Management of Greater Short-toed Larks *Calandrella brachydactyla* in Indian aerodromes

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Abstract

Aerodromes provide vast, relatively undisturbed, short-grass habitat along the runways and taxi track shoulders. These areas, kept free from overgrowing grass and other vegetation for unhindered and safe operations of aircraft, attract Greater Short-toed Larks Calandrella brachydactyla during their winter migration in India. Shrinking grassland cover outside the airports increases the 'menace' of larks at airfields with aircraft sometimes colliding with flocks of Short-toed Larks during take-off or landing, leading to engine damage. Ecological preferences of larks were studied at six IAF airfields to identify management strategies to reduce economic losses.

Introduction

All over India, civil aerodromes and defence airfields constitute relatively undisturbed grassland with no grazing pressures or human interference. Most aerodromes manage the grassland habitat close to runways and taxi tracks where airfield lighting can be obstructed by tall vegetation. Typically a grass height of 15–20 cm is maintained irrespective of the actual requirements. This also helps aerodromes appear tidy and enables easy visual inspection. Planting of '*dhub*' or Bermuda grass *Cynodon dactylon* was recommended by the BNHS in reports (1982–1988)[1] to reduce the attraction of birds to grassland habitat of aerodromes. This recommendation has not been followed and most Indian aerodromes today have multiple species of grass growing on the runway shoulders. Mowing of grass is constrained due to lack of serviceable equipment and the rapid growth of vegetation during the rains. Grass seeds are set periodically and shed or dispersed by wind, attracting Greater Short-toed Larks *Calandrella brachydactyla*.

Strikes by small birds

The instances of strikes to aircraft by small birds have increased in IAF from a mere 5% in 1995 to over 30% in recent years[2]. Due to this, the number of engine withdrawal cases has increased. Though small birds do not result in severe damage to the airframe, they do cause nicks and bends in the turbo-engine blades. Lack of spare engines and the turnaround time for making damaged engines airworthy is very important. This hampers training and the combat worthiness of aircraft, e.g., flying could not be undertaken for about a week at Bidar during the migration period of larks and swallows (October) forcing a change in the training schedule.

Greater Short-toed Larks are a common 'problem species' at north-western and central Indian airfields during winter[3]. In 2003, at IAF Bidar, 40 larks got ingested into a Kiran aircraft's engine. That year, in the same month, Bidar had 14 strikes in a row due to larks. Their population reached problematic levels during February 2008 at Bidar. Large numbers were seen at this airfield and they flew in thick flocks of up to 700 individuals. Sunrise to sunset observations over two days revealed a mean flock size of 66 birds[4] (50 observations, N=3,297). Small numbers (12) of Short-toed Larks were also recorded in Hakimpet airfield (21st February 2008) in the scrub interspersed with grassland areas.

On 21st October 2008, the situation at Bidar airfield was aggravated by a sudden, heavy influx of Greater Short-toed Larks. The migratory aggregations persisted for seven days. During this period the larks basked and fed on runway surfaces, taxi tracks, shoulders, and short grass and sparsely grown long grass areas leaving no areas of the airfield unoccupied (Figs. 1a, b). Their population dropped after 28th October 2008. The mean flock size based on two days of sunrise to sunset observations in November 2008 was 143 birds (179 observations, N=25,586)[5]. The largest flock had more than 1,500 birds actively flying at 1639 hrs on 16th November 2008.

These observations provide information on the increasing presence and hence, 'menace,' of Greater Short-toed Larks at southern aerodromes. In this paper, reasons for the attraction of Greater Short-toed Larks to aerodromes, a case study in Bidar airfield, and management modules are discussed.

Reasons for attraction to aerodromes

Eight airfields, namely, Bidar (Karnataka), Hakimpet (Andhra Pradesh), Naliya, Bhuj, Jamnagar (Gujarat), Utarlai, Nal (Rajasthan) and Gwalior (Madhya Pradesh) were studied to identify the reasons for attracting Short-toed Larks. The following observations were made:

1. Maintaining short grass (4–20 cm) in the manoeuvring area (Bidar, Jamnagar, Bhuj, Gwalior, Naliya).
2. Sparse stands of tall grass (>21 cm) with debris in the manoeuvring area (Bidar).
3. Allowing the grass to flower and seed in the rainy season (all airfields).
4. Pulverisation of grass stands in winter due to plying of vehicles on shoulders resulting in de-husking of seeds (Bhuj, Naliya).

[1] Comprehensive studies of Indian aerodromes BNHS (1982–1988).
[2] Bird strike Database (including BNHS data) of IAF airfields at Directorate of Flight Safety, Air HQ, New Delhi.
[3] Bird Database of IAF airfields at Directorate of Flight Safety, Air HQ, New Delhi.
[4] Time series data collected by Ornithology Cell, Directorate of Flight Safety at Bidar, Feb 2008.
[5] Airfield Studies: Bidar airfield, Ornithology Cell, Directorate of Flight Safety, Air HQ, New Delhi-66.

Fig. 1a. Greater Short-toed Larks *Calandrella brachydactyla* in Bidar airfield, 21–28 October 2008, flying in dense flocks.

5. Accidental fires (Goose-neck lamps, Very cartridge firing, *etc*.) and burning off grass in winter (Naliya).
6. Existence of bare patches in the grass cover (Utarlai, Bidar, Bhuj, Naliya).
7. Presence of agricultural fields in the surroundings and coincidence of harvesting season (Nal).
8. Presence of grassland contiguous with airfield (Bidar, Utarlai, Naliya).
9. Habitat management like cutting trees and increasing grass cover.
10. Absence or persecution of natural predators like harriers *Circus* spp.
11. Assured water supply in the vicinity of airfields (Utarlai, Bidar, and Naliya). Such places are preferred for roosting.

Fig. 1b Greater Short-toed Larks *Calandrella brachydactyla* in sitting on asphalt surfaces at Bidar airfield, 21–28 October 2008.

Case study: Bidar airfield

IAF Bidar was studied over two winters for problematic birds. A detailed report has been submitted to Directorate of Flight Safety, Air HQ, New Delhi, on comprehensive management measures to reduce problem of bird hits[5]. Here, a part of the original report is presented on understanding aerodrome usage patterns of Greater Short-toed Larks and measures to curb the 'menace'. This being a species-specific design, the modules concerning larks are discussed in detail.

Methods

Airfield habitat usage pattern of Greater Short-toed Larks was studied at IAF Bidar for five days in February 2008 and for 15 days in November 2008. A new method of collecting data was developed for Indian airfields. A grid system based on magnetic orientation of runway was combined with time series data collection to obtain spatial distribution of birds (Fig. 2). Data were collected continuously from half an hour before sunrise to half an

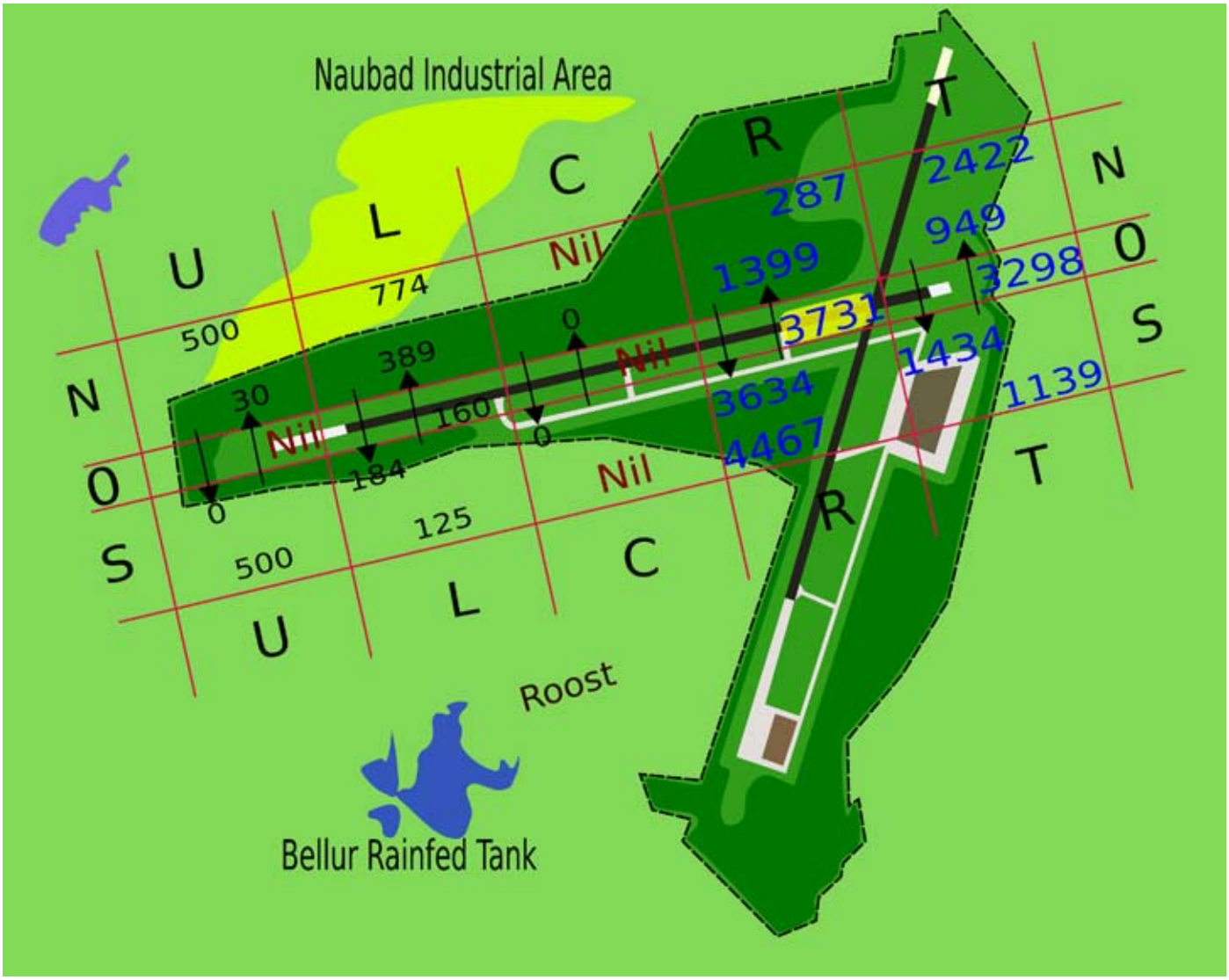

Fig. 2. Classification of Bidar airfield into 'data collection' grids. Number of larks recorded each grid is given in respective blocks.

hour after sunset for two days during both visits and compared for detecting change.

For developing horizontal zone classification, runway orientation was considered. North or east was taken as 'reference direction' depending on the runway orientation. All runways with orientations falling in 5–14 (45°–135°) to 23–32 (225°–315°) were considered suitable for east (E) reference. The rest of the orientations were considered under north (N) reference. Once the reference direction was found, each runway was assigned five important vertical zones and three horizontal zones with two events of birds crossing runway.

Vertical zones were abbreviated with five letters i.e., left one third portion of runway (facing north or east) as 'L', center one third as 'C', right one third as 'R', undershoot on the left as 'U' and, undershoot on the right designated as 'T'. Horizontal zones were abbreviated as east/north (E/N), west/south (W/S), and all birds occurring on runway (+10 m from edges) were denoted as 0 (zero).

In the time series data, approximate height of birds, factors for attraction, and pertinent remarks were also recorded. Number of larks recorded at each grid is given in respective blocks (Fig. 2).

All crossings from north to south or east to west were denoted as 1 (one) and crossings from south to north or west to east denoted as 2 (two). Combinations (total 25) arising out of this were entered immediately, in the field, into an Excel worksheet on a laptop, along with relevant columns for species, time, height, date, number, *etc*. In Bidar, horizontal zones of main runway were fitted into 'north' reference (Fig. 2). Data collected were subjected to simple statistical analysis to try and understand the preferences of larks. The entire airfield was surveyed to plot areas in which long or short grass was maintained. Areas outside the airfield were surveyed to identify the water, roosting and feeding requirements of larks. Time series arrival counts of Short-toed Larks, from their roosting ground (near Bellur tank) in the south, were made on two days and are represented in Fig. 3.

Habitat around Bidar airfield

Bidar airfield is located on a laterite plateau measuring *c*. 16 km^2. The watershed area in the north drains into Bellur tank. The plateau is covered extensively by various grass species.

Blackbuck *Antilope cervicapra* and grazing cattle populate the area south of the airfield. There are bare patches and the grass cover here is short, reaching a maximum height of 20 cm. This area is being developed as an industrial estate. Much of the grass cover on the south-western part of the plateau has been lost due

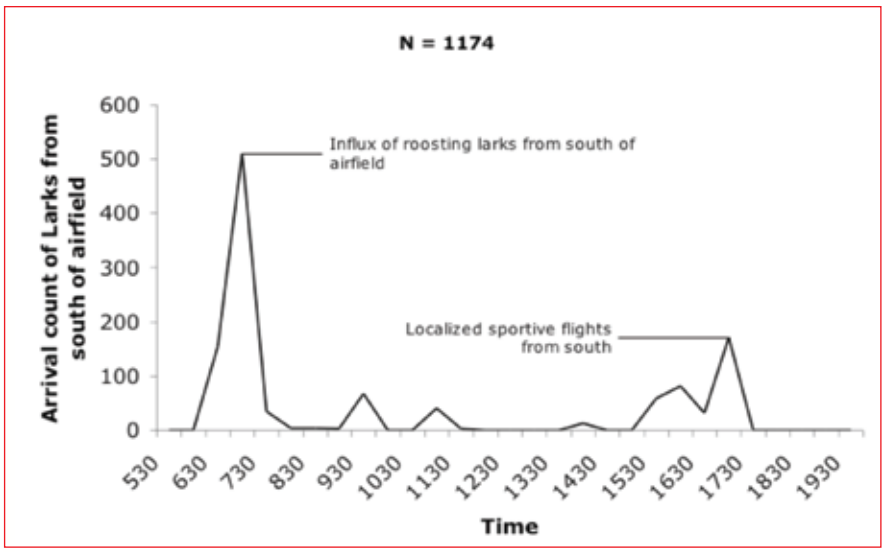

Fig. 3. Greater Short-toed Larks roost south of Bidar airfield and infest all along secondary runway (2–20)

to development. The area north of the airfield belongs to the IAF and has a similar habitat but lacks blackbuck although grazing by cattle is intense. This area has scattered shrubs like '*vilayati babool' Prosopis juliflora* and *Acacia nilotica*. A railway line runs along the northern periphery. The airfield itself is sandwiched between these grazing areas. During the study period, extensive long grass stands (100–125 cm) were found 70–100 m away from runway edges towards boundary wall except in the north, where shorter grass species were abundant. Short grass (4–20 cm) was maintained up to 70–100 m from the runway and taxi track edges. Details of long and short grass cover are shown in Fig. 4.

Analysis of habitat dependency of Greater Short-toed Larks in Bidar

Our study found Greater Short-toed Larks extensively dependent on short grass area (Figs 2 & 4) for feeding and roosting. Time series data analysis and field observations strongly indicated that

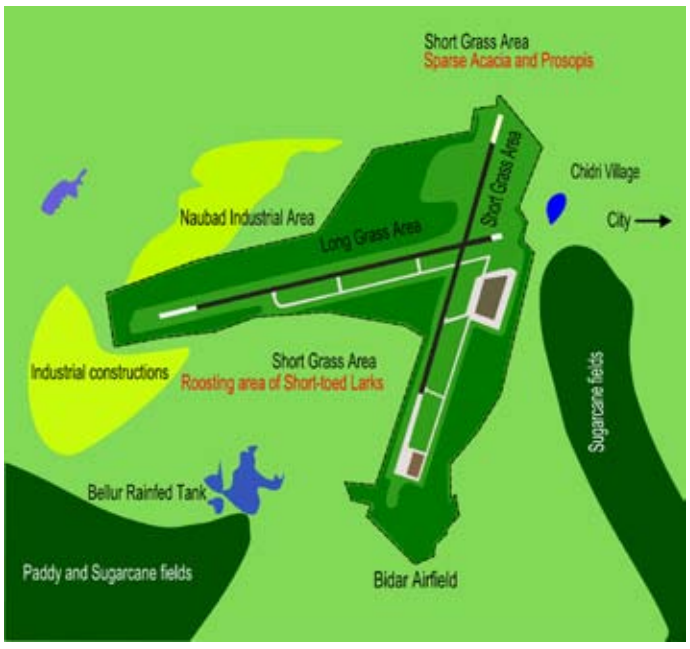

Fig. 4. Bidar airfield and its surrounding habitat including long and short grass area.

larks operated over airfield in a corridor (Fig. 5; also see Fig. 2).

A patch of long grass stand adjacent to the point where the two runways cross each other (Fig. 5), within the southern boundary wall of airfield, had been removed a few weeks after the migration of larks. During the study period, grass height at this place resembled short grass area. This provided Greater Short-toed Larks a continuous patch of short grass extending from Bellur tank to north of airfield, rich with fallen seeds in the uncollected debris. This observation is supported by data collected along the secondary runway in February 2008 with previous winter migrants.

Management modules

Comprehensive measures to manage harriers, rodents, wildlife and other predators of small birds have been discussed under respective headings in the final report submitted to Air HQ. The following habitat modification modules were considered after a careful analysis of roosting pattern around the airfield.

Studies clearly established an operating corridor of Greater Short-toed Larks over Bidar airfield. This was used in designing specific management modules. The corridor was divided into three blocks for this purpose (Fig. 5). It was evident that at least two blocks needed to be managed to reduce the dependence of larks on airfield. The obvious choices were Blocks 2 and 3 as they were under the control of IAF. Block 1, fulfilling the roosting requirement of larks with abundant supply of water, was more difficult to manage due to presence of blackbuck and grazing requirements of village livestock.

In Block 3, '*vilayati babool*' was planted at distances of 2 x 2 m (Fig. 6). The close spacing, along with frequent pruning and grazing by livestock, will help in maintaining shrubs to a height not more than 1–1.5 m. *Prosopis* withstands heavy grazing. Bougainvillea is planted in the fringe area adjoining the link road to airfield. This breaks the continuity of grassland and reduces large patches of habitat preferred by larks.

In Block 2, Bougainvillea is grown near the compound wall and all along the road leading to ATC and beyond (north-end of secondary runway). The plants may be closely spaced to cover ground and fragment the habitat.

Long grass should be maintained in airfield at least 100 m from the edges of runway and taxi tracks up to boundary wall (Fig. 4). In winter, from September to April, retain the density of ground cover by not cutting the grass. Modules to manage wildlife and rodents are in place.

In Monsoon months, the grass sprouts should be maintained at 100 cm or slightly above (110 cm) and grass debris should be collected.

Maintain short grass (10–15 cm) in areas adjoining runway and taxi tracks. Here, mow the grass as frequently as possible since the species flower in short span of time and shed seeds. Collect the debris after mowing. As far as possible, do not let the grass set seed. Rejuvenate barren patches by sprinkling grass seeds, collected in the previous winter, mixed with fine sand during first rain.

The calls of Common Kestrel *Falco tinnunculus* and Collared Scop's Owl *Otus bakkamoena* should be broadcast on runway shoulders at appropriate points.

Drumbeats on the runway shoulders (a beater positioned on a vehicle) are effective from a distance of 200 m. It has been observed

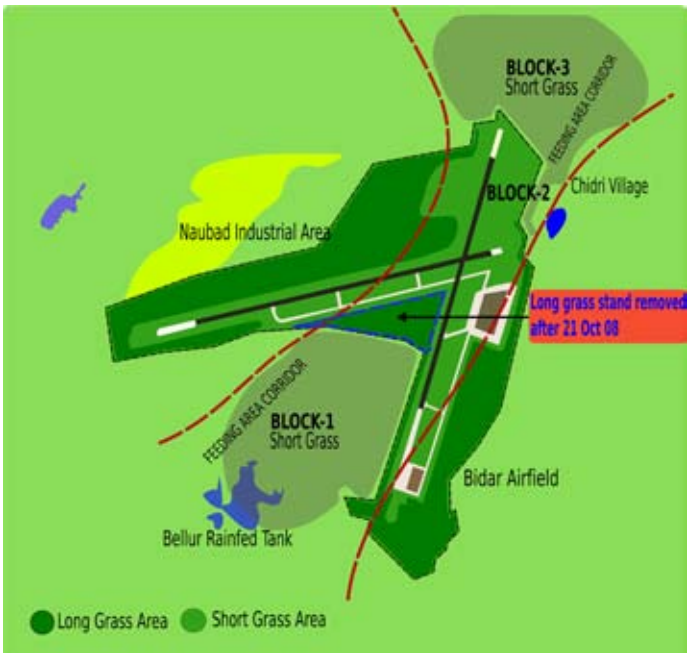

Fig. 5. Greater Short-toed Larks operate in a corridor fashion over Bidar airfield.

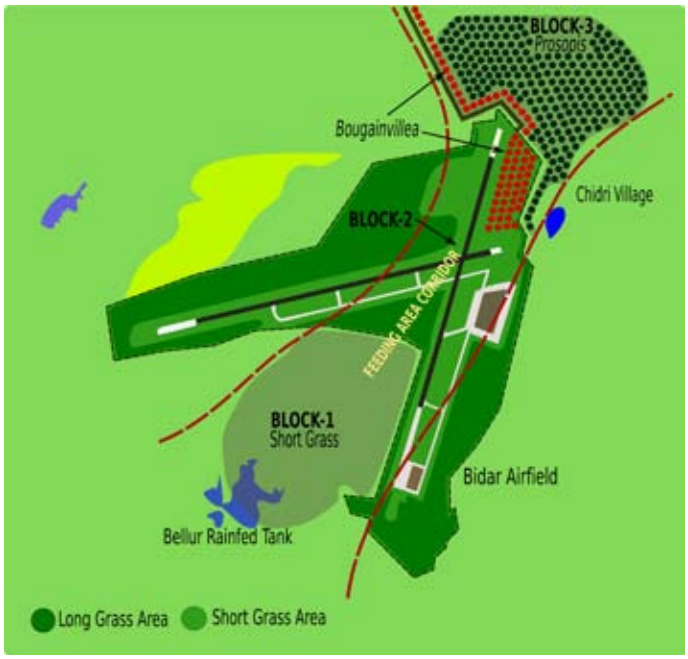

Fig-6. Block management with *Prosopis* & *Bougainvillea*

that the birds effectively got disturbed and moved away from runway edges.

Fishnets of 5 x 5 cm openings should be laid on runway shoulders without any bait on short grass. The net will be laid out horizontally on areas preferred by larks. Two systems of laying the nets should be practiced along the runway shoulders. In the first, a set (maximum two) of nets (dimension: 3–4 m of length by fixed breadth) will be placed on the shoulders every morning and collected back in the evening. The position is changed everyday. Nets can be laid at important points on shoulders like abeam touchdown zone, middle markers, undershoots, *etc*. In second, a set of nets should be positioned in places where larks congregate in large numbers. Here, the nets will remain for three to four days. Thereafter the position of the nets should be changed to another lark-frequenting area. In both systems, larks trapped in the net should be released after a short time. A bird watcher should be guarding the net to drive away harriers that may get attracted to the easy prey base. Distress calls should be digitally recorded from the trapped birds for future use on runway shoulders.

Pallid *Circus macrourus* and Montagu's Harriers *C. pygargus* should not be persecuted on airfield as they feed on Greater Short-toed Larks. The mobile birdwatchers positioned along the runway are employed to chase harriers away from the shoulders during flying time.

Obtain the rainfall pattern of the north-western Indian airfields like Jaisalmer, Nal, Naliya, Bhuj, Jodhpur and Jamnagar from April to August every year. Though this is not a foolproof system to forecast the numbers of larks migrating to Bidar, at least a rough estimate can be made. The less rainfall (than average) in the north-western airfields vis-à-vis normal or excess rainfall in Bidar would result in more food being available to larks at Bidar and hence an increase in the migratory population expected. Suitable preparations for the coming winter should be made based on this.

Conclusion

The 'menace' of Greater Short-toed Larks in Indian aerodromes can be managed by designing suitable species-specific management modules. These modules will always be aerodrome-specific in nature. Habitat management inside the airfield should not be considered lightly as the stakes involved are high. Long grass lost will take at least a year to regain its height. Hence, keeping the requirements of airfield vis-à-vis wildlife population increase due to long grass inside the boundary wall should be brought to equilibrium to achieve win-win situations.

Acknowledgements

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