylkum physiographical region is arid and sharply continental. It is characterized by high summer temperatures, a very low level of annual precipitation and a strong fluctuation of daily and annual temperatures (Gulomov et al., 2013).

Winter in Kyzylkum is cold. The reason for this is the frequent invasions of dry and cold Arctic air masses and the Siberian anticyclone from the north. On such days, the air temperature drops sharply to  $-31-35^{\circ}\text{C}$ . Western air masses bring precipitation and a slight increase in temperature. The average temperature in January in the north of Kyzylkum is  $-5-10^{\circ}\text{C}$ , in the middle part  $-2-4^{\circ}\text{C}$ , in the south  $-1-2^{\circ}\text{C}$  (Gulomov et al., 2013).

With the coming of spring, the temperature gradually rises and rainfalls become quite frequent. Nature awakens and the earth becomes covered with ephemeral plants. The precipitation season is already over in April. In the long summer period (lasts more than 150 days), the air temperature is the same almost throughout. This is due to the large amount of solar radiation (total annual radiation is 120 kcal per  $1\text{ cm}^3$ ) and the penetration of hot tropical air masses from the south. The average temperature in the southern and central parts is  $+30^{\circ}$ , in the north  $+26 + 28^{\circ}\text{C}$ ; on some days the temperature reaches  $+48^{\circ}\text{C}$ . At this time, the sands warm up to  $+75 + 80^{\circ}\text{C}$ .

Autumn in Kyzylkum is usually dry. There is little precipitation (up to 75–100 mm annually), and it is unevenly distributed over the seasons. The largest portion of the annual amount of precipitation falls in spring (up to 48%) and winter (up to 30%), but the evaporation rate reaches 1,000–1,500 mm (Gulomov et al., 2013).

The region has a significant stock of groundwater. The dynamic amount of groundwater is 58–60  $\text{m}^3/\text{sec}$ . The groundwater is salty. Fresh artesian waters are available in the strata of the Mesozoic and Paleogene sediments. Also, mineral thermal waters were found in the Paleozoic deposits (Gulomov et al., 2013).

In Kyzylkum, sandy and mixed sandy and loamy soils are widespread in the plains, foothills and on the slopes of the elevations – grey-brown soils, and in the basins – solonchak and marshy solonchak soils (Gulomov et al., 2013).

More than 600 plant species grow in the Kyzylkum area. They are dominated by ephemerals and ephemeroids with a short spring growing season: bulbous bluegrass, sedge, *Bromus danthoniae*, tulips, snowdrops, *Ixiolirion*, *Cousinia microcarpa*. When the hot season sets in, they wither. Plants adapted to droughts and solonchaks continue to grow in summer (Gulomov et al., 2013).

Calligonum, white saxaul, *Stipagrostis*, sand acacia inhabit fixed sands. Sagebrush and weed widely occur on grey-brown soils (Gulomov et al., 2013).

Black saxaul, tamarisk, *Climacoptera crassa*, *Halocnemum* grow on solonchak and solonchak-marshy soils, *Gamanthos* – on takyr (Gulomov et al., 2013).



## METHODS OF CONDUCTING HERPETOLOGICAL FIELD SURVEY

During the field survey an attempt was made to assess the status of reptiles and amphibians in the study area (specification of the species and quantitative composition, territorial distribution, including places of concentration, the state of habitats). However, it should be noted that cold weather did not allow for a full survey in this area, while single records of reptiles do not give a complete understanding of the composition of the biodiversity in the area. Therefore, the combination of field survey and desktop analysis was used.

Field studies were carried out according to generally accepted zoological methods for identifying species composition. The following methodological guidelines were used in the survey: L. G. Dinesman, M. L. Kaletskaya (1978), V. M. Makeev, A. T. Bozhansky (1988) and N. N. Shcherbak (1989), D. A. Bondarenko, Chelintsev, (1996). Literature sources and statistical data had been processed.

The main research method used was mixed stationary and transect survey. Points and transects for conducting research were outlined at the project monitoring stations in accordance with different types of habitats.

The field research methodology reflects the following aspects:

- species composition in the study area;
- distribution across habitats;
- daily and seasonal changes in activity;

Thus, the method of quantitative assessment was based on the ecology of the species under consideration, landscape and geographical conditions, season and type of work.

The quantitative assessment of reptiles and amphibians was mainly based on the transect survey. The transect method consists in counting individuals along a fixed long line (transect), on both sides of it, with the duration of the survey determined by the known distance, which is selected depending on the type of reptile and the area, but does not exceed 1 km in one way. In this case, all individuals encountered on the transect are registered, regardless of the distance they are identified at. The perpendicular distance is measured between the transect axis and each individual. The results obtained are used to calculate the density of recorded reptiles. The one-kilometer transect was chosen because heaviest errors arise when long transects are used for species that, like the Russian Tortoise, have high density, daily and seasonal activity cycles fluctuations with high peak values, and are caused by incorrect selection of a minimum survey area for a particular species (Vashetko et al, 2001).

The Russian tortoise population density ( $D$ ) was calculated using the following formula (Bondarenko, Chelintsev, 1996):

$$D = \frac{n}{2LB}$$

where  $n$  – number of animal individuals recorded on the transect;  $L$  – length of the transect;  $B$  – formula to calculate an effective width of the survey strip:

$$B = W(0,79F + 0,21F^4)$$

where  $W$  – width of the limited strip on both sides of the transect axis;  $F$ :

$$F = \frac{2y}{W}$$

The use of perpendicular distances to carry out survey on a strip of limited width excludes underestimation of the population density of the Russian tortoise caused by a decrease in their detectability in remote parts of the survey strip, regardless of the degree of its limitation (Bondarenko and Chelintsev, 1996).

**The survey method for the Southern Even-fingered Gecko (*Alsophylax laevis*)** is different from the method of accounting for other reptile species. This is mainly due to the small size, secretiveness and other aspects of the biology of this species such as nocturnalism.

Southern Even-fingered Gecko (*Alsophylax laevis*) is distinguished by the acoustic interaction between individuals, but louder signals are noted in males. Acoustic signals of females are practically not audible in the field. The signals of males, under ideal weather conditions, can be heard within a radius of 100 meters or more.

Before starting accounting of Southern Even-fingered Gecko, it is necessary to identify the optimal biotope for this species. Since the Southern Even-fingered Gecko is a stenobiont species, the survey should be carried out only on a suitable biotope.

The method of accounting for the Southern Even-fingered Gecko (*Alsophylax laevis*) is carried out after sunset; the surveyor takes a position on the optimal biotope, preferably on a hill so that the acoustic signals reach the surveyor better. After taking the position, the surveyor must observe absolute silence and not turn on the lighting devices. The acoustic signals produced by the Southern Even-fingered Gecko in the accounting radius, which on average covers 1 ha, are recorded in a notebook with information about the direction of the acoustic signals and the distance to the gecko.

Since only males can be heard, the resulting density should be multiplied by a factor of 0.3 when extrapolating. This coefficient is derived from the males: females ratio in a gecko population (2 males per one female in average).

The abundance of the reptiles in habitats was estimated using the following population density scale for 1 ha (Kuzynkin, 1962): 0.1 – 0.9 – rare, 1.0 – 9.9 – common, 10.0 and higher – abundant.

## RESULTS

This section provides historical data and data collected during the field trips carried out in Spring and Summer of 2021. Also, in this section, the primary abundance of reptiles found at the accounting points (transects) and the average density derived by analyzing the primary data at each of the accounting points are shown. These data will help to create a map of the abundance and distribution of reptiles in the project area in the future, as well as help to create an action plan to reduce the burden on the populations.

The basis for compiling the list of herpetofauna of the studied territory was the modern list of amphibian fauna of Uzbekistan, consisting of 3 species from two families and the list of reptile species of Uzbekistan, consisting of 62 species from 13 families.

### Herpetological survey in the Dzhankeldy WF project area (Kuldzhuktau residual mountains)

Herpetological survey in this area is of particular interest because there are various biocenoses and, consequently, the species diversity of reptiles is very rich. The most concerning species is critically endangered Southern Even-fingered Gecko (*Alsophylax laevis*), which was first found in this area last century. However, it should be noted that Southern Even-fingered Gecko inhabiting this territory is more likely to be a separate new species (Figure 2). And most likely it is an even rarer and endemic species that inhabits only this territory. Currently, the active study of this species is being conducted. Due to the fact that this species is the only representative of vertebrates on the project territory that is included in the Red List of the International Union for Conservation of Nature (IUCN Red List) with the status CR - critically endangered, survey on this particular species was given priority.



Figure 2 Southern Even-fingered Gecko at Dj 8 point in April 2021 (adult male)



The first field visit was made in April 2021. April is the period of the highest activity of the Russian tortoise (*Testudo horsfieldii*), which is also listed in the Red List of the International Union for Conservation of Nature (IUCN Red List) as VU - vulnerable. However, April appeared to be not optimal for the gecko survey this year, since night temperatures were still quite low, and the weather in the desert is not stable at this time of the year. During this period, the very first individuals appear on the surface, while most are waiting for warmer weather. In connection with the above, the accounting of this species in April is not indicative. More information that is accurate was collected during the summer survey, when an absolute number of individuals were active. As for the Caspian monitor (*Varanus griseus caspius*), the situation is almost the same as with the gecko, in April only some individuals were active. The Desert sand boa (*Eryx miliaris*) is active in both spring and summer, but this species can be observed in the daytime only in spring (Figure 3).



**Figure 3 Young Desert sand boa (*Eryx miliaris*) at Dj 20 point in April 2021**

The second field visit was carried out in June 2021. In the summer months, it is almost impossible to find Russian tortoise on the territory, since this species has a period of aestivation (summer hibernation). Occasionally in summer, individual tortoises can be seen on the surface in those places where the green juicy grass is preserved. No such places were found on the project territory, as well as the tortoises themselves in the summer period. For other listed species, such as the Southern Even-fingered Gecko and Caspian monitor, summer is the period of the highest activity.

All 4 species are listed also in the Red Book of the Republic of Uzbekistan and were found in the project area around the Kuldzhuktau residual mountains.

**Table 1 List of reptile species inhabiting the Dzankeldy WF project area**

№	Species	Species presence acc. to literary sources	Author's earlier personal data	April 2021 field expedition data	June 2021 field expedition data	Endemism	Conservation status		
							UzRDB	IUCN	CITES
Family <i>Bufonidae</i> (toads)									
1	Turan Toad <i>Bufo</i> <i>turanensis</i>	+	+	+		UZ, TJ, TM			
2	Marsh frog <i>Pelophylax</i> <i>ridibundus</i>	+	+	+				LC	
Family <i>Testudinidae</i> (tortoises)									
1	Russian tortoise <i>Testudo</i> <i>horsfieldii</i>	+	+	+			2 (VU)	VU	II
Family <i>Gekkonidae</i> (geckoes)									
2	Southern Even-fingered Gecko <i>Alsophylax</i> <i>laevis</i>	+		+	+	UZ, TM	VU:D	CR	
3	Caspian Bent-Toed Gecko <i>Tenuidactylus</i> <i>caspius</i>	+	+	+	+			LC	
4	Turkestan thin-toed gecko <i>Tenuidactylus</i> <i>fedtschenkoi</i>	+	+	+	+	UZ, TJ, TM, KZ			
Family <i>Agamidae</i> (agamas)									
5	Steppe agama <i>Trapelus</i> <i>sanguinolentus</i>	+	+	+	+				
6	Sunwatcher toad-headed agama <i>Phrynocephalus</i> <i>helioscopus</i>	+	+	+	+				
7	Reticulated toad-headed agama <i>Phrynocephalus</i> <i>reticulatus</i>	+	+	+	+	UZ, TM		LC	
Family <i>Lacertidae</i> (true lizards)									
8	Rapid Lizard <i>Eremias</i> <i>velox</i>	+	+	+	+				
9	Aralo-Caspian racerunner <i>Eremias</i> <i>intermedia</i>	+		+					
Family <i>Varanidae</i> (monitor lizards)									

10	Caspian Monitor <i>Varanus griseus caspius</i>	+	+				2 (VU:D)		I
<b>Family Boidae (Boas)</b>									
11	Desert sand boa <i>Eryx miliaris</i>	+		+			3 (NT)		II
<b>Family Colubridae (colubrid snakes)</b>									
12	Sand racer <i>Psammophis lineolatus</i>	+	+	+					
13	Spotted whip snake <i>Hemorrhois ravergieri</i>	+		+	+				
14	Spotted desert racer <i>Platycephalus karelinii</i>	+	+						
15	Dice Snake <i>Natrix tessellata</i>	+	+						

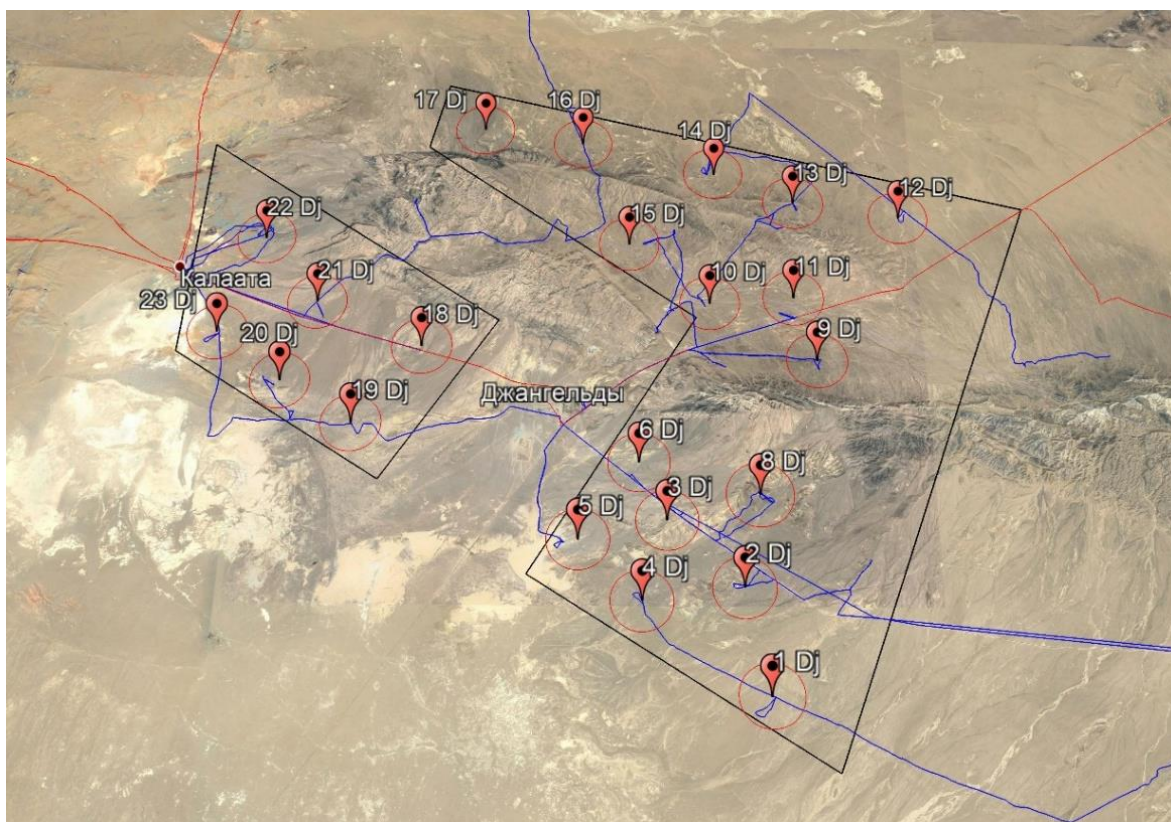
Notes: UzRDB– species/subspecies listed in the Red Data Book of Uzbekistan (2019) (CR – critically endangered; VU – vulnerable; NT – near-threatened); IUCN – species included in the Red List of the International Union for Conservation of Nature (VU - vulnerable; NT – near-threatened); CITES I, II – species listed in the appendices (I, II) to the Convention on International Trade in Endangered Species of Wild Fauna and Flora; Endemism: AF - Afghanistan, KZ – Kazakhstan; TM – Turkmenistan; KG – Kyrgyzstan; TJ – Tajikistan; UZ – Uzbekistan.

According to processed information, the author's personal data and two field survey results, currently, the Dzankeldy wind farm project area is inhabited by 2 amphibian species and 15 reptile species belonging to 7 families (Table 1). The total number of amphibian species comprises 66,6% of the total diversity of the amphibian fauna of Uzbekistan, reptiles – 24,2%. Among them, 4 species are included in the Red Book of the Republic of Uzbekistan (2019) (26,7% of the total number of species inhabiting the project area), 2 species are included in the Red List of the International Union for Conservation of Nature (IUCN Red List) (13,3% of total number of species inhabiting the project area) and 3 species – in the Appendices to the Convention on International Trade in Endangered Species of Wild Fauna and Flora (20% of the total number of species inhabiting the project area).

### Spring survey (April 2021)

The first field trip to the survey points in the area of the Kuldzhuktau residual mountains was carried out from April 17 to 20, 2021. During the spring survey of the project area, 22 km of hiking routes (transect) were completed. The transects passed through pre-selected survey points and their 1 kilometer radius (Figure 4).





**Figure 4 Observation points and transects on the Dzankeldy project territory in spring 2021**

Reptile survey was carried out both during the day (Figure 5) and at night. Moreover, in some points that were identified as potential habitats of the Southern Even-fingered Gecko during the day, both day and night surveys were carried out, in places that were identified as not suitable biotope for the Southern Even-fingered Gecko, night records were not carried out.



**Figure 5 Photographing a Desert sand boa at the Dj 20 point in April 2021**



The average night air temperature in April was 18 °C, the soil temperature was 17 °C, the air humidity was 35%. These values are not high enough for the reptile nocturnal survey.

During the survey of the territory, we recorded 11 reptiles species (17.7% of the total number of reptiles species), of which 3 species (27.3% of the number of species encountered) - Russian tortoise, Desert sand boa and Southern Even-fingered Gecko are included in the Red Book of the Republic of Uzbekistan, and two (18.2% of the number of species encountered) of them are included in the Red List of the International Union for Conservation of Nature (IUCN Red List).

The highest density of the Russian tortoise on the project territory during the Spring survey was recorded at Dj 13 point and amounted to 3.99 ind/ha. However, similar number of 2 tortoises per transect was observed at several other points: Dj 9, Dj 10, Dj 12 and Dj 14. The Russian tortoise was found at 8 points, which is 38% of the total number of observation points (21 points), most of which are located in the northern foothill part of the Kuldzhuktau mountains (Figure 6). It is worth noting that the Russian tortoise is not a numerous species throughout the project area.



**Figure 6 Russian tortoise at Dj 10 point in April 2021**

The highest density of Southern Even-fingered Gecko on the project territory, during the first field trip, was recorded at 3 points: Dj 3, Dj 6, Dj 18 and amounted to 3 ind/ha on each of them. However, as mentioned above, the spring abundance and density indicators for this species can not be considered indicative, due to low night temperatures and small percentage of individuals coming to the surface (Figure 7).

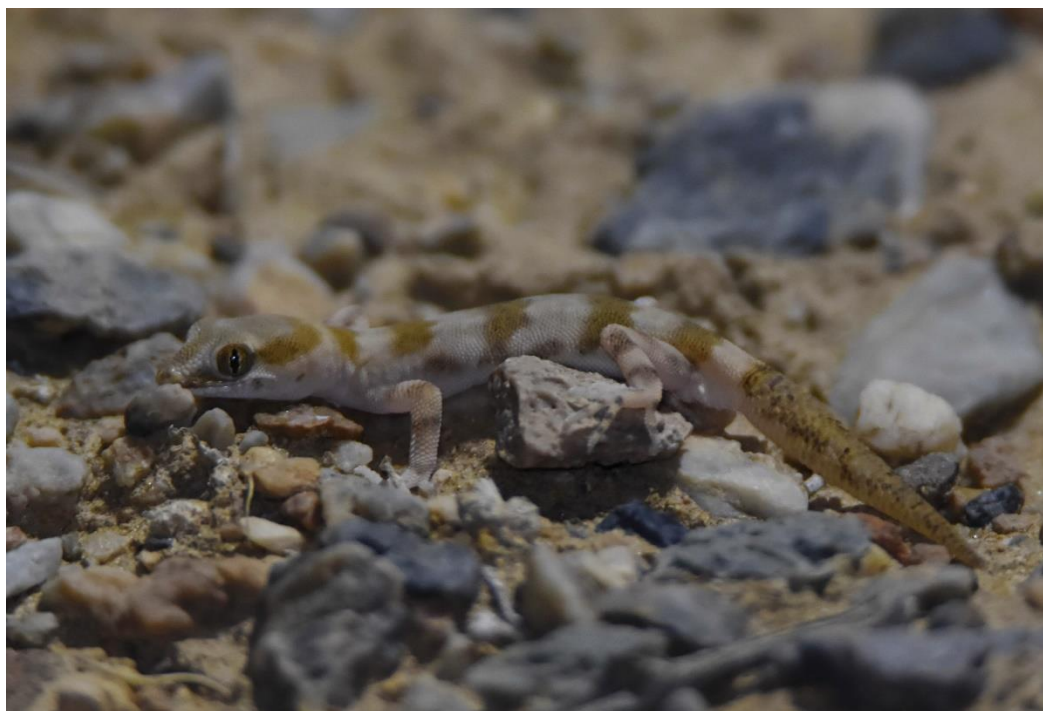


Figure 7 Southern Even-fingered Gecko at Dj 6 point in April 2021

In general, the reptiles' species composition is typical for this geographical area.

**Table 2 Primary data and the density of reptiles at the accounting points in the area of the Kuldzhuktau outlier in the spring of 2021**

No	Species	No. of recorded animals	Population density on the site, inds/ha	Biotope	Transect length	Date and time	Air temperature	Soil temperature	Humidity, %
<b>Dj 1</b>				Rubbly-clayey plain with depressions, Artemisia association	1 km	20.04.21	C24,9°	C30,9°	29%
1	<i>Phrynocephalus reticulatus</i> Reticulated toad-headed agama	3	1,5						
3	<i>Eremias intermedia</i> Aralo-Caspian racerunner	4	2						
<b>Dj 2</b>				Rubbly-clayey plain with cliffs and elevations, Artemisia-Ferula association	1 km	19.04.21	C29,8°	C38,4°	17%
1	<i>Trapelus sanguinolentus</i> Steppe agama	1	1						

<b>Dj 3</b>				Multicolour uplands, rubbly-clay depressions Artemisia association	1 km	19.04.21	C18,2°	C17,2°	22%
1	<i>Alsophylax laevis</i> Southern Even-fingered Gecko	2	3						
<b>Dj 4</b>				Rubbly-clayey plain with depressions, Artemisia association	1 km	20.04.21	C23,3°	C27,2°	30%
1	<i>Phrynocephalus reticulatus</i> Reticulated toad-headed agama	2	1						
2	<i>Trapelus sanguinolentus</i> Steppe agama	1	1						
3	<i>Eremias intermedia</i> Aralo- Caspian racerunner	2	1						
<b>Dj 5</b>				Rubbly-clayey plain, sparse wormwood and saxaul bushes	1 km	19.04.21	C24,3°	C32,7°	17%
1	<i>Phrynocephalus helioscopus</i> Sunwatcher toad-headed agama	1	0,5						
<b>Dj 6</b>				Multicolour uplands, rubbly-clay depressions Artemisia association	1 km	19.04.21	C18,0°	C18,6°	28%
1	<i>Alsophylax laevis</i> Southern Even-fingered Gecko	2	3						
<b>Dj 8</b>				Multicolour uplands, rubbly-clay depressions Artemisia association	1 km	19.04.21	C20,3°	C19,1°	22%
1	<i>Alsophylax laevis</i> Southern Even-fingered Gecko	1	1,3						
<b>Dj 9</b>				Hilly sandy foothills, sarzagan association	1 km	19.04.21	C29,0°	C37,4°	18%
1	<i>Testudo horsfieldii</i> Russian tortoise	2	0,89						
2	<i>Tenuidactylus fedtschenkoi</i> Turkestan thin-toed gecko	1	0,2						
3	<i>Trapelus sanguinolentus</i> Steppe agama	1	1						
4	<i>Eremias velox</i> Rapid Lizard	1	0,5						
<b>Dj 10</b>				Rubbly-clayey plain with depressions,	1 km	18.04.21	C29,0°	C44,8°	30%

				Artemisia association					
1	<i>Testudo horsfieldii</i> Russian tortoise	2	2,78						
2	<i>Trapelus sanguinolentus</i> Steppe agama	1	1						
<b>Dj 11</b>				Hilly sub-sandy foothill plain, in some places the sections are rubbly-sandy, Artemisia-saxaul formation, in in some places along sai (small water flow) Tamarix	1 km	19.04.21	C27,5°	C27,7°	18%
1	<i>Tenuidactylus fedtschenkoi</i> Turkestan thin-toed gecko	1	0,2						
2	<i>Trapelus sanguinolentus</i> Steppe agama	1	1						
3	<i>Eremias velox</i> Rapid Lizard	2	1						
<b>Dj 12</b>				Rubbly-sandy desert, sai (water flow) from the Kuldjuktai Mountains, Artemisia-Ferula association, Tamarix and Peganum harmala along sai	1 km	18.04.21	C23,5°	C24,3°	18%
1	<i>Testudo horsfieldii</i> Russian tortoise	2	0,85						
2	<i>Tenuidactylus caspius</i> Caspian Bent-Toed Gecko	1	0,2						
<b>Dj 13</b>				Hilly loamy plain, Artemisia-ferula association	1 km	18.04.21	C27,5°	C30,0°	17%
1	<i>Testudo horsfieldii</i> Russian tortoise	2	3,99						
2	<i>Eremias intermedia</i> Aralo-Caspian racerunner	2	1						
<b>Dj 14</b>				Clay foothills, Artemisia-ferrula association	1 km	18.04.21	C28,1°	C29,2°	18%
1	<i>Testudo horsfieldii</i> Russian tortoise	2	0,3						
2	<i>Trapelus sanguinolentus</i> Steppe agama	2	2						
<b>Dj 15</b>				Rubbly-sandy hummocky foothill desert, Artemisia - ferula association	1 km	18.04.21	C29,7°	C42,3°	18%

1	<i>Testudo horsfieldii</i> Russian tortoise	3 trace	–						
2	<i>Trapelus sanguinolentus</i> Steppe agama	1	1						
<b>Dj 16</b>				Rubbly-sandy foothills, Artemisia- ferula association	1 km	17.04.21	C25,4°	C27,9°	23%
1	<i>Testudo horsfieldii</i> Russian tortoise	3	1,4						
2	<i>Trapelus sanguinolentus</i> Steppe agama	1	1						
<b>Dj 18</b>				Rubbly plain with clay cliffs, Artemisia association	1 km	17.04.21	C17,6°	C16,4°	38%
1	<i>Alsophylax laevis</i> Southern Even-fingered Gecko	2	3						
<b>Dj 19</b>				Rubbly-sandy hummocky foothill desert, Artemisia - ferula association	1 km	18.04.21	C27,7°	C36,2°	21%
1	<i>Tenuidactylus caspius</i> Caspian Bent-Toed Gecko	1	0,4						
2	<i>Phrynocephalus reticulatus</i> Reticulated toad-headed agama	2	1						
3	<i>Trapelus sanguinolentus</i> Steppe agama	6	6						
4	<i>Eremias intermedia</i> Aralo- Caspian racerunner	2	1						
<b>Dj 20</b>				Rubbly plain, Artemisia-ferula association	1 km	18.04.21	C32,2°	C36,8°	24%
1	<i>Phrynocephalus reticulatus</i> Reticulated toad-headed agama	2	1						
2	<i>Trapelus sanguinolentus</i> Steppe agama	2	2						
3	<i>Eremias intermedia</i> Aralo- Caspian racerunner	1	0,5						
4	<i>Eremias lineolata</i> Striped Racerunner	1	0,2						
5	<i>Eryx miliaris</i> Desert sand boa	1	-						
<b>Dj 21</b>				Rubbly-sandy foothills, Artemisia- ferula association	1 km	17.04.21	C23,8°	C25,8°	26%
1	<i>Phrynocephalus reticulatus</i> Reticulated toad-headed agama	2	1						

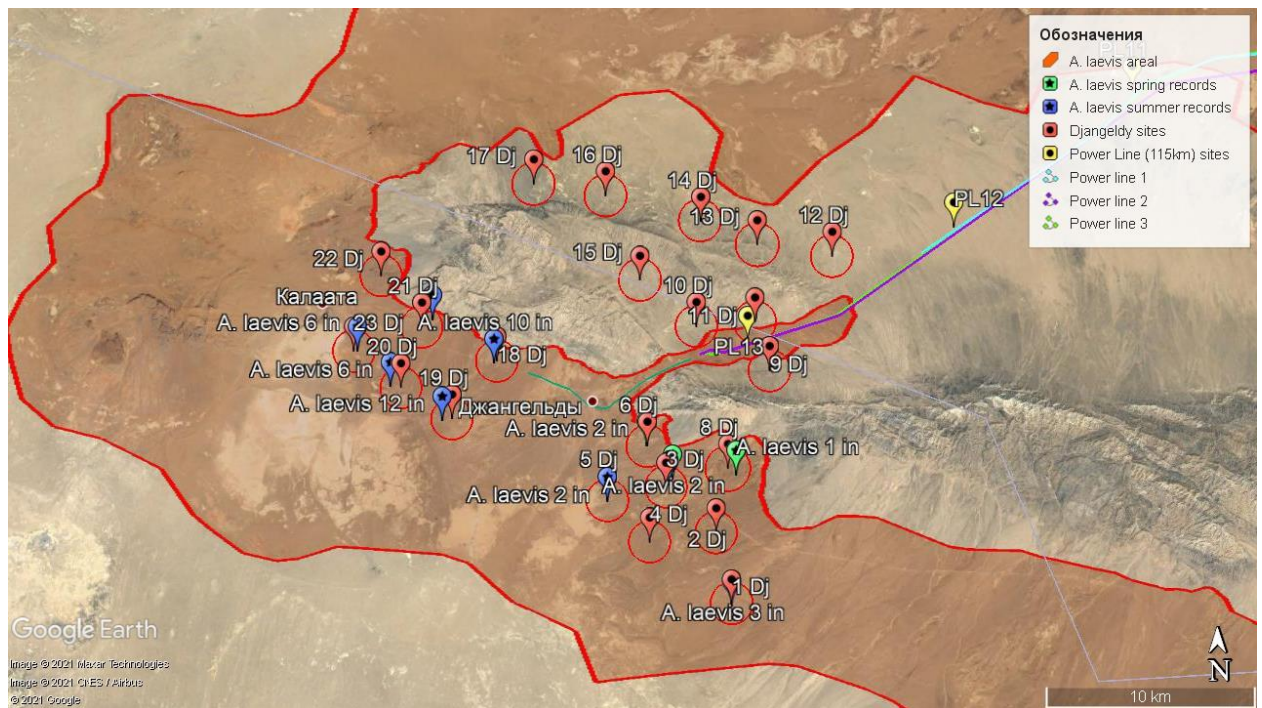
<b>Dj 22</b>				Rubbly-sandy plains Artemisia-ferula association	1 km	18.04.21	C21,1°	C20,2°	40%
1	<i>Phrynocephalus reticulatus</i> Reticulated toad-headed agama	3	1,5						
<b>Dj 23</b>				Rubbly plain with depressions and chakalaks (large hillocks up to 1-3 m in height) Artemisia- Ferula association	1 km	18.04.21	C24,7°	C25,0°	32%
1	<i>Testudo horsfieldii</i> Russian tortoise	1	1,3						
2	<i>Phrynocephalus reticulatus</i> Reticulated toad-headed agama	2	1						
3	<i>Trapelus sanguinolentus</i> Steppe agama	1	1						
4	<i>Eremias intermedia</i> Aralo- Caspian racerunner	1	0,5						

It is worth noting that almost the entire southern foothill part of Kuldzhuktau is a potential habitat for the Southern Even-fingered Gecko (see points DJ 1, 2, 3, 4, 5, 6, 8, 11, 18, 19, 20, 21, 22, 23). On the contrary, most of the northern sub-mountain plain of Kuldzhuktau, as well as the outlier itself, is unsuitable habitat for this species. However, such rare and listed in the Red Book of the Republic of Uzbekistan species as: Russian tortoise, Caspian monitor, and Desert sand boa inhabit the entire area of the construction of the Dzankeldy wind farm.

#### Summer survey (June 2021)

The second field trip to the survey points in the area of the Kuldzhuktau residual mountains was carried out from June 19 to 22, 2021. The priority of this field visit was to conduct the quantitative assessment of Southern Even-fingered Gecko population at the points identified in spring as the most suitable. During the summer survey of the project area, 6 km of hiking routes (transect) were completed. The transects passed through pre-selected survey points and their 1 kilometer radius (Figure 8).





**Figure 8** Survey points on the Dzankeldy WF project territory, as well as locations where the Southern Even-fingered Gecko was observed in summer and the areal range for the Southern Even-fingered Gecko population in the vicinity of the settlements of Dzankeldy and Kalaata

Reptile survey was carried out mainly at night – after sunset and before the night coolness, until about 2 am, when the activity of the Southern Even-fingered Gecko decreases (Figure 9). However, at some points, the survey was also conducted during the daytime.





**Figure 9 Nocturnal survey with a headlamp**

The average night air temperature in June was 26-27°C, the soil temperature was 27-28°C, the air humidity was 20-25%. These values are ideal for the nocturnal reptile survey, including the Southern Even-fingered Gecko.

During the survey of the territory, we recorded 8 reptiles species (12,9% of the total number of reptiles species), of which 1 species (12,5% of the number of species encountered) - Southern Even-fingered Gecko is included in the Red Book of the Republic of Uzbekistan, and 1 species - Southern Even-fingered Gecko (12,5% of the number of species encountered) of them are included in the Red List of the International Union for Conservation of Nature (IUCN Red List). The variety of species for the second field visit turned out to be less than for the first, due to the narrow focus and specifics of the summer survey.

**Table 3 Primary data and the density of reptiles at the accounting points in the area of the Kuldzhuktau outlier in the summer of 2021**

No	Species	No. of recorded animals	Population density on the site, inds/ha	Biotope	Transect length	Date and time	Air temperature	Soil temperature	Humidity, %
<b>Dj 1</b>				Rubbly-clayey plain with depressions, Artemisia association	1 km	22.06.21	C24,1°	C25,3°	29%
1	<i>Alsophylax laevis</i> Southern Even-fingered Gecko	3	4						
<b>Dj 2</b>				Rubbly-clayey plain with cliffs and elevations, Artemisia-ferula association	1 km	22.06.21	C29,8°	C23,4°	17%
1	<i>Tenuidactylus caspius</i> Caspian Bent-Toed Gecko	1	-						
2	<i>Phrynocephalus helioscopus</i> Sunwatcher toad-headed agama	2	2,7						
<b>Dj 3</b>				Multicolour uplands, rubbly-clay depressions Artemisia association	1 km	19.06.21	C26,2°	C25,6°	18%
1	<i>Alsophylax laevis</i> Southern Even-fingered Gecko	4	5,3						
<b>Dj 4</b>				Rubbly-clayey plain with depressions, Artemisia association	1 km	22.06.21	C23,3°	C23,0°	30%
1	<i>Tenuidactylus caspius</i> Caspian Bent-Toed Gecko	2	2,4						
<b>Dj 5</b>				Rubbly-clayey plain, sparse sagebrush and saxaul bushes	1 km	22.06.21	C24,3°	C23,6°	17%
1	<i>Alsophylax laevis</i> Southern Even-fingered Gecko	2	2,7						
<b>Dj 6</b>				Multicolour uplands, rubbly-clay depressions Artemisia association	1 km	19.06.21	C25,9°	C24,6°	18%

1	<i>Trapelus sanguinolentus</i> Steppe agama	1	-						
<b>Dj 8</b>				Multicolour uplands, rubbly-clay depressions Artemisia association	1 km	19.06.21	C24,3°	C22,7°	18%
1	<i>Tenuidactylus</i> <i>fedtschenkoi</i> Turkestan thin-toed gecko	3	4,5						
<b>Dj 18</b>				Rubbly-clayey plain with cliffs and elevations, Artemisia association	1 km	21.06.21	C27,0°	C29,3°	17%
1	<i>Alsophylax laevis</i> Southern Even-fingered Gecko	10	13,3						
<b>Dj 19</b>				Rubbly-sandy hillock desert, Artemisia-saxaul association	1 km	22.06.21	C28,0°	C27,2°	18%
1	<i>Alsophylax laevis</i> Southern Even-fingered Gecko	12	16						
2	<i>Trapelus sanguinolentus</i> Steppe agama	2	-						
3	<i>Tenuidactylus caspius</i> Caspian Bent-Toed Gecko	3	4,7						
<b>Dj 20</b>				Rubbly plain, Artemisia-saxaul association	1 km	22.06.21	C25,5°	C25,3°	18%
1	<i>Alsophylax laevis</i> Southern Even-fingered Gecko	6	8,1						
2	<i>Hemorrhois ravergeri</i> Spotted whip snake	1	-						
<b>Dj 21</b>				Rubbly-sandy foothills, Artemisia- ferula association	1 km	21.06.21	C25,6°	C24,1°	18%
1	<i>Alsophylax laevis</i> Southern Even-fingered Gecko	4	5,3						
<b>Dj 22</b>				Rubbly plain with clay cliffs, Artemisia-saxaul association	1 km	22.06.21	C28,6°	C32,3°	17%
1	<i>Phrynocephalus</i> <i>reticulatus</i> Reticulated toad-headed agama	4	2,5						
2	<i>Eremias velox</i> Rapid Lizard	1	-						
<b>Dj 23</b>				Rubbly plain with depressions and chakalaks (large hillocks up to 1-3 m	1 km	21.06.21	C25,5°	C24,1°	18%

				in height) Artemisia-Ferula association					
1	<i>Alsophylax laevis</i> Southern Even-fingered Gecko	6	8,1						

The highest density of Southern Even-fingered Gecko on the project territory, during the summer field trip, was recorded at Dj 19 point and amounted to 16 ind/ha (Figure 10).

As a result, Southern Even-fingered Gecko was found at 8 survey points during the summer field trip, which is 38% of all the survey points on the project territory. However, it must be noted that we did not find Southern Even-fingered Gecko at several points on potentially suitable biotope due to bad weather conditions during the survey period, namely due to strong wind: the wind speed sometimes reached 15-18 m/s. The following points (on which we did not observe the gecko during the summer survey) are still potential for Southern Even-fingered Gecko: Dj 2, 4, 6, 8, 22, 10 and 11.



Figure 10 Southern Even-fingered Gecko on Dj 19 point in June 2021 (adult male)

In general, the reptiles' species composition is typical for this geographical area.

### Herpetological survey in the Bash WF project area (Ayak-agitma lake)

The first field visit was conducted in April 2021. April is the period of the highest activity of the Russian tortoise (*Testudo horsfieldii*), which is also listed in the Red List of the International Union for Conservation of Nature (IUCN Red List) as VU - vulnerable. However, April appeared to be not optimal for the gecko survey this year, since night temperatures were still quite low, and the weather in the desert is not stable at this time of the year. During this period, the very first individuals appear on the surface, while most are waiting for warmer weather. In connection with the above, the accounting of this species in April is not indicative. More information that is accurate was collected during

the summer survey, when an absolute number of individuals were active. As for the Caspian monitor (*Varanus griseus caspius*), the situation is almost the same as with the gecko, in April only some individuals were active. The Desert sand boa (*Eryx miliaris*) is active in both spring and summer, but this species can be observed in the daytime only in spring.

The second field visit was conducted in June 2021. In the summer months, it is almost impossible to find Russian tortoise on the territory, since this species has a period of aestivation (summer hibernation). Occasionally in summer, individual tortoises can be seen on the surface in those places where the green juicy grass is preserved. No such places were found on the project territory, as well as the tortoises themselves in the summer period. For other listed species, such as the Southern Even-fingered Gecko and Caspian monitor, summer is the period of the highest activity.

All 4 species are listed also in the Red Book of the Republic of Uzbekistan and were found in the project area near Ayak-agitma lake.

**Table 4 List of reptile species inhabiting the Bash WF project area**

№	Species	Species presence acc. to literary sources	Author's earlier personal data	April 2021 field expedition data.	June 2021 field expedition data	Endemism	Nature conservation status		
							UzRDB	IUCN	CITES
Family <i>Bufonidae</i> (toads)									
1	Turan Toad <i>Bufo turanensis</i>	+	+	+		UZ, TJ, TM			
Family <i>Testudinidae</i> (tortoises)									
1	Russian tortoise <i>Testudo horsfieldii</i>	+	+	+			2 (VU)	VU	II
Family <i>Gekkonidae</i> (geckoes)									
2	Southern Even-fingered Gecko <i>Alsophylax laevis</i>	+			+	UZ, TM	VU:D	CR	
3	Comb-toed Gecko <i>Crossobamon eversmanni</i>	+				UZ, TJ, TM, KZ, IR, AF			
4	Caspian Bent-Toed Gecko <i>Tenuidactylus caspius</i>	+	+	+	+			LC	
5	Turkestan thin-toed gecko <i>Tenuidactylus fedtschenkoi</i>	+	+	+	+	UZ, TJ, TM, KZ			
6	Common Wonder Gecko <i>Teratoscincus scincus</i>	+	+	+		UZ, TJ, TM, KG, IR,CN			
Family <i>Agamidae</i> (agamass)									
7	Steppe agama <i>Trapelus sanguinolentus</i>	+	+	+	+				
8	Sunwatcher toad-headed agama <i>Phrynocephalus helioscopus</i>	+	+	+	+				

9	Lichtenstein's Toadhead Agama <i>Phrynocephalus interscapularis</i>	+	+	+		UZ, TM, KZ			
<b>Family Lacertidae (true lizards)</b>									
10	Rapid Lizard <i>Eremias velox</i>	+	+	+	+				
11	Aralo-Caspian racerunner <i>Eremias intermedia</i>	+		+					
12	Sand Racerunner <i>Eremias scripta</i>	+		+					
<b>Family Varanidae (monitor lizards)</b>									
13	Caspian Monitor <i>Varanus griseus caspius</i>	+	+	+			2 (VU:D)		I
<b>Family Boidae (Boas)</b>									
14	Desert sand boa <i>Eryx miliaris</i>	+		+			3 (NT)		II
<b>Family Colubridae (colubrid snakes)</b>									
15	Sand racer <i>Psammophis lineolatus</i>	+	+	+					
16	Spotted whip snake <i>Hemorrhois ravergieri</i>	+		+	+				
17	Spotted desert racer <i>Platycephalus karelinii</i>	+	+	+					
18	Dice Snake <i>Matrix tessellata</i>	+	+						

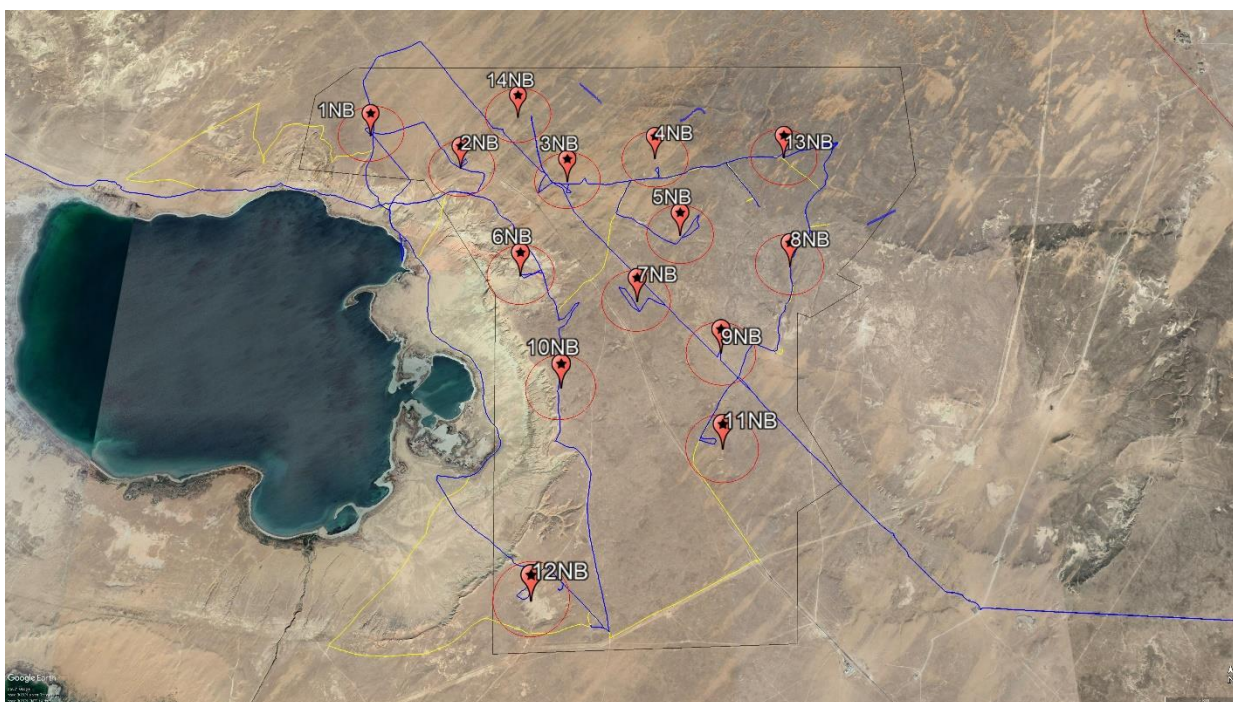
Notes : UzRDB– species/subspecies listed in the Red Data Book of Uzbekistan (2019) (CR – critically endangered; VU – vulnerable; NT – near-threatened); IUCN – species included in the Red List of the International Union for Conservation of Nature (VU - vulnerable; NT – near-threatened); CITES I, II – species listed in the appendices (I, II) to the Convention on International Trade in Endangered Species of Wild Fauna and Flora; Endemism: AF - Afghanistan, KZ – Kazakhstan; TM – Turkmenistan; KG – Kyrgyzstan; TJ – Tajikistan; UZ – Uzbekistan.

According to processed information, the author's personal data and two field survey results, currently, the Bash wind farm project area is inhabited by 1 amphibian species and 18 reptile species belonging to 7 families (Table 4). The total number of amphibian species comprises 33,3% of the total diversity of the amphibian fauna of Uzbekistan, reptiles – 29,03%. Among them, 4 species are included in the Red Book of the Republic of Uzbekistan (2019) (22,2% of the total number of species inhabiting the project area), 2 species are included in the Red List of the International Union for Conservation of Nature (IUCN Red List) (11,1% of total number of species inhabiting the project area) and 3 species – in the Appendices to the Convention on International Trade in Endangered Species of Wild Fauna and Flora (16,7% of the total number of species inhabiting the project area).

### Spring survey (April 2021)

The first field trip to the survey points in the area of the Ayak-agitma lake was carried out from April 20 to 22, 2021. During the spring survey of the project area, 14 km of hiking routes (transect) were completed. The transects passed through pre-selected survey points and their 1 kilometer radius (Figure 10).





**Figure 11 Observation points and transects on the Bash project territory in spring 2021**

Reptile survey was carried out during the daytime, since the night temperature was too low for reptile activity. The situation was worsened by a strong gusty wind. Wind speed reached 16-18 m/s. However, during the daytime surveys, points on suitable for Southern Even-fingered Gecko biotope were examined for the possibility of conducting surveys in the summer.

The average night air temperature in April was 14 °C, the soil temperature was 11-12 °C, the air humidity was 38%. These values are not high enough for the reptile nocturnal survey.

During the survey of the territory, we recorded 7 reptiles species (11,3% of the total number of reptiles species), of which 3 species (42,8% of the number of species encountered) - Russian tortoise, Desert sand boa and Caspian monitor are included in the Red Book of the Republic of Uzbekistan, and one (14,3% of the number of species encountered) of them is included in the Red List of the International Union for Conservation of Nature (IUCN Red List).

**Table 5 Primary data and the density of reptiles at the observation points in the area of Lake Ayak-Agitma in the spring of 2021**

No	Species	No. of recorded animals	Population density on the site, inds/ha	Biotope	Transect length	Date and time	Air temperature	Soil temperature	Humidity, %
	<b>NB 1</b>			Loamy plain, Artemisia- Calligonum association,	1 km	20.04.21	C30,3°	C32,3°	21%



				Peganum harmala and Ferula					
1	<i>Testudo horsfieldii</i> Russian tortoise	2	0,8						
2	<i>Trapelus sanguinolentus</i> Steppe agama	1	-						
<b>NB 2</b>				Loamy plain, Artemisia- Calligonum association, Peganum harmala and Ferula	1 km	20.04.21	C33,4°	C35,6°	19%
1	<i>Testudo horsfieldii</i> Russian tortoise	2	1,6						
2	<i>Eremias velox</i> Rapid Lizard	6	8,7						
<b>NB 3</b>				Small-hill sands, Artemisia- Calligonum- Ferula association	1 km	21.04.21	C19,3°	C29,0°	37%
1	<i>Testudo horsfieldii</i> Russian tortoise	2	3,1						
2	<i>Trapelus sanguinolentus</i> Steppe agama	1	-						
<b>NB 4</b>				Fixed hilly sands, Artemisia-- Calligonum- Ferula association	1 km	21.04.21	C18,7°	C23,2°	22%
1	<i>Testudo horsfieldii</i> Russian tortoise	4	3,03						
2	<i>Trapelus sanguinolentus</i> Steppe agama	1	-						
<b>NB 5</b>				Fixed hilly sands, Artemisia-- Calligonum- Ferula association	1 km	21.04.21	C19,3°	C23,7°	23%
1	<i>Trapelus sanguinolentus</i> Steppe agama	2	1,8						
<b>NB 6</b>				Clay hilly plain crossed by ravines Artemisia association	1 km	20.04.21	C28,2°	C33,8°	20%
1	<i>Testudo horsfieldii</i> Russian tortoise	2	0,22						
2	<i>Trapelus sanguinolentus</i> Steppe agama	2	2,3						
3	<i>Eremias velox</i> Rapid Lizard	1	-						
4	<i>Eryx miliaris</i> Desert sand boa	1	-						

<b>NB 7</b>				Clay plain, Artemisia association	1 km	20.04.21	C28,7°	C34,7°	20%
1	<i>Trapelus sanguinolentus</i> Steppe agama	1	-						
<b>NB 8</b>				Fixed hilly sands, Artemisia-association	1 km	21.04.21	C23,5°	C31,5°	20%
1	<i>Testudo horsfieldii</i> Russian tortoise	13	3,6						
2	<i>Eremias velox</i> Rapid Lizard	2	3,1						
3	<i>Varanus griseus</i> Caspian Monitor	1	0,06						
<b>NB 9</b>				Clay plain, Artemisia association	1 km	21.04.21	C21,7°	C35,1°	31%
1	<i>Testudo horsfieldii</i> Russian tortoise	2	0,5						
2	<i>Eremias velox</i> Rapid Lizard	3	4,7						
<b>NB 10</b>				Clay hilly plain crossed by ravines, wormwood association	1 km	20.04.21	C27,1°	C28,0°	22%
0									
<b>NB 11</b>				Clay plain, Artemisia-Saxaul association	1 km	21.04.21	C23,1°	C33,6°	19%
1	<i>Testudo horsfieldii</i> Russian tortoise	2	1,6						
2	<i>Phrynocephalus helioscopus</i> Sunwatcher toad-headed agama	2	2,7						
<b>NB 12</b>				Clay hilly plain, Artemisia association	1 km	20.04.21	C22,7°	C19,4°	24%
0									
<b>NB 13</b>				Fixed hilly sands, Artemisia-Saxaul association	1 km	21.04.21	C19,1°	C29,3°	22%
1	<i>Testudo horsfieldii</i> Russian tortoise	6	2,6						
<b>NB 14</b>				Clay plain, Artemisia-Ferula association	1 km	21.04.21	C16,5°	C26,0°	41%
1	<i>Eremias velox</i> Rapid Lizard	2	3,1						
2	<i>Psammophis lineolatus</i> Sand racer	1	-						

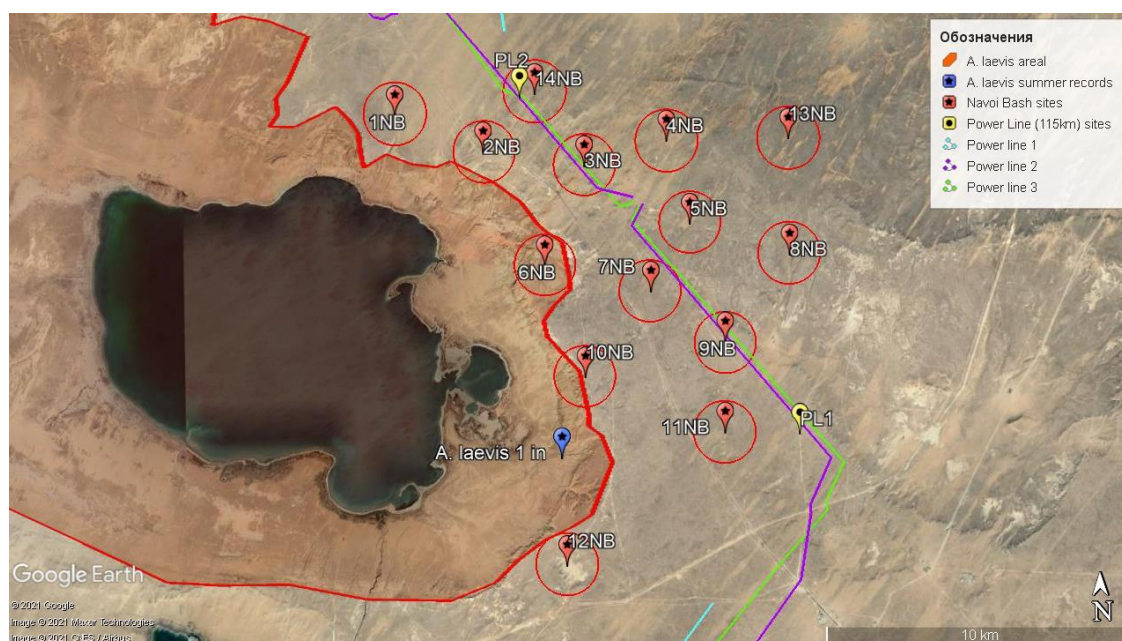
The highest density of the Russian tortoise on the project territory during the Spring survey was recorded at NB 8 point and amounted to 3.6 ind/ha. However, similar number of 2 tortoises per transect was observed at several other points: NB 3, NB 4 and NB 13. The Russian tortoise was found at 9 points, which is 64,3% of the total number of observation points (14 points). It is worth noting that the Russian tortoise is not a numerous species throughout the project area.

The points located along the chinks of the Ayak-Agitma depression were identified as the most promising points for the summer Southern Even-fingered Gecko survey.

In general, the reptiles' species composition is typical for this geographical area.

### Summer survey (June 2021)

The second field trip to the survey points in the area of the Ayak-Agitma lake was carried out from June 22 to 24, 2021. The priority of this field visit was to conduct the quantitative assessment of Southern Even-fingered Gecko population at the points identified in spring as the most suitable. During the summer survey of the project area, 13 km of hiking routes (transect) were completed. The transects passed through pre-selected survey points and their 1 kilometer radius (Figure 8).



**Figure 12** Survey points on the Bash WF project territory, as well as location where the Southern Even-fingered Gecko was observed in summer and the areal range for the Southern Even-fingered Gecko population in the vicinity of the Ayak-Agitma lake

Reptile survey was carried out mainly at night – after sunset and before the night coolness, until about 2 am, when the activity of the Southern Even-fingered Gecko decreases.

The average night air temperature in June was 27°C, the soil temperature was 28°C, the air humidity was 20%. These values are ideal for the nocturnal reptile survey, including the Southern Even-fingered Gecko.

However, the windy weather did not allow us to find many Southern Even-fingered Gecko. The wind speed reached 10-12 m/s.

**Table 6 Primary data and the density of reptiles at the accounting points in the area of Lake Ayakagitma in the summer of 2021**

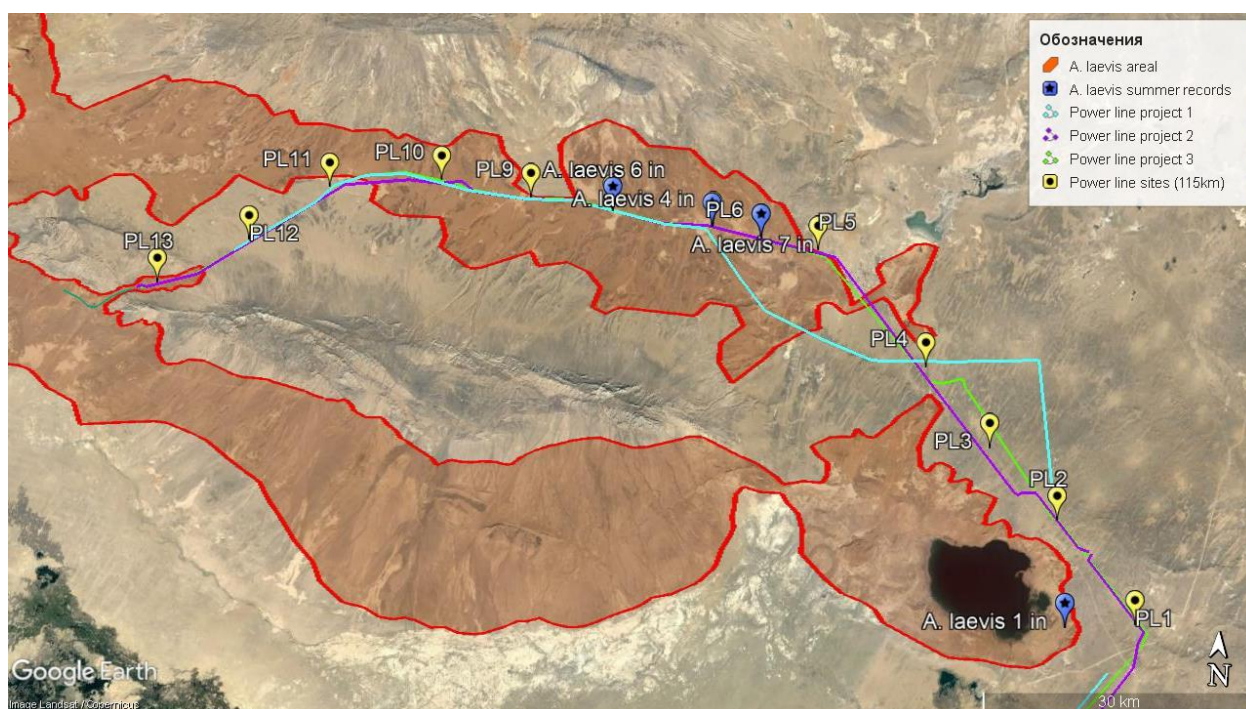
No	Species	No. of recorded animals	Population density on the site, inds/ha	Biotope	Transect length	Date and time	Air temperature	Soil temperature	Humidity, %
NB 1				Loamy plain, Artemisia-- Calligonum- Ferula association	1 km	22.06.21	C30,3°	C32,3°	21%
0									
NB 2				Loamy plain, Artemisia- Calligonum association, Peganum harmala and Ferula	1 km	22.06.21	C33,4°	C35,6°	19%
0									
NB 6				Clay hilly plain crossed by ravines, Artemisia association	1 km	24.06.21	C28,2°	C33,8°	20%
0									
NB 10				Clay hilly plain crossed by ravines, Artemisia association	1 km	24.06.21	C27,1°	C28,0°	22%
0									
NB 12				Clay hilly plain crossed by ravines, Artemisia association	1 km	23.06.21	C22,7°	C19,4°	24%
0									
NB 15 levis				Clay hilly plain crossed by ravines, Artemisia association	1 km	23.06.21	C22,7°	C24,8°	19%
1	<i>Alsophylax laevis</i> Southern Even-fingered Gecko	1	1,3						

During the survey of the territory, we recorded 1 reptiles species - Southern Even-fingered Gecko - (1,6% of the total number of reptiles species), which is included in the Red Book of the Republic of Uzbekistan (100% of the number of species encountered), and included in the Red List of the International Union for Conservation of Nature (IUCN Red List) (100% of the number of species encountered). The variety of species for the second field visit turned out to be less than for the first, due to the narrow focus and specifics of the summer survey.

### Herpetological survey along planned Dzhankeldy-Bash OHTL

During the construction of new power lines, there are great risks that some populations of rare and endemic species may be destroyed, in this regard, it is necessary to conduct detailed field studies for such populations.

The field trip to the survey points in the area along planned Dzhankeldy-Bash OHTL was carried out from June 19 to 25, 2021. During the summer survey of the project area, 13 km of hiking routes (transect) were completed. The transects passed through pre-selected survey points and their 1 kilometer radius (Figure 13).



**Figure 13 Survey points along planned Dzhankeldy-Bash OHTL, as well as locations where the Southern Even-fingered Gecko was observed in summer and the areal range for the Southern Even-fingered Gecko population**

The main purpose of this field trip was to identify the areal of Southern Even-fingered Gecko population on the project territory. In the summer months, it is almost impossible to find Russian tortoise on the territory, since this species has a period of aestivation (summer hibernation). Occasionally in summer, individual tortoises can be seen on the surface in those places where the green juicy grass is preserved. No such places were found on the project territory, as well as the tortoises themselves in the summer period. However, we found many burrows of this species at many survey points. For other listed species, such as the Southern Even-fingered Gecko and Caspian monitor, summer is the period of the highest activity.

**Table 7 List of reptile species inhabiting the project area along planned Dzhankeldy-Bash OHTL**

№	Name of species	The presence acc. to literary sources	Author's earlier personal data	June 2021 field expedition data	Endemism	Endemism		
						UzRDB	IUCN	CITES
Family Bufeniode (toads)								
1	Turan Toad <i>Bufotes turanensis</i>	+	+		UZ, TJ, TM			
Family Testudinidae (tortoises)								
1	Russian tortoise <i>Testudo horsfieldii</i>	+	+	+		2 (VU)	VU	II
Family Gekkonidae (geckoes)								
2	Southern Even-fingered Gecko <i>Alsophylax laevis</i>	+		+	UZ, TM	VU:D	CR	
3	Comb-toed Gecko <i>Crossobamon evermanni</i>	+			UZ, TJ, TM, KZ, IR, AF			
4	Caspian Bent-Toed Gecko <i>Tenuidactylus caspius</i>	+	+	+			LC	
5	Turkestan thin-toed gecko <i>Tenuidactylus fedtschenkoi</i>	+	+		UZ, TJ, TM, KZ			
6	Common Wonder Gecko <i>Teratoscincus scincus</i>	+	+	+	UZ, TJ, TM, KG, IR, CN			
Family Agamidae (agamass)								
7	Steppe agama <i>Trapelus sanguinolentus</i>	+	+	+				
8	Sunwatcher toad-headed agama <i>Phrynocephalus helioscopus</i>	+	+					
9	Lichtenstein's Toadhead Agama <i>Phrynocephalus interscapularis</i>	+	+		UZ, TM, KZ			
Family Varanidae (monitor lizards)								
10	Rapid Lizard <i>Eremias velox</i>	+	+	+				
12	Sand Racerunner <i>Eremias scripta</i>	+						
Family Varanidae (monitor lizards)								
13	Caspian Monitor <i>Varanus griseus caspius</i>	+	+	+		2 (VU:D)		I
Family Boidae (Boas)								
14	Desert sand boa <i>Eryx miliaris</i>	+				3 (NT)		II
Family Colubridae (colubrid snakes)								
15	Sand racer <i>Psammophis lineolatus</i>	+	+					

16	Spotted whip snake <i>Hemorrhois ravergieri</i>	+						
17	Spotted desert racer <i>Platyceps karelinii</i>	+	+					

Notes : UzRDB – species/subspecies listed in the Red Data Book of Uzbekistan (2019) (CR – critically endangered; VU – vulnerable; NT – near-threatened); IUCN – species included in the Red List of the International Union for Conservation of Nature (VU - vulnerable; NT – near-threatened); CITES I, II – species listed in the appendices (I, II) to the Convention on International Trade in Endangered Species of Wild Fauna and Flora; Endemism: AF - Afghanistan, KZ – Kazakhstan; TM – Turkmenistan; KG – Kyrgyzstan; TJ – Tajikistan; UZ – Uzbekistan.

According to processed information, the author's personal data and the field survey results, currently, the project area along planned Dzankeld-Bash OHTL is inhabited by 1 amphibian species and 17 reptile species belonging to 7 families (Table 7). The total number of amphibian species comprises 33,3% of the total diversity of the amphibian fauna of Uzbekistan, reptiles – 27,4%. Among them, 4 species are included in the Red Book of the Republic of Uzbekistan (2019) (23,5% of the total number of species inhabiting the project area), 2 species are included in the Red List of the International Union for Conservation of Nature (IUCN Red List) (11,7% of total number of species inhabiting the project area) and 3 species – in the Appendices to the Convention on International Trade in Endangered Species of Wild Fauna and Flora (17,6% of the total number of species inhabiting the project area).

Reptile survey was carried out both during the day and at night. Moreover, in some points that were identified as potential habitats of the Southern Even-fingered Gecko during the day, both day and night surveys were carried out, in places that were identified as not suitable biotope for the Southern Even-fingered Gecko, night records were not carried out. Nocturnal survey was carried out after sunset and before the night coolness, until about 2 am, when the activity of the Southern Even-fingered Gecko decreases.

The average night air temperature was 22 °C, the soil temperature was 20 °C, the air humidity was 17%. These values are not high enough for the reptile nocturnal survey.

Since most of the project area runs along the highway, it was decided that in addition to the transect survey along planned OHTL, we would record the roadkill on the highway No. 4P61. So for 79.5 km of this highway, we found 2 young Caspian monitors (Figure 14), 2 Common Wonder Geckos and 4 Steppe agamas.





Figure 14 A young individual of Caspian monitor killed on highway No. 4P61 in Summer 2021

Table 8 Primary data and the density of reptiles at the survey points along planned Dzankeld-Bash OHTL in the summer of 2021

No	Species	No. of recorded animals	Population density on the site, inds/ha	Biotope	Transect length	Date and time	Air temperature	Soil temperature	Humidity, %
PL 1				Sub-sand hilly plain, Artemisia saxaul association	1 km	25.06.21	C34,1°	C53,6°	16%
1	<i>Testudo horsfieldii</i> Russian tortoise	4 holes	-						
2	<i>Trapelus sanguinolentus</i> Steppe agama	6	8,9						

<b>PL 2</b>				Clay plain, Artemisia-Ferula association	1 km	25.06.21	C34,4°	C52,4°	16%
1	<i>Eremias velox</i> Rapid Lizard	4	5,7						
<b>PL 3</b>				Sub-sand hilly plain, Artemisia saxaul association	1 km	25.06.21	C34,8°	C48,1°	16%
0									
<b>PL 4</b>				Sub-sand hilly plain, Artemisia saxaul association	1 km	25.04.21	C33,7°	C47,2°	16%
2	<i>Trapelus sanguinolentus</i> Steppe agama	1	-						
<b>PL 5</b>				Semi-fixed hilly sands, Artemisia saxaul -ferula association	1 km	19.06.21	C40,0°	C55,3°	16%
1	<i>Testudo horsfieldii</i> Russian tortoise	1 hole	-						
2	<i>Trapelus sanguinolentus</i> Steppe agama	2	2,8						
3	<i>Varanus griseus caspius</i> Caspian Monitor	1	0,06						
<b>PL 6</b>				Sub-sandy hilly plain crossed by ravines and clay- rubbly uplands, Artemisia association	1 km	25.06.21	C24,7°	C22,5°	18%
1	<i>Alsophylax laevis</i> Southern Even-fingered Gecko	7	9,3						
2	Common Wonder Gecko <i>Teratoscincus scincus</i>	20	16,3						
<b>PL 7</b>				Clay hilly plain crossed by ravines, Artemisia-Saxaul- Sazkazgan association	1 km	25.06.21	C21,5°	C19,7°	17%
1	<i>Alsophylax laevis</i> Southern Even-fingered Gecko	4	5,2						
2	<i>Testudo horsfieldii</i> Russian tortoise	14 holes and 2 shells	-						
3	<i>Trapelus sanguinolentus</i> Steppe agama	3	4,3						
<b>PL 8</b>				Clay hilly plain, Artemisia-Tamarix association	1 km	25.06.21	C20,8°	C19,3°	17%
1	<i>Alsophylax laevis</i> Southern Even-fingered Gecko	6	8,1						

2	<i>Trapelus sanguinolentus</i> Steppe agama	3	4,3						
<b>PL 9</b>				Clay plain, Artemisia association	1 km	19.06.21	C36,7°	C42,8°	16%
1	<i>Trapelus sanguinolentus</i> Steppe agama	1	-						
2	<i>Eremias velox</i> Rapid Lizard	1	-						
<b>PL 10</b>				Small-hill sands, Artemisia- Calligonum- Ferula association	1 km	19.06.21	C35,4°	C39,5°	17%
1	<i>Testudo horsfieldii</i> Russian tortoise	Ruine d egg clutch							
2	<i>Trapelus sanguinolentus</i> Steppe agama	2	2,7						
3	Common Wonder Gecko <i>Teratoscincus scincus</i>	trails	-						
<b>PL 11</b>				Fixed hilly sands, Artemisia-ferula association	1 km	20.06.21	C31,2°	C48,2°	16%
1	<i>Trapelus sanguinolentus</i> Steppe agama	1	-						
<b>PL 12</b>				Small-hill sands, Artemisia- Calligonum- Ferula association	1 km	20.06.21	C31,4°	C46,0°	16%
1	<i>Varanus griseus caspius</i> Caspian Monitor	1	0,01						
<b>PL 13</b>				Small-hill sands, with depressions Artemisia- Calligonum- Ferula association	1 km	20.06.21	C31,5°	C43,6°	16%
1	<i>Tenuidactylus caspius</i> Caspian Bent-Toed Gecko	1	-						
2	<i>Trapelus sanguinolentus</i> Steppe agama	3	4,1						
3	<i>Varanus griseus caspius</i> Caspian Monitor	1	0,025						

During the survey of the territory, we recorded 7 reptiles species (11,3% of the total number of reptiles species), of which 3 species (42,8% of the number of species encountered) - Russian tortoise, Caspian Monitor and Southern Even-fingered Gecko are included in the Red Book of the Republic of Uzbekistan, and two (28,6% of the number of species encountered) of them are included in the Red List of the International Union for Conservation of Nature (IUCN Red List).

The highest density of Southern Even-fingered Gecko on the project territory was recorded at PL 6 point and amounted to 9.3 ind/ha (Figure 15).





**Figure 15 Southern Even-fingered Gecko on the PL 6 point in Summer 2021 (adult male)**

Since Russian tortoise is in a state of aestivation in the summer months, the presence of the latter on the project territory was determined by the remains and traces of the species vital activity (burrows, etc.) (Figure 16).



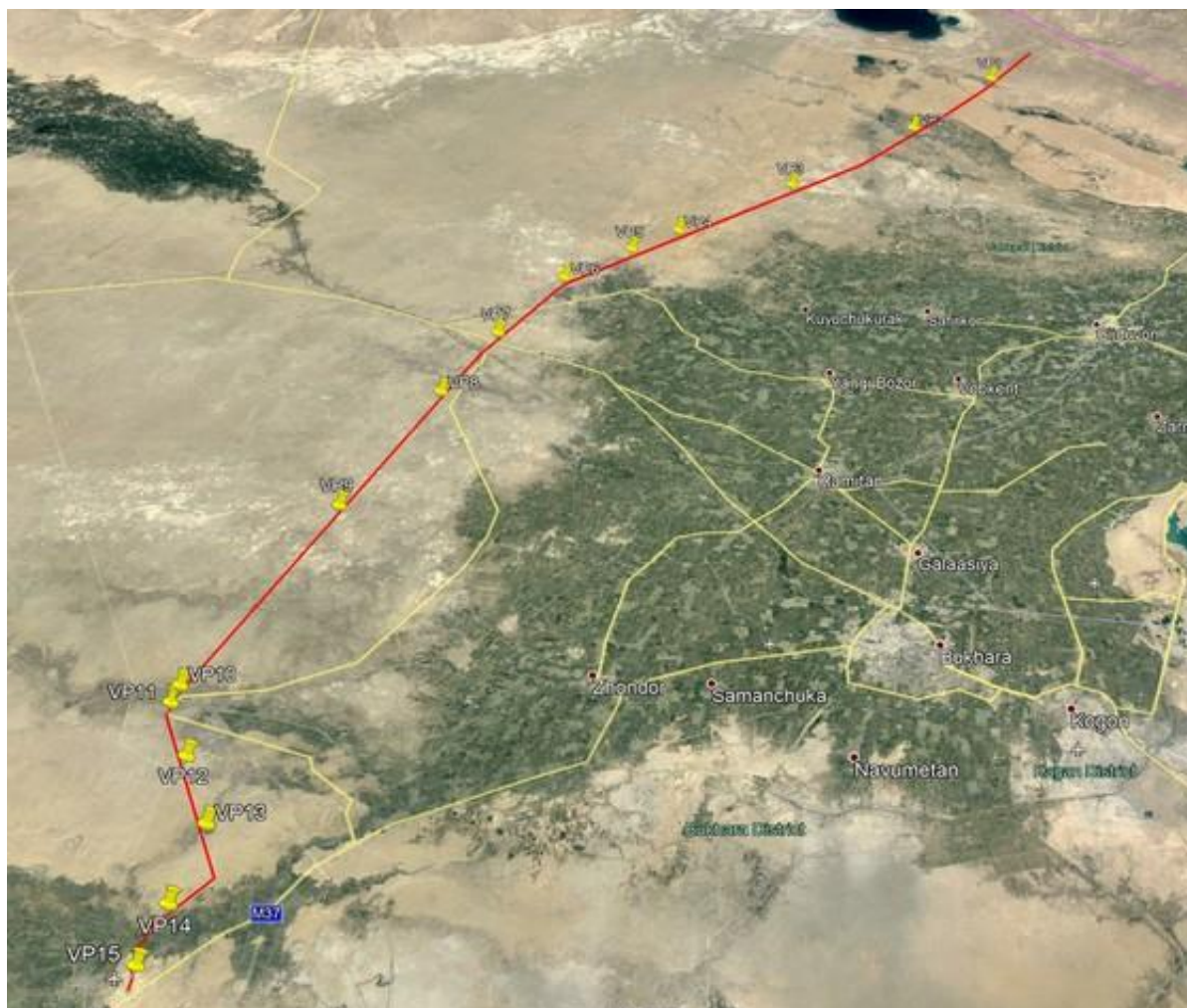
**Figure 16. The burrow of the Russian tortoise at the PL 6 point in Summer 2021**

In general, the reptiles' species composition is typical for this geographical area.



## Herpetological survey along planned Bash-Karakul OHTL

The field trip to the survey points in the area along planned Bash-Karakul OHTL was carried out from May 5 to 7, 2021. The transects passed through pre-selected survey points and their 1 kilometer radius (Figure 17).



**Figure 17 Survey points along planned Bash-Karakul OHTL**

As a result of the field trip, 8 species of reptiles were recorded on the project territory, of which 2 species – the Russian tortoise and Caspian Monitor, are rare and threatened species listed in the Red Book of the Republic of Uzbekistan (2019). The most of the encountered reptiles are typical psamobionts. It is worth noting that the main part of the project area passes through agricultural lands, and no potential habitats for the Southern Even-fingered Gecko were identified throughout the project area.

**Table 9 List of reptile species inhabiting the project area along planned Bash-Karakul OHTL**

№	Species	Species presence acc. to literary sources	Author's earlier personal data	May 2021 field expedition data	Endemism	Nature conservation status		
						UzRDB	UzRDB	UzRDB

Family Bufonidae (toads)								
1	Turan Toad <i>Bufo turanensis</i>	+	+		UZ, TJ, TM			
Family Testudinidae (tortoises)								
1	Russian tortoise <i>Testudo horsfieldii</i>	+	+	+		2 (VU)	VU	II
Family Gekkonidae (geckoes)								
2	Comb-toed Gecko <i>Crossobamon eversmanni</i>	+			UZ, TJ, TM, KZ, IR, AF			
3	Caspian Bent-Toed Gecko <i>Tenuidactylus caspius</i>	+	+				LC	
4	Turkestan thin-toed gecko <i>Tenuidactylus fedtschenkoi</i>	+	+		UZ, TJ, TM, KZ			
5	Common Wonder Gecko <i>Teratoscincus scincus</i>	+	+	+	UZ, TJ, TM, KG, IR, CN			
Family Agamidae (agamas)								
6	Steppe agama <i>Trapelus sanguinolentus</i>	+	+	+				
7	Sunwatcher toad-headed agama <i>Phrynocephalus helioscopus</i>	+						
8	Lichtenstein's Toadhead Agama <i>Phrynocephalus interscapularis</i>	+		+	UZ, TM, KZ			
9	Secret Toadhead Agama <i>Phrynocephalus mystaceus</i>	+						
Family Lacertidae (true lizards)								
10	Rapid Lizard <i>Eremias velox</i>	+	+	+				
11	Sand Racerunner <i>Eremias scripta</i>	+	+	+				
12	Reticulate Racerunner <i>Eremias grammica</i>			+				
Family Varanidae (monitor lizards)								
13	Caspian Monitor <i>Varanus griseus caspius</i>	+	+	+		2 (VU:D)		I
Family Boidae (Boas)								
14	Desert sand boa <i>Eryx miliaris</i>	+				3 (NT)		II
Family Colubridae (colubrid snakes)								
15	Sand racer <i>Psammophis lineolatus</i>	+	+					
16	Spotted whip snake <i>Hemorrhois ravergieri</i>	+	+					
17	Spotted desert racer <i>Platyceps karelinii</i>	+	+					
18	Diadem Snake <i>Spalerosophis diadema</i>	+	+					
Family Viperidae								
19	Saw-scaled Viper, Phoorsa <i>Echis multisquamatus</i>	+	+					

Notes: UzRDB– species/subspecies listed in the Red Data Book of Uzbekistan (2019) (CR – critically endangered; VU – vulnerable; NT – near-threatened); IUCN – species included in the Red List of the International Union for Conservation

of Nature (VU - vulnerable; NT – near-threatened); CITES I, II – species listed in the appendices (I, II) to the Convention on International Trade in Endangered Species of Wild Fauna and Flora; Endemism: AF - Afghanistan, KZ – Kazakhstan; TM – Turkmenistan; KG – Kyrgyzstan; TJ – Tajikistan; UZ – Uzbekistan.

According to processed information, the author's personal data and the field survey results, currently, the project area along planned Bash-Karakul OHTL is inhabited by 1 amphibian species and 19 reptile species belonging to 8 families (Table 9). The total number of amphibian species comprises 33,3% of the total diversity of the amphibian fauna of Uzbekistan, reptiles – 30,6%. Among them, 3 species are included in the Red Book of the Republic of Uzbekistan (2019) (15,8% of the total number of species inhabiting the project area), 1 species is included in the Red List of the International Union for Conservation of Nature (IUCN Red List) (5,2% of total number of species inhabiting the project area) and 3 species – in the Appendices to the Convention on International Trade in Endangered Species of Wild Fauna and Flora (15,8% of the total number of species inhabiting the project area).

**Table 10 Primary data and the density of reptiles at the survey points along planned Bash-Karakul OHTL in the spring of 2021**

№	Species	Number	Density in/ ha	Biotope	Route length	Date and time	Air temperature	Soil temperature	Humidity %
<b>VP 1</b>				Sandy desert/ Waterbody	1 km	05.05.21	C34,1°	C42,6°	25%
1	<i>Eremias grammica</i> Reticulate Racerunner	1	1						
<b>VP 2</b>				Saline land Alhagi, Harmala, Capparis, Salsola association	1 km	05.05.21	C34,4°	C42,4°	21%
1	<i>Trapelus sanguinolentus</i> Steppe agama	1	1						
2	<i>Eremias grammica</i> Reticulate Racerunner	2	4,9						
3	<i>Varanus griseus caspius</i> Desert Monitor	1	0,1						
<b>VP 3</b>				Fixed sands. Sheep cot.	1 km	05.05.21	C34,8°	C38,3°	19%
1	<i>Trapelus sanguinolentus</i> Steppe agama	4	4,6						
2	<i>Eremias grammica</i> Reticulate Racerunner	2	3,3						



3	<i>Eremias scripta</i> Sand Racerunner	2	6,2						
4	<i>Eremias velox</i> Rapid Racerunner	1	1						
5	<i>Varanus griseus caspius</i> Desert Monitor	1	0,7						
<b>VP 4</b>				Sandy desert. Sheep cot. Vegetation is sparse.	1 km	05.05.21	C33,7°	C37,8°	19%
1	<i>Testudo horsfieldii</i> Central Asian tortoise	2 traces	-						
2	<i>Teratoscincus scincus</i> Common Wonder Gecko	12	12						
3	<i>Phrynocephalus interscapularis</i> Lichtenstein's Toadhead Agama	10	20						
4	<i>Eremias velox</i> Rapid Racerunner	2	3,3						
5	<i>Varanus griseus caspius</i> Desert Monitor	1	0,1						
<b>VP 5</b>				Old quarry with water	1 km	06.05.21	C32,0°	C35,6°	26%
1	<i>Eremias velox</i> Rapid Racerunner	2	3,3						
<b>VP 6</b>				Agricultural zone	1 km	06.05.21	C28,7°	C36,5°	24%
1	<i>Eremias grammica</i> Reticulate Racerunner	2	3,3						
<b>VP 7</b>				Developed zone	1 km	06.05.21	C28,5°	C36,7°	23%
1	<i>Eremias velox</i> Rapid Racerunner	2	3,3						
<b>VP 8</b>				Sandy desert	1 km	06.05.21	C27,8°	C35,3°	22%
0									
<b>VP 9</b>				Sandy desert	1 km	06.05.21	C33,7°	C43,8°	21%
1	<i>Testudo horsfieldii</i> Central Asian tortoise	3 traces	-						
2	<i>Trapelus sanguinolentus</i> Steppe agama	1	1						
3	<i>Phrynocephalus interscapularis</i> Lichtenstein's Toadhead Agama	3	7,2						
4	<i>Eremias scripta</i> Sand Racerunner	1	1						

5	<i>Eremias velox</i> Rapid Racerunner	1	1						
<b>VP 10</b>				Sandy desert/ Waterbody	1 km	06.05.21	C33,4°	C38,5°	28%
0									
<b>VP 11</b>				Sandy desert. Saxaul association	1 km	07.05.21	C31,2°	C45,4°	19%
1	<i>Trapelus sanguinolentus</i> Steppe agama	2	3,3						
2	<i>Eremias grammica</i> Reticulate Racerunner	1	1						
3	<i>Eremias scripta</i> Sand Racerunner	2	4,9						
4	<i>Varanus griseus caspius</i> Desert Monitor	1	0,1						
<b>VP 12</b>				Sandy desert. Artemisia association.	1 km	07.05.21	C31,4°	C43,0°	22%
1	<i>Testudo horsfieldii</i> Central Asian tortoise	1	0,01						
2	<i>Trapelus sanguinolentus</i> Steppe agama	3	2,3						
3	<i>Teratoscincus scincus</i> Common Wonder Gecko	1 egg	-						
4	<i>Eremias scripta</i> Sand Racerunner	1	3,1						
<b>VP 13</b>				Sandy desert Saxaul. Alhagi, Salsola association	1 km	07.05.21	C31,5°	C45,7°	22%
1	<i>Trapelus sanguinolentus</i> Steppe agama	1	1						
2	<i>Eremias scripta</i> Sand Racerunner	2	3,3						
<b>VP 14</b>				Agricultural zone. In the fields of alfalfa and wheat Tamarix association	1 km	07.05.21	C23,7°	C29,1°	26%
1	<i>Trapelus sanguinolentus</i> Steppe agama	1	1						
2	<i>Eremias velox</i> Rapid Racerunner	1	1						
<b>VP 15</b>				Developed zone	1 km	07.05.21	C22,5°	C28,7°	24%
0									

## RARE SPECIES OF REPTILES INHABITING THE PROJECT TERRITORIES

### Family *TESTUDINIDAE*

#### Russian tortoise

#### *Testudo horsfieldii* (Gray, 1844)



Figure 18 Russian tortoise. Photo by T. V. Abduraupov.

The Russian tortoise is a vulnerable species endemic to Central Asia, whose numbers are decreasing. It is included in the IUCN Red List [VU] and the Red Book of the Republic of Uzbekistan 2(VU) (2019) and listed in Appendix II of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES).

This species is endemic to Central Asia, where it inhabits lowlands and foothills (except drifting sands). In addition to Southern Kazakhstan, Turkmenistan, Uzbekistan, Kyrgyzstan and Tajikistan, it is distributed in Northern and Eastern Iran, Afghanistan, North-western China and Northern Pakistan (Ananyeva et al., 1998; Bogdanov, 1960, 1965).

Carapace length is up to 286.4 mm. The carapace is flat, slightly serrated at the rear edge. The indentation on its front edge is not deep. Each of the front paws has four claws. The forearm is covered with six to seven transverse rows of tile-like mails. On the back of the thigh there are several horny tubercles concentrated in one group. The horny mails of the carapace are usually monochromatic, yellowish or brownish-olive, sometimes with wide black spots, more pronounced on the plastron.

It inhabits both sandy and clayey deserts, plains, mountain slopes, depressions and valleys, gorges and mountain steppe up to 1,150 m above sea level (Dal, 1936, 1937). Rarely lives on agricultural lands – on the edges of irrigated and unirrigated fields, in

vegetable gardens and orchards. Avoids places with dense grass cover, as well as areas grazed intensively by livestock.

This is a strictly diurnal species. In hot weather, it can be observed only in the morning and before sunset. In the middle of the day, animals hide from the heat in temporary shelters under shrubs, where they half burrow into the soil, into the holes of rodents or those dug by themselves. During the day, tortoises are capable of covering from 120 m to 2 km. At night they burrow into shallow pits, sometimes remaining on the surface of the ground.

After the winter diapause, tortoises appear on the surface in March—early April, in warm winters and in the south of the range – in February. Mating begins a few days after their emergence. The breeding season is extended from late March to late May. Newly emerged tortoises with a shell 30—50 mm long remain under the ground during the winter and usually appear on the surface next spring.

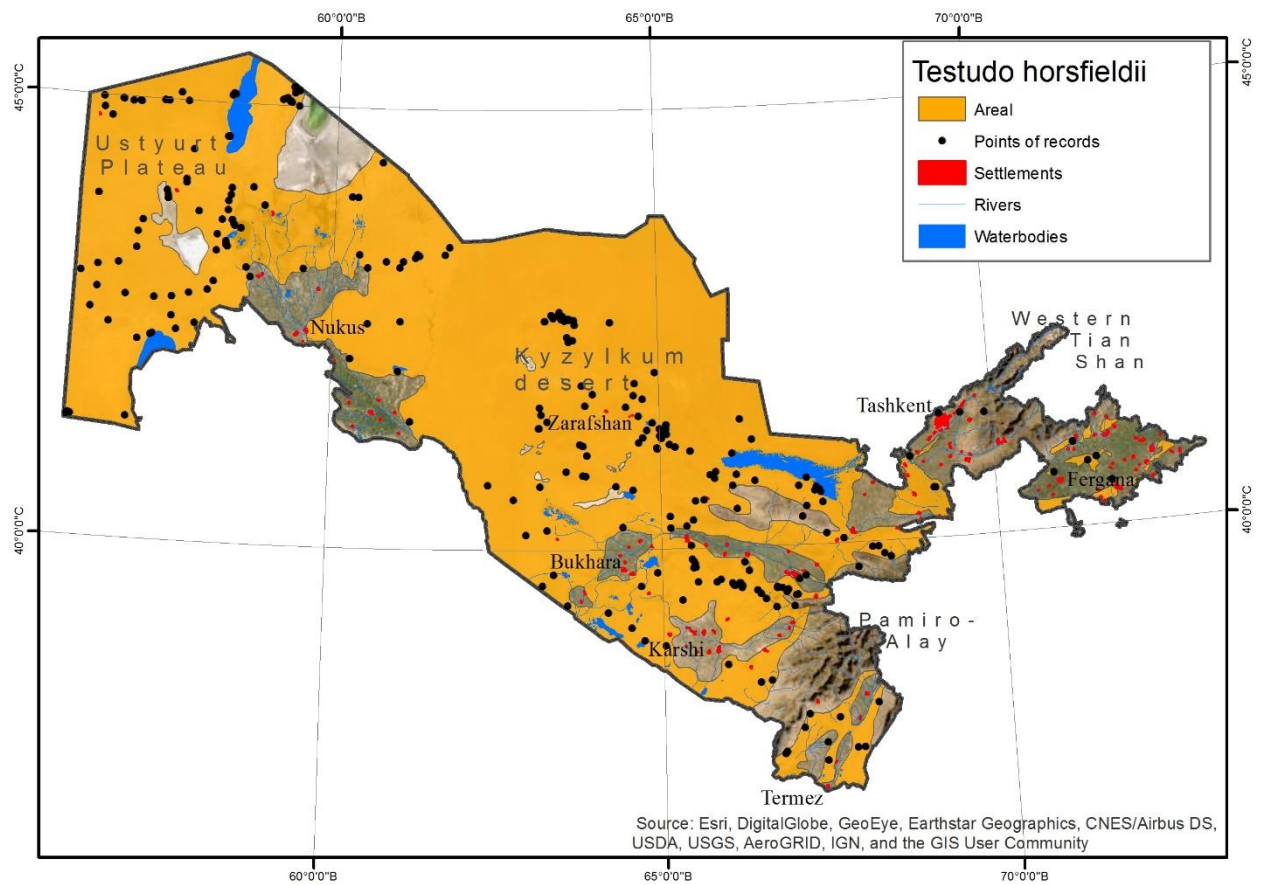
They grow slowly. Tortoises become mature at the age of 10—13 years, when their carapaces reach 11 cm in length. In natural environment, they can live for at least 30 years.

In June, when ephemeral vegetation dries, the Russian tortoise enters a period of estivation (summer dormancy), for which it digs holes up to 1 m long. In deserts tortoises disappear by the end of May, but in the mountains or on irrigated lands, single individuals may be recorded in June and even July. Much more often, estivation flows into hibernation (winter dormancy).

In certain areas in the southern piedmont plains of Tamdytau and the eastern piedmont plains of Dzhetymtau (Navoi region), the population density averaged 11.7 individuals/ha, with a maximum of up to 15.6 inds./ha; in the pebbly-gravelly-loamy piedmont plain – 12.31 inds./ha (avg.  $7.63 \pm 5.92$  inds./ha); in the rest of the area it was rare. In the rugged rocky areas of low mountains (Aitymtau Mountains) the tortoise occurs mainly along valleys. The highest population density of the species is 4.14 individuals/ha, which was recorded in a gently sloping valley with eroded loamy slopes (Bondarenko, 1994).

In the steppe between Tamdy and Ayakuduk – 29.2 inds./ha were recorded – 26.4♂: 50.5♀: 23.1 juv (Vashetko, Nuridjanov et al., 2010).

The number of tortoises is subject to significant fluctuations (Bogdanov, 1965), which depend on winter and spring meteorological conditions, as well as the abundance of food in biotopes where the animals live. The cultivation of virgin lands, livestock grazing and the use of natural habitats by humans significantly impact the population.



**Figure 19 Map of the areal and known locations of the Russian tortoise in various regions of the Republic of Uzbekistan**



## Family *GEKKONIDAE*

### Southern Even-fingered Gecko *Alsophylax laevis* Nikolsky, 1907



Figure 20 Southern Even-fingered Gecko. Photo by T. V. Abduraupov.

This is a vulnerable, declining, sporadically distributed endemic species. Listed in the IUCN Red List [CR] and in the Red Book of the Republic of Uzbekistan 2 (VU: D) (2019). Endemic to Uzbekistan and Turkmenistan.

Length of the body with the head: male – up to 31 mm, female – up to 33 mm (Figure 14). The head and body are slightly flattened from top to bottom. There are 16—20 scales across the forehead between the centers of the eyes. The upper side of the body is yellowish with a grey tint, with four indistinct, dark transverse, sometimes interrupting stripes on the back; similar stripes can be seen on the upper surface of the limbs and tail; in immature individuals the stripes are more contrasting. A wide dark longitudinal stripe extends from the tip of the muzzle across the eyes as far as the nape. There is a transverse stripe on the back of the head.

The Southern Even-fingered Gecko occurs on takyr with sparse vegetation, where completely barren and flat areas alternate with areas where short saltwort, clusters of wormwood and camel thorn and weak meadow grass plants grow.

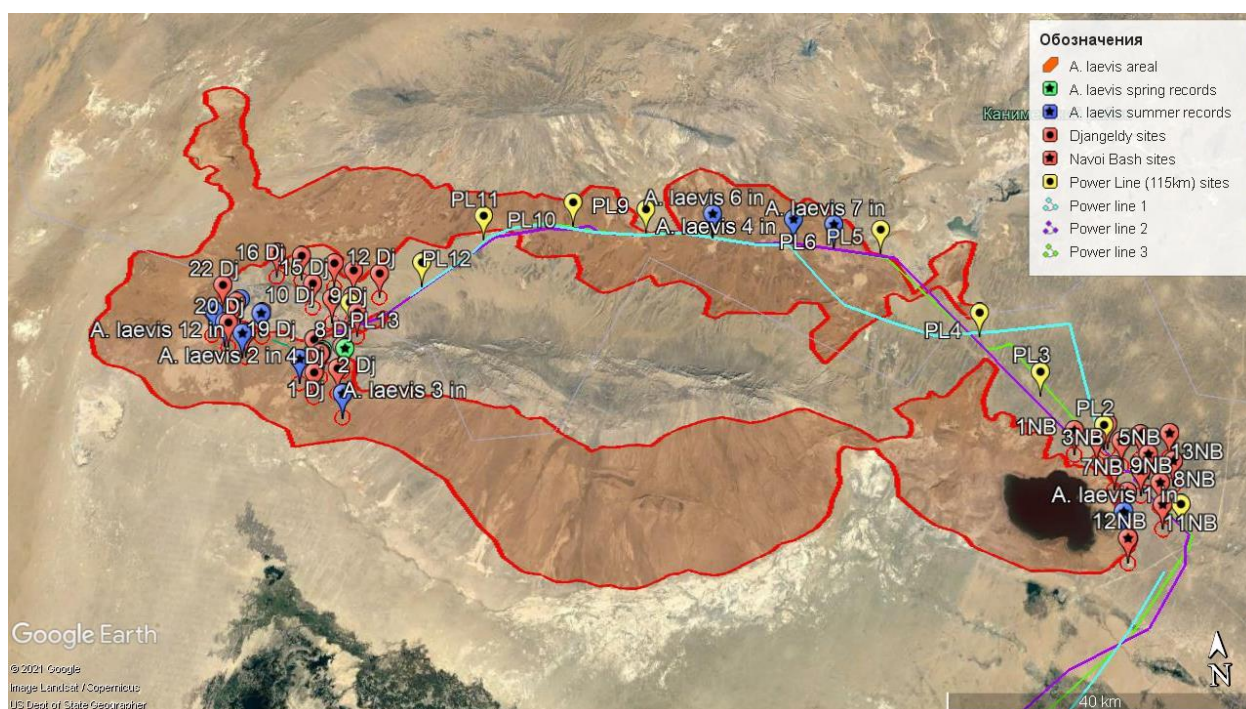
In the 1970s, there were from 0.3 (Ayakagytna depression) to 1,600 individuals (Kuldzhuktau sky island) recorded on 1 hectare in local populations; by now it has disappeared from many known habitats, while in others the number has sharply decreased (Bogdanov, 1992).

Southern Even-fingered Gecko is active from March to October at night, while during the day it hides in cracks in the ground, in its burrow or the hole of an insect or some other lizard. Mating takes place in March—April. In one season (from May to August) females produce 1–2 clutches each consisting of 1–2 eggs. The first young under 1 year of age

are observed from mid-July; they become mature after wintering. It feeds on small insects and arachnids.

O. P. Bogdanov (1992) recorded Southern Even-fingered Gecko in the central part of Kyzylkum, near the Kuldzhuktau residual mountains and along the escarpments of the Ayakagytna depression. We recorded this species in small numbers at the foot of the Lau-Lau elevation: during a 3-hour night transect we encountered only 2 individuals. We also found one individual near a railway, at the Moilisay station not far from Uchkuduk.

Quite numerous mosaic populations were observed by us near the settlements of Dzhankeldy and Kalaata in the southern foothill part of the Kuldzhuktau outlier. In this part of the range, the number of Southern Even-fingered Gecko reaches up to 12-16 ind/ha. Also, almost the same populations exist north-east of the Kuldzhuktau outlier, near the Karakata depression – 9-10 ind/ha. According to our data, the number of Southern Even-fingered Geckos on the slopes of the Ayak-Agitma depression is quite low – 1.3 ind/ha.



**Figure 21 Map of the areal and known locations of the Southern Even-fingered Gecko on the project territories**



## Family *VARANIDAE*

### Caspian Monitor

*Varanus griseus caspius* (Eichwald, 1831)



Figure 22 Caspian Monitor. Photo by T. V. Abduraupov.

Rare species. UzRDB (2019): 2 (VU:D).

The largest lizard in Uzbekistan and neighboring countries. The length of the body with the head is up to 520 mm. The upper side of the body is greyish-brown, yellowish-brown or reddish-brown, with numerous dark dots and specks. On the upper side of the neck there are two or three longitudinal brown stripes, and on the back and tail there are several transverse stripes of the same colour. In youngsters, the stripes are very pronounced, they are black or almost black.

After hibernation, the first individuals appear relatively late – in early to mid-April. Active all day throughout April. In May, they are active in the morning and evening hours. They go into hibernation in September-October. Often the Caspian Monitor has an estivation in summer, which gradually turns into winter hibernation. They begin estivating in late June—early July.

It inhabits mainly fixed and semi-fixed sands, clay and stony-gravelly soils, visits solonchaks. Sometimes it is found in the foothills of sky islands up to 1,000 m above sea level. M. Andrushko (1953) recorded the species in the central part of Kyzylkum. T. Z. Zakhidov (1938) reports that the Caspian Monitor often occurs in the northern part of the Kenimeh desert.

According to an oral report of the surveyor of the Houbara Bustard Breeding Center in the Bukhara region, Dr. John Burnside, Caspian Monitor is quite often found around the remnants of Kuldzhuktau, especially in the vicinity of the villages of Dzhankeldy and

Kalaata. We have also repeatedly observed it in the area of the Kuldzhuktau, Bukantau and Auminzatau residual mountains, as well as in the vicinity of Ayak-Agitma Lake in 2012, 2014 and 2019.

## Family *BOIDAE*

### Desert sand boa

*Eryx miliaris* (Pallas, 1773)



Figure 23 Desert sand boa. Photo by T. V. Abduraupov.

Desert sand boa is a near-threatened, sporadically distributed subspecies, included in the Red Data Book of the Republic of Uzbekistan (2019) with the status 3(NT); also included in Appendix II of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES).

A medium-size snake. Females reach 720 mm in length, males are somewhat smaller – 550-580 mm. Tail length – 50-70 mm. The tail is short and blunt.

It lives mainly in sand deserts, where it prefers drifting and semi-fixed dunes, as well as more or less loose soils in deserts and semi-deserts with wormwood-saltwort communities and saltwort populations. It is less common on takyr with patches of vegetation near sands and on relatively hard loess and clay soils, near ruins, on the slopes of gullies and at the borders of irrigated lands. Often occurs near colonies of Gerbils, whose burrows it uses to shelter. It is able to plunge into the sand quickly, head first, and "swim" under its surface, leaving a characteristic trail in the form of a serpentine bulge. The upward-looking eyes allow the Desert sand boa to examine the surface without raising its head above the sand.

Active from April to October. In the hot season, it leads a nocturnal and crepuscular lifestyle. It uses the holes of rodents as a refuge, therefore it often settles in colonies of Gerbils. The breeding season is in late March. In June-July, the female gives birth to 4—10 babies up to 12—14 cm long. It feeds on lizards, rodents and small birds.

M. N. Bogdanov (1882) encountered this species in the sands of the Kyzylkum desert. A. M. Andrushko (1953) recorded it in the central part of the desert, and T. Z. Zakhidov

(1938) – in the Kenimeh desert. Kh. S. Salikhbayev caught this snake in the Shafrikan forestry enterprise (leskhoz) near Barat-Kuduk (Bogdanov 1960).

In the 1950s, up to 20 individuals from the local population were recorded on a three-hour transect in Bukhara region (Shafrikan leskhoz).

In 2014 and 2016 our team recorded the Desert sand boa in the central part of the Kyzylkum desert, in the Yamankum sands, where it inhabits semi-fixed dunes. The average density of this species during the period of the highest activity in the Yamankum sands is 0.3–0.4 ind/ha. The average density of the Desert sand boa during the period of the highest activity in this area is 0.2-0.3 ind/ha. We have repeatedly observed it near the Ayak-Agitma depression and near the settlements of Kalaata and Dzhankeldy.

Currently, the population is rapidly decreasing due to increased poaching (the species is used in traditional medicine), high export and cultivation of lands.



## SUMMARY TABLES

**Table 11 List of reptile species found on the Dzankeldy WF project area**

	NAME OF SPECIES		IUCN /RDB STATUS	TOTAL NO. OBSERVED	
	LATIN	ENGLISH		SPRING	SUMMER
1	<i>Testudo horsfieldii</i>	Russian tortoise	VU/ 2 (VU)	17	-
2	<i>Alsophylax laevis</i>	Southern Even-fingered Gecko	CR/2(VU:D)	7	47
3	<i>Tenuidactylus caspius</i>	Caspian thin-toed gecko	LC/-	2	6
4	<i>Tenuidactylus fedtschenkoi</i>	Turkestan thin-toed gecko	LC/-	2	3
5	<i>Trapelus sanguinolentus</i>	Steppe Agama	-/-	18	3
6	<i>Phrynocephalus helioscopus</i>	Sunwatcher toad-headed agama	-/-	1	2
7	<i>Phrynocephalus reticulatus</i>	Reticulated toad-headed agama	LC/-	11	4
8	<i>Eremias intermedia</i>	Aralo-Caspian racerunner	LC/-	12	-
9	<i>Eremias lineolata</i>	Striped racerunner	LC/-	1	-
10	<i>Eremias velox</i>	Rapid racerunner	-/-	3	1
11	<i>Eryx miliaris</i>	Desert sand boa	-/3(NT)	1	
12	<i>Hemorrhois ravergieri</i>	Spotted whip snake	-/-	-	1

**Table 12 List of reptile species found on the Bash WF project area**

	NAME OF SPECIES		IUCN /RDB STATUS	TOTAL NO. OBSERVED	
	LATIN	ENGLISH		SPRING	SUMMER
1	<i>Testudo horsfieldii</i>	Russian tortoise	VU/ 2 (VU)	35	-
2	<i>Alsophylax laevis</i>	Southern Even-fingered Gecko	CR/2(VU:D)	-	1
3	<i>Trapelus sanguinolentus</i>	Steppe Agama	-/-	8	-
4	<i>Phrynocephalus helioscopus</i>	Sunwatcher toad-headed agama	-/-	2	-
5	<i>Eremias velox</i>	Rapid racerunner	-/-	14	-
6	<i>Varanus griseus</i>	Caspian Monitor	-/2(VU:D)	1	-
7	<i>Eryx miliaris</i>	Desert sand boa	-/3(NT)	1	-
8	<i>Psammophis lineolatus</i>	Sand racer	-/-	1	-

**Table 13 List of reptile species found on the project area along planned Dzhankeldy-Bash OHTL**

	NAME OF SPECIES		IUCN /RDB STATUS	TOTAL No. OBSERVED
	LATIN	ENGLISH		
1	<i>Testudo horsfieldii</i>	Russian tortoise	VU/ 2 (VU)	19 holes
2	<i>Alsophylax laevis</i>	Southern Even-fingered Gecko	CR/2(VU:D)	17
3	<i>Tenuidactylus caspius</i>	Caspian thin-toed gecko	LC/-	1
4	<i>Teratoscincus scincus</i>	Common Wonder Gecko	-/-	20
5	<i>Trapelus sanguinolentus</i>	Steppe Agama	-/-	22
6	<i>Eremias velox</i>	Rapid racerunner	-/-	5
7	<i>Varanus griseus</i>	Caspian Monitor	-/2(VU:D)	3

**Table 14 List of reptile species found on the project area along planned Bash-Karakul OHTL**

	NAME OF SPECIES		IUCN /RDB STATUS	TOTAL No. OBSERVED
	LATIN	ENGLISH		
1	<i>Testudo horsfieldii</i>	Russian tortoise	VU/ 2 (VU)	5 traces, 1 in.
2	<i>Teratoscincus scincus</i>	Common Wonder Gecko	-/-	12
3	<i>Trapelus sanguinolentus</i>	Steppe Agama	-/-	13
4	<i>Phrynocephalus interscapularis</i>	Lichtenstein's Toadhead Agama	-/-	13
5	<i>Eremias grammica</i>	Reticulate racerunner	LC/-	8
6	<i>Eremias scripta</i>	Sand racerunner	LC/-	6
7	<i>Eremias velox</i>	Rapid racerunner	-/-	9
8	<i>Varanus griseus</i>	Caspian Monitor	-/2(VU:D)	4

## CONSTRUCTION-RELATED THREATS

1. The development of natural habitats for many species of reptiles (including rare ones) may cause the population loss, especially populations of narrow-area endemics, such as Southern Even-fingered Gecko;
2. Animals (insects, amphibians, reptiles, birds, mammals) can get into the pit and trenches dug for the construction purposes, which can lead to their injury and death. These trenches are especially dangerous for the Russian tortoise;
3. Changing the existing relief will lead to partial loss of the habitats for animals inhabiting the project area;
4. If the construction work is begun in the winter season, part of the population of reptiles (including rare ones) being in hibernation in the ground may die;
5. Linear structures connected to the construction site will also pose threat to the life of most reptiles, especially Russian tortoise and Caspian Monitor.

## RECOMMENDATIONS

Safety and environmental protection must be priorities in any activity, for which it is necessary, after assessing potential threats, in this case to biodiversity, to make efforts to carry out activities aimed at minimizing potential damage. In this regard, we recommend the following actions:

1. Seasonality of work. The construction work must take into consideration the reptiles' activity features. That is, it is advisable that all construction work should be carried out at a time when all reptiles came out of hibernation (winter dormancy). In this period, reptiles do not have permanent burrows and can leave the construction site in advance. If the works begins in the hibernation period, underground wintering chambers can be damaged and then the reptile is doomed to death.
2. Construction works must be carried out strictly within the territory designated for the purpose.
3. All trenches must be levelled (filled with earth) after the termination of the construction; trenches should not be used as barriers to protect the territory, so that animals should not be captured there.
4. When the construction stage is over, it is necessary to monitor regularly populations of terrestrial animals in the existing research sites within the project territory.
5. The so-called 'closed zones' (protected with a fence) must be organized in the territory of the objects, where no activity should be allowed. This territory should be representative from the point of view of the biotope and the presence of a protected species. It would serve both a buffer zone of the object and, at the same time, a kind of protected area where animals can live undisturbed.
6. Creation/support of a reptile's nursery, with the function of rehabilitation and breeding of rare species, such as Southern Even-fingered Gecko and Russian tortoise. After the construction work, it is possible to resettle these animals back to



the reclaimed areas from the nursery. This nursery could help in preserving rare narrow-area endemic reptile species.

7. It is necessary to conduct large-scale work to study the current state of populations and the boundaries of the areal of the Southern Even-fingered Gecko throughout Uzbekistan.
8. The Russian tortoises must be removed from the construction site to nearby areas with similar biotopes. Moreover, after the removal, the construction site must be enclosed in a solid corrugated metal fence to prevent the tortoises' possible returning to the construction site.

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## Entomological survey

<b>Report Title</b>	<u>Entomological survey</u>
<b>Scope</b>	INVERTEBRATES
<b>Areas Covered</b>	DZHANKELDY WF / DZHANKELDY TO BASH OHTL
<b>Seasons Covered</b>	SPRING 2021 / SUMMER 2021
<b>Notes</b>	

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# Entomological survey

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**DZHANKELDY WIND FARM PROJECT:**

**CLIENT: 5 CAPITALS**

Date: June 2021

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## Introduction

Studies of the regional entomofauna were launched in the second half of the 19<sup>th</sup> century by researchers and travelers A. P. Fedchenko and O. A. Fedchenko, who made large collections of plants and insects in the Kyzylkum desert. Descriptions of a number of new species and information on the distribution of representatives of the Kyzylkum entomofauna can be found in A. P. Fedchenko's Trip to Turkestan series (1871—1873).

The studied area of Dzhankeldy WF is located in the south-west of the Kyzylkum desert, Bukhara Province.

In 1923-1931, the entomofauna of Bukhara Province was studied by V. V. Yakhontov.

In 1934-1937, entomologists V. N. Nevsky and A. A. Bekuzin from the Central Asian State University organised a zoological expedition to the Kanimeh steppe (south-eastern part of Kyzylkum). The data they collected was used by V. P. Nevsky to write his work Entomofauna of the Kanimeh Desert («Энтомофауна Кенимехской пустыни») (1953). The author described 250 insect species and their associations with specific biotopes and plants.

M. P. Sosnina (1958) and B. V. Korniyenko (1962, 1963, 1967, 1971) provide information on the insects of the Karnabchul clayey desert adjoining South-Western Kyzylkum. The deepest research was made by Yu. V. Sinadsky (1959, 1963, 1964, 1968), who studied insects damaging Central Asian desert forests, including those in Kyzylkum. His works summarise data on insects' species composition, ecology and biology.

In 1962-1963, a team of researchers from the Severtsov Institute of the Evolutionary Morphology and Ecology of Animals, Academy of Sciences of the USSR, headed by Academician M. S. Gilyarov, studied the zoology of soils in the Ayakguzhumdy area. The findings were published in articles by B. M. Mamayev (1966), F. N. Pravdin (1965), M. S. Gilyarov and B. M. Mamayev (1964, 1967).

In 1965-1966, a team of entomologists from the Institute of Zoology, Academy of Sciences of the USSR, worked in the Kyzylkum desert and gathered large amounts of data on various groups of insects. Since 1966, M. I. Falkovich was studying the ecology and economic significance of lepidopterans in the territory of the Kyzylkum desert station. He identified over 600 insect species, studied trophic links in about 250 and described a number of new species in the families Coleophoridae, Scythridae and Geometridae (1969, 1970, 1972). I. L. Sukhareva (1972) published materials on the owl moths of Kyzylkum.

The most comprehensive work covering the insect fauna of the region is Entomofauna of South-Western Kyzylkum (A. G. Davletshina et al. 1979). In 1962—1964 the authors made research into the part of the desert between the Shafirkan village and Jingildy in the west, the Mingbulak depression in the north and Tamdybulak in the east. The route ran along the sky islands of Kuljuktau, Auminzatau, the southern portion of Bukantau, Tamdytau, and the Mingbulak, Karakata and Ayakagitma depressions.

In 1974—1975, in the north and north-east of the western portion of the Kyzylkum desert the survey covered the villages of Ayakagytma and Jingildy, Karakata depression, the towns of Zeravshan and Tamdybulak, in the south – Alat District of Bukhara Province and the Karakul Reserve, which is the southernmost point of the South-Western Kyzylkum.

According to the authors, this territory was inhabited by 1,100 species from 16 genera and 108 families, 3 of which are included in the Red Data Book of Uzbekistan:



*Hypermnestra helios* Nickerl, 1846 (NT), *Satanas gigas* Eversmann, 1855 (VU: R), *Reduvius fedtschenkianus* Oshanin, 1871 (VU: R).

The collection of papers Insects as Components of the Saxaul Forest Biocoenosis (Mamayev et al., 1975) on insects' species composition, ecology and their biocoenotic relations with plants was a great contribution to the study of the entomofauna of desert forest biocoenoses. The work reveals insects' evolution and distribution patterns in man-planted saxaul woods.

G. M. Dlussky made big research into the ants of the desert in 1960—1970, which resulted in the monograph *Ants of the Desert* (Dlussky 1981).

The entomofauna of specific desert plants was studied in subsequent years – saxaul (Nurmuratov, 1971), *Calligonum* (Yelyubayev, 1974), sagebrush (Moiseyeva, 1965, Korniyenko, 1967), sand acacia (Soitova, 1974) and other.

In April 2014, May 2015 and September 2017, 3 joint Russian-Uzbek expeditions were organised as part of an international cooperation agreement between the Karshi and Nizhny Novgorod State Universities to inventory the entomofauna of certain regions of Uzbekistan. The results of the first expedition, including the itinerary with the coordinates of locations where the material was collected, were published in a special issue of the 'Эверсманния' (Eversmannia) magazine (Anufriyev, Rahimov, 2015 and other). The same issue contains an article describing 24 ant species (Mokrousov, Zryanin, 2015).

In 2017, A. G. Blummer described a new species in the Kyzylkum desert – *Uranembia rivkusi* Blummer.

However, in general, desert entomocoenoses are not studied properly. There are no comprehensive, generalising works on or full lists of Central Asian desert insects.

Based on the desktop study 11 insect species listed in the Red Data Book of Uzbekistan were identified as possible on the studied territory and adjacent areas.

### **Order – Heteroptera**

1. *Reduvius fedtschenkianus* Oshanin, 1871 (VU:R)

### **Order – Hymenoptera**

Family – Sphecidae

2. *Fedtschenkia indigotea* Radoszkowski, 1886 (EN)
3. *Chlorion regae* F.Smith, 1873 (VU:R)
4. *Prionyx macula lugens* Kohl, 1890 (VU:R)
5. *Prionyx nigropenctinatus* (Taschenberg, 1869) (VU:R)
6. *Eremochares mirabilis* (Gussakovskij, 1928) (VU:R)

Family – Crabronidae

7. *Larra transcaspica* F.morawitz, 1894 (VU:R)
8. *Laphyragogus kohlii* (Bingham, 1896) (VU:R)

### **Order – Lepidoptera**

Family – Noctuidae

9. *Catocala remissa* Staudinger, 1891 (VU:D)

Family – Papilionidae

10. *Hypermnestra helios* Nickerl, 1846 (NT)

**Order – Diptera**

Family – Asilidae

11. *Satanas gigas* Eversmann, 1855 (VU:R)

## **Methods and collection of material**

Transect and area surveys were used in this study. Transects were employed for noticeable and easily identifiable large-size species, such as mantis, various beetles, butterflies and dragonflies, as well as their nests (wasps, ants). Transects were 1 km long and 2 m wide. One of the varieties of transect – current recording method – was used in complex topographies. In this case, the 1-kilometre-long line was divided into two 500-metre or five 200-metre sections, depending on the terrain. As they moved along a transect, researchers recorded in their notebooks every insect that could be identified right on the spot. In addition, insects along the transects were caught using a net. All transects were recorded with the help of GPSs.

Since often it is impossible to identify reliably the species of an insect without examining it with a microscope or magnifying glass, the insects were caught with the help of special traps for identification.

After the expedition, the material that could not be identified in the field was identified at the entomology laboratory at the Institute of Zoology, Academy of Sciences of Uzbekistan, with the help of a binocular digital microscope.

## Physiographical characteristics of the survey areas

The studied area is located in the south-west of the Kyzylkum desert. The desert is a unique physiographical region spreading over the interfluvial area between the Amudarya and Syrdarya in Uzbekistan. In the north-west it is bordered by the Aralkum desert and Aral Sea, in the north-east by the Syrdarya river, in the east by the spurs of the Tien Shan and Pamir-Alai and in the south-west by the Amudarya.

The study area encompasses the low sky islands of Kuljuktau in the west and south and Ayakagytm depression as far as to the Bashagytm spring in the east. The territory is a flatland with fixed and semi-fixed sands and piedmont plains covered with gypsum deserts. Sand ridges and hillocks are fixed with vegetation. Depressions between the ridges are occupied by takyr.

Accumulative temperatures in the growing season are quite high in the area, while relative humidity in the daytime in July is never above 20%, usually ranging within 15-16%. About 45% of annual precipitation falls in spring.

Because of low precipitation, very dry air and high temperatures in summer, the soil dries up somewhat earlier than in more humid regions of Uzbekistan. Nevertheless, due to a lower wilting point, the drought on sandy and sandy-loamy soils affects vegetation less than in loamy and clayey areas.

## Vegetation

The vegetation in the studied area is highly diverse. One of the typical plants is the semi-shrub sagebrush *Artemisia*. Sagebrush associations occupy large areas of the gypsum desert on the piedmont plains of the Kuljuktau area. The sand cover is favourable for the distribution of bindweed, *Astragalus* and saltwort (*Salsola arbuscula*, *Salsola orientalis*) associations. Sandy areas feature *Aristida*, *Calligonum*, *Ammodendron*, *Haloxylon persicum*, *Carex physodes*, *Astragalus*, *Ephedra* and similar plants. *Tamarix*, *Haloxylon persicum* and *Salsola* associations develop on the bottoms of depressions near bodies of water (wells).

Intense overgrazing in the desert leads to strong changes in the numbers and composition of natural biocoenoses. *Peganum harmala* develops actively on heavily overgrazed areas.

## Results

The entomological survey was conducted from 15 to 17 April on the project territory of Dzhankeldy WF and from 7 to 9 May 2021 along OHTL from Dzhankeldy WF to Bash WF, by A. G. Akhmedov, a researcher from the Entomology laboratory at the Institute of Zoology, Academy of Sciences of the Republic of Uzbekistan.

**All the recorded insect species have the status of 'not listed'.**

22 locations were surveyed on the project territory of Dzhankeldy WF (Figure 1). The results of the survey are presented in the Table 1.

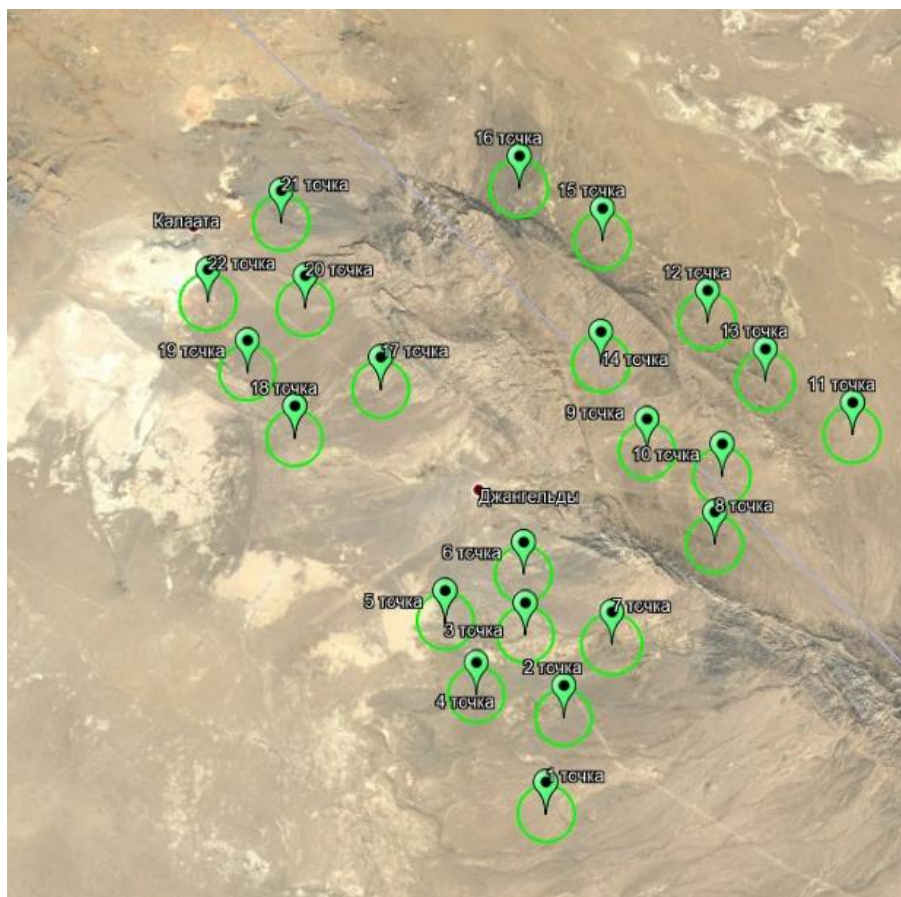


Figure 1 Studied locations on the project territory of Dzhankeldy WF

Table 1 Results of the entomological survey on the project territory of Dzhankeldy WF

No. of monitoring location	Coordinates	Biotope	Recorded species
Location 1	40°45'52.40"N63°24'31.57"E	Gravelly-clayey plain	Messor variabilis Lycosa sp. Sarcophaga sp. Neoplocaederus scapularis Plagiolepis pallescens Zophosis punctate Halictus sp. Scolopendra cingulate

<b>Location 2</b>	40°47'43.10"C 63°24'0.68"B	Gravelly-clayey plain	Lycosa sp. Adesmia sp. Anacanthotermes turkestanicus Halictus sp.
<b>Location 3</b>	40°48'54.02"C 63°22'17.99"B	Gravelly-clayey area	Halictus sp. Lucilia sp. Neoplocaederus scapularis Messor variabilis Messor aralocaspicus Lepisiota semenovi Cardiocondyla uljanini Plagiolepis pallescens
<b>Location 4</b>	40°47'28.69"C 63°21'44.07"B	Gravelly-clayey plain	Messor aralocaspicus Anacanthotermes turkestanicus Adesmia sp. Zophosis punctate Sarcophaga sp. Lucilia sp.
<b>Location 5</b>	40°48'31.22"C 63°20'17.88"B	Fixed sands	Orthochirus scrobiculosus Scolopendra cingulate Camponotus xerxes
<b>Location 6</b>	40°49'57.92"C 63°21'40.02"B	Gravelly-clayey plain	Plagiolepis pallescens Messor aralocaspicus Sarcophaga sp.
<b>Location 7</b>	40°49'22.81"C 63°24'25.27"B	Gravelly-clayey plain	Nighttime records Camponotus xerxes Hyles sp. Messor variabilis
<b>Location 8</b>	40°51'54.69"C 63°25'51.38"B	Gravelly-clayey elevations	Camponotus turkestanus Lycosa sp. Scolopendra cingulate Sarcophaga sp.
<b>Location 9</b>	40°53'3.51"C 63°23'21.60"B	Sand hillocks	Camponotus xerxes Halictus sp. Anthophora sp. Scolopendra cingulate
<b>Location 10</b>	40°53'10.19"C 63°25'22.01"B	Gravelly-clayey foothills	Camponotus fedchenkoi Messor variabilis Cardiocondyla uljanini Plagiolepis pallescens Lepisiota semenovi Tapinoma erraticum Scolopendra cingulate

<b>Location 11</b>	40°54'51.73"C 63°28'1.43"B	Gravelly-clayey plain	Tapinoma erraticum Messor aralocaspius Anacanthotermes turkestanicus
<b>Location 12</b>	40°55'46.84"C 63°23'31.75"B	Sandy-gravelly area	Adesmia sp. Plagiolepis pallescens Messor aralocaspius Messor variabilis Lucilia sp. Lycosa sp.
<b>Location 13</b>	40°55'10.10"C 63°25'27.33"B	Loamy plain	Messor aralocaspius Scolopendra cingulate
<b>Location 14</b>	40°54'15.72"C 63°21'25.97"B	Foothills	Sarathropus depressus
<b>Location 15</b>	40°56'27.38"C 63°20'15.91"B	Gravelly-clayey plain	Messor aralocaspius Cardiocondyla uljanini Plagiolepis pallescens Tapinoma erraticum Adesmia sp.
<b>Location 16</b>	40°56'46.42"C 63°17'48.08"B	Gravelly-clayey plain	Messor variabilis Lycosa sp. Neoplocaederus scapularis Adesmia sp.
<b>Location 17</b>	40°52'11.19"C 63°16'30.64"B	Gravelly-clayey plain	Bombus sp. Halictus sp. Anthophora sp. Messor aralocaspius Zophosis punctate
<b>Location 18</b>	40°50'41.05"C 63°14'58.05"B	Gravelly-clayey plain	Lycosa sp. Sarcophaga sp.
<b>Location 19</b>	40°51'29.85"C 63°13'12.74"B	Gravelly-clayey plain	Anacanthotermes turkestanicus Halictus sp. Plagiolepis pallescens Cataglyphis cinnamomeus Monomorium kusnezovi Camponotus turkestanicus
<b>Location 20</b>	40°53'4.35"C 63°13'56.35"B	Gravelly-clayey plain	Adesmia sp. Neoplocaederus scapularis Lycosa sp.



<b>Location 21</b>	40°54'24.07"C 63°12'32.17"B	Sandy-gravelly area	Sarcophaga sp. Lycosa sp. Messor variabilis Anacanthotermes turkestanicus-термит Adesmia sp. Scolopendra cingulate Halictus sp. Anthophora sp.
<b>Location 22</b>	40°52'27.53"C 63°11'35.24"B	Gravelly plain	Adesmia sp. Lucilia sp. Scolopendra cingulate Messor aralocaspius Tuponia pallida Adelungia sp.

11 locations were surveyed along planned OHTL from Dzhanekedy WF to Bash WF (Figure 2). The results of the survey are presented in the Table 2.

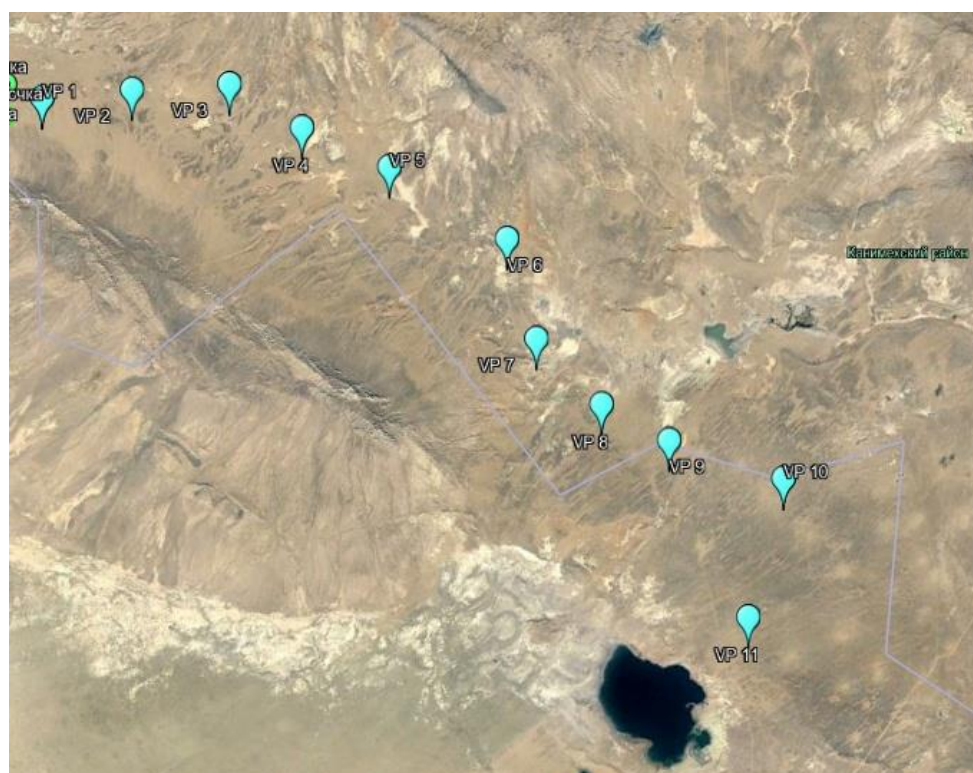


Figure 2 Studied locations along planned OHTL from Dzhanekedy WF to Bash WF

Table 2 Results of the entomological survey along the projected power line from Dzhanekedy WF to Bash WF

No. of monitoring location	Coordinates	Biotope	Recorded species
<b>Location 1</b>	40°54'59.18"C 63°31'7.06"B	Dunes, loose sands	Cataglyphis pallidula Sarcophaga sp.
<b>Location 2</b>	40°57'28.26"C 63°37'21.21"B	Fixed sands	Theone costipennis Lycosa sp. Nabis ferus Messor aralocaspius Cataglyphis oxiana

			<i>Cataglyphis cinnamomea</i> <i>Megamecus variegatus</i> <i>Anthaxia anatolica</i> <i>Anacanthotermes turkestanicus</i>
<b>Location 3</b>	40°59'56.75"C 63°44'13.51"B	Sands	<i>Cataglyphis pallidula</i> <i>Plagiolepis pallescens</i> <i>Messor variabilis</i> <i>Cucullia boryphora</i> <i>Tentyria</i> sp. <i>Halictus</i> sp. <i>Bembex</i> sp. <i>Theone costipennis</i> <i>Lycosa</i> sp. <i>Nabis ferus</i> <i>Anacanthotermes turkestanicus</i>
<b>Location 4</b>	40°59'11.95"C 63°50'44.76"B	Fixed sands	<i>Anthaxia anatolica</i> <i>Neoplocaederus scapularis</i> <i>Zophosis punctate</i> <i>Machozetus lehmanni</i>
<b>Location 5</b>	40°59'0.79"C 63°58'13.03"B	Fixed sands	<i>Lycosa</i> sp. <i>Sarcophaga</i> sp. <i>Anacanthotermes turkestanicus</i>
<b>Location 6</b>	40°57'41.99"C 64° 8'49.14"B	Fixed sands	<i>Chioneosoma Porosum</i> <i>Tricomymex</i> sp. <i>Cataglyphis oxiana</i> <i>Tetramorium schneideri</i> <i>Neuroleon</i> sp. <i>Lycosa</i> sp.
<b>Location 7</b>	40°52'53.95"C 64°13'51.22"B	Fixed sands	<i>Julodis variolaris</i> <i>Clytra</i> sp. <i>Messor variabilis</i> <i>Cataglyphis cinnamomea</i> <i>Lycosa</i> sp.
<b>Location 8</b>	40°50'45.36"C 64°20'28.15"B	Fixed sands	Bombyliidae (3 species) <i>Cataglyphis oxiana</i> <i>Anacanthotermes turkestanicus</i>
<b>Location 9</b>	40°50'16.41"C 64°26'23.39"B	Fixed sands	<i>Sarathropus depressus</i> <i>Anacanthotermes turkestanicus</i> <i>Lycosa</i> sp. <i>Menecleon</i> sp.
<b>Location 10</b>	40°50'40.94"C 64°35'45.76"B	Fixed sands	<i>Menecleon</i> sp. <i>Lycosa</i> sp. <i>Zophosis punctate</i>
<b>Location 11</b>	40°42'20.01"C	Sands	<i>Trichomyrmex</i> sp.

	64°37'13.16"B		Cataglyphis pallidula Anthaxia anatolica Neoplocaederus scapularis Lixus hirticollis Anacanthotermes turkestanicus Adesmia sp. Zophosis punctate
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## Conclusions and recommendations

The recorded entomofauna was typical for this area. The most common species in all biotopes were darkling beetles and ants, as well as *Anacanthotermes turkestanicus*. The highest insect diversity was recorded on flowering plants (Ferula, Astragalus, Ammodendron). There were numerous records of various dipterans and hymenopterans, which were impossible to identify in the field. One of the most interesting finds was a bumble-bee from the genus *Bombus*. Other common arthropods included tarantula and *Scolopendra cingulata*. In April, when nighttime temperatures were low and winds quite strong, the insect species diversity was low. No insects were caught by light traps. During the second survey in early May the weather was warmer and the species diversity at night was somewhat higher. Recorded insects included antlions, bugs and numerous unidentifiable small butterflies. At one location not included in the survey area, mass migration of Trichoptera was recorded when we were camping. It is also quite possible that various butterflies (Lepidoptera) migrate through the construction site. No species listed in the Red Book of Uzbekistan or IUCN Red List were found.

In general, we do not see any potential threat to the entomofauna on the construction site, but, nevertheless, we recommend that the construction work have as little impact on the site as possible.

Table 3 Summary table for Dzhanakeldy WF

	INVERTEBRATES	
	TAXONOMIC ORDER	NO. OF SPECIES
1	Hymenoptera	15
2	Coleoptera	3
3	Diptera	2
4	Blattodea	1
5	Hemiptera	2
6	Araeae	1
7	Scorpiones	1
8	Scolopendromorpha	1
9	Lepidoptera	1

Table 4 Summary table for Dzhanakeldy-Bash OHTL

	INVERTEBRATES	
	TAXONOMIC ORDER	NO. OF SPECIES
1	Hymenoptera	10
2	Coleoptera	13
3	Diptera	4
4	Blattodea	1
5	Hemiptera	1
6	Araeae	1
7	Scorpiones	1
8	Scolopendromorpha	1

9	Neuroptera	1
10	Trichoptera	1
11	Lepidoptera	1



## Appendix 1



*Orthochirus scrobiculosus*



*Coccinella septempunctata*



*Neoplocaederus scapularis*





*Crematogaster subdentata*



Lycosa sp.



At one of the survey locations



Bombyliidae (species 1)





Bombyliidae (species 2)



*Julodis variolaris*

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