# Assessing the wintering population and conservation challenges of the Little Bustard *Tetrax tetrax* in Azerbaijan

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**Summary:** The Little Bustard *Tetrax tetrax* has a breeding distribution spanning Europe and Central Asia, with Azerbaijan hosting a globally significant wintering population, representing up to *c*69% of the species' total population. A 10-day preliminary survey in early 2023 documented nearly 20 000 Little Bustards and highlighted illegal poaching and land conversion as major conservation challenges. More extensive surveys in early 2024 and 2025 provided a fuller assessment of the Transcaucasian wintering population. These larger undertakings recorded nearly 100 000 and 160 000 Little Bustards respectively, and significantly advanced our understanding of the species' distribution, population and conservation challenges in the region. Poaching remains the primary threat to the Little Bustard in Azerbaijan, with illegal hunting by Arab falconers exacerbating conservation challenges. Although hunting pressure has declined over recent decades due to protective measures, enforcement remains weak and many offenders persist despite fines. Falconry-related activities, such as off-road driving, also degrade habitats and increase bird mortality risks. Additionally, habitat loss due to agricultural expansion has forced Little Bustards to adapt to the agricultural landscape mosaic. While they have shown some flexibility in their habitat use, overgrazing and pastureland mismanagement further threaten their survival. Another significant concern is collision with powerlines, particularly in migration corridors and wintering areas. Powerlines have caused high mortality rates in the past, and new energy infrastructure projects could magnify the problem. Given Azerbaijan's importance in hosting a large proportion of the global population, conservation measures—including stronger anti-poaching laws, habitat protection, and mitigation of infrastructure risks—are urgently needed to safeguard the species' future.

## INTRODUCTION

The Little Bustard *Tetrax tetrax* has an extensive global distribution, which although stretching from Portugal in the west to Xinjiang, China, in the east, has been much fragmented over the 20th century (BirdLife International 2018). In the first half of the 20th century, Little Bustards bred in some parts of Azerbaijan, possibly continuing to do so in Gobustan into the 1950s or 1960s (Radde 1884, Patrikeev 2004). More notably, however, Azerbaijan serves as a crucial habitat for possibly the world's largest wintering population of the species (Vereschagin 1940, Gauger 2007, Heiss 2013, Heiss *et al* 2020). These birds migrate from northern breeding grounds in Russia and Kazakhstan, passing through and congregating in the Caucasus region. Classified as globally Near Threatened (BirdLife International 2018), the species is listed in Azerbaijan's Red Book as Near Threatened (MENR 2023) and consequently has national protected status.

The primary period of Little Bustard autumn migration through Azerbaijan's Beshbarmag bottleneck, on the Caspian Sea coast 70 km north-west of Baku, typically begins in October, reaching its peak intensity in November, with birds settling further south to overwinter and move between sites, presumably responding to weather, food availability and disturbance. The return journey takes place during March and April, likely on a broad-front migration, as spring numbers at Beshbarmag are considerably lower; Heiss (2013) speculated that the birds might cross the Caspian Sea on their way back to the breeding grounds. Based on Gauger's (2007) fieldwork in the early 2000s, the Little Bustard was found to have a strong preference for large, undisturbed areas of semi-desert and steppe used for winter pasturing, but tended to avoid areas with intensive agriculture. In Azerbaijan, the species faces a series of threats, especially poaching, overgrazing and destruction of suitable habitats, and powerline collisions.

Prior to the 1930s, it is estimated that up to 300 000 Little Bustards wintered in Azerbaijan (Patrikeev 2004). While no detailed survey results exist from the early Soviet

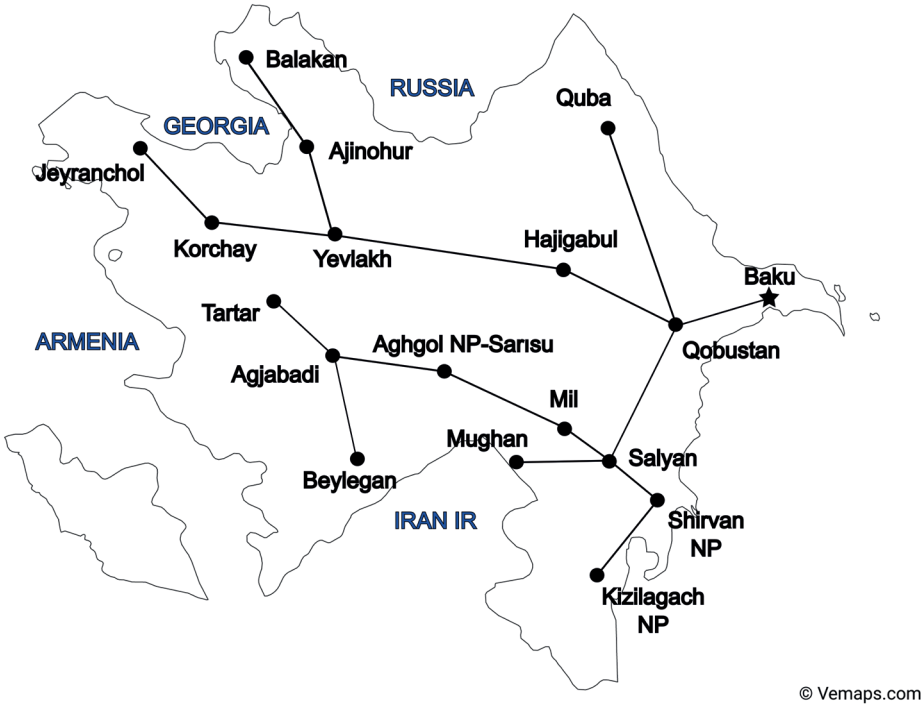


**Figure 1**. Map of Azerbaijan and neighbouring countries showing the 17 main sites we surveyed, plus our routes, in 2024 and 2025 combined (NP = National Park).

period, Vereschagin estimated that, during the 1930s, 40 000–50 000 Little Bustards were hunted each winter in Azerbaijan, decreasing to 20 000 by the 1940s (Vereschagin 1940). He observed that motor vehicles, which Little Bustards allowed to come much closer than humans on foot, significantly facilitated bird hunting in Transcaucasia. In the second half of the 20th century, the species experienced significant declines globally; however, relatively high numbers of Little Bustards were still reported in Azerbaijan on some occasions around the turn of the century. For example, 62 300 individuals were observed in 1971 and 30 000 in 1982 in Kizilagach National Park (Patrikeev 2004), and Gauger (2007), citing Martinez *et al* (1997), reported an estimated 100 000 birds in the same location during the winter of 1990. This led Gauger (2007) to question whether the lack of observations was due to a genuine large decline of the species or simply a lack of data over the period.

The number of Little Bustards wintering in the country each year varies in total and with area, depending on regional and local weather conditions (Gauger 2007). Differences can be dramatic: having recorded 62 300 birds in Kizilagach National Park in 1971, Patrikeev (2004) found none in 1984/85 or 85/86. For him one explanation for such local movements was possibly disturbance, driving birds from Shirvan to Kizilagach and from Korchay to Ajinohur (Figure 1). Increased hunting pressure in the 1980s might have caused the birds to shift their preference to the Mughan steppes (Patrikeev 2004).

After his 2005/06 winter monitoring, Gauger (2007) estimated the minimum number of Little Bustards wintering in Azerbaijan at 150 000, with a maximum of 200 000. He also reported a single site count of approximately 35 000 birds in Aghghol National Park. Occasional observations from the Beshbarmag bottleneck in the mid-2000s provide additional data on migrating Little Bustards. In autumn 2011 the count of birds there

exceeded 100 000, a figure estimated to represent 41–44% of the global population of the species at the time (Heiss 2013). Subsequent autumn tallies documented fewer than 30 000 Little Bustards migrating through the bottleneck until autumn 2024, when over 181 000 birds were recorded between 15 October and 13 November, surpassing all previous counts. Indeed, this number exceeds the published estimated breeding population of the Little Bustard in its eastern range and represents 40–69% of the estimated global population (BirdLife International 2018, Morales & Bretagnolle 2022).

However, these figures only capture a portion of the wintering population in Azerbaijan for two reasons: first, there is an additional migration of Little Bustards in the western regions of the country, as evidenced by earlier data (Vereschagin 1940, pers obs); second, the counts at Beshbarmag ended in mid-November, while Little Bustards may continue to arrive afterwards, depending on weather conditions further north. Similarly, during the winter of 2025, an increase in reports of Little Bustards was observed in regions where the species had previously been uncommon, including Croatia, Greece, and Türkiye (evidence from Birding Croatia, Balkans Rare Bird Sightings, social media). This pattern, in conjunction with the high numbers recorded during migration counts at Beshbarmag—despite reduced field effort—yet yielding a higher total count of individuals in 2025 compared to 2024, suggests a large-scale southward displacement of the population. This shift is likely to be driven by ecological or climatic factors operating in Russia and/or Kazakhstan.

To conserve this significant portion of the global population effectively, a deeper understanding is needed of its distribution, numbers, ecology and threats. In 2023 colleagues and I implemented a preliminary survey to gauge the size of the wintering population and document the conservation issues affecting it. In 10 days we counted 19 221 Little Bustards across 29 different locations, documented illegal poaching of the birds and identified land conversion as an additional threat (Farajli & Mammadsoy 2023). In 2024 and 2025, with higher effort and more people, we undertook a larger survey aiming for a comprehensive review of the winter range and numbers in Azerbaijan. Furthermore, a team of ornithologists in Georgia coordinated their surveys in suitable areas near the border to reduce the risk of double-counts and document the birds' movements there (Budagashvili 2025). This paper seeks to present the latest population estimates of Little Bustards in Azerbaijan as well as to highlight the threats they face.

## METHODS

We took a comprehensive approach intended to provide insights into the ecological dynamics and conservation needs of the Little Bustard populations in Azerbaijan. Our survey focused on habitats known to be used by wintering Little Bustards or identified through satellite imagery. Both the literature and our 2023 preliminary survey indicated that in Azerbaijan the species makes use of a mix of habitats, including grass steppes, winter crops and fallow fields (Gauger 2007, Heiss 2013, Farajli & Mammadsoy 2023). These habitats are well represented in the Caucasus region, with shrub desert and steppe ecosystems being particularly extensive. This ecoregion, spanning Azerbaijan, Georgia and Iran, covers approximately 6.4 million hectares, at elevations ranging from 27 m to 900 m, and covers about 70% of Azerbaijan's land area (WWF 2018). However, agricultural landscapes, including winter crops and fallow fields, are also widespread within this region.

During our 31 days of fieldwork between 13 January and 14 February 2024 and 22 days between 30 January and 21 February 2025, we drove from 9:00 to 18:00 along predetermined itineraries, pausing in suitable open habitats to scan carefully for Little Bustards from whatever vantage points we could find. We used cars to move between and within sites, but suitable roadless habitats were also explored on foot. In total we drove just short of 6540 km and 4500 km in 2024 and 2025 respectively. Certain large locations

needed more than a day of coverage. As a result, Little Bustards were encountered in three main ways: (a) on the ground, including birds flushed by our approach, (b) in flying flocks, or (c) by feathers or dead specimens (including collision victims, roadside game markets and falconer leftovers).

During the survey we systematically recorded data concerning any encountered Little Bustards, including GPS coordinates, flock sizes, habitat types and potential threats. When standing flocks were near human settlements (*eg* farms, houses) or infrastructure (*eg* main roads and powerlines) we visually estimated the distances between them to better understand the birds' tolerance of human activities. We visually assessed plant height in the vicinity of the birds and categorised it as follows: 1 (<10 cm), 2 (10–30 cm), 3 (30–50 cm), or 4 (>50 cm). We rated the quality of our bird counts on a scale from 1 to 5, where 1 represented brief sightings of distant flocks, and 5 represented thorough and repeated counts of all birds. We supplemented written notes of observations with photographs of certain flocks; these allowed for a more accurate count and enabled corrections to be made if required. Two or more birds together, whether on the ground or in the air, were considered a flock.

## RESULTS

### *Distribution, numbers and habitat*

Little Bustards were observed in nearly all of the 17 main sites we targeted for survey (Figures 1 & 2). Of these sites, 14 were visited in both 2024 and 2025, but Quba, which held only 80 birds in 2024, was omitted in 2025 while Balakan, Beylegan and Tartar were only visited for the first time in 2025 but no birds were found. Jeyranchol also lacked birds in 2025 despite past observations in the literature and our 2024 survey (Figures 1 & 2). In total, we recorded 97 355 and 159 156 individuals in 2024 and 2025 respectively, while acknowledging the possibility of double-counting in some areas. After adjusting for potential overestimation, and an estimate by other observers at Shirvan in 2025, the population sizes were refined to *c*95 000 and *c*175 000 individuals for 2024 and 2025, respectively (Table 1, Figure 2). The quality of our bird counts averaged 4.17. Mean flock size was 2310 individuals, based on 67 and 40 locations in 2024 and 2025 respectively. The highest elevation we found the birds was just above 400 m. Throughout our survey, Little Bustards primarily used two habitat types: (a) natural steppe environments, and (b) fallow lands interspersed with winter crops (including pivot irrigation areas known as 'agroparks'; Plate 1), notably barley and wheat. We did not observe any Little Bustards in true desert or semi-desert habitats.

In 2024, the largest congregations of the species were observed in Shirvan and Kizilagach National Parks, with 25 573 and 17 850 birds respectively (Figure 2). These two locations hosted 45.7% of all the birds counted in that year, indicating their importance for the conservation of the species. In Shirvan National Park we observed three subpopulations with seemingly little movement between flocks. Within both parks, the birds occupied natural steppe with a plant height of 20–50 cm, and were observed in flocks of 20–8000 individuals. However, outside these national parks more than 37 000 Little Bustards were spotted in agroparks in 2024, highlighting the significance of these unprotected lands for the species. At present, there are at least 12 large-scale agroparks in the parts of the country we visited, with one company alone cultivating 60 000 ha across Jeyranchol, Samukh and Hajigabul districts since 2014.

In 2025 the highest concentrations of birds were recorded in the districts of Qobustan, Hajigabul, Tartar and Yevlakh, as well as in Shirvan National Park, with each site supporting almost or exceeding 20 000 individuals (Figure 2). Collectively, these areas accounted for approximately 81% of the total birds recorded that year. Notably, a substantial decline

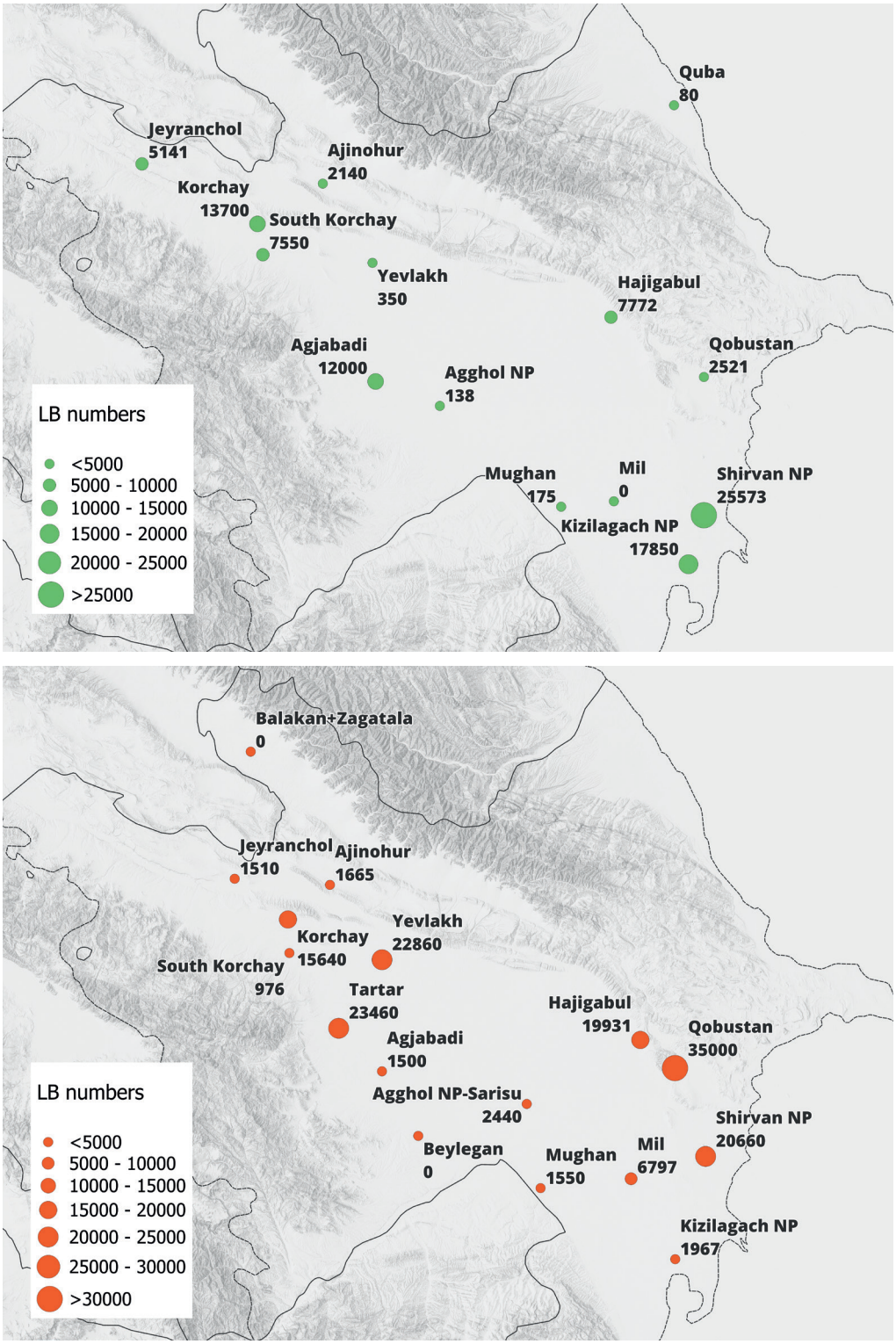


**Figure 2.** Key sites where Little Bustards were recorded during our 2024 (green) and 2025 (red) surveys. Nearby flocks are lumped together for display purposes.

was observed in previously significant sites including Agjagabi Agropark and Kizilagach National Park, where the combined population approached 30 000 individuals in 2024 but dropped to fewer than 3500 individuals in 2025 (Table 1).

In the winters of 2024 and 2025, winter crops, characterised by a total plant height consistently below 20 cm, supported 46 319 and 50 865 birds, respectively. Steppe habitats, where plant height exceeded 20 cm, hosted 48 780 and 69 055 individuals respectively. The remaining birds were recorded either in flight or within habitats exhibiting a mosaic of vegetation height categories. Further research is necessary to refine our understanding of habitat preferences in relation to spatial coverage in these environments. In seven locations, flocks were observed less than 50 m from settlements and infrastructure, suggesting an adaptation to mosaic habitats near human activity and a tolerance for disturbance in the absence of hunting. Flock sizes in these locations were generally below 1650 individuals, with the exception of Qobustan, where in 2025 an estimated 35 000 birds were dispersed across the steppe, some feeding in close proximity to shepherd farms, likely due to the absence of hunting pressure. Flock sizes ranged from 100 to 5000 individuals at distances of 50–100 m (four locations) from human infrastructure and increased to 8000 at 150 m (one location). This pattern conjecturally suggests that larger congregations tend to occur at greater distances from settlements and infrastructure.

In addition to wintering grounds noted in the literature and those monitored in 2023, two notable new locations were discovered in 2024 and 2025. One, in 2024, was the agropark in Agjabadi (Agjabadi Wheat LLC), where an estimated 12 000 birds were observed; the other, in 2025, was in Tartar, where over 23 000 individuals had gathered. In contrast, significantly lower numbers were recorded at the historically well-documented wintering site of Aghgol National Park and its surroundings, with only 138 birds observed in 2024 and 2440 in 2025. Rangers from this park have also reported a decline in Little Bustard sightings in recent years compared to a decade ago, suggesting a potential shift in wintering areas toward safer locations such as the agropark in Agjabadi, where food resources are abundant and hunting is prohibited. Although hunting is also banned within the national park, frequent human activity, including fishing and the presence of domestic livestock, may contribute to higher levels of disturbance for Little Bustards. In contrast, agroparks offer a more stable and readily available food supply, potentially making them more favorable wintering habitats. However, in 2025 we recorded only 1500 Little Bustards in this park. According to local workers, the species had initially been present in high numbers, similar to the previous year, but the birds left the area following ongoing harvest and plowing activities. Additionally, a single gun cartridge was discovered, suggesting potential hunting activity on the site. Local sources claimed that shotguns are used for deterrence by firing into the air rather than for direct hunting, but we could not verify this.

Likewise, a significant number of birds (exceeding 7500 in 2024) were sighted in fields south of the Korchay sanctuary/agroparks (Plates 1 & 2). However, the movements of birds between these fields and agroparks are not well understood. Workers at these agricultural facilities informed us that they scared the birds away daily, but that they returned for roosting in the evening. Our observations in the agropark confirmed this claim, as in both 2024 and 2025 we encountered significant numbers of Little Bustards (13 700 and 15 640 respectively) just before sunset. A parallel pattern is evident in the Mughan steppes, where the presence of falconry and hunting activities is likely to drive Little Bustards to congregate in the agropark in Bilesuvar. Even so, despite daily falconry activity on the nearby Mil plains by foreigners, over 6700 birds were present.

To improve our understanding of transboundary movements, in 2024 we coordinated our surveys with those of a team of Georgian ornithologists from SABUKO (Society for Nature Conservation) in Vashlovani National Park near the Azerbaijani border. Despite

investing over six hours in the field and covering almost 150 km by vehicle, the Georgian team was unable to spot any Little Bustards (Budagashvili 2025). This mirrored our team's experience, where we only encountered a single bird in the western parts of the Jeyranchol steppes along the Georgian border after a six-hour drive spanning 96 km (providing visual coverage of approximately 755 km$^2$). Records on eBird indicate a peak count of (only) 468 Little Bustards on the Georgian side of the border on 9 December 2023 (Kitel & Kochetkov 2023), but nearly 2000 birds were recorded on 17 December 2024 and up to 5600 individuals on 3 March 2025 in Samukhi near the Azerbaijani border (N Budagashvili pers comm, A Rukhaia pers comm).

**Plate 1.** A flock of Little Bustards in an agropark (pivot-irrigated fields) in Korchay Sanctuary, 2024.
*© Elvin Mammadsoy*

### *Hunting*

During our fieldwork in both 2023 and 2024, we encountered up to 10 roadside markets or stalls where dead Little Bustards were being sold alongside other types of game. Drawing on information from locals and our own investigations, we found that these activities are particularly prevalent along the main highway between the districts of Hajigabul and Kürdemir, where the sale of Little Bustards (as well as other hunted or trapped animals) occurs during the winter season. Gauger (2007) also noted similar roadside markets in these districts. By collaborating with local authorities, we successfully closed down these roadside markets and disseminated our findings through social media to the public. With law enforcement charged with taking action to curb such illegal wildlife trade, recognising the protected status of the species listed in the Red Book, our efforts garnered attention in the local media.

After some time, we conducted monitoring efforts to assess the situation in 2024 and found no such markets along the highway, suggesting that they had either been dismantled or relocated. Similarly in 2025 we encountered no such stalls alongside the same highway during our visits and this either indicates our previous campaign was

successful or they just relocated to a new location. Ongoing monitoring in future years will help answer this question.

During our surveys, groups of falconers from Qatar and UAE were discovered hunting in the central Mil steppes near Bilesuvar district, an area historically known to host 20 000 to 30 000 wintering Little Bustards (Patrikeev 2004, Gauger 2007). Further investigation revealed that one group consisted of the same individuals who have been visiting Azerbaijan for Little Bustard hunting since 2019, indicating that any fines imposed in previous years have failed as a deterrent, and that these individuals were not barred from entry to the country. Additionally, the Ministry of Environment and Natural Resources imposed fines on only one individual from this particular group in 2024, and the penalties were considerably lower than those mandated by law. Illegal hunting, including of birds and animals completely protected by law, is subject to criminal liability in Azerbaijan (Criminal Code of the Azerbaijan Republic, Article 258). Subsequently, the other individuals involved in the incident left the country.

In 2025, reports of similar hunting parties once again emerged. Through local knowledge, and our field visits, we identified three distinct hunting groups from Qatar and the UAE operating in the south-eastern region of Azerbaijan, primarily in the Mughan steppe and Mil plain.

**Plate 2.** Counting Little Bustards in Korchay Sanctuary, 2024. © *Elvin Mammadsoy*

***Treatment as crop pests in agroparks***

Apart from the threats of falconry and poaching for meat, we have identified a new hunting pressure on the Little Bustards which involves one of the key stakeholders in their conservation: agroparks or large-scale agricultural landowners subsidised by the government. In both the 2024 and 2025 surveys we discovered that some of these companies incentivise local hunters to shoot birds in order to deter them from feeding on crops, in the mistaken belief that this will reduce crop loss.

**Plate 3.** Fresh remains of a Little Bustard that collided with a low-voltage transmission line in Hajibagul, 31 January 2025. © *Zulfu Farajli*

*Powerlines*

Collision with powerlines also represents a significant threat, especially for larger flocks of birds. While we did not observe any fatalities resulting from birds colliding with powerlines during our 2024 survey, this may have been easily overlooked since collision monitoring was not our primary focus. By contrast in 2025 we found over 10 Little Bustard remains while driving and walking along 6 km of distribution line, some being quite fresh under a low voltage (35 kV) line in Hajigabul district (Plate 3). Given that this transmission line extends over 20 km through suitable Little Bustard habitat, the potential number of mortalities is likely to be significant at this location.

*Overgrazing*

In addition to the direct threats outlined above, overgrazing remains a significant challenge for the conservation of Little Bustards. During our surveys, flocks of sheep and cattle were recorded across nearly all natural steppe habitats, including Shirvan, Aghgol and Kizilagach National Parks. Of particular concern is the extent and density of domesticated cattle (cows and buffaloes) within Kizilagach National Park, despite its designation as a Ramsar site.

## DISCUSSION

In European Russia and Kazakhstan, where Azerbaijan's wintering Little Bustards are thought to breed, achieving a high level of population monitoring through field surveys is impractical. Consequently, monitoring of major concentrations of birds, as can be achieved in the relatively small areas of the Transcaucasus, is an expedient means of assessing the wider region's population size and trends, despite the species' migratory changes over the years due to temperature variations and disturbance (Patrikeev 2004). Winter surveys

of Little Bustards in Azerbaijan recorded approximately 95 000 and 156 000 individuals, highlighting the country's critical role in the species' wintering range. Based on these surveys, autumn counts at Beshbarmag and other data, the estimated annual wintering population of Little Bustards in Azerbaijan ranges between 65 600 and 208 100 individuals (Table 1), with fluctuations primarily driven by variable weather conditions in their northern range. The population is considered likely to be stable based on overall numbers in the last two decades (Table 1). Furthermore, considering maximum reported individuals from Azerbaijan, Georgia and Iran the total wintering population of Little Bustards in the Transcaucasus is estimated not to exceed 230 000–250 000 individuals, with Azerbaijan hosting the majority of this population.

Across observations conducted over two years at 107 locations, flock sizes exceeded 3000 individuals on 21 occasions. The enumeration of such large aggregations posed a considerable challenge, necessitating estimations based on counting in increments of ten, fifty or, in some instances, one hundred before flock dispersion occurred. In these cases, count quality was assigned a score of 4 when estimations were made in groups of ten to fifty, and a score of 3 when counting by hundreds was required. On seven occasions, a quality score of 2 was assigned due to significant observer–flock distance or exceptionally large flock sizes. Scoring was based on self-evaluation of the observers involved and subsequently reviewed by the team to enhance accuracy.

Given the substantial discrepancies between population estimates reported in the literature (Gauger 2007), our survey data, and counts from the Beshbarmag bottleneck (*eg* just above 12 000 birds in autumn 2023)—along with the decline observed in Georgia and Iran during the 2023/24 season relative to previous years (N Budagashvili pers comm, Anon pers comm)—it appears that the wintering distribution of Little Bustards is strongly influenced by weather conditions. However, in 2024/25, a higher number of individuals were recorded during migration and wintering in Azerbaijan and other regions. Owing to the irregularity of their movements, continued research and systematic monitoring are necessary to assess whether (or the degree to which) there is a genuine decline in the overall wintering population that is currently being masked by the natural variability attributable to regional and local conditions (for trends, see Table 1). Moreover, transboundary initiatives are necessary to achieve a sufficient understanding of the movements of Little Bustards between neighbouring countries such as Georgia and Iran. Satellite telemetry could greatly help detect patterns in movements within and between wintering and breeding grounds.

Our observations suggest that Little Bustards are now less tied than they were to natural steppes, such as Vashlovani and Chachuna in Georgia and Jeyranchol (steppe part) in Azerbaijan, where they previously wintered in their thousands (N Budagashvili pers comm, Gauger 2007), instead preferring the agroparks nearby in Jeyranchol and Samukh. Given the considerable size of the agroparks (stretching for tens of kilometres) and their presumed suitability as habitat, we suspect that the actual number of birds residing inside could be even greater. Despite our repeated requests, we were denied entry to these two vast agricultural facilities and could only count the birds visible from outside. As a result only some 4500 birds were recorded in Jeyranchol agropark in 2024 and something over 1500 birds in Samukh agropark in 2025 (Figure 2). Given our inability to explore two significant agricultural areas with suitable habitat (and other challenges, such as limited accessibility due to snowfall obstructing dirt roads in other locations), it is plausible that the actual number of birds wintering in Azerbaijan may be higher than our recorded counts.

Similarly, movements of birds across the Azerbaijan–Iran border present challenges for a complete census of Little Bustards. In the Mughan (Moghan) plains of Ardabil, Iran, which border the plains of the same name in Azerbaijan, up to 10 000 Little Bustards

**Table 1.** Wintering population size and trends of Little Bustards in the 17 main sites targeted for survey in Azerbaijan in 2024 and 2025. Quality of estimate: 1 = low, 5 = high. * = key source Patrikeev (2004), also Vereschagin (1940); ** = key source Gauger (2007), also eBird; *** = author's rounded estimate, using data from previous two winter surveys. The movement patterns of birds between Aghgol NP (A) and surroundings (eg Agjabadi), and those between Korchay Sanctuary (B) and its southern vicinity, are currently not fully understood (see Discussion). [1] In Shirvan National Park, an additional estimate from independent observers János Oláh and Hikmet Qemberov in 2025 was incorporated as the maximum value. [2] For Kizilagach, the minimum population estimate excludes the exceptionally warm winters of 1984/85 and 1985/86, during which no individuals were recorded, as reported by Patrikeev (2004). [3] The total provided for these time periods is the total estimate provided by the authors cited, which does not equal the sum of values for each site listed above.

| Region (Figure 1) | Number of birds 2023/2024 | Number of birds 2024/2025 | Important sites | Average quality of estimate | Population trend | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | 1950–1990* ↘ | 1990–2020** ↗ | 2020–2025*** → | 1950–2023 ? |
| Qobustan | 2521 | 35 000 | 1 | 5 | ? | 20 000 | 2500–35 000 | ↘ |
| Hajigabul | 7772 | 19 931 | 3 | 4 | ? | 500–7500 | 7000–20 000 | ↗ |
| Quba | 80 | ? | 1 | 5 | ? | 50–500 | 50–500 | → |
| Yevlakh | 350 | 22 860 | 2 | 5 | <7000 | ? | 300–20 000 | ? |
| Korchay | 13 700 | 15 640 | 3 | 4 | 300–600 | <15 000 | 13 000–15 000 | ? (B) |
| South of Korchay | 7550 | 976 | 4 | 4 | ? | ? | 1000–7500 | ? (B) |
| Jeyranchol | 5141 | 1510 | 2 | 3 | ? | 15 000 | 1500–5000 | ↘ |
| Ajinohur | 2140 | 1665 | 1 | 5 | 200–300 | 10 000 | 1500–2000 | ↘ |
| Balakan + Zagatala | ? | 0 | 2 | 5 | 900–2000 (30s) | 185 | 0–100 | ↘ |
| Mil Plain | 0 | 6797 | 3 | 4 | 5000–10 000 | ? | 5000–7000 | ↘ |
| Mughan Steppe | 175 | 1550 | 1 | 3 | 10 000–30 000 | >20 000 | 200–1500 | ↘ |
| Shirvan NP + Salyan | 25 573 | 20 660–40 000[1] | 4 | 4 | 400–1000 | <25 000 | 20 000–40 000 | ↗ |
| Kizilagach NP | 17 850 | 1967 | 3 | 4 | 2000[2]–62 300 | 8000 | 2000–20 000 | ? |
| Aghgol NP + Sarisu | 138 | 2440 | 3 | 5 | 40–590 | <35 000 | 100–2500 | ↘ (A) |
| Agjabadi | 12 000 | 1500 | 1 | 3 | ? | ? | 1500–12 000 | ? (A) |
| Barda + Tartar | ? | 23 460 | 1 | 3 | ? | ? | 10 000–20 000 | ? (A) |
| Beylegan | ? | 0 | 2 | 5 | | 6800 | 0 | ? (A) |
| **Country TOTAL** | **94 990** | **175 296** | **37** | **4.2** | **8000–40 000[3]** | **150 000–200 000[3]** | **65 650–208 100** | **?** |

were observed in the early years of the century (Sehhatisabet *et al* 2012). It is important to highlight that the number of Little Bustards wintering in the Mughan plains (Iran) varies considerably from year to year, with numbers occasionally falling below 1000. Furthermore, flocks spend less time at this area, typically arriving in mid-December and departing by mid-February (Sehhatisabet *et al* 2012) and then staging in Azerbaijan before moving back further north. In 2025 an estimated 1550 birds were observed in the agropark in Bilesuvar near the Iranian border, whereas only 175 birds were found in 2024 (Figure 2).

On 30 January 2025, an estimated 35 000 birds were recorded in western Qobustan. However, by early February, observations in Shirvan National Park indicated a significant increase in bird numbers, rising from some 5000 individuals on 19 January (ZF data) to 20 000–40 000 individuals on 16 and 19 February (ZF data, János Oláh and Hikmet Qemberov pers comm). Whether this increase resulted from the movement of the same birds southward from Qobustan in response to adverse weather conditions remains uncertain.

***Hunting***

The main threat to the Little Bustard in Azerbaijan remains poaching. According to one estimate in the winter of 1960/61 in Kizilagach no fewer than 2500 birds were hunted (Ivanov & Priklonskii 1965). Thanks to the protection of the species, hunting pressure has decreased significantly in recent decades, but it still presents a threat.

Over the past few years, the Little Bustard has faced a new and important challenge in Azerbaijan from Gulf state falconers (Collar & Kessler 2021), despite its protected status in the country (MENR 2023). Falconry has been described as 'a way of connecting to nature' (UNESCO Intangible Cultural Heritage of Humanity) and typically kills smaller numbers of individuals of a game species than hunting with guns (Šegrt *et al* 2008). However, the reckless off-road driving of falconers in SUVs across the steppes contributes to habitat degradation and increases the birds' energy expenditure during winter. The extent of this impact depends on the scale and logistics of falconry—large-scale operations involving tens of falcons and vehicles as observed during our surveys indicates that these hunting parties can be just as disruptive as traditional hunting with firearms. This additional stress may also heighten the risk of collisions with human infrastructure, such as powerlines, as birds attempt to evade approaching vehicles. Of further concern is that many of these falconers are repeat offenders—individuals who have been fined in previous years but remain undeterred from engaging in illegal hunting activities.

The threat of being targeted in agroparks as crop pests is a new dimension to the problem of poaching. Apart from the illegality of targeting this protected species, and of hunting outside designated areas (hunting grounds), this approach is also ineffective, as according to local hunters the majority of birds quickly return to the same areas. To address this issue, we are currently trying to collaborate with these companies to explore sustainable deterrent methods. In 2025 with a member of management of an agropark we discussed the feasibility of deploying some sustainable diverters such as motion-detected sprinklers (although these are deemed to be ineffective in agroparks), while bird-shaped kites or 'motion scarecrows' have been identified as of potential value and need testing in future studies.

To address the primary threat of poaching, national laws in Azerbaijan should explicitly prohibit companies from promoting illegal bustard hunting, especially by foreign visitors, as emphasised by Collar & Kessler (2021). Legislation must also evolve to enable the Ministry of Ecology and Natural Resources (MENR) to penalise individuals based on evidence from social media posts suggesting poaching, rather than relying solely on issuing fines when poachers are caught with killed birds. Additionally, Azerbaijan

could benefit from becoming a party to the Convention on the Conservation of Migratory Species of Wild Animals (CMS), which would enhance conservation efforts for Little Bustards and other migratory species.

***Powerlines***

Little Bustards, like other large ground-dwelling birds such as geese, storks and cranes, are particularly vulnerable to collisions with powerlines. Their eyes are positioned on the sides of their heads, providing wide 310° vision for detecting predators, but leaving them with poor forward vision (Martin & Shaw 2010). In the 1960s, studies reported up to 10 bird fatalities per kilometre along the Kizilagach powerlines (Patrikeev 2004). Little Bustards are at high risk of colliding with powerlines (especially low voltage lines) when startled by human activity or predators, or when flying in low-visibility conditions such as at night or in fog. In a single foggy day, the remains of 50 birds were found beneath a 5-km stretch of telephone wires in Kizilagach (Ivanov & Priklonskii 1965).

According to Central Baltic Programme's Report on Electric Industry of Azerbaijan (2023) the total length of high-voltage (110–500 kV) transmission lines alone already exceeds 7600 km. In this regard, a proposed renewable energy project currently under consideration is particularly worrying. According to the online Draft Environmental and Social Scoping Report for the Azerbaijan Scaling-Up Renewable Energy Project (AZURE Project, P505208) under consideration by the World Bank, some of the newly proposed transmission lines would traverse the buffer zone of Shirvan National Park, encircle its landward side and pass through the main migration corridors of Little Bustards and other birds. This poses a significant threat to flocks moving between nearby agricultural lands and the Shirvan park, as they are likely to encounter these powerlines mid-air, potentially resulting in numerous fatalities. Given the park's critical importance in holding one of the largest concentrations of wintering Little Bustards in Azerbaijan (approximately 25 000–40 000 birds, Table 1), it is essential to implement appropriate mitigation measures before any energy sector developments proceed. Rerouting or burying the wires in key migration and wintering areas should be prioritised. Little Bustards are known to collide with both high-voltage transmission lines and low-voltage distribution lines as well as telephone, railway and other lines, and there is limited evidence that 'bird flight diverters' reduce mortality for bustard species significantly (Silva *et al* 2023). Moreover, the building of new transmission lines might cause Little Bustards to desert suitable habitats, because raptors use the pylons to perch and search for prey (Silva 2010).

Given the large numbers of birds wintering and the high number of transmission lines, hundreds of Little Bustards may perish annually due to transmission line collisions in Azerbaijan during migration and winter. Considering the scavengers likely remove a significant portion of the carcasses as well, more research focused on collision mortality is needed to assess the true scale of the impact.

***Farming expansion and intensification***

Agriculture is the foremost threat to grassland birds on a global scale (Douglas *et al* 2023). In Azerbaijan, the conversion of natural steppes into agricultural land has altered the habitat use dynamics of Little Bustards, causing them to shift from their historic natural steppe habitats to mosaic agricultural landscapes. Little Bustards have been able to partially adapt to these changes by modifying their diet to perennial herbs (Belik 1986). Our observations show that when the disturbance is high in natural steppes, Little Bustards prefer agroparks or mosaic habitats. Similarly overgrazing in all the steppes and protected areas like Kizilagach, Aghgol and Shirvan National Parks contributes to the destruction of suitable habitats for wintering Little Bustards. With Azerbaijan's growing

human population and the increasing demand for dairy and meat products (Food and Agriculture Organization of the United Nations 2023), the conservation of natural steppes—predominantly used as pastureland by herders—has become increasingly critical. Immediate measures are required to prevent the mismanagement of protected areas and mitigate overgrazing in key habitats essential for the Little Bustard population.

***Conclusion***

In most years, Azerbaijan's wintering population of Little Bustards appears to comprise a very large proportion, perhaps more than 50%, of the global total. Consequently, Azerbaijan has an international obligation to protect these highly vulnerable concentrations from anthropogenic perturbations caused by hunting, powerline kill and habitat loss. As outlined above, each of these threats is significant in itself, but in combination they have the potential to produce a strong, relentless numerical decline to the point where the current phenomenon, involving several hundred thousand birds, disappears forever. The most efficient and effective way to counter this possibility is through the development and implementation of a plan that integrates measures to control direct exploitation, restrict energy infrastructure and promote sustainable agricultural practices. Further monitoring research, especially through the use of telemetry devices, is necessary to assess the full impact of these threats on Little Bustard populations and to develop the scientifically robust and strategically coherent responses by which the future of the species can be secured.

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