

CHANGES IN THE MODERN RANGE OF THE GREAT BUSTARD *OTIS TARDA* IN UZBEKISTAN UNDER THE INFLUENCE OF AGRICULTURAL TRANSFORMATION OF LANDSCAPES AND CLIMATE

Roman D. Kashkarov^{1,2*}, Anna Ten^{1,2}, Yuliya O. Mitropolskaya¹, Valentin Soldatov¹

¹ Institute of zoology, Bogi-Shamol Str., 232 B, Tashkent, 100053, Republic of Uzbekistan

² Uzbekistan Society for the protection of birds, Bogi-Shamol Str., 232 B, Tashkent, 100053, Republic of Uzbekistan

*Corresponding author: roman.kashkarov@iba.uz

Received: May 16th, 2022 / Accepted: February 15th, 2023 / Published: March 31st, 2023

<https://DOI-10.24057/2071-9388-2022-091>

ABSTRACT. Previously, there was no special study of the Great Bustard (*Otis tarda*) in Uzbekistan. The first Bustard survey was conducted within the Winter Bustards Census Programme of the Eurasian Bustard Alliance in 2019. The discovery of a Great Bustards aggregation of 96 individuals in Jizzakh region showed that the wintering grounds are more stable than was expected before and that there is no information about the wintering grounds of this species in the country. The aim of this work was to find other wintering grounds, estimate the number of wintering Great Bustards and assess threats. The identification of potential wintering grounds was carried out using satellite images in Q-GIS 3.0 based on published records of the Great Bustard in the winter season. The field survey of the Great Bustard was carried out using two methods. The first one was based on car transects, which is suitable for natural habitats. The second method that we used on open rain-fed fields, was point count from higher locations. Both methods give the actual number of birds, and could not be used for extrapolation as this species' distribution is fragmented. In 2020-2021 we covered a considerable part of the foothill plains of the central part of Uzbekistan. As a result, two wintering grounds were identified in which about 500 Great Bustards were concentrated. The surveys also made it possible to identify the main threats, which are poaching and collision with power lines. The results highlighted wintering grounds which required conservation.

KEYWORDS: the Great Bustard, wintering grounds, rare species, conservation

CITATION: Kashkarov R. D., Ten A., Mitropolskaya Y. O., Soldatov V. (2023). Changes In The Modern Range Of The Great Bustard *Otis Tarda* In Uzbekistan Under The Influence Of Agricultural Transformation Of Landscapes And Climate. *Geography, Environment, Sustainability*, 1(16), 140-149

<https://DOI-10.24057/2071-9388-2022-091>

ACKNOWLEDGEMENTS: The study was conducted within the framework of the programme "Conservation of Wintering Great Bustard (VU) in Uzbekistan" by the Uzbekistan Society for the Protection of Birds (UzSPB), with the support of the Mark Constantine international conservation foundation and Eurasian Bustard Alliance (headed by Dr. Aimee Kessler).

We thank Timur Abduraupov from the Institute of Zoology and Jurabek Tulaev – a UzSPB member, for participating in the fieldwork. Special thanks to Abdurasul Khaydarov (local guide) for his active role in this survey and the worries of Great Bustards.

Conflict of interests: The authors reported no potential conflict of interest.

INTRODUCTION

The Great Bustard (*Otis tarda* Linnaeus 1758) is a rare species listed in the Red Data Book of Uzbekistan (Lanovenko and Filatova 2019) with status 1 (CR) – critically endangered, a migratory European subspecies. It is included in the IUCN Red List as vulnerable (VU) (BirdLife 2022). The first inclusion of the Bustard in the Red Data Book of the Uzbek SSR was in 1983 (Salikhbaev 1983), when it was listed as an extinct breeding and very rare passage and wintering bird. In the subsequent four editions of the Red Data Book of Uzbekistan in 2003, 2006, 2009, and 2019, the Great Bustard was assessed as critically endangered – a migratory European subspecies on the verge of complete extinction.

The global population of the Great Bustard is estimated to be between 44,000 and 57,000 individuals (Alonso and Palacín 2010; Alonso 2014). Most of it (57-70%) inhabits the Iberian Peninsula, and the second largest (15-25%) habitat in terms of population is the south-west of Russia. Here populations are declining in most of this species' range (Oparin et al. 2013; Oparina et al. 2022). Over the past fifty years, its numbers have declined sharply in the eastern half of the Great Bustard's range, where this species has completely disappeared from a number of regions (Kessler and Batbayar 2014; Kessler 2016).

Historically, Great Bustards in Kazakhstan and Tajikistan used to migrate southwards, to Uzbekistan, Turkmenistan, Afghanistan, and Pakistan for wintering (Bostanjoglo 1911; Gubin 2010). Prior to the development of Kazakhstan's

virgin lands, the Great Bustard was mainly a passage bird in Uzbekistan, with smaller numbers staying in the country for the winter and on very rare occasions – to breed in steppe areas (Meklenburtsev 1990). As the steppes in Jizzakh, Tashkent, and Syrdarya regions of Uzbekistan had been developed, the species completely stopped breeding there (Meklenburtsev 1990; Kreuzberg-Mukhina 2003). In the 1970s and 1980s, individual passage birds were recorded in Uzbekistan (Meklenburtsev 1990). That period, when the development of agriculture peaked in the USSR, proved to be the most critical for the Great Bustard (Kashkarov et al. 2022). R. Meklenburtsev (1990) associated the decrease in the numbers of the Great Bustard in wintering grounds in Uzbekistan with a sharp decline in the Great Bustard population in Kazakhstan and its disappearance from Tajikistan.

After the disintegration of the Soviet Union and changes in the land use system in Kazakhstan, when a large portion of developed steppe territories became neglected, the situation changed somewhat for the better (Berezovikov et al. 2002). Based on her personal records and interviews with hunters, rangers, and colleagues, E. Kreuzberg-Mukhina (2003) came to the conclusion that the numbers of migrating and wintering Great Bustards in Uzbekistan have increased slightly in recent decades. The modern data on the distribution of Great Bustards in Uzbekistan during migration and in winter are very scarce and comprise rare and occasional records or oral reports from hunters. These data were brought together in a paper on the specification of the Great Bustard's status in Uzbekistan completed by Kashkarov et al. (2022). These studies have shown that the area of land suitable for the habitation of the species has decreased more than 15 times. The current estimate of the number of wintering and migratory birds in Uzbekistan – up to 500 individuals in severe winters – is also very rough and inaccurate.

No special census of the Great Bustard has been made in the country in recent decades (Kreuzberg-Mukhina 2003; Kashkarov et al. 2022). Only in 2019, with the support of the Eurasian Bustard Alliance, probably, the first targeted survey of Great Bustards was conducted, which confirmed them wintering in the foothills of the Pistalitau Range area (Forish District, Jizzakh region) (Ten et al. 2020).

This article presents the results of the study of the Great Bustard's wintering grounds in 2020-2021 conducted within the framework of the programme 'Conservation of the wintering Great Bustard in Uzbekistan' by the Uzbekistan Society for the Protection of Birds (UzSPB).

MATERIALS AND METHODS

Identification of biotopes

The Great Bustard is the most typical species for open steppes. It breeds in the steppes and desert steppes of Eurasia, as well as in some parts of North Africa. Today, agricultural fields in some areas are the only available breeding habitats for Great Bustards (Kessler and Batbayar, 2014). These birds use active, fallow and abandoned grain fields, where they feed mainly on insects and non-cereal vegetation (Bravo et al. 2012). Wintering sites are similar to breeding biotopes. In winter, Great Bustards feed on stubble or alfalfa in agricultural fields (Lane et al. 2001).

Before starting surveys in winter 2019–2020, we made effort to identify potential wintering sites for Great Bustards. Based on the results of the study in January 2019 and on the analysis of the Great Bustard records from literature sources, we managed to identify the main biotopes preferred by the Great Bustard in winter: 1) clayey or gravelly foothills or piedmonts, mostly flat and gently rolling, covered mainly with sagebrush associations, more rarely without any shrub; 2) non-irrigated rain-fed lands planted with traditional winter wheat and other winter crops. Great Bustards do not visit irrigated lands, perhaps, because of various agricultural activities, including the soil washing of fields in winter.

Potential wintering biotopes were identified based on the study of literature data and comparison of satellite images in Google Pro, as well as by satellite images. The mapping was carried out in QGIS 3.0 and Google Pro.

Suitable sites were identified in Jizzakh region (Pistalitau, Gallaaral, Arnasay, Zaamin) and Samarkand region (near Kattakurgan and Juma); the survey also covered Karnabchul, located in the territories of Bukhara, Samarkand and Kashkadarya regions. Many of them were visited and inspected in 2020 and 2021. As a result, the aggregations of Great Bustards were recorded on a site near the villages of Yangikishlak (Forish district) and Gallaaral (Gallaaral district).

Survey methods

The Great Bustard is a rare species, which is hard to record due to its behaviour, extremely low numbers, and fragmented distribution. This is the reason why experts recommend to count its numbers in situ without extrapolation. The survey was carried out following the recommendations by Dr. Mimi Kessler (co-chief IUCN Bustard Specialist Group), it was most comprehensively standardized in Spain (Alonso et al. 1990) and is generally applicable across the range of the species. The field survey of



Fig. 1. The small group of Great Bustards flying from the rain-fed fields planted with winter wheat (Jizzakh region, Gallaaral district) Photo by V. Soldatov

the Great Bustard was carried out using two methods. The first one was line auto transects (Alonso et al. 1990). In this method, observers are driving through the survey area slowly (max. 30 km/h) following an established uninterrupted zigzag route with frequent stops (about once every 1 km, but this depends on the weather, terrain, density of birds, and vegetation structure). We used it for natural habitats, covered with bushes. The potential territory was combed using a 4x4 vehicle UAZ 2206, which stopped every 2-3 km, depending on the landscape and viewing range. The second method was point count from elevated spots. This method was suitable for survey on open rain-fed fields. Our experience of the Great Bustard survey in Jizzakh region has shown that in open rain-fed fields, where visibility is 3-5 km, it is possible to count birds from higher points (with a telescope) at a distance of 1-2 km. This approach helps to not disturb birds and minimizes the possibility of a double count. The survey method was chosen based on visibility condition in the survey area.

We used 60x magnification telescopes and 8-10x magnification binoculars. The Great Bustard surveys require observers who can detect the species and determine the age and sex of the observed birds. Routes and locations were recorded with the use of a mobile application for outdoor navigation.

It is recommended to identify the social and age composition of the group because these data allow to assess the structure of the population, but also to differentiate groups from each other to prevent the counting of the same groups. However, in 2019–2021, we observed the birds from an average distance of 800-1,000 m, which made it difficult to identify the sex and almost impossible to identify the age.

The studies took 9 days in January and February of 2020 (January 6-10, January 31-February 3), as well as 19 days in the winter of 2020-2021 (December 23-27, 2020, January 25-29, 2021, February 18-22, 2021). The total length of the transect over 28 field days was 3,350 km, (Fig. 2).

The data on population size presented in the article include the total number of individuals in all groups of Great Bustards recorded during one trip to a certain site (no more than 1 day). Based on the movements of these groups of birds, some groups were excluded from the count so that they could not be erroneously recorded for the second time. That was why in 2021 we preferred not to disturb groups and count from a considerable distance, which affected the identification of the social and age composition of groups. The surveys were carried out within a short period of time, and although they were not in fact a one-time survey, they can

probably be treated like this. It is also worth noting that in January and February 2021, with a difference of 1-2 days, the surveys were carried out in both Gallaaral and Forish Districts.

Weather during the survey was generally satisfactory, in winter, fog is the most common factor that impacts the efficiency of counting and is difficult to predict.

Interviewing local people

The local population was interviewed using standard methods of collecting information on rare species, including the demonstration of photographic materials for comparison with other similar species.

RESULTS

Wintering grounds

The search for wintering grounds confirmed the data by E. Kreuzberg-Mukhina (2003) about the Great Bustard wintering in the Aydar Lake area. In addition to the 2019 data (Ten et al. 2020), our studies in 2020 and 2021 showed that Great Bustards winter regularly in this part of Forish District. Further research revealed a wintering ground near the town of Gallaaral. These two sites were surveyed several times in 2020 and 2021 (Fig. 3). Also, based on interviews, potential wintering sites were identified in the Zaamin area in Jizzakh region, near the village of Jum (Samarkand region) and the village of Krasnogorsk (Tashkent region), but the data were not confirmed due to a lack of surveys. As a result, the most significant regular wintering sites for the Great Bustard in Uzbekistan were identified in Forish District (near Pistaltau) and in Gallaaral District (near the village of Gallaaral) (Fig. 3).

Population size

In winter 2019–2020, the number of Great Bustards on the site near Yangikishlak ranged from 11 to 28 individuals, while the population near Gallaaral consisted of 107 individuals. The total number of Great Bustards in Jizzakh region in winter 2019–2020 was estimated at 107. In winter 2020–2021, surveys revealed 3-42 wintering individuals in Forish District, and 42-455 individuals near Gallaaral. The total number of wintering Great Bustards was estimated at 455 individuals (Table 1).

Detailed information is presented in Table 2.

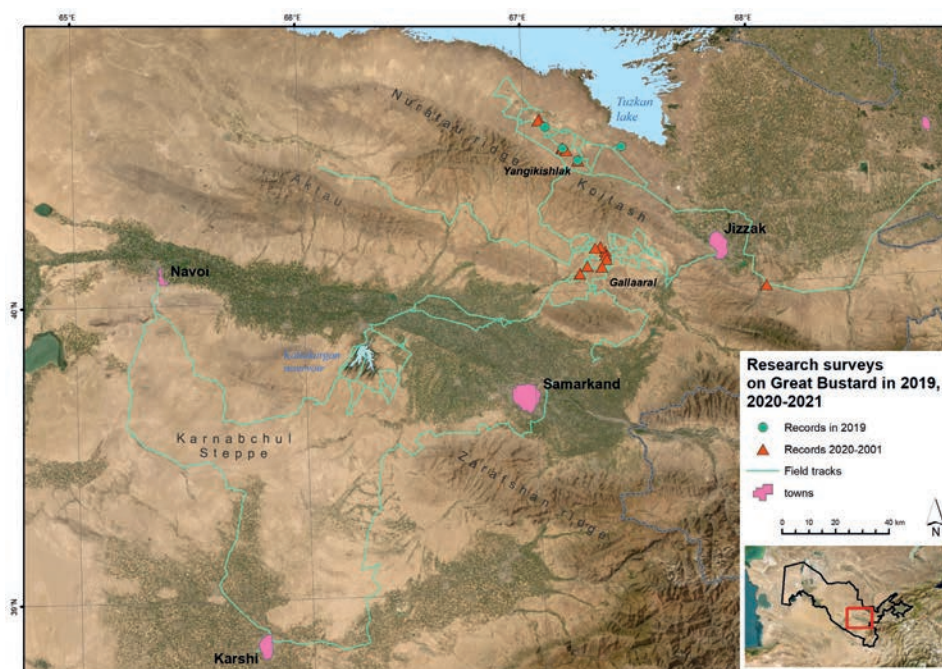


Fig. 2. Field survey of the Great Bustard in Jizzakh, Samarkand, Bukhara, Navoi, and Kashkadarya regions, 2020–2021

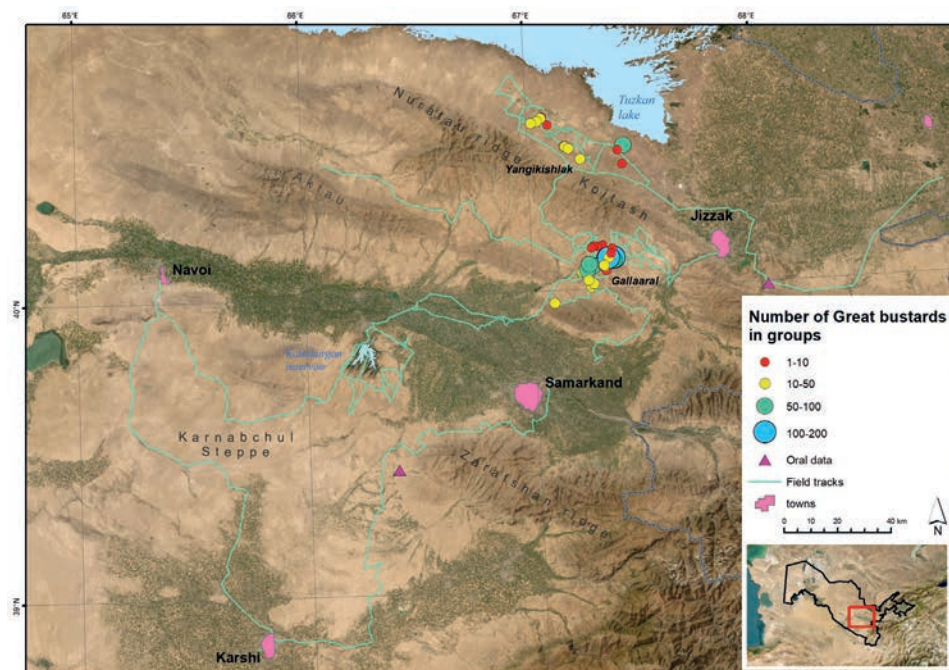


Fig. 3. Number of Great Bustards in flocks in winter 2020–2021

Table 1. Numbers of the Great Bustard on 2 wintering sites from 2019 to 2021

Year	Forish	Gallaaral	Total number
2019	105	No data	105
2019-2020	1-40	107	107
2020-2021	3-42	42-455	455

Table 2. Great Bustards records in 2019–2020

Date	Place	Natural habitats	Rain-fed fields	Total number
12.01.2019	Forish (Jizzakh region)	2	96	98
13.01.2019	Forish (Jizzakh region)	7	0	7
24.12.2019	Forish (Jizzakh region)	40	0	40
07.01.2020	Forish (Jizzakh region)	1	-	1
09.01.2020	Forish (Jizzakh region)	11	0	11
13.01.2020	Forish (Jizzakh region)	20	0	20
14.01.2020	Forish (Jizzakh region)	17	-	17
22.01.2020	Forish (Jizzakh region)	21	-	21
01.02.2020	Gallaaral (Jizzakh region)	-	30+77	107
03.02.2020	Malguzar (Jizzakh region)	0	0	oral data
15.02.2020	Forish (Jizzakh region)	28	-	28
14.11.2020	Bogaty (Tashkent region)	14 (oral data)		14
15.12.2020	Forish (Jizzakh region)	3	0	3
21.12.2020	Forish (Jizzakh region)	22	0	22
24.12.2020	Gallaaral (Jizzakh region)	-	20+30+1+1+3+6	61
25.12.2020	Gallaaral (Jizzakh region)	-	42	42
26.01.2021	Gallaaral (Jizzakh region)	-	4+6+161+105+72+7+80+20	455

28.01.2021	Gallaaral (Jizzakh region)	-	33+13+26+70+8+18+179+33+6+4	390
03.02.2021	Forish (Jizzakh region)	27+15	0	42
06.02.2021	Forish (Jizzakh region)	12+1+8	0	21
10.02.2021	Forish (Jizzakh region)	3+10	0	13
09.02.2021	Jam (Samarkand region)	-	0	oral data

The areas of the Great Bustard aggregations in the survey territory showed that these birds are more frequently found in rain-fed fields than in natural biotopes, which is associated with rich food resources (Fig. 1). Birds also used some slopes for rest (Fig. 4).

The survey showed that the first birds appear in December after a long period of cold weather in Kazakhstan, which confirms the reports of wintering in Kazakhstan (Shakula et al. 2016) and the assumptions of E. Kreuzberg-Mukhina (2003) that the arrival of Great Bustards in Uzbekistan is the result of winter short-distance migration. However, according to our data, this wintering is regular. Birds begin to move back to the north in early-mid-February. We also assume that the Gallaaral and Forish

sites are interconnected and represent a single wintering aggregation (Fig. 5), in which birds move depending on the level of disturbance (possibly hunting pressure), food resources, and weather conditions.

The boundaries of the “Forish” and “Gallaaral” wintering grounds were identified based on suitable habitat. The total area was estimated at 166,000 hectares (Fig. 4). The number of Great Bustards wintering in these sites was 107 birds in 2020 and 455 in 2021 (Table 1). This means, that the population of wintering Great Bustards in Uzbekistan could be close to the KBA criteria A1b – ≥1% of the global population size of a VU species (IUCN 2016), or 440-570 individuals according to Alonso and Palacín (2010).



Fig. 4. Great Bustards resting in Gallaaral
Photo by V. Soldatov

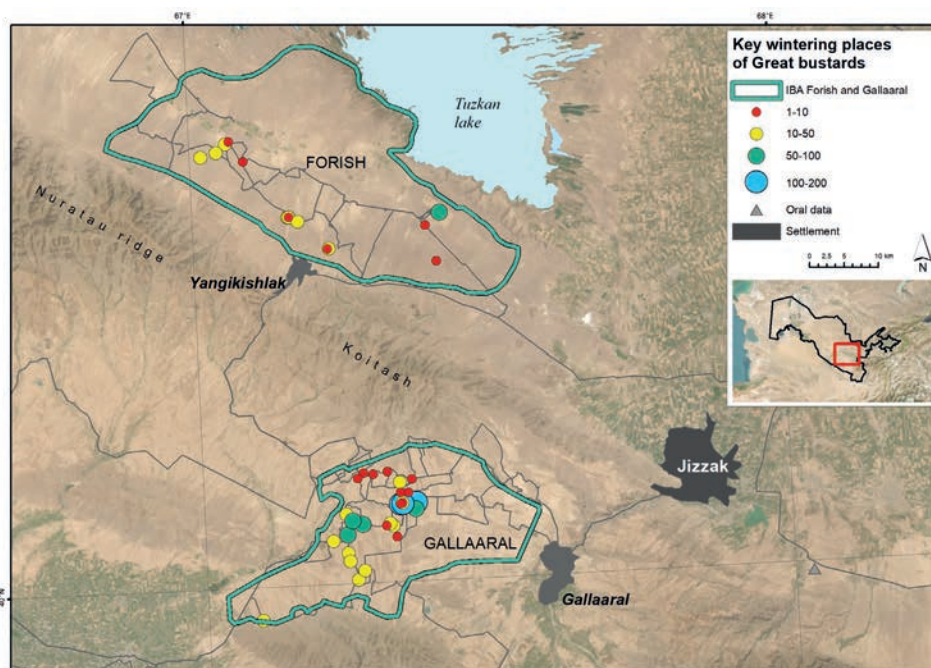


Fig. 5. Forish and Gallaaral – regular wintering sites for the Great Bustard

Work with the local community

The work conducted with the local community was key to identifying the wintering grounds of the Great Bustard. Local people, mainly shepherds, know all 3 Bustard species (Asian Houbara, Little Bustard, and Great Bustard). Local people - shepherds, hunters, farmers - were interviewed all across the survey sites. A total of 48 local residents were interviewed, 6 of them near the village of Yangikishlak, 3 in the Zaamin area, 16 near the village of Gallaaral, 6 near the village of Jush, 7 near the village of Jum, 5 near Kattakurgan and 5 in Karnabchul.

The interviewees were divided into groups:

- Shepherds who know the Great Bustard well and remember well when, where, and how many individuals they have seen – 11 people
- Shepherds who do not know the Great Bustard – 15 people. Only one knew the name.
- Farmers who know the Great Bustard (forestry workers) – 8 people.
- Farmers who do not know the Great Bustard – 1 person.
- Local residents who do not know the Great Bustard – 11 people.
- Hunters – 2 people. One of them knew the Great Bustard but attempted to mislead us, saying there were no Great Bustards in the Gallaaral area. The other said he used to hunt the Great Bustard.

The interview results suggest that shepherds are the most informed group of local residents familiar with Great Bustards. Moreover, they not only know the birds but also remember their numbers, where they stay and when. The age of shepherds also matters, so the best informed are middle-aged and old shepherds. Young shepherds do not see these birds, apparently, because of their small numbers.

In general, locals know that all Bustards are included in the Red Data Book and protected by the state. About 44% of respondents know and have seen the Great Bustard, the rest know Macqueen's Bustard or do not know about Bustards at all. Raising the awareness of local residents about threats to Bustards requires a careful approach, which should primarily include fostering a sense of pride in their native land. This species also rarely occurs near relatively large human settlements, in 2019 we recorded Great Bustards 3 km from the village of Yangikishlak

Threats

Threats in this article are presented in the format of the Great Bustard MOU – Action Plan 2018. Except for threats related to breeding, since the Great Bustard no longer breeds on the territory of Uzbekistan. The main reason for the disappearance of Great Bustards from their nesting grounds is the transformation of habitats caused by agricultural modification (Kashkarov et al. 2022).

Collision with power lines. One of the largest and heaviest birds with low maneuverability in flight, the Great Bustard is very prone to collisions with overhead power lines (Janss & Ferreer 2000; Raab et al. 2012). Collision mortality is recorded throughout the species' range and is expected to increase in Asia as infrastructure and industry develop (Kessler and Batbayar, 2014).

On 6 February 2021, Abdurasul Khaydarov recorded a Great Bustard that died from a collision with a power line during a survey in Forish District.

There are plans to develop power infrastructure at well-known wintering sites (UzAtom project, solar power station, and others). These projects involve the creation of power lines or long-term construction work, which will increase disturbance at wintering sites.

Hunting. Hunting for Great Bustards is prohibited almost throughout their entire range. However, over the past fifty years, uncontrolled illegal hunting has become the main reason for the reduction and even extinction of local populations of this slow-breeding species in the central and eastern parts of its range (Chan and Goroshko 1998; Heunks et al. 2001). Poaching, in either breeding or wintering grounds, is a grave threat to the survival of the Great Bustard population breeding in Turkey, Kazakhstan, south-eastern Russia, and Mongolia. The development of a network of paved roads in rural Asia has made it easier for urban hunters to reach rural areas (Kessler and Batbayar 2014; Kessler 2016). Some researchers note that the abolition of many anti-poaching departments and the atmosphere of lawlessness and chaos after the disintegration of the Soviet Union have contributed to the rise of illegal hunting (Berezovikov and Levinsky 2005; Khokhlov et al. 2010). Hunting in the Great Bustard wintering grounds in the south of Kazakhstan and Uzbekistan is a special problem as it is particularly common due to the proximity of these territories to capital cities. This poaching, apparently, caused a 30% reduction in the number of wintering Great Bustards in eastern Kazakhstan in 2012 (Berezovikov and Levinsky 2012) and the destruction of a wintering aggregation of at least 200 birds in Uzbekistan (Kreuzberg-Mukhina 2003).

The Great Bustard – is a state-protected, Critically Endangered, migratory European subspecies. According to Resolution No. 290 by the Cabinet of Ministers of the Republic of Uzbekistan, the fine for illegal hunting is 100 times the reference calculation value (27 million Uzbek soums or 2,480 USD).

Our survey did not record any death of a Great Bustard through hunting. Nevertheless, there is a lot of data confirming poaching, which is especially important for the key wintering sites we have identified. According to R. Meklenburtsev (1953), "during migration, Great Bustards fly



Fig. 6. Great Bustard that died as a result of collision with a power line
Photo by A. Khaydarov

at a height of 40 m above the ground; they are not capable of manoeuvring quickly and are thus extremely vulnerable. Great Bustards are sold at bazaars in Tashkent". Illegal hunting was mentioned as one of the gravest threats when Kh. Salikhibayev and M. Ostapenko (1964) wrote: "The numbers of wintering birds in the lower reaches of the Surkhandarya river have significantly decreased because hunters chase birds in cars". E. Kreuzberg-Mukhina (2003) confirms that poaching remains the main threat to the species in Uzbekistan. According to A.S. Nuridjanov, in the winter of 1999, about 200 Great Bustards appeared near Aydar Lake after cold weather had settled. Within a few days, almost all the birds were shot by poachers (Kreuzberg-Mukhina, 2003). In February 2015, after a heavy snowfall, 30-40 Great Bustards were spotted in the same area, and 6 of them were later killed by hunters (Asif Khan, oral report). Regular mass wintering of Great Bustards in the Zeravshan River valley is well known to local hunters (survey data, 2010). Besides purposeful poaching, some Great Bustards die because of the ignorance of local people. Local residents admitted that Great Bustards were shot by mistake instead of geese and pheasants in the Keles valley in 2008 and in the Karnabchul steppe in 2009 due to poor visibility (oral data by A. Ten).

Our research confirmed the high pressure from poachers. The first indicator was the distance, at which the birds left, scared. It was not smaller than 500 m. In our survey, we had to record Great Bustards at a distance of 800-1,000 m. The second one was the interviews with hunters. Hunters with a Niva car interviewed on 28 January 2021 in Gallaaral told they came to hunt Great Bustards. On 10 February 2021, a farmer told poachers shot a bird weighing 9 kg in 2020 (Gallaaral).

Interviews with local residents on poaching gave a mixed picture. We could not gain reliable information from a local hunter, since he said there were no Great Bustards in Gallaaral (we came across a group of birds 15 km from his village of Lalmikor) and that all hunters went to Aydar Lake (Forish District) for Great Bustards.

Habitat quality decrease. The use of agricultural machinery at inappropriate times and the intensification of agricultural production are the main threats to the quality of breeding habitats. For Great Bustards inhabiting natural

pastures, overgrazing reduces the quality of food and increases the risk of destroying nests.

This threat is significant in Uzbekistan, where crops on the Great Bustard's wintering grounds, including those in Gallaaral, are sown in winter. In February 2021, large-scale agrotechnical activities (ploughing and sowing) in Gallaaral led to a sharp decline in the Great Bustard population, while in Forish District it grew somewhat. Probably, the wintering aggregation, disturbed by tractors and larger numbers of people, moved to the Forish area.

Disturbance. Great Bustards are extremely cautious and sensitive to disturbance from humans, and run away when one approaches them to a distance of 500 to 1,500 m (Gewalt 1959). This is particularly so in areas where they are hunted by people. An inappropriate level of even harmless human activity may cause Great Bustards to leave a suitable habitat (Kessler and Batbayar 2014).

The birds that we encountered on the wintering grounds were extremely cautious and did not allow us to observe them from a smaller distance than 800-1,000 m. This behaviour confirms the high sensitivity of this species to various kinds of disturbances and should be taken into account in implementing further protection measures.

Climate change. Large and heavy, male Great Bustards are sensitive to high temperatures (Alonso et al. 2009). Climate modelling suggests that most of the Great Bustard's current range in Europe would become unusable by the late 21st century. Huntley et al. (2007) found that suitable habitats will move from Western Europe to some parts of Eastern Europe and Sweden, currently uninhabited by this species. It is unclear how this highly philopatric species will adapt to climate change (Kessler and Batbayar 2014).

It is likely that this threat may indirectly affect the state of food resources on rain-fed farmlands in Uzbekistan, which are one of the important wintering habitats (Fig. 7). The low precipitation in autumn often leaves land dry, which does not allow farmers to plough it and sow crops in the usual time and forces them to do it at the end of the cold season, when first warm days set in. It is possible that the active ploughing of fields in Gallaaral in February 2021 forced the birds out of this area. Our interviews in other regions showed that in some areas of Kashkadarya region, similar foothills are much less often used for agricultural purposes



**Fig. 7. A group of Great Bustards foraging in a wheat rain-fed field (Jizzakh region, Gallaaral district)
Photo by V. Soldatov**

because winter precipitation has decreased heavily. All this may lead, on the one hand, to a decrease in food resources, on the other hand, to a higher disturbance in the fields associated with agricultural activities in winter (December-February).

Threats associated primarily with migration and movements. The long flyways of the Asian subspecies, which include several stopovers and the crossing of international borders, as well as its nomadic behaviour on wintering grounds, expose them to special risk. Tagged females in a group of Asian Great Bustards died through all kinds of causes on their migration route and in wintering grounds (Kessler and Batbayar 2014). Most likely, Great Bustards that remain for the winter in Forish and Gallaaral breed in the central part of Kazakhstan. According to the study of wintering in the south of Kazakhstan, on the border with Uzbekistan (Shakula et al. 2016), the birds most likely migrate to the south as unfavourable conditions, such as lack of food resources and unsuitable weather, develop in the region. Wintering in Uzbekistan, they also face various threats. Increased agricultural activities in Gallaaral in February 2021 made the birds abandon their wintering grounds in that region. It is not clear where the birds have moved to. The population in Forish has increased slightly, but it is likely that the birds migrated not only to Forish, but also to other less favourable areas.

National and international use. In the past, international trade in the Great Bustard feathers led to the inclusion of this species in Appendix II and then in Appendix I of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). This trade has largely been overcome. Great Bustard hunting is prohibited in Uzbekistan.

DISCUSSION

The legal protection of the Great Bustard in Uzbekistan is at the highest national and international levels. In addition, the species is protected by international conventions ratified in Uzbekistan. The Great Bustard is included in Appendix II to the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). It is also listed in Appendix I to the Convention on the Conservation of Migratory Species of Wild Animals (CMS): within the framework of this convention, according to the Action Plan for the Central Asian Flyway, migratory birds must be protected throughout their year-round range in Central Asia. In addition, the Great Bustard is included in Appendix I of the European Commission Birds Directive. Importantly, this list also provides a mechanism to share knowledge about advanced methods of protecting Great Bustards (for example, methods to equip power lines with bird-protective devices, and development of cooperation agreements with farmers) through EU projects with non-EU range states (Kessler and Batbayar, 2014). This means that Uzbekistan should take into account the significance of the species for the territories in which EU-supported projects will be implemented, including those funded by the European Bank for Reconstruction and Development (EBRD). According to Kreuzberg-Mukhina (2003), nowadays, effective protection of the Bustard populations, including those of the Great Bustard, is possible through the development of multilateral treaties and agreements under the CMS and CITES, as well as through the development of a special action plan that would enhance the legal protection of the species and creation of strictly protected natural areas to ensure the protection of species within their ranges.

Observations made in recent years arouse hope that the Great Bustard will not disappear from Central Asia. However, the recorded population growth is insignificant, rapid changes are taking place in the region and the species remains very vulnerable. In order to conserve its population, it is necessary to immediately improve the situation with poaching and low reproduction (Kessler 2016). Habitat protection should be formalized and strengthened with more steps to combat poaching and reduce disturbance.

To prepare an Action Plan for the conservation of the Great Bustard in Uzbekistan, it is important to obtain a full picture of the ecology of the species in winter, including its distribution, abundance, mortality, threats, migration routes, wintering grounds, and other information. This requires various kinds of studies, including sociological ones, since winter grounds are located in close proximity to human settlements. Therefore, the preparation of the plan remains a long-term activity. Since wintering sites are currently under threat, urgent measures must include an immediate action plan to conserve Great Bustards, which should include priority steps to protect already known wintering sites and reduce known threats – combating poaching, supplying power lines with bird protection devices, informing energy infrastructure development projects and so on.

One of the main goals of such a plan we think is creating natural protected areas on the key wintering sites – Forish and Gallaaral with a regime prohibiting hunting in the winter period. As the area is mainly used by farmers, the optimal category for this area is an ornithological 'zakaznik' – IV category of the IUCN protected areas – with enhanced protection and prevention of any disturbance during the winter period.

The second is reducing the risks of collision with power lines on key sites and flyways. The main areas of Great Bustards' movements (between roosting and foraging sites, short-distance flyways) should be identified, and the sections of power lines that have already caused deaths should be spotted. Power lines should be equipped with bird-protective equipment or, ideally, diverted from sensitive areas to reduce mortality (Raab et al. 2012). The potential danger of constructing power lines should be taken into account when large-scale industrial projects are implemented in the Great Bustard habitats. This action seems to us to be quite realistic. Several experienced experts, including the authors of this article, have in recent years carried out environmental impact assessments for large power plant and transmission line projects. Recommendations have already been made to reduce the risks for the Great Bustard.

Information campaigns should also contribute to developing in people a sense of pride in the preservation of this species. Taking into account that some hunters come from urban settlements, such campaigns should be implemented not only at the local, but also at the national level (Kessler 2016).

One of the possible long-term steps is to develop a Great Bustard - friendly farming system, e.g. protecting some areas with natural food from ploughing and reducing disturbance by farmers in places where Great Bustards aggregate.

CONCLUSION

Surveys in Jizzakh, Samarkand, Kashkadarya, and, partially, Bukhara regions show that key wintering sites for the Great Bustard species are located in Forish and Gallaaral

Districts of Jizzakh region. In these sites we recorded 455 individuals in winter 2020-2021 (Fig.3, Fig.5). This number is close to the KBA criteria A1b – $\geq 1\%$ of the global population size of a VU species (IUCN 2016), as the total global number is estimated at 44,000-57,000 individuals (Alonso and Palacín 2010).

48 local residents were interviewed and shepherds were identified as a key group as they are the most aware of the distribution of these birds. Hunters are aware of the status of the Great Bustard and purposefully hunt this species on its wintering grounds in Forish and Gallaaral Districts of Jizzakh region. Constant structural changes taking place in the State Committee for Ecology of the Republic of Uzbekistan lead to a weakening of the protection, which is carried out by state inspectors.

We found all signs of poaching (from interviews with hunters and local people, literature data, and Bustard behaviour), and found a bird dead due to the collision with a power line. There are also other non-direct threats, such as climate change, which is already negatively affecting traditional farming in the southern regions of Uzbekistan, in recent years farmers have been unable to sow due to the low precipitation in the winter period. And in 2021, for the same reason, farmers started to plow in February while traditionally they do this in late November - December.

The results of this study show the need to conserve the Great Bustard wintering grounds (Forish and Gallaaral) through the creation of a protected area. ■

REFERENCES

- Alonso J.C. and Palacín C.A. (2010). The world status and population trends of the great Bustard (*Otis tarda*). *Chinese Birds*, 1, 141-147.
- Alonso J.A., Alonso J.C., Hellmich J. (1990). Metodología propuesta para los censos de avutardas. In: Alonso, J.C., Alonso, J.A. eds., *Parámetros demográficos, selección de hábitat y distribución de la Avutarda en tres regiones españolas*, 1st ed. Madrid: Icona, 86-98
- Alonso J. C., Palacín, C. A., Alonso, J. A. and Martín, C. A. (2009). Post-breeding migration in male Great Bustards: low tolerance of the heaviest Palaearctic bird to summer heat. *Behav. Ecol. Sociobiol.*, 63, 1705-1715.
- Alonso J.C. (2014). The Great Bustard: past, present and future of a globally threatened species. *Ornis Hungarica* 22(2), 1-13.
- Beresovikov N.N., Anisimov E.I., Levinskiy Yu.P., Zinchenko Yu.K., Kovalenko A.V., Gavrillov E.I., Gavrillov A.E., Belyalov O.V., Gubin B.M., Levin A.C., Karpov F.F. (2002). Great Bustard. *Kazakhstan ornithological bulletin*, 1, 74-77 (in Russian).
- Berezovikov N.N., Levinskii Y.P. (2005). Overwintering of Great Bustards in the Alakol' Basin in 2004–2005, *Russian Ornithological Journal*, 289, 489-491 (in Russian).
- Berezovikov N.N., Levinskii Y.P. (2012). Overwintering of the Great Bustard in the Alakol' depression form 2011–2012, *Russian Ornithological Journal* №758, 1153–1155 (in Russian)
- BirdLife International (2022). Available at: <http://datazone.birdlife.org/species/factsheet/great-Bustard-otis-tarda/text>.
- Bostanzhoglo V.N. (1911). Ornithological fauna of the Aral-Caspian steppes. Moscow, Russia (in Russian).
- Bravo C., Ponce C., Palacín C.A., Alonso J.C. (2012). Diet of young Great Bustards *Otis tarda* in Spain: sexual and seasonal differences. *Bird Study*, 59(2), 243-251.
- Chan S., Goroshko O.A. (1998). Action plan for conservation of the Great Bustard. BirdLife International, Tokyo, Japan.
- Gewalt W. (1959). Die Großstrappe (Great Bustard). Die neue Brehm-Bücherei. Wittenberg Lutherstadt, Germany.
- Gubin B.M. (1996). Great Bustard. In: A. Kovshar, ed., *Red Book of Kazakhstan*, 3rd ed. Almaty: Konjyk, 168-169 (in Russian)
- Heunks C., Heunks E., Eken G., Kurt B. (2001). Distribution and current status of Great Bustard *Otis tarda* in the Konya Basin, central Turkey. *Sandgrouse* 23, 106-111.
- Huntley B., Green R.E., Collingham Y.C., Willis S.G. (2007). A climatic atlas of European breeding birds. Barcelona: Durham University, the RSPB and Lynx Edicions.
- IUCN (2016). A Global Standard for the Identification of Key Biodiversity Areas, Version 1.0. 1 ed. Gland, Switzerland: IUCN
- Janss G.F.E. and Ferrer M. (2000). Common crane and great Bustard collision with power lines: collision rate and risk exposure. *Wildlife Society Bulletin*, 28(3), 675-680.
- Kashkaro R.D., Mitropolskaya Yu.O., Ten A.G. (2022). The historic and current status of the Great Bustard *Otis tarda* in Uzbekistan and prospects for its conservation. *Sandgrouse*, 44(1), 26-34
- Kessler M. (2016). Modern status of Great Bustard in Central Asia and steps for conservation. *Steppe Bulletin*, 46, 61-69. (in Russian)
- Kessler M., Batbayar N. (2014). Proposal to list the global population of Great Bustard on Appendix I, submitted by the Government of Mongolia to the Convention on Migratory Species in 2014. UNEP/CMS/ScC18/Doc.7.2.4: Proposal 1
- Khokhlov A.N., Il'yukh M.P., Shevtsov A.S., Khokhlov N.A. (2010). On the significant decreases in migratory and wintering Great Bustards in Stavropol Krai. *Ornithology in Northern Eurasia. Materials of the 13th International Ornithological Congress of Northern Eurasia*. Orenburg, 319 (in Russian)
- Kreuzberg-Mukhina E.A. (2003). The current status of Bustard species in Uzbekistan. *Bustards of Russia and adjacent countries*, 2. Saratov, 64-75 (in Russian)
- Lane S.J., Alonso J.C., Martín C.A. (2001). Habitat preferences of Great Bustard *Otis tarda* flocks in the arable steppes of central Spain: are potentially suitable areas unoccupied? *J. Appl. Ecol.*, 38, 193-203
- Lanovenko E.N., Filatova E.A. (2019). Great Bustard. In: *The Red Data Book of the Republic of Uzbekistan. Vol. II. Animals*. Tashkent, Uzbekistan: Chinor ENK publishing house. (in Russian with English summary)
- Meklenburtsev R.N. (1953). *Fauna of the Uzbek SSR. Vol 2: Birds, Part 1*. Tashkent, Uzbek SSR: FAN publishing house. (in Russian)
- Meklenburtsev R.N. (1990). Order Gruiformes. In: N. Matchanov, A. Sagitov, ed., *Birds of Uzbekistan*, 2. Tashkent, Uzbek SSR: FAN publishing house, 7-10 (in Russian)
- Oparin M.L., Oparina O.S., Kondratenkov I.A., Mamaev A.B., Piskunov V.V. (2013). Factors causing long-term dynamics in the abundance of the Trans-Volga Great Bustard (*Otis tarda* L.) population. *Biol. Bull.*, 40, 843-853 (in Russian).
- Oparina O.S., Oparin M.L., Kudryavtsev A.Yu., Oparina A.M. (2022). Characteristics of the Great Bustard (*Otis tarda*) (*Otididae*, *Aves*) habitats in the Trans-Volga region according to food availability during the chick rearing period. *Povolzhskiy Journal of Ecology*, (1), 34-54 (in Russian)
- Raab R., Schütz C., Spakovszky P., Julius E., Schulze C.H. (2012). Underground cabling and marking of power lines: conservation measures rapidly reduced mortality of West-Pannonian Great Bustards *Otis tarda*. *Bird Conservation International*, 22, 299-306, DOI: 10.1017/S0959270911000463.
- Salikhbaev H.S. (1983). Great Bustard. In: *Red Data Book of Uzbek SSR. Rare and endangered species of animals and plants. Vol. I. Vertebrates*. Sadykov A. S. ed. Tashkent, Uzbek SSR: FAN publishing house (in Russian)

Salikhbaev H.S., Ostapenko M.M. (1964). Birds. In: Ecology and economic value of vertebrate animals of Southern Uzbekistan (Surkhandarya Basin). Bogdanov O. P. ed. Tashkent, Uzbek SSR: FAN publishing house (in Russian)

Shakula G., Baskakova S., Shakula D., Shakula S. (2016). Great Bustard (*Otis tarda*) on the southern Kazakhstan. Ornithol. conf. « Birds and agriculture: current state, problems and prospects for study». Moscow, 313-318. (in Russian)

Ten A.G., Tulayev J.A., Soldatov V.A., Khaydarov A. (2020). Wintering grounds of Great Bustard *Otis tarda* in the Jizzakh region and threats. Zoological science of Uzbekistan: modern problems and development prospects. Materials of II national science conf., 281-283. Tashkent, Uzbekistan: FAN publishing house (in Russian with English summary).