Решающая роль Южного Казахстана в сохранении дрофы *Otis tarda tarda* в Центральной Азии

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Аннотация: Статья содержит анализ литературных данных по дрофе *Otis tarda tarda*, начиная с 1864 г. и дает обзор материалов по этому подвиду на основе информации из 129 опубликованных источников. Основной современный материал базируется на наблюдениях авторов, произведенных в 2005–2021 гг. Район исследования охватывает Туркестанскую, Кызылординскую и Жамбылскую области Казахстана, где проанализировано 264 встречи птиц. в том числе 67 встреч авторами. На основе анализа данных мы оцениваем количество дроф в регионе на гнездовании и во время миграций в 50–70 особей, Наибольшая численность наблюдается на зимовках и составляет 400–500 птиц. Представленная в статье сезонная и многолетняя динамика говорит о малочисленности, нестабильности и уязвимости южно-казахстанской популяции. Первоочередными мерами охраны являются борьба с браконьерством и внедрение щадящих сельскохозяйственных практик, позволяющих дрофе успешно выводить птенцов на полях люцерны и озимой пшеницы. Необходим также дальнейший международный мониторинг состояния южно-казахстанской популяции.

Southern Kazakhstan is crucial to the survival of Central Asia's remaining Great Bustard *Otis tarda tarda* populations

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Summary: To characterise the presence of *Otis tarda tarda* in southern Kazakhstan, we present the most comprehensive collection of observations of the Great Bustard across this region, defined as encompassing Kyzylorda, Turkistan and Zhambyl provinces. We gathered observations of this species from 129 publications since 1864. Modern evidence is primarily derived from our own surveys from 2005 through 2021. We identified 264 records of the Great Bustard, including 67 of our own sightings. Based on these data, we estimate that a total of 50–70 Great Bustards currently occupy southern Kazakhstan during the breeding and migratory season, and 400–500 in winter. As the only region in Central Asia consistently hosting the species during all four seasons, southern Kazakhstan must play a central role in the species' conservation. Incentives for compatible and environmentally friendly agricultural practices will allow the species to breed more successfully in alfalfa and winter wheat fields. Particularly important is increased anti-poaching control during the migratory and winter seasons, when Great Bustards arrive from the north and unite into larger flocks, which are more conspicuous and attractive to hunters. International support for monitoring of the southern Kazakhstan Great Bustard population is needed, given the large territory to be covered, central role of this region in sustaining Central Asia's Great Bustard population, and ongoing issues of poaching.

HISTORICAL BACKGROUND

Records of the Great Bustard *Otis tarda tarda* in southern Kazakhstan, an area of just under half a million square kilometres covering the provinces of Kyzylorda, Turkistan (formerly South Kazakhstan) and Zhambyl, extend back to 1864 (Appendix). Chokpak pass, at the western end of the Tian Shan mountains in Turkistan province, became a famous hunting ground for Great Bustards in the early 20th century (Dolgushin 1960) owing to the large autumn congregations of the species at this site. Nesting and passage of Great Bustards was recorded in the adjacent Aksu-Zhabagly nature reserve in 1948 (Shevchenko 1948). Regular hunting of Great Bustards took place at the Maylikent pass, just west of Chokpak pass (Kovshar' 1966). Encounters with Great Bustards in the valleys of the Arys and Mashat rivers, north of Shymkent and west near Aksu-Zhabagly nature reserve, were noted by ornithologists in 1953, 1961 and 1964 (Kovshar' 1966).

Until the mid-20th century there were no lists of protected and rare species, and the Great Bustard was not legally protected. Regular hunting undoubtedly had a negative impact on its populations throughout much of Kazakhstan at this time (Gavrin *et al* 1962). However, hunting in southern Kazakhstan is primarily conducted in spring and autumn and thus may have impacted abundances on more northerly breeding grounds to a greater extent than in southern Kazakhstan itself.

MATERIALS, METHODS AND STUDY AREA

We analysed the abundance and seasonal distribution of Great Bustards in the south of Kazakhstan by reviewing observations from our own fieldwork in 2005–2021 and all known published data of other researchers, as well as pictures and data obtained from the Kazakhstan birdwatching citizen science website birds.kz (Appendix). Our field studies took place in spring 2005, 2009–2010 and 2014–2021, summer 2016–2021, autumn 2006, and winter 2009–2022, and were conducted in appropriate bustard habitats with a 64× spotting scope, 10× binoculars and an off-road vehicle, using both walking routes and circular observations from vantage points. We obtained additional information by questioning both professional

Table 1. Estimate of current Great Bustard population in southern Kazakhstan, encompassing Kyzylorda, Turkistan and Zhambyl provinces. These numbers are an expert evaluation of the number of individual birds appearing in the region in each season.

Season	Number of Great Bustards	Number of sites	Quality of estimate, from 1 (low-quality) to 5 (high-quality)
Breeding	50–70	13	4
Gathering for migration	180–200	6	2
Wintering	400–500	12	4

wildlife biologists and local people, including hunters, district environmental inspectors, shepherds, agricultural machinery operators, and rural residents.

The area we surveyed included steppe and agricultural lands in the foothills of the Syrdar'ya Karatau ridge and the north-western spurs of the Talas Alatau mountains within the Baidibek, Kazygurt, Ordabasy, Otyrar, Saryagash, Sairam, Shardara, Sozak, Tolebi and Tulkibas administrative districts of Turkistan (previously South Kazakhstan) province, as well as Baizak, Chu, Kordai, Merki, Moiynkum, Ryskulov, Sarysu, Talas, and Zhambyl districts in Zhambyl province and Aral, Karmakshi, Shieli and Syrdar'ya districts of Kyzylorda province.

We considered the breeding season to last from March to mid-July, covering the period when birds first arrive at breeding sites through to fledging. Pre-migratory staging lasts from late July through October, as Great Bustards gather in larger flocks, and birds pass through the province on migration. The wintering period was defined as November through February.

RESULTS

Seasonal dynamics

Seasonal distribution of Great Bustards in southern Kazakhstan is shown in Figures 1 and 2. Pairs and small groups of Great Bustards appear on the breeding grounds in late February and early March. Breeding displays were observed on 16 April 2017, 23 April 2015, and 30 April 2014. The breeding season must begin earlier than this, however, because females sitting on nests were found on 6 April 2015 and 8 April 2014. The hatching of chicks (in other nests) was observed on 10 May 2015 and 17 May 2014.

During high summer, July–August, young birds begin to fly and broods unite in flocks. Autumn migration begins in the second half of August and continues in September and October (individual birds may delay migration until mid-November), and given favourable feeding conditions (*ie* absence of heavy snow or ice cover) the birds may spend the winter in South Kazakhstan province, otherwise moving further south into adjacent areas of Uzbekistan. Birds from other regions also arrive in southern Kazakhstan in the late autumn and winter, forming large flocks of several tens and even up to 150 or more individuals (Shakula *et al* 2016, 2018). Unfavourable factors on wintering grounds include deep snow cover and low air temperature (Gubin & Vagner 2005). In February 2005, Great Bustards died due to unusually deep snow and temperatures as low as −20 C. Weakened birds were easily caught by local hunters on horseback (Gubin & Vagner 2005). On average, the depth of snow on wintering habitat is 0–10 cm, and the air temperature in winter varies from +2 C to −10 C. Quite often thaws occur, and in January–February the air temperature can rise to +10 or even +20 C during the day.

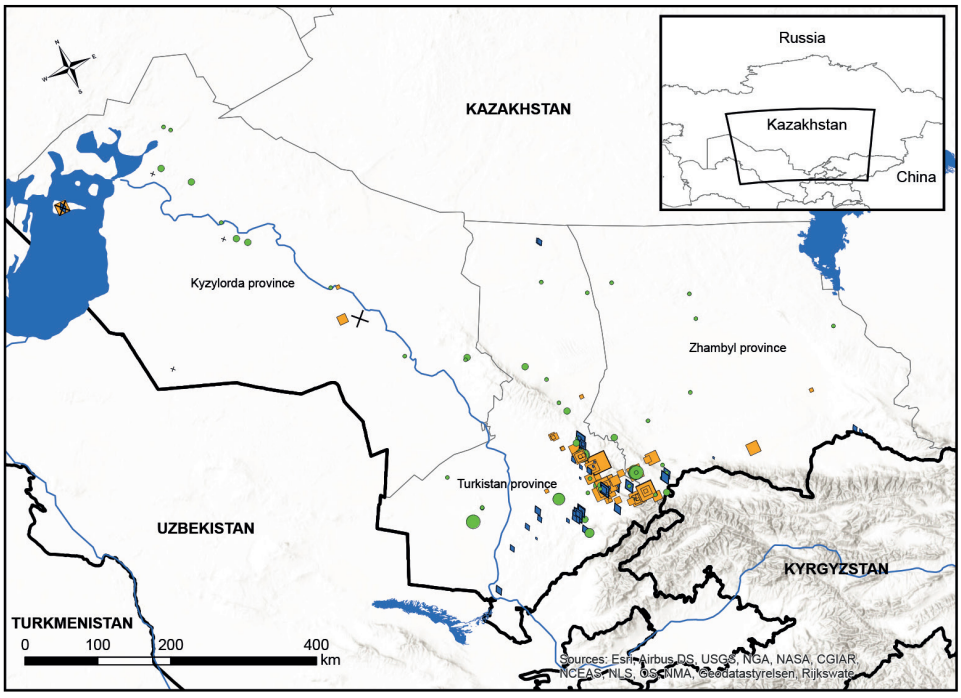

Figure 1. Seasonal distribution of Great Bustards in southern Kazakhstan, defined as Kyzylorda, Turkistan and Zhambyl provinces. Green circles indicate observations during the breeding season; orange squares indicate observations of pre-migratory flocks; blue diamonds indicate wintering; black x represent observations for which the season is unclear. The size of the symbol is proportional to the number of Great Bustards observed at a given point. Geographical relief is displayed with grey shading. Major rivers and water bodies are displayed in blue. The cluster of points in the south-east is shown at higher scale in Figure 2.

The records we obtained on Great Bustards in southern Kazakhstan allow us to make an informed estimate of the current regional annual breeding population at 50–70 individuals (Table 1). Some 180–200 individuals are counted in total during the autumn migratory period (July–October), and 400–500 during winter (November through February; Table 1). Given the tendency of migratory Great Bustards to gather in larger flocks at southernmost breeding spots of a flyway in autumn before moving further south, it is likely that the breeding population is included in the estimates for the migratory period and possibly winter.

Habitat

In southern Kazakhstan the Great Bustard inhabits the foothill plains and spurs of mountain ranges at elevations of 250–1200 m above sea level (Rustamov & Kovshar' 2007). These habitats are widely used by people for growing grain, oilseeds and fodder crops, and for grazing livestock including sheep, cows and horses. A network of asphalt and dirt roads crosses the landscape. Cultivated fields and roads are surrounded by plantation shelterbelts. Typically, Great Bustards remain loyal to areas even after the habitat has been degraded and transformed for intensive agricultural production. In some regions where virgin steppe is available they prefer to nest in spring crops (Ponomareva 1983). Such is the case in southern Kazakhstan, where the species inhabits both cultivated farmland and unplowed valleys that humans have found unsuitable for cultivation or pasture. For nesting, Great Bustards select growing crops as well as fallows and depressions overgrown

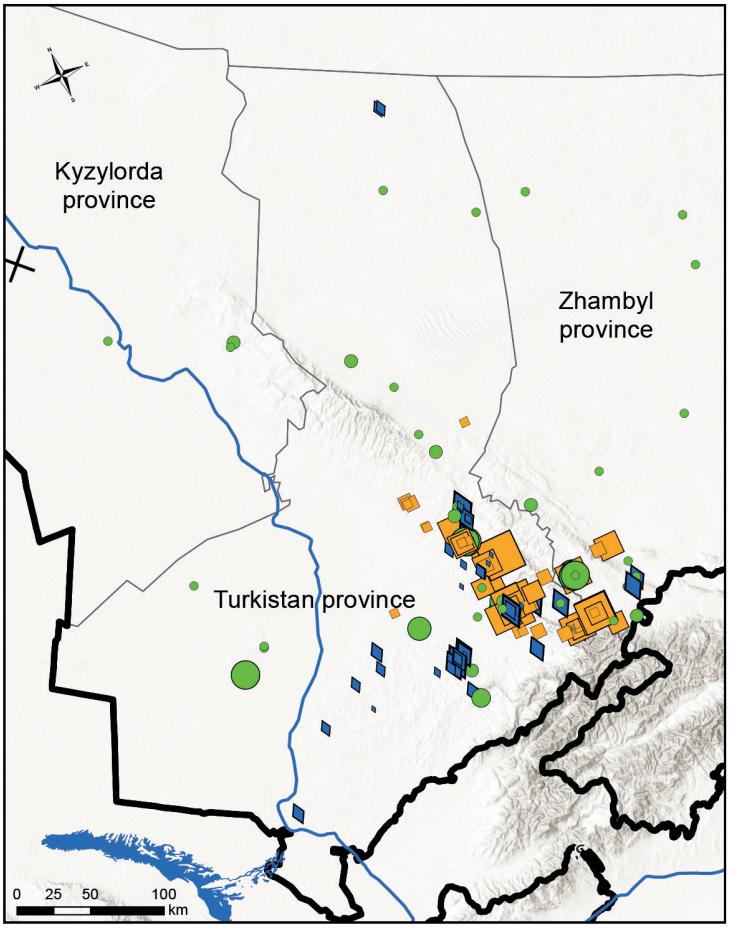

Figure 2. Close-up of the cluster of points in Turkistan and Zhambyl provinces shown in Figure 1.

with weeds and shrubs. In winter they prefer the southern slopes of depressions, covered with wild plants and often free of snow. An important factor in habitat choice in Kazakhstan is the availability of water sources for drinking (Isakov & Flint 1987). Great Bustard habitats in southern Kazakhstan are situated in a dry climate zone, but groundwater lies at a depth of 5–17 m and comes to the surface in foothills and mountains in the form of springs, forming a network of small rivers from which Great Bustards are observed to drink.

Threats

Poaching is one of the main factors reducing the number of Great Bustards in southern Kazakhstan. Although hunting is prohibited, persecution and shooting of Great Bustards occurs everywhere in the region and at any time of the year, involving ordinary citizens such as agricultural machinery operators and shepherds as well as rich hunters in jeeps with modern, long-range weapons (Gubin & Vagner 2005). Poaching is greatly facilitated by the widespread use of cellular communications (pers obs). Shepherds commonly herd their flocks in bustard habitat, and alert their hunting friends when they encounter Great Bustards.

Agricultural machinery is a significant danger for Great Bustards nesting in cultivated fields. For example, in 2015 one of four monitored nests was destroyed by a tractor during agricultural work (Shakula *et al* 2016). The use of pesticides in agricultural fields also presents threats to Great Bustards. Although diet analyses have not been undertaken in southern Kazakhstan, animal foods represent 35–85% of the Great Bustard diet in summer, according to work conducted in Kostanai province of northern Kazakhstan (Ryabov 1949). Studies in Europe have similarly found invertebrates to play a significant role outside of winter (Cabodevilla *et al* 2021), indicating that application of insecticides and rodenticides will negatively impact food availability for this species. It is possible that bioaccumulation of insecticides from invertebrate prey poses an additional threat. On 14 May 2017 we observed Rooks *Corvus frugilegus* eating locusts impaired by an aerial

application of pesticides, and we presume Great Bustards also eat insects poisoned in this way. Although pesticide use significantly declined with the disappearance of Soviet collective farms, its current extent in the private sector is unknown and the effects on Great Bustards have not been investigated.

The Sheikh Khalifa breeding centre for the Asian Houbara *Chlamydotis macqueenii* at Shayan, Baidibek district in Turkistan province, constitutes a further, unquantified threat by offering financial rewards to local people to collect Houbara eggs. Local farmers at Birlik recounted in 2017 to I Vagner and M Kessler that there have been cases of mistaken identity, involving collection of Great Bustard eggs rather than Houbara. We do not know how widespread this problem is.

The Great Bustard has few natural enemies, but it is highly vulnerable during the breeding season when steppe predators such as Red Fox *Vulpes vulpes*, Asian Badger *Meles leucurus* and Golden Jackal *Canis aureus* present a danger to eggs and young birds. Badgers and jackals inhabit small hollows between fields, and cavities overgrown with grasses and shrubs. Over the last 10 years, the number of foxes and jackals has increased as authorities have stopped making payments for their skins, and sport hunting of these species has become unpopular. On 29 May 2021, a jackal was observed predating a Great Bustard chick in the area of the Sheikh Khalifa breeding centre at Shayan (see above; A Martineau pers comm). The destruction of nests of other bustard species by these predators in southern Kazakhstan has been documented, including Little Bustard *Tetrax tetrax* nests in Arystandy Important Bird Area in May 2020, and an Asian Houbara nest in Moiynkum desert in June 2021 (authors' unpublished observations). Based on the range and abundance of these species, we infer that Carrion Crows *Corvus corone* and Rooks represent a threat to Great Bustard nests in the foothills of the Syrdar'ya Karatau. Domestic dogs also present a danger to nests and young birds; as a rule, dogs on farms and in rural settlements are not leashed and scavenge widely for food.

PROPOSED CONSERVATION MEASURES

Our surveys and experience convince us that sufficient ecological conditions for Great Bustard population growth exist in southern Kazakhstan; it is only necessary to minimise threats. As the only area in Central Asia regularly hosting Great Bustards during the breeding, migratory and wintering periods, and the region hosting the largest number of individuals during the breeding season (Kessler 2022), southern Kazakhstan plays a critical role in sustaining the region's populations. Successful actions to protect and nurture flocks here during the migratory and wintering periods may produce positive impacts for populations breeding to the north. Most urgently, anti-poaching efforts must be strengthened. The hunting inspectorate should devote increased attention to the protection of Great Bustard breeding grounds (see next paragraph), as well as migratory staging areas and overwintering sites and the flocks they host. Public engagement programs should promote the conservation of the species through social media, educational institutions, and hunting organisations, while taking care not to publicly identify sensitive sites (Kessler 2017a, b). Suitable habitat with preferred forage such as soy and alfalfa should be maintained for wintering flocks. If these fields are kept free of snow, they may retain Great Bustards for a greater portion of the non-breeding season, as observed at migratory staging points in eastern Kazakhstan (Berezovikov 2016). This could aid anti-poaching efforts and reduce risks encountered during nomadic and migratory movements, such as powerline collisions.

Conditions for the vulnerable southern Kazakhstan breeding population can be improved through strengthening the protection of lek sites. The status of locally protected sites significant to the species, in particular the Arystandy Important Bird Area should be

elevated to the national level to increase opportunities for funding and human resources. The network of protected sites should be expanded to include additional leks, specifically sites along south-western slopes of the Syrdar'ya Karatau range including Zhylandy, Mashat, Sastobe and Krasnaya Gorka. M Nukusbekov in Zhambyl province has admirably modelled the role of a community lek 'caretaker' (Nukusbekov 2016): he annually monitors a Great Bustard lek adjacent to his village and promotes the conservation of these birds by warning farmers of the location of nests in order to avert their destruction by machinery. A network of lek caretakers could be nurtured across southern Kazakhstan (and other parts of Central Asia!) through provision of a short training, a modest stipend and equipment (*eg* binoculars, cellular phone credits), and encouragement and recognition of their efforts. The observations of both caretakers and professional researchers can aid in the identification of site-specific activities to improve breeding success, such as control of locally abundant nest predators and changes to incompatible agricultural practices.

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LITERATURE CITED

Afanas'ev, AV & AA Sludskii. 1947. [Materials on mammals and birds of Central Kazakhstan.] *Proceedings of Academy of Science of the Kazakh SSR, Zoology Series* 6: 48–64. [In Russian]

Akimkanova A. 2015. Blogpost [Great Bustard.] https://birds.kz/v2photo.php?l=ru&s=044300005&n=1&t=182&p=6&sortby=1&sor=desc&saut=all&si=kaz. [In Russian]

Ayé, R, M Schweizer & T Roth. 2012. *Birds of Central Asia*. Princeton University Press, Princeton.

Balykin, A. 2010, 2017. Two photo posts titled [Great Bustard.] to https://birds.kz/v2photo.php? with extensions of 9 numbers and suffix '&si=kaz'l=ru&s=, thus 019400044, 019400558. [In Russian]

Baskakova, SV. 2019-2021. Five blogposts to http://birds.kz/v2blogentry.php?1=ru&a= with extensions of 14 numbers and suffix '&si=kaz', thus 20191217041901, 20200218041901, 20200527041901, 20210215041901, 20210219041901. [In Russian]

Belousov, E. 2013-2014. Two photo posts titled [Great Bustard.] to https://birds.kz/v2photo.php? with extensions of 9 numbers and suffix '&si=kaz'l=ru&s=, thus 016800506, 016800695. [In Russian]

Belyalov, O. 2011-2013. Two photo posts titled [Great Bustard.] to https://birds.kz/v2photo.php? with extensions of 9 numbers and suffix '&si=kaz'l=ru&s=, thus 002700015, 002700489. [In Russian]

Berezovikov, NN. 2016. [Problems in the conservation of wintering Great Bustards in Kazakhstan.] *Russian Ornithological Journal* 25: 4506–4509. [In Russian]

Berezovikov, NN & BP Annenkov. 2018. [Summer observation of the Great Bustard *Otis tarda* in Syrdar'ya Karatau range.] *Russian Ornithological Journal* 27: 5413–5415. [In Russian]

Berezovikov, NN & BM Gubin. 2010. [Great Bustard.] *In*: Meldebekov, AM (ed). *Red Book of the Republic of Kazakhstan.* Vol 1. *Animals*. Adzhil, Almaty, pp 162–163. [In Russian]

Bis, Ye. 2011. [Great Bustard.] https://www.remiz.org/photo.php?lang=ru&pic=99341&sel=s. [In Russian]

Borisenko, VA. 1977. [On the numbers of the Demoiselle Crane, Great Bustard, Little Bustard and Houbara Bustard in some parts of Kazakhstan.] *In*: Sludskii, A (ed). *Rare and Endangered Animals and Birds of Kazakhstan*. Nauka, Alma-Ata, pp138–141. [In Russian]

Bostanzhoglo, VN. 1911. Ornithological fauna of the Aral-Caspian steppes. *Materials on the Fauna and Flora of the Russian Empire, Zoology Section* 11: 81–82. [In Russian]

Brushko, ZK. 1986. [Short notes on the Great Bustard.] *In: Rare Animals of Kazakhstan*. Nauka, Alma-Ata, p72. [In Russian]

Cabodevilla, X, F Mougeot, G Bota, S Mañosa, F Cuscó, J Martínez-García, B Arroyo & MJ Madeira. 2021. Metabarcoding insights into the diet and trophic diversity of six declining farmland birds. *Scientific Reports* 11:1-13.

Chalikova, YeS. 2007. [Observation of birds in the Talas Alatau in 2007.] *Kazakhstan Ornithological Bulletin* 2007: 56. [In Russian]

Chalikova, YeS. 2008. [Avifauna of the Irsu-Mashat part of the Sairam-Ugam national park.] *Selevinia* 2008: 171–177. [In Russian]

Collar, NJ, HS Baral, N Batbayar, GS Bhardwaj, N Brahma, RJ Burnside, AU Choudhury, O Combreau, PM Dolman, PF Donald, S Dutta, D Gadhavi, K Gore, OA Goroshko, C Hong, GA Jathar, RRS Jha, YV Jhala, MA Koshkin, BP Lankar, G Liu, SP Mahood, MB Morales, SS Narwade, T Natsagdorj, AA Nefedov,

JP Silva, JJ Thakuri, M Wang, Y Zhang & AE Kessler. 2017. Averting the extinction of bustards in Asia. *Forktail* 33: 1–26.
Dolgushin, IA. 1939. [On the avifauna of the lower reaches of the Chu river.] *Proceedings of Academy of Sciences of the Kazakh SSR, Zoology Series* 1: 43–70. [In Russian]
Dolgushin, IA. 1960. [*The Birds of Kazakhstan*. Vol 1.] Academy of Sciences of the Kazakh SSR, Alma-Ata. [In Russian]
Dolgushin, IA. 2008. [Ornithological journal from a trip to Kazgurt in 1938.] *Selevinia* 2008: 48–50. [In Russian]
Dyakin, G. 2013. Blogpost [Great Bustard.] https://birds.kz/v2photo.php?l=ru&s=000501045&n=1&t=182&p=8&sortby=1&sor=desc&saut=all&si=kaz. [In Russian]
Dyakin, G. 2019. Blogpost [In the south of Kazakhstan. The first day.] http://birds.kz/v2blogentry.php?l=ru&a=20190321000501&si=kaz. [In Russian]
Erokhov, SN, OV Belyalov & FF Karpov. 2004. [Numbers of aquatic birds overwintering on water bodies in Almaty and South Kazakhstan provinces.] *Kazakhstan Ornithological Bulletin* 2004: 51–52. [In Russian]
Fadeev, BA & EF Savinov. 1986. [Short notes on the Great Bustard.] *In: Rare Animals of Kazakhstan.* Nauka, Alma-Ata, p71. [In Russian]
Flint, VE, RL Beme, YuV Kostin & AA Kuznetsov. 1968. [*Birds of the USSR*]. Mysl' Moscow, USSR. [In Russian]
Gavrilov, AE & EI Gavrilov. 2005. [Results of bird ringing in 2005]. *Kazakhstan Ornithological Bulletin* 2005: 223. [In Russian]
Gavrilov, AE, AJ Abaev & SKh Zaripova. 2016. [Materials on the dates and number of migrating birds at the Chokpak pass (foothills of western Tian' Shan) from 1982–2016.] *Selevinia* 24: 201–208. [In Russian]
Gavrilov, AE, EI Gavrilov, AN Dikhanbayev, KA Sarsekova & AJ Abayev. 2003. [Results of work at the Chokpak ornithological station in 2003.] *Kazakhstan Ornithological Bulletin* 2003: 92–93. [In Russian]
Gavrilov, EI. 1981. [Bird migration in the lower reaches of the Chu river in 1967.] *Bird Migration in Asia* 6: 116–144. [In Russian]
Gavrilov, EI. 1999. [*Fauna and distribution of birds in Kazakhstan*.] Printed privately, Almaty: 50. [In Russian]
Gavrilov, EI. 2004. [Results of the work of the Chokpak ornithological team.] *Kazakhstan Ornithological Bulletin* 2004: 55–56. [In Russian]
Gavrilov, EI & AE Gavrilov. 2005. [*Birds of Kazakhstan*.] Tethys, Almaty, Kazakhstan. [In Russian]
Gavrilov, EI & AP Gistsov. 1985. [*Seasonal migrations of birds in the foothills of western Tian' Shan*.] Academy of Sciences of the Kazakh SSR Institute of Zoology, Alma-Ata. [In Russian]
Gavrin, V, I Dolgushin, M Korelov & M Kuzmina. 1962. [*Birds of Kazakhstan*. Vol 2.] Academy of Sciences of the Kazakh SSR Institute of Zoology, Alma-Ata. [In Russian]
Gladkov, NA & VB Grinberg. 1932. [Materials on the avifauna of the Chu river.] *Bulletin of Moscow Society of Naturalists, Biological Series* 41: 303–319. [In Russian]
Grachev, VA. 2000. [Birds in the vicinity of Aral'sk and Kamyshlybash lake (according to observations from 1951–1953 (non-passeriformes).] *Selevinia* 8: 95–103. [In Russian]
Gubin, BM. 1996. [Great Bustard.] *In*: Kovshar', AF Kovshar (ed). *Red Data Book of Kazakhstan*, Vol 1. *Animals*. Part 1. V*ertebrates. Konzhiq, Almaty*, pp168-169. [In Russian]
Gubin, BM. 2018. [*Birds of the Deserts of Kazakhstan.* Vol 2. *Birds of Betpakdala and Adjacent Territories.*] Kolor, Almaty. [In Russian]
Gubin, BM. 2020. [*Birds of the Deserts of Kazakhstan.* Vol 3. *Birds of the Aral Sea, Floodplains of the Syrdar'ya and Adjacent Territories.*] SpringR, Almaty. [In Russian]
Gubin, BM & OV Belyalov. 2017. [Nesting birds of the Karatau mountains.] *Ornithological Newsletter of Kazakhstan and Middle Asia* 4: 85–131. [In Russian]
Gubin, BM & SL Sklyarenko. 2014. [Birds of the eastern edge of the Kyzylkum desert.] *Ornithological Newsletter of Kazakhstan and Middle Asia* 3: 84–134. [In Russian]
Gubin, BM & II Vagner. 2005. [On the overwintering of the Great Bustard in the south of Chimkent province in 2004–2005.] *Kazakhstan Ornithological Bulletin* 2005: 171–172. [In Russian]
Gubin, BM & II Vagner. 2009. [Great Bustard *Otis tarda* L. in southern Kazakhstan.] *In*: Spitsyn, VV (ed). *Bustards of the Palearctic: Breeding and Protection*. Vol 2. Moscow Zoo, Moscow, pp125–128. [In Russian]
Heinzel, H, R Fitter & J Parslow. 1995. *Birds of Britain and Europe with North Africa and the Middle East*. Collins Bird Guide. London.
Isabekov, A. 2013-2021. Three blogposts to http://birds.kz/v2blogentry.php?1=ru&a= with extensions of 14 numbers and suffix '&si=kaz', thus 20130525000101, 20140503000101, 2021032100. [In Russian]
Isakov, Yu & VE Flint. 1987. [Bustard family.] *In*: (Il'ichev, VD, VE Flint, RL Beme, VM Galushin, YuA Isakov, JeV Kumari, EN Kurochkin, RL Potapov, SG Priklonskii, AK Rustamov, LS Stepanyan & VE Fomin (eds). *Birds of the USSR. Galliformes, Gruiformes.* Nauka, Leningrad, pp466–481. [In Russian]
Ismagilov, M. 1973. [Birds of the Betpak-Dala desert station.] *Biological Sciences* 5: 111–118. [In Russian]

Ismagilov, M & E Vasenko. 1950. [Birds of the Barsa-Kelmes island.] *Works of the Barsa-Kelmes Nature Reserve* 1: 116–135. [In Russian]

Ivanov, A & B Shtegman. 1978. [Brief Guide to the Birds of the USSR.] Nauka, Leningrad. [In Russian]

Ivashchenko, AA. 1986. [Short notes on the Great Bustard.] *In: Rare Animals of Kazakhstan.* Nauka, Alma-Ata, p71. [In Russian]

Ivashchenko, AA. 2008. [Observation of birds in the western Tian' Shan in spring 2008.] *Kazakhstan Ornithological Bulletin* 2008: 146. [In Russian]

Kashkarov, DN. 1928. [Ecological sketch of the lake region: Biilyu-Kul, Akkul and Ashchi-Kul of Aulieatinsky district.] *Proceedings of Central Asian University, Series VIII-a. Zoology* 2: 1–54. [In Russian]

Kessler, A. 2015. Asian Great Bustards: from Conservation Biology to Sustainable Grassland Development. PhD thesis, Arizona State University, Tempe.

Kessler, A. 2016. [Current status of the Great Bustard in Central Asia and conservation actions.] *Steppe Bulletin* 46: 61–67. [In Russian]

Kessler, A. 2017a. Recent research on the ecology and conservation of the Great Bustard Otis tarda in Asia. *In:* Abyl, EA & TM Bragina (eds). *Biological Diversity of the Asian Steppes*. KGPI, Kostanai, pp231-235.

Kessler, A. 2017b. [International conference 'Advancing the conservation of the Great Bustard in Asia'.] *Steppe Bulletin* 50: 61. [In Russian]

Kessler, A & NN Berezovikov. 2019. [Does the Great Bustard have a future in Kazakhstan?] *Green World* 14: 23–25. [In Russian]

Kessler, A, M Santos, R Flatz, N Batbayar, T Natsagdorj, D Batsuuri, F Bidashko, N Galbadrakh, O Goroshko, V Khrokov, T Unenbat, I Vagner, M Wang & C Smith. 2018. Mitochondrial divergence between western and eastern Great Bustards: implications for conservation and species status. *Journal of Heredity* 109: 641–652.

Kessler A & A Smith. 2014. The status of the Great Bustard (*Otis tarda tarda*) in Central Asia: from the Caspian Sea to the Altai. *Aquila* 121: 115-132.

Kessler, M. 2022. Status of the Western Great Bustard *Otis tarda tarda* in Asia, and its significance to an updated estimate of the global population of Great Bustards. *Sandgrouse* 44: 6-13.

Khrokov, V & S Sklyarenko. 2009. [*Brief Guide to the Birds of Kazakhstan*.] ACBK, Almaty, Kazakhstan. [In Russian]

Koblik, EA. 2001. [*The Diversity of Birds.* Vol 1.] Moscow State University, Moscow, Russia. [In Russian]

Kolbintsev, VG. 2006. [On encounters with the Great Bustard in the foothills of Talas Alatau.] *Kazakhstan Ornithological Bulletin* 2006: 172. [In Russian]

Kolbintsev, VG. 2014. [On the overwintering of some bird species in the south of Kazakhstan.] *Russian Journal of Ornithology* 23: 3142–3143. [In Russian]

Kolbintsev, VG. 2015. [Summer record of the Great Bustard in the foothills of the Talas Alatau.] *Russian Journal of Ornithology* 24: 1561. [In Russian]

Korelov, MN. 2012. [Ornithological expeditions to Karatau in 1958 and 1960.] *Ornithological Newsletter of Kazakhstan and Middle Asia* 1: 25–41. [In Russian]

Kornev, SV. 2016. [Materials on the avifauna of the Aral sea area and south-western Kazakhstan.] *Russian Journal of Ornithology* 25: 1770–1779. [In Russian]

Kovalenko, AV. 2004. [Observation of birds in south-eastern and southern Kazakhstan.] *Kazakhstan Ornithological Bulletin* 2004: 66–64. [In Russian]

Kovalenko, AV, EI Gavrilov & AE Gavrilov. 2002. [The Great Bustard. Chokpak.] *Kazakhstan Ornithological Bulletin* 2002: 76. [In Russian]

Kovalenko, AV & S Kravchenko. 2006. [Survey of the wintering grounds of aquatic birds in South Kazakhstan province in February 2006.] *Kazakhstan Ornithological Bulletin* 2006: 49–53. [In Russian]

Kovshar', AF. 1966. [Birds of the Talas Alatau.] *Works of the Aksu-Zhabagly Nature Reserve* 1: 27–28. [In Russian]

Kuzmina, M & B Korobkin. 2021. [On the winter avifauna of the Chu river floodplain.] *Russian Journal of Ornithology* 30: 3096–3098. [In Russian]

Malyshevsky, RI. 2004. [Ornithological observations in the lower Syrdar'ya valley in spring 1964.] *Kazakhstan Ornithological Bulletin* 2004: 211–213. [In Russian]

Martin, T, R Guerin, F Fages, A Martineau & Y Hingrat. 2018. Breeding populations of Great Bustard and Little Bustard in South Kazakhstan province, Republic of Kazakhstan. *Sandgrouse* 40: 138–143.

Mikhailov, KE & EA Koblik 2020. [*Birds of Russia Photoguide*.] Fithon XXI, Moscow, Russia. [In Russian]

Nukusbekov, M. 2013–2021. Nineteen blogposts to http://birds.kz/v2blogentry.php?1=ru&a= with extensions of 14 numbers and suffix '&si=kaz', thus 20130419017701, 20130420017701, 20130510017701, 20130523017702, 20140401017701, 20140409017701, 20140412017701, 20140426017705, 20140508017701, 20140512017701, 20140518017701, 20150402017701, 20150406017701, 20150408017701, 20150412017701, 20160311017701, 20200413017701, 202101140, 20210407017701. [In Russian]

Nukusbekov, M. 2017. Two blogposts titled [Great Bustard] to https://birds.kz/v2photo.php? with extensions of 9 numbers and suffix '&si=kaz'l=ru&s=, thus 017702160. [In Russian]
Nurushev, MZ, EZ Makazhanov & SS Kairushev. 2018. [About the project for reintroduction of valuable bird populations (*Otis tarda*) into the nature of Kazakhstan based on the experience of European countries.] *In*: Chibilev, AA (ed). *The Steppes of Northern Eurasia. Proceedings of VIII International Symposium.* Ural'sk Branch of the Russian Academy of Sciences, Orenburg, pp709–712.[In Russian]
Ponomareva, T. 1983. [Towards the conservation of the Great Bustard and Little Bustard.] *Hunting and Game Management* 1: 22–23. [In Russian]
Rustamov, AK & AF Kovshar'. 2007. [*Birds of Central Asia*. Vol 1.] NABU, Almaty. [In Russian]
Ryabitsev, VK (ed). 2019. [*Birds of Central Asia.* Vol 1.] Kabinetnyi uchenyi, Moscow: 116–117. [In Russian]
Ryabitsev, VK (ed). 2019. [*Birds of Central Asia*. Vol 2.] Kabinetnyi uchenyi, Moscow. [In Russian]
Ryabitsev, VK, AF Kovshar', VA Kovshar' & NN Berezovikov. 2014. [*Field Guide to the Birds of Kazakhstan*.] NCOC, Almaty. [In Russian]
Ryabov, V. 1949. [On the ecology of some steppe birds of northern Kazakhstan, based on observations in the Naurzum Reserve.] *Works of the Naurzum Nature Reserve* 2: 153–232. [In Russian]
Sabaneev, LP. 2015. [*Russian Hunt.*] Exmo, Moscow. [In Russian]
Savin, YuG & AM Sema. 1986. [Short notes on the Great Bustard.] *In: Rare Animals of Kazakhstan.* Nauka, Alma-Ata, p71. [In Russian]
Sema, AM & AP Gistsov. 1984. [Spring migration of birds in the lower reaches of the Sarysu.] *In:* Gvozdev, EV (ed). *Bird Migration in Asia.* Fan, Tashkent, pp40-45. [In Russian]
Sema, AM & AP Gistsov. 1986. [Short notes on the Great Bustard.] *In: Rare Animals of Kazakhstan.* Nauka, Alma-Ata, p71. [In Russian]
Severtsov, NA. 1947. [*Travels in the Turkestan Province.*] OGIZ, Moscow. [In Russian]
Shakula, GV. 2019. [The return of the Great Bustard.] *Qansonar* 1: 56–57. [In Russian]
Shakula, GV & SV Baskakova. 2019. [Monitoring of the Great Bustard (*Otis tarda tarda*) in the south of Kazakhstan.] *Proceedings of the Aksu-Zhabagly Natural Reserve* 12: 112–119. [In Russian]
Shakula, GV, SV Baskakova, DV Shakula & SV Shakula. 2016. [Great Bustard *Otis tarda* in the south of Kazakhstan.] *In*: Zheleznova, T & L Malovichko (eds). *Birds and Agriculture.* Znak, Moscow, pp313–318. [In Russian]
Shakula, GV, FV Shakula & SV Baskakova. 2021. [Dynamics of the Great Bustard population in Kazakhstan. Ups and downs.] *In*: *Materials of the International Conference 'The Rufford Foundation for Biodiversity Research and Conservation in Northern Eurasia*'. Moscow, pp68–87. [In Russian]
Shakula, SV, DV Shakula, GV Shakula & SV Baskakova. 2018. [Spatial and temporal distribution of the Great Bustard *Otis tarda* population in the south of Kazakhstan during the wintering and short-distance spring migrations in 2018.] *In*: Zheleznova, T & L Malovichko (eds). *Birds and Agriculture.* Znak, Moscow, pp366–371. [In Russian]
Shevchenko, VV. 1948. [Birds of the Aksu-Zhabagly Nature Reserve.] *Works of the Aksu-Zhabagly Nature Reserve* 1: 67. [In Russian]
Shnitnikov, V. 1949. [*Birds of Semirech'e*.] Academy of Sciences of the USSR, Moscow. [In Russian]
Sklyarenko, SL. 2004. Wintering of Great Bustard in southern Kazakhstan. *In*: (Bota, G, MB Morales, S Mañosa Riféa & J Camprodon Subirachs (eds). *Ecology and Conservation of Steppe-land Birds*. Lynx Edicions, Lleida, pp213–220.
Sklyarenko, SL. 2006. [Overwintering Great Bustards in the south and south-east of Kazakhstan.] *In: Research on Important Bird Areas in Kazakhstan and Central Asia.* RSPB, Almaty, pp213–220. [In Russian]
Sklyarenko, SL. 2008. [Arystandy.] *In*: Khrokov, VV & SL Sklyarenko (eds). *Important Bird Areas in Kazakhstan*. ACBK, Almaty, pp193–194. [In Russian]
Sklyarenko, SL & II Vagner. 2004. [Winter census of the Great Bustard in South Kazakhstan province.] *Kazakhstan Ornithological Bulletin* 2004: 156. [In Russian]
Sklyarenko, SL & II Vagner. 2012. [Winter census of the Great Bustard in South Kazakhstan province.] *Russian Journal of Ornithology* 21: 2297. [In Russian]
Spangenberg, EP & GA Feigin. 1936. [Birds of the lower Syrdar'ya and adjacent areas.] *Works of the Zoological Museum of Moscow State University* 3: 41–184. [In Russian]
Stepanyan, LS. 1990. [*Abstract of the Avifauna of the USSR.*] Nauka, Moscow: 166-167. [In Russian]
Stepanyan, LS. 2003. [*Abstract of the Avifauna of Russia and Adjacent Territories (Within the Borders of the USSR as a Historical Region).*] Akademkniga, Moscow: 185-186. [In Russian]
Valkenburg, M. 2008. Ornithologische reis naar Kazachstan. https://www.rubythroatbirdingtours.com/wp-content/uploads/2017/11/SouthKazakhstan_ 2009.pdf. [In Dutch]
Vygovskii, AE. 1986. [Short notes on the Great Bustard.] *In: Rare Animals of Kazakhstan.* Nauka, Alma-Ata, p72. [In Russian]
Wassink, A. 2015. *The New Birds of Kazakhstan.* Texel, De Cocksdorp.

Zakhidov, TZ. 1971. [*Biocenoses of the Kyzylkum Desert*.] FAN, Tashkent. [In Russian]
Zarudnyi, NA. 1915. [Birds of the Kyzylkum desert.] *Materials on the Fauna and Flora of the Russian Empire: Zoological Department* 14: 1-149. [In Russian]
Zarudnyi, NA. 1916. [Birds of the Aral Sea.] *Bulletin of the Turkestan Department of the Imperial Russian Geographical Society* 12: 1-240.
Zarudnyi, NA & S Bilkevich. 1918. [List of birds in Trans-Caspian region and their distribution across zoological zones of the country.] *News of the Trans-Caspian Museum* 1: 1–48. [In Russian]
Zhatkanbaev, A. 1986. [Short notes on the Great Bustard.] *In: Rare Animals of Kazakhstan*. Nauka, Alma-Ata, p72. [In Russian]

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Appendix 1. All records of Great Bustard in southern Kazakhstan, by province, district and locality. Provinces are ordered west to east. Districts and localities are ordered alphabetically. The most specific locality relating to the particular record is given in bold. IBA = Important Bird Area; NR = nature reserve.

Kyzylorda province

Aral district

- **Aral Sea**, north-eastern corner, on migration (noted as weak and brief), late April 1905 (Bostanzhoglo 1911)
- Aral Sea east coast between **Aral'sk** and Kamyshlybas lake, frequently seen on migration, much commoner near Kazalinsk, early 20th century (Zarudnyi 1916)
- **Barsakel'mes** island, flocks of <20 after snowfall, 15–27/11/1941; many flocks of 10–12, 06/11/1943; 16 birds reported, 14/01–25/02/1944; flocks of 10–20 after snowfall, mid-November 1944 (Ismagilov & Vasenko 1950)
- south-east of **Eza point**, flocks of 20–25, massive migration, extraordinarily abundant, 28/10/1935 (Grachev 2000)
- between **Kamyshlybas** and the Utebas well, 3 birds, 19–21/03/1873 (Bogdanov in Zarudnyi 1915)
- northern edge of **Kyzylkum** desert along the Karakum tract, flocks of 3–4, 15–17/07/1907 (Zarudnyi 1914); northern and eastern edges of Kyzylkum desert and Syrdar'ya basin, nesting, stopping over and wintering, 1914 (Zarudnyi 1915)
- unspecified locality, flock of 10 flying south, 01/11/1953, 2 flying north, 18/04/1954 (Grachev 2000)

Karmakshi district

- west of **Baykonur**, 2 and 2+1, May 1965 (Borisenko 1977)
- **Donsary**, 3 birds, May 1965, and female on nest with 2 eggs, 11/05/1965 (Borisenko 1977)

Shieli district

- south of **Baigakum** railway station (lower Syrdar'ya river), 1 in sand-dunes near a gravel road, 18/04/1964 (Malyshevskii 2004)
- eastern **Kyzylkum** desert towards Betpakdala, wintering, early 20th century (Zarudnyi 1915)

Zhalagash and Shieli districts

- lower reaches of the Syrdar'ya from **Zhusaly** to Shieli, spring and autumn (no years given; Spangenberg & Feigin 1936)

Zhanakorgan district

- **Domba river valley**, south-west foothills of Karatau range, 1, 09/06/2014 (Gubin & Belyalov 2017)
- **Kulanshi river valley**, south-west foothills of Karatau range, 4 including 2 juveniles, 08/06/2014 (Gubin & Belyalov 2017)

Turkistan province

Baidibek district

- **Arystandy** IBA, fresh bone and feathers of a bird at the southern edge, 27/10/2006 (MK and II Vagner, pers obs); 3, 29/12/2009, and 105, 04/01/2010 (Shakula *et al* 2016); 2 on fallow land near a ravine and cliffs, 15/04/2017; 1 with 12 on periphery, 10/02/2018 (Shakula *et al* 2018); 5, 16/02/2020 (Shakula *et al* 2021); Arystandy plateau, 3, 19/02/2019 (Shakula *et al* 2019)
- near **Boraldai** village, 2, 08/02/2018, 10, 09/02/2018, with 1 north of the village same day (Shakula *et al* 2018); 2, 16/02/2020 (Shakula *et al* 2021)
- western ridges of **Boraldai mountains** (Sastyube, Maybulak, Zhylandy and [for other records see below] Arystandy), 171, 14–15/02/2004 (Sklyarenko & Vagner 2004); birds were present in the same area of 'foothill steppe', but to a lesser degree, in December 2002 (Sklyarenko & Vagner 2004)
- between **Bugun' reservoir** and Boraldai range, 7, 20/01/2010 (Shakula *et al* 2016)
- south of **Karaoi**, eastern slope of Karatau range, 3, 29/05/2015 (Kornev 2016)
- north of **Mynbai**, 3 in wheatfield, 17/04/2017 (Shakula *et al* 2018)
- near **Mynbulak**, 2+3, 06/08/2021 (Shakula *et al* 2021)
- near **Shayan**, 35, 05/10/2001 (Gubin & Vagner 2005); near town on road north to Sozak, 5 in flight, 21/03/2021 (Isabekov 2021); by Shayan reservoir, 21+3, 10/02/2018 (Shakula *et al* 2018) and 5 there, 28/01/2019 (Shakula *et al* 2019)
- **Sheikh Khalifa houbara breeding centre**, near Birlik, at least 31 birds, with a minimum of 8 displaying males and annual records of nests and chicks, March–June 2015–2017 (Martin *et al* 2018); 3 females inside centre walls, 1 outside, and at least 1 chick eaten by jackal, 29/05/2021 (R Bigonneau, M Rohee & A Martineau, pers comm), with apparently different female flushed on same date, and on that and next day 2 females feeding 100–200 m apart, one with at least 1 pigeon-sized chick (Shakula *et al* 2021); 1 female flushed in the evening, 17/07/2021, 1 adult, 19/08/2021, and 2 adults, 21/09/2021 (Shakula *et al* 2021)
- between Boraldai and **Turakty**, 16 in field, 26/10/2006 (S Michel, pers comm)
- **Ulken Bugun' river**, foothill valley south of Karatau mountains, 33, 07/10/2004 (Gubin & Vagner 2005)
- between **Ulken-Tura mountain** and highway, 5, 08/02/2018, and 2, 09/02/2018 (Shakula *et al* 2018)
- near **Verkhnii Boraldai**, 6, 16/02/2021 (Shakula *et al* 2021)
- near **Zhuzemdyk**, 1, 22/07/2021, 1, 23/07/2021 (Shakula *et al* 2021)
- unspecified locality, between Boraldai and Arys' rivers, female on winter wheatfield, 1, 18/04/2017 (Shakula *et al* 2018)

Sairam and Tulkibas districts

- south of **Boraldai mountains**, 30 on agricultural land in steeply sloping foothills, 20–21/04/2005 (Gubin & Vagner 2005)

Kazygurt district

- near **Chanak**, 3, 09/02/2020 (Shakula *et al* 2021)
- between **Kazygurt** and Shymkent, group of 3 in steppe, 23/07/1938 (Dolgushin 2008); foothills near Kazygurt, 8, 29/06/2013 (Belyalov 2013)

- east of **Kyzyldala** and west of main road to Tashkent, 7+23 in hilly pasture, some of it recently burnt, 28/10/2006 (MK and II Vagner, pers obs)

Ordabasy district
- near **Arys'** town, 20 in bare desert steppe and 6 in steppe near dry riverbed cliffs, 07/02/2018 (Shakula *et al* 2018); 25 km south of the town, 6, 12/02/2020 (Shakula *et al* 2021)
- **Badam railway station**, 12 on agricultural land, 27/03/2016 (Shakula *et al* 2016)

Otyrar district
- **Baimakhan** well, Kyzylkum desert, 30, early April 1985 (Gubin & Sklyarenko 2014)
- unspecified locality: vast plain next to an artesian well in eastern Kyzylkum desert, 1 feeding male, 06/04/2016, and female near the well, 15/04/2016 (Gubin 2020)

Sairam district
- **Akzhar**, 15 km south of Shymkent, along the road to Tashkent, 4, 05/02/2018, and 152, 06/02/2018 (Shakula *et al* 2018); 23, 20/01/2019 (Shakula *et al* 2019); 6, 17/12/2019 (Shakula *et al* 2021); 'south of Shymkent', 70+9, 06/02/2018 (Shakula *et al* 2018); also 30 km south of Shymkent, 16 birds reportedly feeding in fields, 31/01/2004 (Erokhov *et al* 2004)
- between **Karabulak** and Mashat, 1 female, 27/05/2020 (Shakula *et al* 2021)
- **Kemeshbulak lakes**, outskirts of Shymkent, 1, 05/03/2014 (Belousov 2013-2014)
- **Mashat pass**, 2, 02/02/2021 (E Bies, pers comm)

Saryagash district
- near **Bel'tau mountains**, 1, 06/02/2018 (Shakula *et al* 2018)
- north bank of **Chardara reservoir**, two flocks of 7 and 8 seen by local hunters, 11/02/2006 (Kovalenko & Kravchenko 2006)
- unspecified locality near Syrdar'ya river, 9, 18/02/2021 (Shakula *et al* 2021)

Shymkent district
- near **Shymkent**, four groups (11+18+2+14; a male displaying in each of two groups) 3–5 km from each other on hilly plain with alfalfa crops, during aerial survey of Saiga Antelope *Saiga tatarica*, 07/02/1979; two groups totalling 40+, same habitat, 10/02/1979; several scattered groups (fewer than two days before but with many displaying males), same habitat, 12/02/1979 (Vygovskii 1986)

Sozak district
- **Chulak-Espe well**, 1, 07/04/1976 (Fadeev & Savinov 1986)
- 40 km south of **Karakoin lake**, 6, 26/11/1966, and 6, 10–15/12/1966 (Borisenko 1977)
- south-west of **Kyzemshek**, male feeding, 12/04/2021 (Shakula *et al* 2021)
- **Kyzylkol lake** southern shore, 1, 13/09/2008 (Valkenburg 2008)
- between **Sholakkurgan** and Kentau, 5 km from Karatau range, 1, 12/06/2012 (Berezovikov & Annenkov 2018); between Sholakkurgan and Shayan on upper reaches of Arystandy river, 2, 08/05/2014 (Gubin & Belyalov 2017)
- **Sozak**, during aerial census of Saiga Antelope, 3, 30/03/1972 (Fadeev & Savinov 1986); between Sozak and Chulakkurgan, 1, 11/04/1976 (Fadeev & Savinov 1986)

Tolebi district
- **Khanaryk**, Aksu river valley, 23 in agricultural fields and mountain foothills, 18/11/2018 (Shakula 2019)

Tulkibas district

- north of **Akkala**, Kyzyl Aryk Sovkhoz, 1 female, 2 males in harvested wheatfield with thin border of trees, 24/10/2006, with hunters reporting killing other birds the week before; north-east of Akkala, 2 flying over alfalfa and safflower, 26/10/2006 (MK and II Vagner, pers obs)
- near **Aksu-Zhabagly NR**, nesting (evidently annually) in low-elevation mountain steppes in piedmont of the Iirsu and Aksu river valleys (Shevchenko 1948); 1 bird, 04/05/1948 (Kovshar' 1966); in the reserve next to Kara-Alma ranger station, 6, 30/09/1977, 4, 01/10/1977, 4, 08/10/1977, unspecified numbers, 19/11/1977 and 26/11/1977; in the reserve, unspecified number between Aksai and Topshak ranger stations, 01/09/1979, with 8 in same area 21/09/1982 (Ivashchenko 1986); foothills of Topshak ravine, 2, 08/04/2007 (Chalikova 2007)
- towards **Alekseevka** via Abai, 3 (the largest flying off, the other two being killed by poachers, the two weighing > and <10 kg respectively, late October 2017 (A Satbaev, pers comm)
- upper reaches of **Arys'** and Mashat rivers in winter (Shevchenko 1948); Arys', Il'inka, Karabulak, Karaungur and Maktaly rivers, south of Karatau mountains, 56, 14–30/10/2004 (Gubin & Vagner 2005)
- **Balykty Sovkhoz**, between Sastobe and Il'inka, dead female with unlaid egg, three other birds seen, spring 2004 (II Vagner, pers comm); between Abai and Kalinino, 5 in fields, spring 2006 (II Vagner, pers comm); between Makhtaly and Sergeevka, 11 in group (mostly males) in fields, 25/10/2006 (MK and II Vagner, pers obs); south of Balykty town, 2 males, 2 females and 1 unsexed in group in fields, 25/10/2006, and on same date 4 likely males, 4 likely females in fields north-west of Abai (where nesting also reported) (MK and II Vagner, pers obs)
- north-west of **Boraldai**, 4 males feeding in winter wheat, 27/10/2006; south of Boraldai between Boraldai and Arys' rivers, 5+2+2, 29/10/2006 (MK and II Vagner, pers obs);
- **Chokpak pass**, well known as a site to hunt the species (Dolgushin 1960); 1, 19/05/1969; 2, 20/09/1970; 1, 08/04/1971; 2, 15/04/1971; 8, 19–25/09/1971; 1, 10/10/1971; 3, 27–28/04/1972; 1, 15/04/1973 (Gavrilov 1985); 1 by the northern boundary of Aksu-Zhabagly NR, 05/05/1983 and 06/05/1983 (Savin & Sema 1986); 2, 05–07/05/2002, 53, 28/09–06/10/2002, and 71, September–October 2002 (Kovalenko *et al* 2002); 1, autumn 2003 (Gavrilov *et al* 2003); 1, autumn 2004 (Gavrilov 2004); 1, 12/04/2005, 2, 08/05/2005 [1 also recorded on same date by Shakula *et al* (2016)], 1, 22/05/2005, and 4 flying east at a height of 100 m, 15/10/2005 (Gavrilov & Gavrilov 2005); 9, 11/09/2011 (Bis 2011); 2, 10/09/2016 (A Kovalenko, facebook)
- north of **Enbek**, 30 in winter wheat and unplowed fields, 19/10/2006 (MK and II Vagner, pers obs); male eaten by a Red Fox *Vulpes vulpes* in a field, 12/10/2006 (II Vagner, pers obs)
- north-west of **Enbekshi** west of road to Tashkent, 1+12 in hilly wheatfield, 28/10/2006 (MK and II Vagner, pers obs)
- **Iirsu valley**, 1500 m, moulting birds appearing in July–August (Shevchenko 1948)
- **Iirsu-Daubaba plateau** (next to Aksu-Zhabagly NR), 1, 03/10/1984, and 4, 10/10/1984 (Chalikova 2008)
- **Krasnaya Gorka**, 1, 30/04/2014 (Shakula *et al* 2016); 1 male, 23/04/2015 (A Aralbaev, pers comm); female, 19/04/2021 (R Karataev, facebook); 58, 20/02/2018 (Shakula *et al* 2018); 2, 01/02/2019 (Shakula *et al* 2019)
- **Makhtaly**, Kyzyl-Aryk, on Ulken Bugun' river in Karatau foothills, 140, 17–23/11/2004 (Gubin & Vagner 2005)
- south-east foothills of **Malyi Karatau**, 7 feeding in gently sloping meadows of short green grasses after a wildfire, 14/11/2004, locals reporting area being used by as many as 1500 birds on annual migration and in winter (Kovalenko 2004)
- east of **Mashat**, two broods (one involving 3 chicks) in hilly valley near stream, spring 2004, with 7 birds same place in autumn 2004 (II Vagner, pers comm)
- **Maylikent (Iirsu) pass**, regularly hunted (Kovshar' 1966); near the pass, unspecified number, 10/05/1975 and again 20/04/1976 (Ivashchenko 1986)
- **Pobeda Sovkhoz**, south-west of Karla Marksa, 5, 19/10/2006 (MK and II Vagner, pers obs)

- near **Sastobe**, 1, 03/12/2018 (Shakula 2019)
- **Sergeevka** (Yntymak), 5 at bottom of gully and on plowed field (1 male displaying), 16/04/2017 (Shakula *et al* 2018); around Sergeevka on both sides of railway, 59+20+8, 05/02/2018, 8+4, 15/02/2018, 102, 16/02/2018, 20, 17/02/2018 (Shakula *et al* 2018)
- **Sovkhoz Kirova** (Oktyabr'), north of Enbek, 38 in fields of wheat, safflower and alfalfa, 16/10/2006, with breeding there reported by locals (II Vagner, pers comm); hill nearby, between Il'inka and Kalinino, 3, 25/10/2006 (MK and II Vagner, pers obs)
- 3 km north of **Vannovka**, 1 in alfalfa field; later flew towards Boraldai mountains, 16/04/2008 (Ivashchenko 2008)
- **Zhabagly**, 12/10/1948 (when unspecified numbers feeding on sown safflower); 2 birds, 03/12/1948; 40 flying west after two-day snowstorm, 06/12/1948; 3, 20/01/1949; 3, 21/02/1949; nest with 2 eggs, summer 1949; 30 by haystack unable to fly after snow and rain, 10/12/1952; 28, 28/09/1953; 2 flying south-west, 15/09/1959; flock of 5 and flock of 4, 26/08/1960; flock of 5 and flock of 4, 23/10/1960; 2, 12/03/1961; flocks flying west, 26/08/1961 and 03/11/1961; 1, 17/04/1964; single birds noted multiple times, September–October 1964, with some remaining to winter in Arys and Mashat river valleys (Kovshar' 1966); between Zhabagly and Abail, 1, 13/10/1967 (Kovshar' in Gavrilov & Gistsov 1985)
- **Zhambyl Sovkhoz**, between Zhanakogam and Kyzylaryk, 12 in alfalfa field, June 2005 (II Vagner, pers comm); and between Sergeevka and Karabulak, 1 flying over alfalfa and a male in alfalfa, 26/10/2006 (MK and II Vagner, pers obs)

Zhambyl province

Assy district

- between **Balykchi** and Boraldai foothills, 1 male feeding in field, 23/04/1958 (Korelov 2012)
- hills near **Shavrovka**, 3 flying over, 23/04/1958 (Korelov 2012)

Chu district

- between **Chu** and Birlik, many (2 killed by geologists), early September 1981 (Brushko 1986)
- **Zhusandala steppe** west of Aksuek village and east from Khantau–Chiganak highway, 1, 15/07/1983 (Jatkanbaev 1986)

Kordai district

- **Kordai pass**, 2, 20/04/1906 (Shnitnikov 1949)

Moiynkum district

- **Betpakdala desert**, 1, 26/03/2015 (Akimkanova 2015)

Ryskulov district

- unspecified locality, 18 in sloping wheatfield, 31/10/2010 (Balykin 2010)

Talas district

- **Akkol' lake**, 2, 21/03/2017 (Balykin 2017)
- 45 km north and 45 km north-west from **Bol'shie Kamkaly lake**, 1 each, 30/03/1981 (Fadeev 1986)
- **Malye Kamkaly**, 1, 30/03/1981 (Fadeev 1986)
- 100 km north of **Zhambyl**, 1, 30/03/1981 (Fadeev 1986)

Zhambyl district

- **Nurly lake**, north-east foothills of the Karatau range, 06/08/2013 (Belousov 2013-2014)

Zhualy district

- **Akyrtas**, 2 males, 20/01/2020 (Nukusbekov 2020)

- entrance to the **Berkara gorge**, 3 moulting males, 01/07/2019 (A Isabekov, pers comm & Nukusbekov 2019)
- **Billikol' lake** (shared with Talas district), 16 birds, 26/09/1957 (remaining until heavy snowfall in November) (Gavrin 1962)
- **Ertai**, north-east foothills of the Boraldai range (all records from agricultural fields), 7, 19/04/2013, 4, 20/04/2013, 3, 23/05/2013 (Nukusbekov 2013); 1, 25/05/2013 (Dyakin 2013); 29, 09/04/2014, 4, 12/04/2014 (Nukusbekov 2014); 11, 26/04/2014, and 1, 03/05/2014 (Isabekov 2014); 17, 08/05/2014, and 9, 12/05/2014, with 5 nests found by 18/05/2014 and first-hatched chicks of year seen next day; 5, 27/08/2014, and 2, 04/11/2014 (Nukusbekov 2014); 3, 06/04/2015, 18, 08/04/2015, and 11, 12/04/2015, with chicks hatched from 4 nests; 24, 01-04/10/2015 (Nukusbekov 2015, M Nukusbekov, pers comm); 23 just arriving to breed, 05/03/2016, and 35 (4 displaying males), 11/03/2016, with 9 nests found by 11/05/2016 (Nukusbekov 2016, M Nukusbekov, pers comm); 3, 31/03/2017, and 8, 20–26/04/2017 (Nukusbekov 2017); 7, 03–15/03/2018, and 4, 19/04–06/05/2018 (Nukusbekov 2018); 4, 04/03/2019 (Nukusbekov 2019); 8 females and 5 displaying males, 21/03/2019 (Dyakin 2019); 1 female in flight, 27/04/2019 (Nukusbekov 2019); 9, 19/03/2020, and 35+, 13/04/2020 (Nukusbekov 2020); several males and females, 06/04/2021 (Nukusbekov 2021)
- Lower reaches of **Koksai canyon**, 3, 13/06/2005 (Kolbintsev 2006)
- **Kuyuk pass**, 40, 29/01/2003 (Kolbintsev 2014); 1 in hilly steppe, 20/06/2011 (Belyalov 2011)
- **Teris** river shoreline, in abundance, 08/07/1864 (Severtsov 1947); Ters-Ashybulak reservoir, 1, 18/04/2014 (Belyalov 2014), and 56, 06/12/2020 (Nukusbekov 2021)