

The return of breeding Little Bustards *Tetrax tetrax* to the Tulek Valley IBA, Kyrgyzstan

LOUIS-PHILIPPE CAMPEAU & SERGEY VIKTOROVICH KULAGIN

Summary: Little Bustards *Tetrax tetrax* have recently resumed breeding in the Tulek Valley Important Bird and Biodiversity Area (IBA) of northern Kyrgyzstan after they stopped doing so last century due to intensive Soviet farming practices. Following a month of fieldwork and the mapping of 149 encounters with the species, we suggest that Little Bustards have adapted to anthropogenic landscapes in the IBA, where they rely on steppe pastures and alfalfa crops for food early in the season before moving to non-irrigated cereal fields to nest as the alfalfa is harvested. The valley's alfalfa fields may represent an ecological trap as they are attractive for nesting females but the majority of them are harvested during the incubation period, resulting in the loss of the clutch and potentially of the females themselves.

INTRODUCTION

During the Soviet period (1917-1991), irrigation and intensive agriculture were developed to an unprecedented extent across the USSR. In Central Asia, steppe ecosystems were particularly affected following the Virgin Lands campaign of the 1950s and 1960s. This large-scale project saw millions of people pouring into the area to farm dry (unirrigated) wheat and 'develop the steppe' (Siegelbaum 2021). One of the results was the collapse and disappearance of many species. The Little Bustard *Tetrax tetrax*, a globally Near Threatened species according to the International Union for Conservation of Nature (IUCN), was especially affected and within the Chuy valley of Northern Kyrgyzstan (Figure 1) it stopped breeding altogether as its native steppe was ploughed and irrigated (Shakula *et al* 2020). Little Bustards require undisturbed vegetation to hide from predators and build their nests - notably alfalfa in cultivated landscapes or fallow land - and a steady supply of grasshoppers to feed their young (Morales *et al* 2013). Large-scale Soviet agriculture, which relied heavily on fertilizers and pesticides applied to vast monocultures, provided neither of these requirements. The Little Bustard population thus declined drastically, mirroring similar trends over much of Europe (Morales & Bretagnolle 2022).



Figure 1. Map of northern Kyrgyzstan including the capital Bishkek, the Chuy valley (the river forms the border between Kyrgyzstan and Kazakhstan) and the Tulek Important Bird and Biodiversity Area (IBA).

Since the collapse of the Soviet Union in 1991, the Little Bustard has made a comeback as marginal lands are no longer cultivated, especially in neighbouring Kazakhstan (Baumann *et al* 2020). While this new availability of recovering steppe plays a role, it may also be that Little Bustards are increasingly adapting and moving into agricultural landscapes, where they prefer fallow lands, to the point of deserting their original steppe pastures (Korovin 2014). Unlike in neighbouring Kazakhstan, fields in Kyrgyzstan have not been abandoned but divided and redistributed to local inhabitants, resulting in a much more diversified, mosaic-like landscape of varied cultures. One farmer interrogated during our survey explained that roughly 50 000 hectares had been redistributed in the area, with each household receiving around 10 hectares. Low human population densities explain these large plots as farmers in the Issyk Kul region generally received between 2 and 3 hectares. Alfalfa, a crop that is considered essential for endangered bustard populations in France and Spain (Bretagnolle *et al* 2011), is part of the agricultural mosaic as it is used to feed livestock over the winter. The increase in poverty in Kyrgyzstan has also meant that farmers have been less able to purchase chemical fertilizers and pesticides, although that is now gradually changing as bigger farms consolidate. This has led to a general increase in the populations of farmland and steppe birds, including Little Bustard.

In 2019, our organisation, the Ornithological Society KG (OSKG), a local, community-led organisation for amateur birdwatchers, became aware of a Little Bustard nest found by local farmers in an alfalfa field near the Tulek Important Bird and Biodiversity Area (IBA; Birdlife International 2021). The area comprises the heavily irrigated valley of the Ak-Suu river, which contains the village of Tulek and where alfalfa, corn, carrots and watermelon are the main crops. The riverbanks are lined with native trees such as willow, poplars, Russian olives and tamarisk, along with planted elms, while the rest of the area is criss-crossed with reed-lined irrigation ditches. The valley is wedged between two areas of dry hills to the east and west, which are devoted to dry cereal crops such as barley and wheat with some patches of steppe pastureland (Plate 1).



Plate 1. A view looking North along the Ak-Suu, with the dry cereal fields visible on the top left. © Pavel Isayenko

Thanks to a grant from the Ornithological Society of the Middle East, the Caucasus and Central Asia (OSME), we were able to investigate the potential recovery of Little Bustards around the Tulek IBA over five weeks in May 2021. This research had three main aims: first, we wanted to find out whether Little Bustards had indeed started breeding again in the area and to what extent. Second, we tried to evaluate the types of land use, the ecological limitations and any other threats that could favour or constrain this return. Third, we aimed to assess whether the birds were facing an 'ecological trap' when trying to breed in apparently suitable agricultural areas that would then be harvested, resulting in the loss of the clutch, as happens elsewhere (Morales & Bretagnolle 2022).

METHODS

To address our three stated aims, we conducted three days of fieldwork in each week over a period of five weeks, from 1-30 May 2021. Following the "*Protocole d'étude 'Outarde canepetière'*" [Study protocol for Little Bustard] from the French organisation Ligue pour la Protection des Oiseaux (LPO), we focussed on finding and monitoring 'singing' males (males making territorial calls), which are much easier to spot than females as they establish territories within a system of exploded lek (LPO 2013). Males' territories average 46 hectares (c0.5 km²), are roughly adjacent with each other and are defended via vocalisation (a regular *prrrrt*, audible from a long distance and emitted a few times per minute), wing flashes, jumping displays (Plate 2) and fights (Plate 3) (Jiguet *et al* 2000). Females visit these leks and eventually mate with a male before laying their eggs nearby and raising their young on their own. Bustard chicks leave the nest very soon after hatching and birds have two main requirements: sheltered nests during the incubation period of 20-22 days and an adequate supply of grasshoppers (Orthoptera) after hatching.

We used whatever agricultural tracks were available to travel the area by car early in the morning and towards dusk (06:00-10:00 and 17:00-21:00), stopping every 500 m to listen for a period of five minutes. We found that, when compared to reports from France and Spain, Little Bustards in Kyrgyzstan were much less active in the morning (often stopping singing by 08:00), but resumed earlier towards the evening. Each encounter was mapped with GPS and data collected on the time, weather, sex, direction of calls, type of agriculture the bird was seen in *etc.* Singing spots were then monitored week after week. Afterwards, all encounters were mapped using GIS to find out which territories were defended for at least three consecutive weeks and thus were occupied by 'a male attempting to breed'. The *Protocole* states that males need to be found over four weeks (LPO



Plate 2. A male Little Bustard during its 'jump' display, at the intersection of fallow and dry cereal fields. © Karen Wykurz



Plate 3. Two males Little Bustard fighting over lekking territory. © Karen Wykurz



Plate 4. A rare encounter with a difficult-to-find female Little Bustard. © Piotr Trommel



Plate 5. An abandoned Little Bustard nest in alfalfa, found by a tractor driver while harvesting. © Pavel Isayenko

2013), but as our survey was only five weeks long, we used a three-week marker. We did not have the manpower to comb fields looking for females (Plate 4) and nests, but we met with local farmers to explain the project, shared leaflets with identification guidance and asked tractor drivers to watch out for Little Bustards as they harvested, which resulted in the mapping of two destroyed nests, as well as another found by a shepherd (Plate 5). We always took the opportunity to talk with farmers and shepherds in order to better understand local agricultural practices. Some irrigated areas prospected during the first week of fieldwork became inaccessible later in the survey as tracks were flooded with irrigation water. Nevertheless, we tried to maintain a balance between irrigated and dry areas throughout our investigation.

After the fieldwork was completed, a land-use map of the area was compiled using Sentinel-2 satellite imagery from 13 May 2021 with a 10-m² resolution (Figure 2). The area of interest comprised the IBA itself plus a 10-km buffer, from which we excluded areas in neighbouring Kazakhstan as well as fields east of the Shor-Koo river, which were not visited. Since alfalfa is a perennial crop, it starts growing before sown crops like corn and watermelon, making it much easier to identify from satellite images early in the season. This allowed us to evaluate changes in the types of habitat defended by male Little Bustards over the five weeks. Overall, the area comprised 47% dry cereal fields, 20% steppe pastures and meadows, 14% alfalfa fields, 15% other agriculture unlikely to be favourable to bustards and 4% water and built-up areas. Alfalfa fields were then monitored using satellite images available every five days from 13 May 2021 to 27 July 2021 (two images had partial cloud cover) and the timing of the harvest was noted (Figure 3). This allowed us to understand the relationship between alfalfa harvesting and the bustards' movements.

RESULTS AND DISCUSSION

Breeding evidence

Little Bustards have clearly resumed breeding in the area. We mapped 149 encounters with the species, with up to 80 different individuals present (including nine females; some satellite males seen only once could have been counted twice if they moved to different areas). Besides the three destroyed nests found by our informants, eight males were seen defending the same territory over four or more weeks, increasing to 17 if we include males only spotted three weeks in a row (many of them in areas prospected only for three weeks after our initial itinerary became impassable).

The spatial arrangement of male territories was significant. While there were males present over much of the area investigated, there was a clear concentration in the hills west of Tulek and north of Besh Terek (Zone A in Figure 4). Areas of dry cereal (shown in yellow in Figure 4) tend to be located on higher, drier grounds. There, the bird density kept increasing over the five weeks of our study. The lack of passable agricultural roads prevented us from reaching the centre of the hills, but since males were found defending territories both east and west of them, it seems safe to assume that the lek covered most of this higher ground. With 12 males found over three weeks over an area of 11.8 km², giving a rough density of one bird per km² (and increasing over the period), we postulate that the hills as a whole could host at least 35 lekking male Little Bustards. This density is similar to that found by Korovin in the early 2000s, during the early stages of the reoccupation of a steppe/cereal agricultural landscape in the trans-Ural region of Russia and before a subsequent doubling in population density over the following decade (Korovin 2014). In contrast, males singing in the irrigated parts of the Tulek valley (Zone C in Figure 4) were both more spread out and fell in numbers as the alfalfa was harvested. It remains uncertain whether birds singing in the irrigated area 3-5 km south of Besh Terek (Zone B), where numbers seemed more stable than those in the Tulek valley itself, were actually part of the Zone A lek or a different one.

Use of alfalfa

One of the aims of our research was to establish what could explain the return of Little Bustards to the area. The literature from Europe emphasises the importance of alfalfa (Bretagnolle *et al* 2011) and, indeed, it seems to be playing a role in the Tulek IBA. To understand the bustards' needs, we buffered all encounters by 250 m in GIS and monitored the type of landscape they were in. Over the first two weeks, alfalfa was proportionally over-represented in these areas, comprising 29% and 20% of buffer area

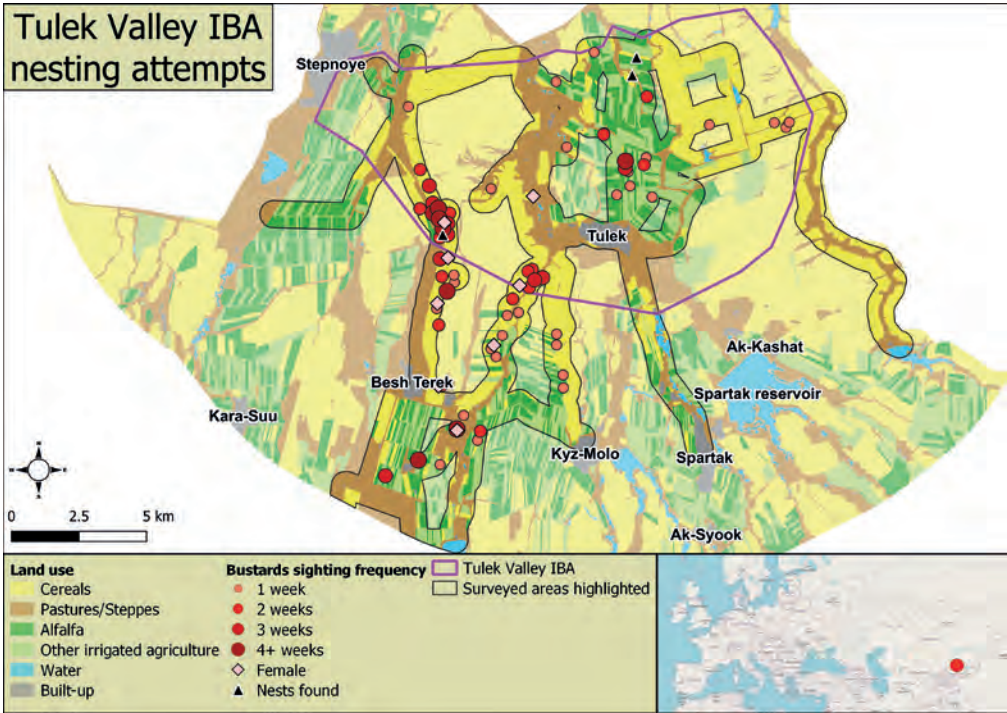


Figure 2. Tulek Valley IBA showing sightings of Little Bustards and land use.

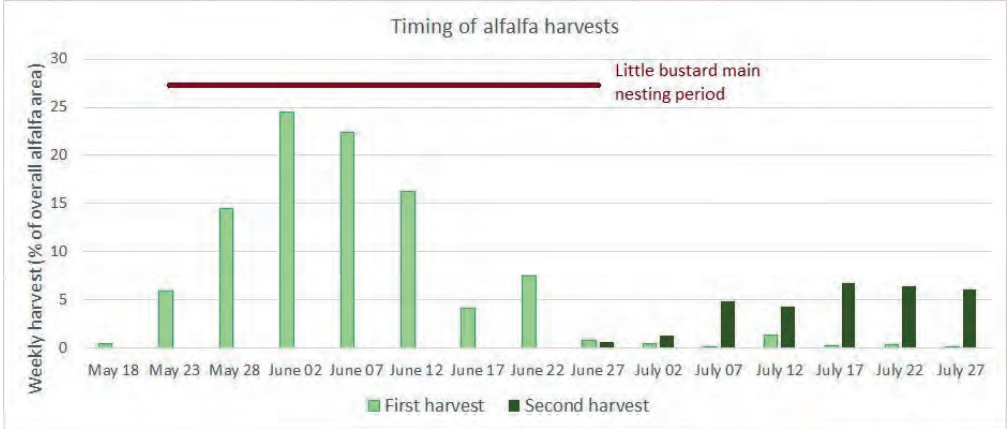


Figure 3. Timing of alfalfa harvest. Over 99% of alfalfa fields had been harvested once over the period covered, but only about 30% had a second cut by 27 July. The dip on 17 June is due to a cloud-obscured image.

respectively, whereas alfalfa as a whole represented only 14% of the area surveyed over the five weeks of fieldwork (Table 1). After the first two weeks the presence of alfalfa near bustard locations decreased significantly, never exceeding 12%, indicating that alfalfa was not significant in the bustards’ territory selection. Harvesting does not seem to be the sole reason for this change as only 21% of alfalfa fields were cut in May (Figure 3), but the drop coincided with the beginning of the irrigation season and we noticed increased human presence in these areas as other fields were sown. Overall, only five of 17 territorial males

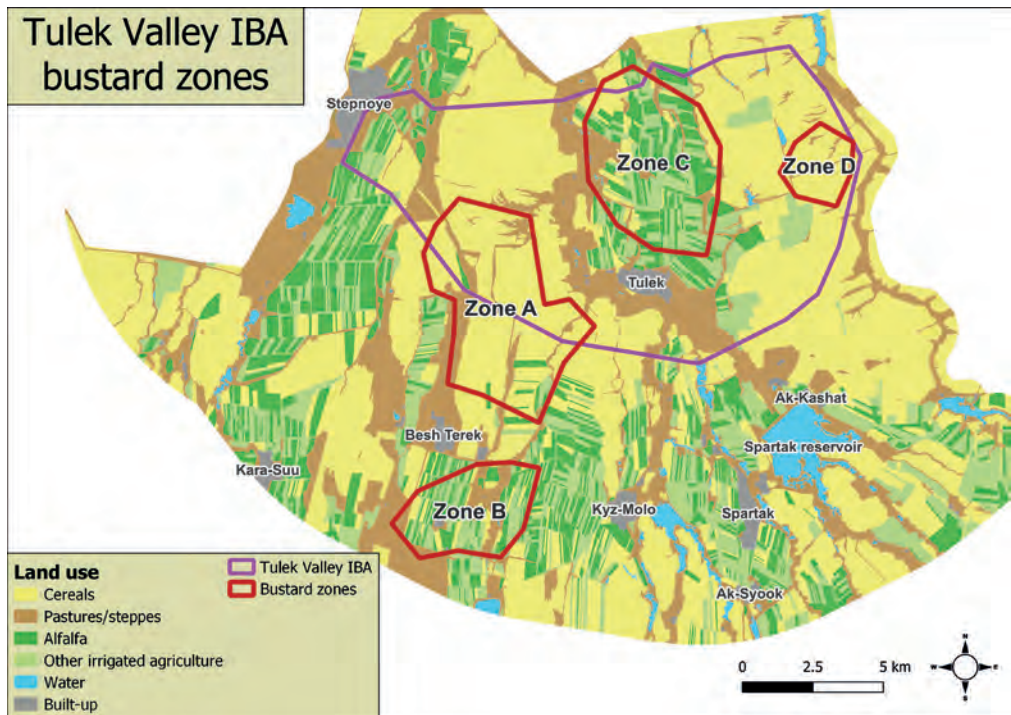


Figure 4. Map of zones of interest in the Tulek valley. Zone A had the largest lek, Zone B contained Little Bustards displaying in an agricultural landscape, Zone C was gradually abandoned as irrigation and agricultural work, including alfalfa harvest, increased and we found our first bustards in the dry cereals in Zone D by the last week of study.

had alfalfa within their territory, which suggests that this crop is important as an early source of food as birds return from migration, but is not so important for breeding.

Looking at the timing of alfalfa harvests confirms these results (Figure 3). Little Bustards in Central Asia lay their eggs from mid-May to late June, with females often attempting a second, smaller clutch if the first one is lost. Incubation usually last between 20 and 22 days, with records of some birds taking up to 30 days (Ryabitshev *et al* 2019). Therefore, the earlier the first harvest, the more likely it is that a female would have sufficient time to raise a brood in regrowing alfalfa fields. A tractor driver mentioned to us that as much as a third of alfalfa fields were kept for seed production after the first cut and thus not re-harvested until late August, potentially providing good nesting areas. As mentioned above, 21% of fields were cut in May and thus could fit this profile, but then just under half of these fields were not re-harvested before the end of July. However, the mean date for the first harvest was 2-7 June, during the peak egg-laying period. This means that only about 10% of alfalfa fields could represent suitable nesting sites, whereas females would have to be very lucky with their timing to be successful in the other fields. This fact is reinforced by the two destroyed nests found by a local tractor driver (Plate 5). This ecological trap is made more serious since it impacts healthy females as well as eggs: the *Protocole* mentions that Little Bustard populations are often dominated by males as females are killed by agricultural machinery (LPO 2013). Indeed, one of the few tractor drivers that was aware of the bustards' presence referred to them as 'stupid birds', as unlike Pheasants *Phasianus colchicus* they only fly away from their nest at the very last moment, if at all (Plate 6).

Table 1. Land use within 250-metre buffers around singing male Little Bustards.

Land use around bustards per week	Alfalfa	Other irrigated agriculture	Dry cereals	Steppes/Pastures
1-3 May 2021	28.78%	18.19%	37.85%	14.72%
7-9 May 2021	20.35%	19.89%	41.21%	18.56%
14-16 May 2021	10.27%	10.58%	55.62%	23.52%
21-23 May 2021	11.05%	12.41%	61.15%	15.40%
28-30 May 2021	12.25%	9.47%	59.6%	18.91%

Seasonal changes in habitat use

Over the five weeks of the survey, we found an increasing proportion of Little Bustards in non-irrigated cereal fields. During our first visit, these areas were mostly devoid of Little Bustards as cereal crops had just been sown and plants had not had time to grow; bustards were only present where there was a nearby steppe pasture. Initially in our fieldwork 38% of the area around territorial Little Bustards encountered was cereal crop, but this climbed to 61% by the fourth week once crops were over 20 cm tall. This increase was mirrored by a drop in sightings in irrigated areas over the same period. Over the final week, we encountered our first males in the eastern hills, a wide area of cereal monoculture with limited steppe pastures, where none had been encountered before (Figure 4, Zone D). We conclude that less-disturbed cereal fields, especially in proximity to steppe pastures or maybe some alfalfa, are the prime environments selected by Little Bustards.

Dry pastureland is the closest land type to the Little Bustard's original habitat in terms of structure. Throughout our survey, pastureland represented an average of 20% of habitats surrounding displaying bustards (with a variation of 15-24%; Table 1). The core of the lek was based around an area where pastureland, fallow dry fields and cereals alternated. Indeed, the only large field left fallow in the area had up to six males singing around it (Plate 7). This suggests that steppe environments remain the most sought-after type of landscape, when available, as they can both sustain birds early and provide cover and food for young. Protecting steppe-like plots could thus be the most significant measure to secure the Little Bustard's continued presence in this area. However, Kyrgyzstan in general suffers from overgrazing and not all pastures are equally beneficial. For example, while pastureland by the centre of the Zone A lek was relatively quiet, with only one or two herds of cattle moving through every day, another extensive pasture patch south of Besh Terek was devoid of Little Bustards as grass never grew more than a few centimetres tall due to heavy grazing.

Threats

Our experience of Little Bustards in the Tulek IBA reflects Korovin's (2014) assertion that the species is moving into agricultural landscapes (non-intensive ones, at least) where birds are becoming less wary of human presence. Throughout the survey, we found males displaying while shepherds on horseback wandered nearby (Plate 8), while tractors were harvesting less than 100 m away or as people worked their fields. On one occasion, a bustard that was using a track to display briefly hid in the cereals as a car passed by before resuming his display.

The recovery of Little Bustards in the Tulek Valley seems to be a very recent phenomenon. The majority of local people we talked with were unaware of the bird's presence, while being very aware of the presence of Pheasants, a key target for local hunting. One local farmer explained how he had never heard of the Little Bustard while a male was singing



Plate 6. Collaboration with tractor drivers allowed us to find two destroyed Little Bustard nests and to confirm the negative impact of machinery in alfalfa fields. © Pavel Isayenko



Plate 7. This unique fallow field (covered in yellow flowers) with neighbouring pastures had up to six male Little Bustards displaying around it. A displaying male is circled in red. © Karen Wykurz



Plate 8. Little Bustards seemed tolerant of human presence, as shown here with a man on horseback at the back of a field containing a singing male. Since most local inhabitants were unaware of the existence of these birds, their return is probably a recent phenomenon. © Karen Wykurz

about 50 m behind him. Only one man stated that he had caught and eaten a Little Bustard a couple of years previously (this would be illegal, but the law is seldom enforced) and said he had been looking for nests since, although unsuccessfully. With Little Bustards having a much slower reproduction rate than Pheasants, illegal hunting could become a problem as local inhabitants begin to realise the bird's presence, or as the birds are mistaken for Pheasants while hunting. Officially, the hunting season begins at roughly the same time as the Little Bustard's migration, posing a risk to migrating bustards as enforcement of illegal hunting restrictions of this threatened species is weak at best.

Recommendations and further research

We suggest a number of recommendations to promote the Little Bustard's return to the Tulek and improve conservation efforts. In regard to the threat of hunting, we believe advocacy work with local communities could be beneficial as hunters are probably unaware of the bustard's protected status and of the fines of up to 20 000 Kyrgyz soms (around US\$2000) they might face for its illegal killing. Similar educational work with agricultural workers, especially tractor drivers (who come from all over northern Kyrgyzstan to work in the Tulek valley), could also be productive as it seems likely that many birds are lost to crop harvesting. Changes to the timing of the alfalfa harvest might also prove beneficial, but may be difficult to implement without monetary support in what are poor farming communities. Ideally, alfalfa fields would be harvested before the end of May and then left undisturbed for six weeks, a common practice in the Little Bustard's few remaining habitats in France (Berthet *et al* 2012). More pragmatically, our local expert Dr Kulagin recommended that fields are cut in strips as many drivers harvest in circular patterns and finish in the centre of the field, preventing trapped birds from escaping. We also trialled the idea of adding poles with flags in the front of tractors to scare the birds ahead of the blades, although this would require more trial and error. This would have the added benefit of preserving Pheasants for the hunting season, an argument that proved popular during our fieldwork. Adding such a device might be effective as a lot of the harvesting happens at night to avoid the heat during the day when temperatures can rise over 45 C. Drivers then go more slowly, but also see less far. Finally, it would be worth



Plate 9. Little Bustard post-breeding flock in the Tulek Valley IBA, 4 October 2021. © Karen Wykurz

expanding the IBA to include the main Zone A lek (Figure 4). This would only be relevant after publicising locally the existence of the IBA, which remains virtually unknown at the moment. Doing so would provide an opportunity to advocate not only in favour of Little Bustards, but also of the unique steppe valley and forest that the IBA was created to protect.

Two issues require further investigation. First, while we determined that Little Bustards are now establishing breeding territories in and around the Tulek IBA, where they favour cereal fields and steppe areas, we do not know to what extent they are breeding successfully and thus whether these are birds moving in from Kazakhstan or the descendants of successful parents locally. Short of catching and tagging them with GPS transmitters, it could be possible to locate nests over the lek by doing extensive combing of the fields, potentially with a dragging rope, and then monitoring their success rates (Bretagnolle *et al* 2011). Investigating the availability of arthropods such as grasshoppers throughout the summer would also reveal whether there is sufficient food for the chicks. Another option would be to try to locate the birds as they form flocks after the breeding season and count the juveniles. This would be error-prone as it needs to be done after fledging, but before flocks are reinforced by early-migrating birds from further north (we encountered just under a hundred birds in the area in early October; Plate 9).

Second, while the Tulek IBA was a good place to begin our study, as it was known to be used by Little Bustards during migration, we know little about the extent of the Little Bustard's recovery within the wider Chuy valley. The initial 2019 nest that sparked our investigation was located about 20 km further east, but we could not survey that area as the bad roads from the Tulek valley made the journey too time-consuming. Furthermore, in December 2021 a local ranger from the Milyanfan area, around 20 km northeast of the capital Bishkek, and 55 km from Tulek, told us that not only were pre-migration flocks becoming larger, with some containing over 200 birds, but also for the first time the previous summer he was approached by local farmers stating that they had seen 'strange pheasants that do not fly away'. He found four Little Bustard nests in what is a much more intensive agricultural landscape, lacking the dry cereal cropped hills of the Tulek valley, at least on the Kyrgyz side of the border with Kazakhstan (Figure 1). Extending our area of investigation to survey more of the Chuy valley could reveal whether Little Bustards are adapting to agricultural landscapes to such an extent that they could be recovering across the entire region (Plate 10).



Plate 10. Little Bustards are returning to the Chuy valley. © Karen Wykurz

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Louis-Philippe Campeau, Director of the Ornithological Society KG. Email: louisphilippecampeau@gmail.com

Sergey Viktorovich Kulagin, Candidate of Biological Sciences, Kyrgyz Society for the Protection of Wild Nature [<https://www.wildlife.kg>]