Ecology and Management of Semi-arid Grasslands in India with Special Reference to Endangered Lesser Florican *Sypheotides indica* Miller

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Abstract

Semi-arid grasslands in western India dominated by zspecies are well-known for globally threatened bustards especially the Lesser Florican and the Great Indian Bustard. In past three decades, most of these grasslands have been either degraded or converted for other land-uses, resulting in rapid decline of breeding habitats of lesser florican. Further, there is no information about the non-breeding habitat of this species. In this context, Wildlife Institute of India has initiated a study aimed to understand the migration pattern of lesser florican and identify critical grassland habitats to prepare a comprehensive conservation plan. Satellite tracking of two male lesser floricans in the year 2014 revealed that males could shift their territories within an arena. It was earlier believed that lesser floricans are long distance migrants and their foraging grounds might be in Western Ghats and Gangetic Plains. However, a tagged florican migrated just 94 km south of its breeding ground, indicating small distance migration and natal philopatry during next breeding. Both breeding and non-breeding habitats of lesser florican are semi-arid grasslands that are under immense anthropogenic pressures such as plantation, agriculture expansion, mining, wind/solar power mills, etc. Overgrazing, invasive alien species, high use of pesticides and changes in traditional crop pattern are also major threats to these grasslands and its dependent fauna. Therefore, a national policy for sustainable management of semi-arid grasslands in India is being suggested in this article.

Key Words: Sypheotides indica, Satellite Tracking western India, Grassland fauna, Semi arid grassland.

Introduction

The semi-arid grasslands in western India have evolved over several centuries under the influence of low-moderate precipitation, sustainable levels of grazing by wild and domestic ungulates and peculiar soil. These grasslands are home to several native fauna including critically endangered birds such as Great Indian Bustard (*Ardeotis nigriceps*), Lesser Florican (*Sypheotides indica*) and winter visitor Houbara Bustard (*Chlamydotis undulata*). Endemic to Indian sub-continent, the Lesser Florican is the smallest member of bustards in the world. It is commonly seen during monsoon season in the eastern parts of Rajasthan, western parts of Madhya Pradesh, Gujarat and in some parts of southern India. Locally called 'Kharmor', katkata or fudakkaro in Rajasthan, Tilor in Kutch and Saurashtra area; Dumbharo in other parts of Gujarat (Collar and Andrews, 1988). Among mammals Indian grey wolf (*Canis lupus*), Indian fox (*Vulpes bengalensis*) and Blackbuck (*Antelope carvicapra*) also take refuse in these grasslands. Currently most of these species are facing threats due to habitat degradation, fragmentation and shrinkage owing to lack of clear policies on the grasslands and faulty land use practices (Rahmani 2006). Therefore, an urgent need is felt to protect and restore the degraded semi-arid grasslands not only for bustards but also for the associated species which can be protected from local extinction (Dutta 2014) and also these ecosystems are managed for sustaining livelihoods of thousands of pastoral communities.

The tropical grasslands in India vary considerably in terms of physiognomy from sparsely vegetated arid grasslands to semi-arid swards, savannahs, and hygrophilous grasslands. Grasslands occupy nearly 39% of the country geographical area. It is estimated that approximately 15, 6000 km^2 area is considered as waste land which is also used for seasonal livestock grazing (Misra 1983). Pastures and grasslands are in different stages of degradation and destruction due to agriculture expansion, urbanization and infrastructure development. The grasslands in India are broadly classified into five types **(Table17.1)** including, *Phragmites - Saccharum - Imperata* grasslands covering 53.7 %, followed by *Sehima - Dichanthium* 33.4 %, *Dichanthium - Cenchrus – Lasiurus* 8.3% and *Themeda - Arundinella* 4.4 %.

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Table 17.1. Types of grasslands in India.

S.no	Type of grasslands	Area (in sq.km)	Grass Species	Climate	Region
1.	*Sehima - Dichanthium grasslands*	17,40,000	*Dichanthium annulatum, Sehima nervosum, Bothriochloa pertusa, Chrysopogon fulvus, Heteropogon contortus, Iseilema laxum*	Semi-arid	Central Indian Chota Nagpur plateau, Aravallis
2.	*Dichanthium - Cenchrus - Lasiurus grasslands*	4,36,000	*Cenchrus ciliaris, C. setigerus, D.annulatum, Cymbopogon jawarancusa, Cynodon dactylon, Eleusine compressa, Lasiurus sindicus, Sporobolus marginatus, Dactyloctenium sindicum*	Arid, Semi-arid,	Northern parts of Gujarat, Rajasthan, Aravalli ranges, Southwestern Uttar Pradesh, Delhi and Punjab
3.	*Phragmites - Saccharum - Imperata grasslands*	28,00,000	*Imperata cylindrica, S. spontaneum, Phragmites karka, Desmostachya bipinnata, Bothriochloa intermedia, Vitevaria zizanioides, Imperata cylindrica, and Saccharum arundinaceum*	Dry-sub-humid, Semi-arid	Gangetic plains, the Brahamputra Valley and the plains of Punjab
4.	*Themeda - Arundinella grasslands*	2,30,400	*Arundinella benghalensis, A. nepaolensis, Bothriochloa intermedia, Chrysopogon fulvus, Cymbopogon jwarancusa, Apluda mutica, Arundinella khaseana, Pennisetum flaccidum*	Humid, Moist -sub-humid.	Manipur, Assam, West Bengal, Uttar Pradesh, Himachal Pradesh and Jammu and Kashmir
5.	*Temperate - Alpine grasslands*	Data not available	*Agropyron conaliculatum, Chrysopogon gryllus, Dactylis glomerata, Danthonia cachemyriana, Phleum alpinum, Carex nubigena, Poa pratensis*		Temperate and cold arid areas of Jammu and Kashmir, Himachal Pradesh, Uttar Pradesh, West Bengal and the northeastern states.

Source: *Modified from Singh et al. (2014).*

Semi-Arid grasslands of India

Based on grass species which dominates the area, there are eight types of grasslands in India. But in Gujarat, South-west Rajasthan and western Madhya Pradesh are dominated by three types *Dicanthium- Cenchrus, Sehima-Dichanthium* and *Cymbopogon* (Whyte, 1957) based on climatic conditions these are semi-arid grasslands (Champion & Seth, 1968). The semi-arid grasslands of western India spread across four states such as Gujarat, Rajasthan, western Madhya Pradesh and Maharashtra. All these grasslands areas fall in to arid and semi-arid region characterised by *Sehima - Dichanthium, Dichanthium - Cenchrus – Lasiurus* grasses. Most of these grasslands are either owned by people or by the revenue department or largely used for fodder. However, some portions of grasslands are under the control of the State Forests Departments. Some of these grassland patches have been brought under the umbrella of protected area network. In Gujarat, Blackbuck National Park, Velavadar, Kutch Great Indian Bustard Wildlife Sanctuary, Gaga, Gir National Park, Rann of Kachchh Wildlife Sanctuary, Narayan Sarovar (Chinkara) Wildlife Sanctuary, Chharidhandh Community Reserve are some of the protected areas notified for the conservation of grassland habitat and associated faunal species. Desert National Park in Jaisalmer and Barmer districts of Rajasthan, Karera Bird Sanctuary, Sailana Khamor Wildlife Sanctuary and Sardarpur Kharmor Wildlife Sanctuary in Madhya Pradesh and Great Indian Bustard Wildlife Sanctuary in Maharashtra are protecting some portions of semi-grasslands and their associated fauna and flora.

The semi-arid region of India with average rainfall varying from 400 to 1000 mm, is largely dominated by grasses and shrubs. Analysis of meteorological data of India for past 40 years reveals that the semi-arid region is increased in considerable range in India due to either poor rainfall or lesser rainy days. While area under semi-arid region increased in Madhya Pradesh, Uttar Pradesh and Bihar, it is said to have decreased in the states of Rajasthan and Gujarat, due to increase in arid region (**Figure 17.1**. Kesava Rao et. al. 2013), which is also one of the attributes for shrinkage of grasslands in western India.

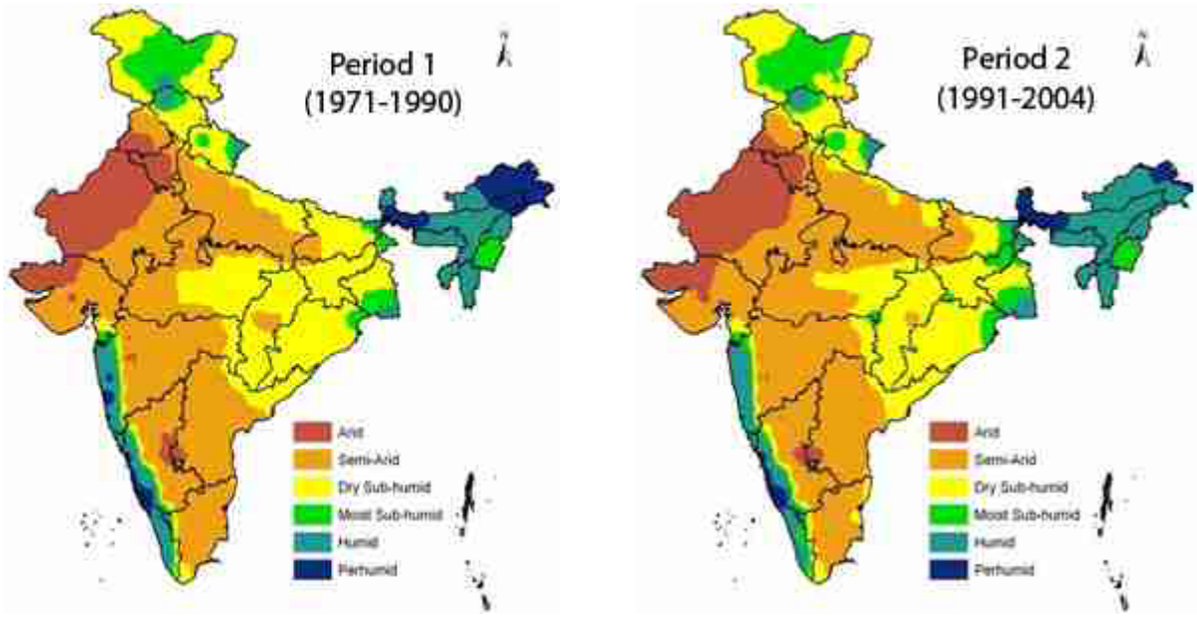

Figure 17.1 The maps showing distribution of climatic zones and expansion of arid and semi arid regions in India (Source: Kesawa Rao et al. 2013)

The semi-arid grasslands of India harbour wide variety of fauna and important fodder species. The grasslands are economically valuable as the local people mostly depend on fodder from grasslands for their livestock. Further, the grasslands can also act as a gene bank for preserving natural fodder species in wild for future benefits. Apart from its high economic value, it also has high ecological and conservation values, for example, more than 90% of endangered Lesser Florican breeds in these grasslands and about 90% of critically endangered the Great Indian Bustard population residing in the same grassland plains of semi-arid region in Rajasthan, Gujarat, Madhya Pradesh and Maharashtra. Moreover, threatened mammals such as Indian grey wolf (*Canis lupus*), Golden jackal (*Canis aureus*), Indian fox (*Vulpes bengalensis*), Indian gazelle (*Gazella bennettii*), Blackbuck (*Antelope cervicapra*), Striped hyaena (*Hyaena hyaena*), Caracal (*Caracal caracal*), Desert cat (*Felis libyca*) and Indian hedgehog (*Paraechinus micropus*) are also typical species of grasslands habitats. Monitor lizard (*Varanus bengalensis*) and Spiny-tailed Lizard (*Uromastix hardwickii*) are important reptiles of these grasslands which need immediate conservation attention. The semiarid grasslands are also roosting sites for all harrier species during their non-breeding season. **Table 17.2** shows the status of the population.

Table 17.2. Bird species inhabiting the semi-arid grasslands of India

S.no	Species	Status	
		IUCN	WPA 1972
1.	Long-billed Vulture (*Gyps indicus*)	CR	I
2.	Slender-billed Vulture (*Gyps tenuirostris*)	CR	I
3.	Eurasian Griffon (*Gyps fulvus*)	LC	IV
4.	Egyptian Vulture (*Neophron percnopterus*)	EN	IV
5.	White-backed Vulture(*Gyps bengalensis*)	CR	I

S.no	Species	Status	
		IUCN	WPA 1972
6.	Red-headed Vulture (*Sarcogyps calvus*)	CR	IV
7.	Laggar Falcon (*Falco jugger*)	NT	I
8.	Saker Falcon (*Falco cherrug*)	EN	I
9.	Peregrine Falcon (*Falco peregrines*)	LC	I
10.	Red-headed Falcon (*Falco chicquera*)	NT	I
11.	Lesser Kestrel (*Falco naumanni*)	LC	IV
12.	Tawny Eagle (*Aquila rapax*)	LC	IV
13.	Steppe Eagle (*Aquila nipalensis*)	LC	IV
14.	Imperial Eagle (*Aquila heliacal*)	VU	IV
15.	Lesser Spotted Eagle (*Eagle Aquila pomarina*)	LC	IV
16.	Common Buzzard (*Buteo buteo*)	LC	IV
17.	Long-legged Buzzard (*Buteo rufinus*)	LC	IV
18.	Upland Buzzard (*Buteo hemilasius*)	LC	IV
19.	Short-toed Snake Eagle (*Circaetus gallicus*)	LC	IV
20.	Eurasian Marsh Harrier (*Circus aeruginosus*)	LC	IV
21.	Eastern Marsh Harrier (*C. Spilonotus*)	LC	IV
22.	Hen Harrier (*C. Cyaneus*)	LC	IV
23.	Pallid Harrier (*C. Macrourus*)	LC	IV
24.	Pied Harrier (*C. melanoleucos*)	LC	IV
25.	Montagu's Harrier (*C. Pygargus*)	LC	VI
26.	Rain quail (*Coturnix coromandelica*)	LC	IV
27.	Grey Francolin (*Francolinus pondicerianus*)	LC	IV
28.	Lesser Florican (*Sypheotides indica*)	EN	I
29.	Great Indian Bustard (*Ardeotis nigriceps*)	CR	I

Lesser Florican

Lesser Florican is endemic to Indian subcontinent **(Plate 17.1)**. Once it was widely distributed in low-lying open grasslands and seen throughout the year. Before the advent of green revolution (before 1960) its breeding areas were almost all in parts of north-western India such as districts of Nasik, Ahmednagar and Sholapur of Maharastra, eastern Haryana and the Kathiawar Peninsula (south-central and south Gujarat) (Goriup and Karpowicz, 1985). Due to agriculture expansion and other developmental activities grassland habitats underwent rapid degradation. Consequently, florican population has immensely declined and became rare. However, it can be frequently seen during monsoon but currently the breeding areas are in isolated patches those leftover in southern Rajasthan, southern and eastern Gujarat, and western Madhya Pradesh (Sankaran 1991, 1994b).

Lesser Florican is an indicator of healthy semi-arid grassland ecosystem and monsoon when they occur in good number in north-western part of India (Manakadan & Rahmani 1999). Continuous increase of anthropogenic pressure in the semi-arid grasslands of Western-India had significantly affected on the Lesser Florican breeding and its population. In general, the population of Lesser florican seems to be at declining trend in these grasslands **(Table 17.3)**. Unfortunately, the more sightings of Lesser florican in the agriculture landscape in the recent past is also not a good sign for the long term conservation of this species.

Table 17.3. Population of status of Lesser Florican in semi-arid grasslands of India

State	District	1982	1989	1994	1999	2010	2014
Gujarat	Bhavnagar	0	2	35	19	27	26
	Amreli	0	NV	0	0	0	NV
	Junagarh	21	0	4	4	0	NV
	Jamnagar	34	NV	1	2	0	NV
	Rajkot	21	NV	27	42	0	NV
	Surendranagar	NV	NV	2	NV	NV	NV
	Kachchh	NV	8	36	67	22	1
	Punchmahal	NV	20	6	11	5	NV
Madhya Pradesh	Ratlam	36	28	25	55	8	7
	Jhabua	5	9	3	1	2	3
	Dhar	14	11	13	7	2	0
Rajasthan	Bhilwara	NV	NV	NV	3	5	0
	Tonk	NV	NV	NV	2	2	NV
	Ajmer	NV	NV	NV	4	3	40
	Pratapgarh	NV	NV	8	25	8	NV
	Total males seen	65	90	161	303	84	57
	Estimated Number in Total	4374	1672	2206	3530	NC	NC

Source: *1982 to 2000 G.S. Bhardwaj (2011), WII progress 2014*

Status of important grassland habitats in India used by Lesser Florican

Breeding habitats

Ajmer: Ajmer district, Rajasthan, dominated by the mosaic of agriculture fields and grasslands, is also well known for the Floricans. It was observed that this area holds largest congregation of breeding floricans during the monsoon. The Lesser Florican (*Sypheotides indica*) is still found during monsoon in small numbers. In 2013, nearly 120 male floricans were seen by the local staff (Rajender Singh *pers com*. 2013) in and around Sonkhaliya.

Most of these areas are under the cultivation with the Kharif crops such as jowar, bajra (Millet), Black gram, Cotton, Soybean etc. and rabi crops such as wheat, gram, mustard and barely in small irrigated areas with well and bore wells. The area is also dominated with *Prosopis juliflora, Capparis decidua,* and *Calotropis procera* etc. Floricans use these agriculture crops and adjoining grasslands to establish their lek area. Though, they use crop fields for display and foraging but they also seek the nearby grasslands as shelter during any kind of threats.

Shahpura: Shahpura and adjoining areas of the district Bhilwara other important Lesser florican breeding sites in Bhilwara district of Rajasthan that lies between 25° 50' 44" N, 74° 39' 21" E to 25° 39' 26" N, 74° 59' 51" E. These areas are also comprises of dry arid agricultural lands, thorny shrubs. Most of the crop lands are live-fenced with live Thor (*Euphorbia nerifolia*) to prevent the loss from of Blue bull (*Boselaphus tragocamelus*) and livestock population.

Sailana: This area falls in Malwa plateau (north-central India) latitude 23°27' N and longitude 75° E in the State of Madhya Pradesh, and largely used for cattle grazing. A portion of grasslands due to the habitat of of Lesser Florican, the Madhya Pradesh government has declared "Sailana Kharmor Wildlife Sanctuary" in June 1983. Every year, this 354 hectares of protected grasslands act as an area for lekking floricans during breeding season every year. This sanctuary with open and undulated landscape with scattered with stunted *Butea monosperma* and *Lantana camara* bushes as bare land during summer and after rains it become an excellent grassland (Rahmani & Sankaran, 1985).

Petlawad: A sloppy and undulated grasslands under Jhabua Forest Division in Malwa plateau, Madhya Pradesh, located between 22°53'45" N 74°51'02" E to 22°51'32' 'N 74°48'51" E also is a potential site for floricans, every year it supporting 5 to 10 male individuals. Vegetation is mainly grasses, *Butea monosperma* and *Lantana camara*.

Sardarpur: Approximately 8 sq km area of these grasslands is also an exclusive protected area for Lesser floricans during breeding season, which lies between 22°46'21"N, 74°54'50"E to 22°43'53" N, 74°53'38" E in Madhya Pradesh. Topography of the grassland are mainly undulating slopes connected with Petlawad grasslands by fragmented and degraded patches of

grasslands. Vegetation compositions of this grassland is similar to Sailana and Petlawad mainly with grasses, *Butea monosperma* and *Lantana camara*.

Dahod: Approximately 18 sq.km under Dahod Forest Division near Rampura village, Gujarat, slope and undulated grasslands acts as breeding area for Foricans it lies 22°50'38" N, 74°12'27" E to 22°48'25"N 74°09'40" E in Malwa Plateau but in recent past year (since monsoon 2012) according to local people there were no sighting records due to gradual changes in vegetation composition as tree cover increases in the area.

Blackbuck National Park, Velavadar: The area is well known as paradise for Lesser floricans located in Bhavanagar district along the costal of Arabian sea. The total area of this protected area is 34.08 sq.km, out of which 9.79 sq.km area is occupied by grasslands serving as breeding habitat for the florican. It is also world's largest communal roosting site for harriers. Major herbivores in the area is Black buck and blue bull. Agriculture land lying adjacent to these protected grasslands is important refuge and foraging ground for the florican.

Naliya: Naliya grasslands (Lala Bustard Wildlife Sanctuary and adjacent grasslands) is a vast area with an approximate area of fifty thousand hectares along the coast of Arabian Sea in Kutchch distrct of Gujrat lies on N 23° 30.00' latitude and E68° 45.00' longitude. Grass patches and crop lands spread within this area support as a breeding ground for Lesser florican and native for Great Indian Bustard.

Grasslands or croplands in Amreli district and Gir National Park in Gujarat, Pratapgarh, Pali and Tonk districts of Rajasthan, Pune and Washim districts of Maharashtra holds outstanding breeding population during monsoon.

Non-breeding habitats

Lesser Floricans are well known to breed in the grasslands of western India but their non-breeding habitat was not known. In this context, the Wildlife Institute of India has been conducting a study to understand the migratory and movement patterns of floricans within and outside the breeding areas using the satellite tracking techniques. In 2014, we were able to tag two male floricans with PTTs in the agriculture fields of Sonkhaliya landscape near Nasirabad area of Ajmer district of Rajasthan. The post tagging behaviour of the two floricans (FLORIKIN-I and FLORIKIN-II) are described below.

A. **FLORIKIN-I:** 18g PTT (Platform no.125812) Florikin-I, was tagged with Agros PPT-100 which spent 112 days and left the breeding ground on 11th November 2014. The bird flew for 94 km towards down south direction and settled down in grasslands at north of Bhilwara, Rajasthan. Florikin-I crossed this distance in 5 days 8 hours with four stopovers. East stopover last one to two days. All the stopovers were in the croplands and grasslands. Florikin-I flew at the speed of 0.73 km/hr which include the stopover time.

B. **FLORIKIN-II:** That was tagged with 22g GPS/Argos PTT had failed after 35 days but had provided much more precise insight to the lekking behaviour of this species. The available data shows Florikin-II, It was found that the florican could shift the displaying territory within an area during a breeding season. Three times this bird had shifted his territory and spent considerable time in each territory and displayed. All these three territories of Florikin-II were within the home range of 6.8 sq.km (MCP 100%).

Plate 17.1: Lesser florican female

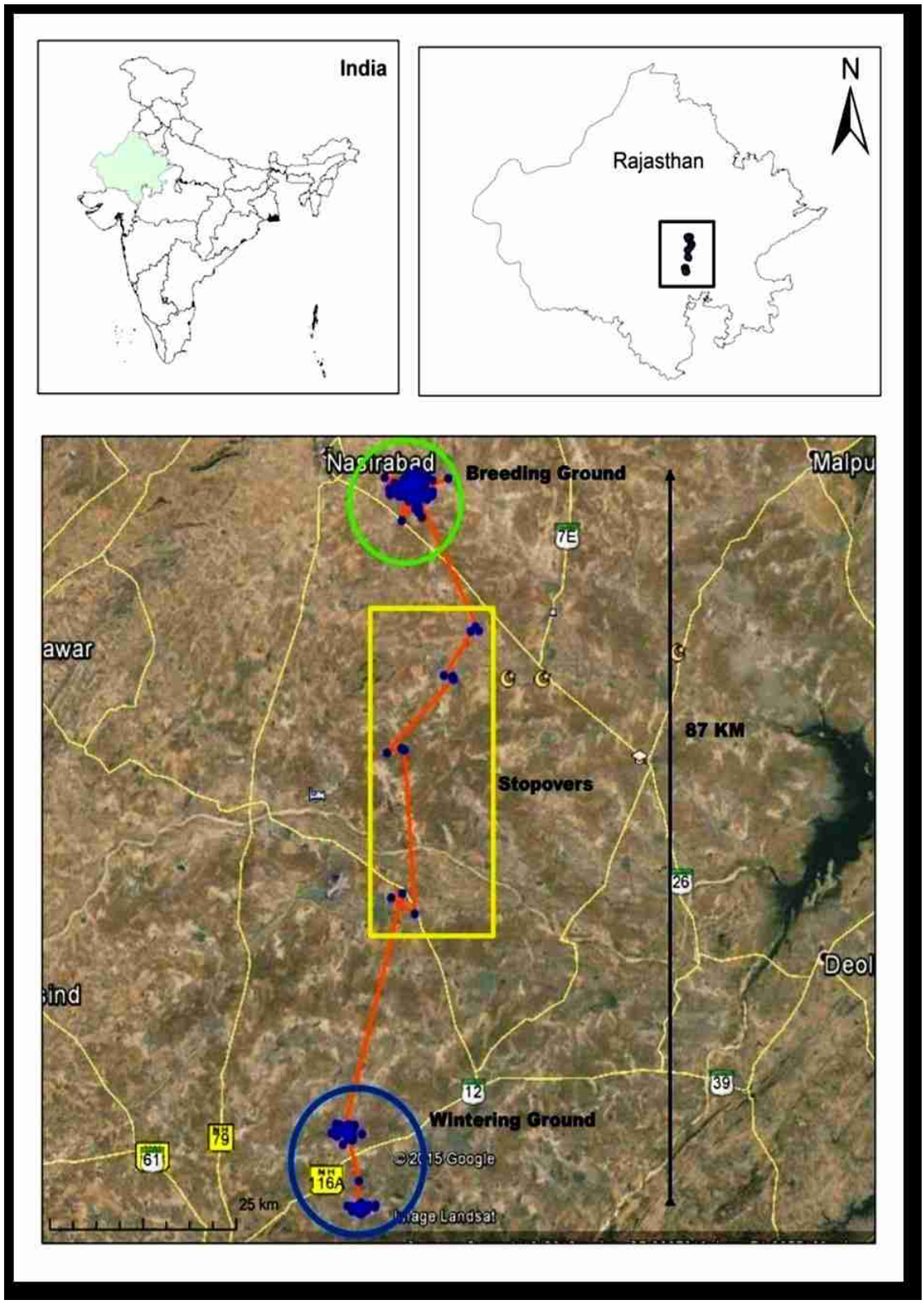

Figure 17.2 Movement of a Lesser Florican fixed with PTT, from August 10th 2014 to March 29th 2015.

Our preliminary observations on one of male florican, which could retain the functional PTTs till 15th June 2015 revealed that the florican did not migrate longer distance. They seem to be migrating to nearby grasslands soon after their breeding seasons located about hundred kilometres away. However, this needs to be confirmed after tracking some more floricans. If the floricans do not migrate long distance and restrict to other parts of semi-arid grasslands during the non-breeding seasons then the importance of semi-arid grasslands goes up several folds with respect to long term conservation of lesser florican in the country.

Threats to semi-arid grasslands in Western India

Lack of National Policy on grasslands

Due to inadequate grassland conservation policy and management practices or a mindset that assumes grasslands as wastelands, many of the state owned grasslands and village pasture lands have been planted extensively with tree species including *Prosopis juliflora* (Bhardwaj et al 2011). Similarly, thousands of hectares of pure patches of grasslands in Thar landscape have been planted with Israeli babul (*Acacia tortilis*) under different afforestation schemes run by the State Forest Departments. Several grasslands in the regions have been converted into either woodlands or crop lands. In addition, due to excess of grazing most of remaining grasslands are in different stages of degradation. Many of the grasslands belonging to state forests departments commonly known as grass birds were auctioned every year. Instead of harvesting the grass manually after the monsoon season, the contractors many times lease out these areas to the local graziers due to non-availability of man power to cut grasses. Herds of cattle throng these grasslands and render a great disturbance to the breeding floricans, even trampling their nests and eggs. Complete removal of grasses from grassland also not conducive for florican to breed in the next year but most of private and government owned grasslands were observed with harvesting of entire grasses leaving no habitat for wildlife.

Habitat degradation and loss

Of the 169 potential grasslands where floricans could be found in the north-western India, 24 grasslands are still believed to be conducive for floricans for breeding. This was largely due to degradation of grasslands, which have failed to attract floricans. Floricans like pure but undisturbed grass patches with mosaics having older tussocks previous years to settle down at the beginning of breeding season. Changes in land-use pattern over the decades have resulted in a drastic decline of grassland habitat in the north-western India. Many of these grasslands were reclaimed for agriculture to meet the demands of the growing population. Ever growing cattle population in the region have also caused overgrazing of the grassland habitats (Sankaran 2000). In many areas, most of protected grasslands were lost to agriculture, leased to graziers or ploughed up, a situation that was particularly alarming in privately owned grassland (Sankaran 1995). Grasslands in the Nalliya area of Kachchh which was known to be an important region for florican conservation had been encroached dramatically by immigrants from Haryana, who are ploughing up florican habitats for cotton cultivation, causing a huge loss of habitat for both bustards and local herdsmen. Moreover, degradation of grasslands in Gondal, Rajkot, Jamnagar, Ratlam, and Dhar districts in the north western India either completely failed to attract florican or attract few individuals.

Plantation and spread of invasive species

It was observed that grasslands have wrongly been considered as waste land and hence large scale plantation was carried out in many grasslands in the north western India. Grasslands with plantation were avoided by the florican as these birds prefer pure grasslands with few trees here and there. Because of plantation, several potential grasslands of florican failed to attract these birds nowadays.

Invasion of alien *Prosopis juliflora* was reported in several grasslands in the north western India. Apart from *Prosopis*, several other tree species were also observed invading in the grasslands largely due to grazing.

Use of pesticides

Lesser Florican is an omnivorous species. Intake of florican include many types of invertebrate: grasshoppers, beetles, flying ants, hairy caterpillars, centipedes, worms, frogs, small lizards and various planta parts: crop shoots, leaves, herbs and berries. Insect form the large part of diet of the Lesser florican (Sankaran, 1995). Crop fields in semi-arid and arid zones are known to be excellent breeding ground for insects. Most of florican sightings during present survey were at the fringes of grasslands which were adjoined with crop fields. It shows that the florican prefer this area largely due to more availability of insects in the region. Use of pesticide in the adjoining agriculture fields around the florican grasslands is being drastically reducing the foods availability. Moreover, insect with pesticide may also threaten the floricans health.

Indiscriminate developmental activities

Windmills in or around the florican habitat are also seems to be threatening bustard in general and floricans in particular. Once the Great Indian Bustard Sanctuary (Lala village) use to attract several floricans had failed to have single florican

this year might be due to mushrooming of windmills around this sanctuary. Apart from windmills, urban expansion, expansion of agricultural activities, road etc in the grasslands are also posing threat to this species.

Poaching

Displaying male floricans are easy victims of poaching. Severe hunting pressure in the last century could have eradicated most of male population (Hume and Marshall 1879-1881, Baker 1921-1930, Birdlife International, 2001), appears to have affected the species drastically (Sankaran 1993). Because of its delicate flesh and excellent taste florican became a best sport-birds of both native people and colonial sportsmen (Jerdon 1839-1840). Sporadic incidences of hunting of this species reported during our survey. However, hunting is not seems to a major threat as most of villagers sympathetic to floricans.

Inadequate Protected Area coverage

Presently semi-arid grasslands are represented by only less than five protected areas in the country which are crucial for the conservation of florican/bustards in the north western India. These include Sailana Kahrmor Sanctuary and Sadarpur Florican Sanctuary both in Madhya Pradesh are exclusively notified for Lesser Florican and Velavadar WLS is for Black Buck in Gujarat. There is also one sanctuary called Great Indian Bustard WLS Kutchh part Gujarat which is chiefly for GIB but it is also a habitat of Lesser Florican. Sailana Kharmor Sanctuary and the Velavadar Blackbuck National Park were the only two wildlife protected areas reported with floricans during our survey. Velavadar NP is the only grassland in the north western India observed with increase in population of Lesser florican in the last three decades was largely due to better grassland management and protection. Some of the protected grasslands in the region were also unfit for florican largely because of these grasslands managed only for fodder.

Strategies for the management of semi-arid grasslands with species reference to Lesser floricans

National policy on the management of grasslands

It is important to have a National Policy on Grasslands Management in India appreciating the ecological services provided by this ecosystem. Currently, grasslands are by and large considered as wastelands due to lack of understanding about their ecological services. The practice of tree plantation by the forest department in grasslands or grass birs should be avoided. Under the umbrella of Joint Forest Management/ Eco-development or social forestry schemes tree plantations were carried out in a major scale which is harmful to floricans and their habitats as well as associated species in the grasslands. Moreover, current practise of looking grasslands as source of only fodder for cattle needs to be reconsidered. Sustainable use of grassland resources without harming their ecological services needs to be emphasised in the National Policy. The Policy is also required to be suggesting the wildlife especially bustard friendly grassland management in India.

Restoration of degraded grasslands with the involvement of local communities

Less than five protected areas (grasslands) are existing exclusively for the conservation of florican/bustards in the north western India. Less than 5% of globally endangered Lesser florican habitat is protected by Wildlife (Protection) Act, 1972. Since the protected florican habitats are comparatively better than non-protected grasslands, it would be better to bring more grasslands under the Wildlife Protected Areas of India by declaring more grasslands as 'Conservation or Community Reserves'. It is urgently required to bring some of the grasslands in Nalliya region in the protected area network. Similarly, some grasslands in Gonda and Rajkot districts as well as in Ratlam and Dhar districts. Grasslands around Sailana are also need to be declared as 'Community/Conservation Reserve' with consensus of local communities. And then the grasslands in the protected areas are need to be managed to fulfil the habitat requirement of bustard in general and Lesser florican in particular.

Control and management of alien invasive plants in grasslands

Eradication of *Prosopis juliflora* and other invaded tree species from the selected grasslands in the north-western India should be taken up immediately. Eradication and monitoring of invasive species in the grasslands should be a continuous programme following the guidelines of IUCN-Invasive Species Specialist Group.

Long term monitoring of floricans and their habitats

The Lesser Florican *Sypheotides indica* population and range is decreasing at an alarming rate due to breeding habitat loss and threats in the non-breeding habitats, believed to be in south and south-east India. Their breeding habitats have sharply declined in north-western India, which is believed to be a major cause for the decline of this endangered species, and there is hardly any information its non-breeding habitat which is supposed to be in Central and South India. A number of studies have been carried on its population status, habitat-use and behaviour in the breeding grounds, but there is practically no information about their habitats, ecology and behaviour in non-breeding habitats, the knowledge

of which is crucial for their comprehensive conservation plan preparation. It is important to know the status of non-breeding habitat of florican using satellite tracking techniques, understand the migration pattern/movements, and investigate its current status and distribution in north-western India, which could lead to data on the species in other areas. There is also need of continuous monitoring of Lesser Florican and its habitat in the states of Rajasthan, Madhya Pradesh, Gujarat and Maharashtra. Studies on impact assessment of mega and even so called eco-friendly projects like wind mills on the Lesser Florican should be initiated. A study on the effects of pesticides and insecticides on Lesser Florican is still lacking there should be a study on theses issues.

Involvement of voluntary action groups and private sectors for restoration of grasslands and grassland fauna

Floricans prefer pure but undisturbed grass patches with mosaic of last year grasses to settle down at the beginning of breeding season. Therefore, it is recommended to leave mosaic of old grasses during harvesting for floricans as well as other grassland wildlife. Instead of leasing out grasslands for grazing it would be better if the grasses are manually cut after the monsoon season that will prevent trampling of cattles on florican nests as well as spreading of invasive tree species in the grasslands. Pesticides use in adjoining agricultural fields found to be detrimental for the survival of floricans, therefore, local communities need to be advised the ill effects of pesticide use and they should be compensated if they incur any loss due to non-use of pesticides around florican habitats.

The financial incentive scheme of Madhya Pradesh Forest Department for rewarding the villagers for giving the information of the presence of bird in their agricultural land needs to be thoroughly reviewed and it may be started in others states of Rajasthan and Gujarat, if it is found be worth. An awareness and sensitisation programme for the conservation of Lesser Florican and its habitat should be initiated by all the state forest departments in the states of Rajasthan, Madhya Pradesh and Gujarat. This should be further supplemented with eco-tourism and sensitive florican watch activities. Local communities need to involved in the management of grasslands and they need to be told the reason behind the decline of florican as well as deterioration of their grasslands. There was an initiative in Naliya, where grasslands grazing/harvesting was regulated with the help of local communities. Because of this some grasslands in Naliya region were not disturbed during the breeding season of florican. This initiative was implemented in collaboration with Forest Department, Revenue Department and Local community. If this model works successfully then the same may be tried elsewhere in the country. **Plate 17.2 - 17.4** shows glimpses of tagging and release of Lesser Florican.

Apart from declaring some of important grasslands as conservation/community reserves, it would also be required to modify the current use of grasslands in the north-western India. Instead of allowing livestock grazing all over grasslands, certain portion of grasslands need to be protected at least for a year period. Next year, these protected grass patches may be used as fodder but protecting other parts of grasslands for another year use. This kind of practice would help the floricans to settle down and to breed.

Plate 17.2: Releasing the tagged Lesser Florican

Plate 17.3: Tagged individual in flight

Plate 17.4: Tagged Lesser Florican

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