STUDY OF ECOLOGY OF CERTAIN ENDANGERED SPECIES OF WILDLIFE AND THEIR HABITATS

THE LESSER FLORICAN

ANNUAL REPORT 2
1985-86

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BOMBAY NATURAL HISTORY SOCIETY

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The Lesser Florican

Annual Report II : 1985-86

Sponsored by
the Department of Environment
Government of India

and

The U.S. Fish and Wildlife Service

Studies conducted in
close association
with
Madhya Pradesh, Rajasthan and Andhra Pradesh
Forest Departments

BOMBAY NATURAL HISTORY SOCIETY
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CONTENT

INTRODUCTION

Of the three resident bustard species in our country, the lesser florican Sypheotides indica(Miller) is the most widely distributed. The lesser florican is the smallest of the Indian bustards and like most bustards is an inhabitant of open grasslands. In recent years due to the destruction of its habitat and indiscriminate hunting, the lesser florican has become rare over much of its former range.

Being a popular game bird, extensive literature on the general behaviour of the florican is present e.g. Jerdon (1964), Hume & Marshall (1878), Blanford & Oates (1898), Baker (1921). However, it was not until 1950 that results of an indepth study on the lesser florican was published by Dharmakumarsinhji. Ali & Ripley (1969) have summarized the range and habits of the lesser florican in the 'Handbook'.

The Bombay Natural History Society has been intensively studying the lesser florican since 1984 under the Endangered Species Project. Preliminary results have been given earlier (see Technical Report No. 2 and Annual Report I: 1984-85). This report is mainly based on the work done in 1986. However data collected earlier has been quoted whereever necessary.

Status survey of the florican, as planned for 1986, could not be completed due to factors like persistant drought in Gujarat and illness of the researchers at the crucial period. However the brief survey in Rajasthan and Madhya Pradesh has revealed that the florican is present in far more areas than previously presumed. Hopefully, we will do a very thorough survey of all the important florican areas in the comming monsoon. The post breeding movements and habits of the lesser florican are still largely unknown. Our attempts to locate the florican in probable wintering grounds in Andhra Pradesh have been unsuccessful so far. A more intensive survey in the coming years is necessary.

Work on the Bengal florican Houbaropsis benghalensis was tardy mainly because of the lack of proper transport. Fortunately, a vehicle has been

provided to the researchers from January 1987, and intensive work has been started in Manas (Assam). As we do not have any new data on the Bengal Florican, this report is based only on the lesser florican. The next annual report, we hope, will be based on the Bengal florican.

OBJECTIVES OF THE PROJECT

1. To obtain precise data on the present distribution of the floricans and other endangered birds by field surveys and questionnaires.

2. To examine habitats presently holding these endangered birds.

3. To determine the exact breeding areas of these birds.

4. To study the ecology and behaviour of the floricans and other endangered birds.

5. To prepare, on the basis of the data obtained, a conservation management plan for the endangered birds.

FIELD STAFF

Dr Salim Ali is the Principal Investigator and Mr J C Daniel is the Co-Investigator of the Project. The field staff consist of the following persons working on the lesser florican:

Dr Asad R. Rahmani	Project Scientist
Mr Ravi Sankaran	Biologist

Office Staff

Mr S R Nayak	Project Administrator
Mr Carl D'Silva	Artist

ACKNOWLEDGEMENTS

The study is sponsored by the Department of Environment, Government of India, and is funded by the U.S. Fish & Wildlife Service vide Grant No. 8851-658-04. The Forest Department of Madhya Pradesh extended its fullest cooperation during our study period.

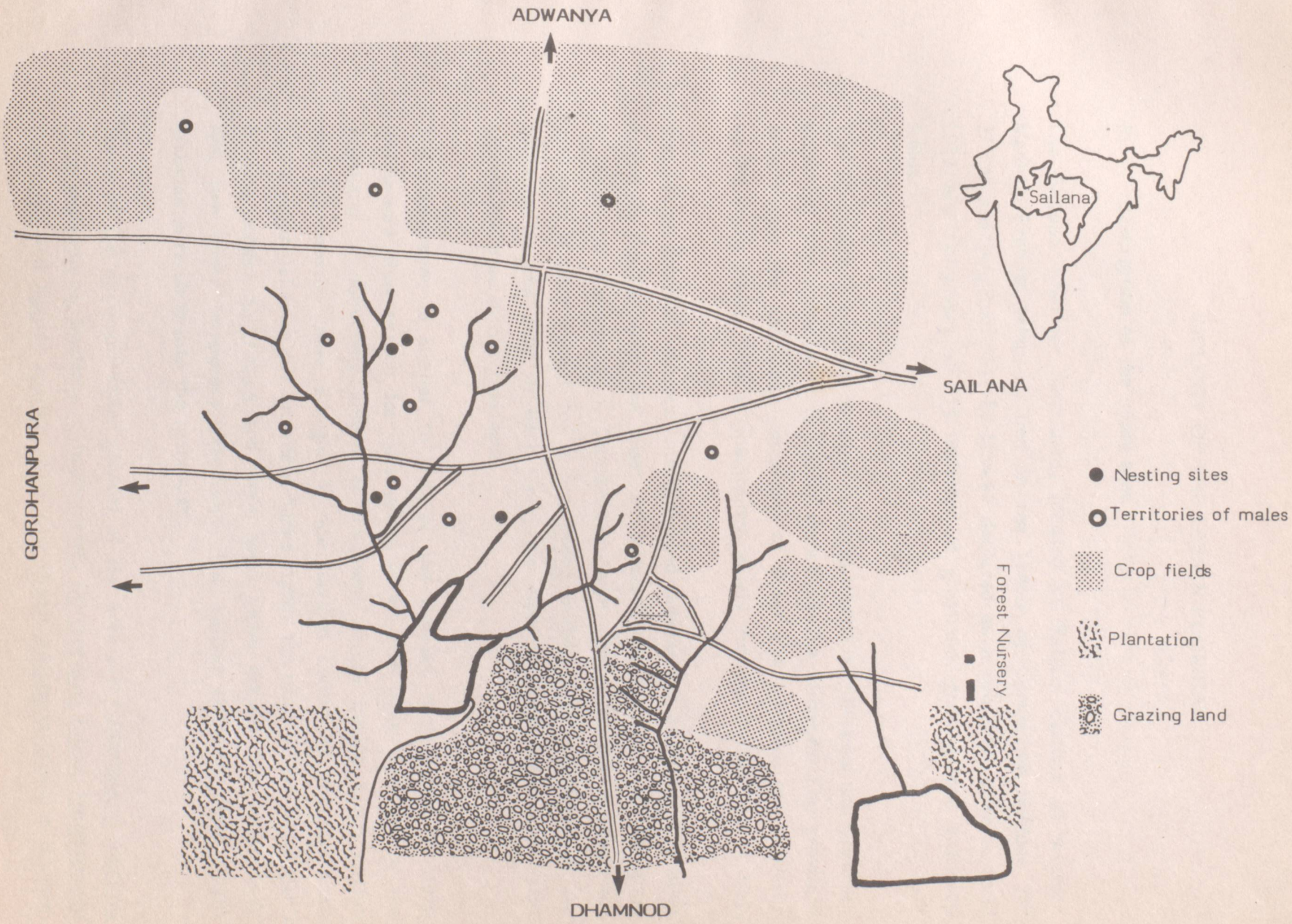
During our studies and surveys, we received valuable assistance and cooperation from many persons. We wish to record our sincere thanks to Mr P.M. Lad, Conservator of Forests (Wildlife), to Mr S.P. Mishra, Chief Wildlife Warden of Madhya Pradesh, to Mr D.R. Verma, Divisional Forest Officer, Ratlam, to Mr Pushp Kumar, Addl. Chief Conservator of Forests, Andhra Pradesh, to Mr Rama Krishana, Director of Zoos, to Mr Vidhya Sagar, Assistant Conservator of Forests, and to Mr Siraj Taher, Hony. Secretary, Birdwatcher's Society of Andhra Pradesh.

We appreciate the help and hospitality of H.H. Raja Dhiraj Sudershan Deo Singhji of Shahpura during our survey of Rajashtan. Mr Shamsher Khan, Security Officer, Rajasthan Tannaries, Tonk, Mr Shantanu Kumar, DIG, Kota, and Mr Subhash Ojha, RFO, Shahpura, also cooperated with us during the Rajasthan survey. We also thank various DFOs and RFOs

of Rajasthan, Madhya Pradesh and Andhra Pradesh for their support during our work.

Mr J C Daniel, Mr J S Serrao and Mr Ranjit Manakadan gave valuable suggestions during the writing of this report.

We want to express our gratitude to Mr Mehboob Alam who assisted us in our field work as well as helped us in running the field station at Sailana.



Map 1. STUDY AREA (NAULAKHA GRASS BHEED, SAILANA)

BIOLOGY OF THE LESSER FLORICAN

A. Description of the study area

The Sailana Kharmor Sanctuary, located in Ratlam district of western Madhya Pradesh (Map 1), lies on the Tropic of Cancer on latitude 23° 27' N and longitude 75° E. It was declared as a protected area in June 1983 and comprises of 354 hectares of grassland, grazing land and crop fields.

The sanctuary is bounded by three villages : Sailana, Adwanya and Gordhanpura and the whole area is jointly owned by the villagers. The grassland area within the sanctuary comprises of about 250 hectares and is known as Naulakha beed. This is maintained solely for the production of hay.

The lesser florican utilizes this grassland habitat for breeding. The birds arrive in Sailana with the onset of monsoon and remain until the grass is ready for harvesting in October-November. Prior to the monsoon the grassland is bare except for a few Butea bushes. With the break of the monsoon by end June or early July, the emerging vegetation soon transforms the area into a grassland.

The topography is similar to that of the Deccan, with gentle to steep undulations that extend for kilometres in all directions. The soil of the grassland is commonly known as 'murram'. Areas having black cotton soil are mostly under plough. At the eastern corner of the sanctuary lies a perennial reservoir on whose banks stands the ruins of the Maharajah's hunting lodge. Six ridges and their spurs slope toward this water body and two other temporary reservoirs. The valleys between these ridges channalize rivulets into the reserviors.

Some of the dominant taller grasses of the area are Cymbopogon martini, Pseudanthesterea, Iseilema anthephoroides, Chrysopogon fulvus, Heteropogon contortus and Apluda mutica. Wild rice Oryza rufipogon grows in ditches.

Brachiaria, Eragrostis, Digitaria, Setaria, Bothriochloa, Dicanthium, Aristida funiculata, etc. grow as shorter vegetation. A few Phoenix palms grow along the streamlets running between ridges to the reservoir. A single species of ground orchid Habenaria marginate occurs sparingly in the monsoon.

Originally known as Shikarwadi due to the abundance of 'game' animals, today the grasslands of Sailana are devoid of most of its original inhabitants. However, a few Indian fox Vulpes bangalensis and jackal Canis aureas survive. Birds of the grassland ecosystem - harriers, larks, quails and partridges - are commonly seen.
(This description is a repetition from Annual Report 1).

B. Methodology

General field observations were carried out with the aid of binoculars (7 x 35, 8 x 40) and a telescope. The birds were mostly observed from 200 to 300 m. Most of the observations were done from a vantage point. A hide was utilized to study the bird from close quarters. Photographs were taken by Minolta X700 using 300 or 600 mm lenses and Olympus OM1n using 135 and 270 mm lenses.

The study period at Sailana extended from August to October 1984, July to November 1985 and June to November 1986. The intervening periods were used for surveys.

During the surveys, a large number of florican pamphlets and posters were distributed among the forest department officials, interested persons and villagers to get some feedback.

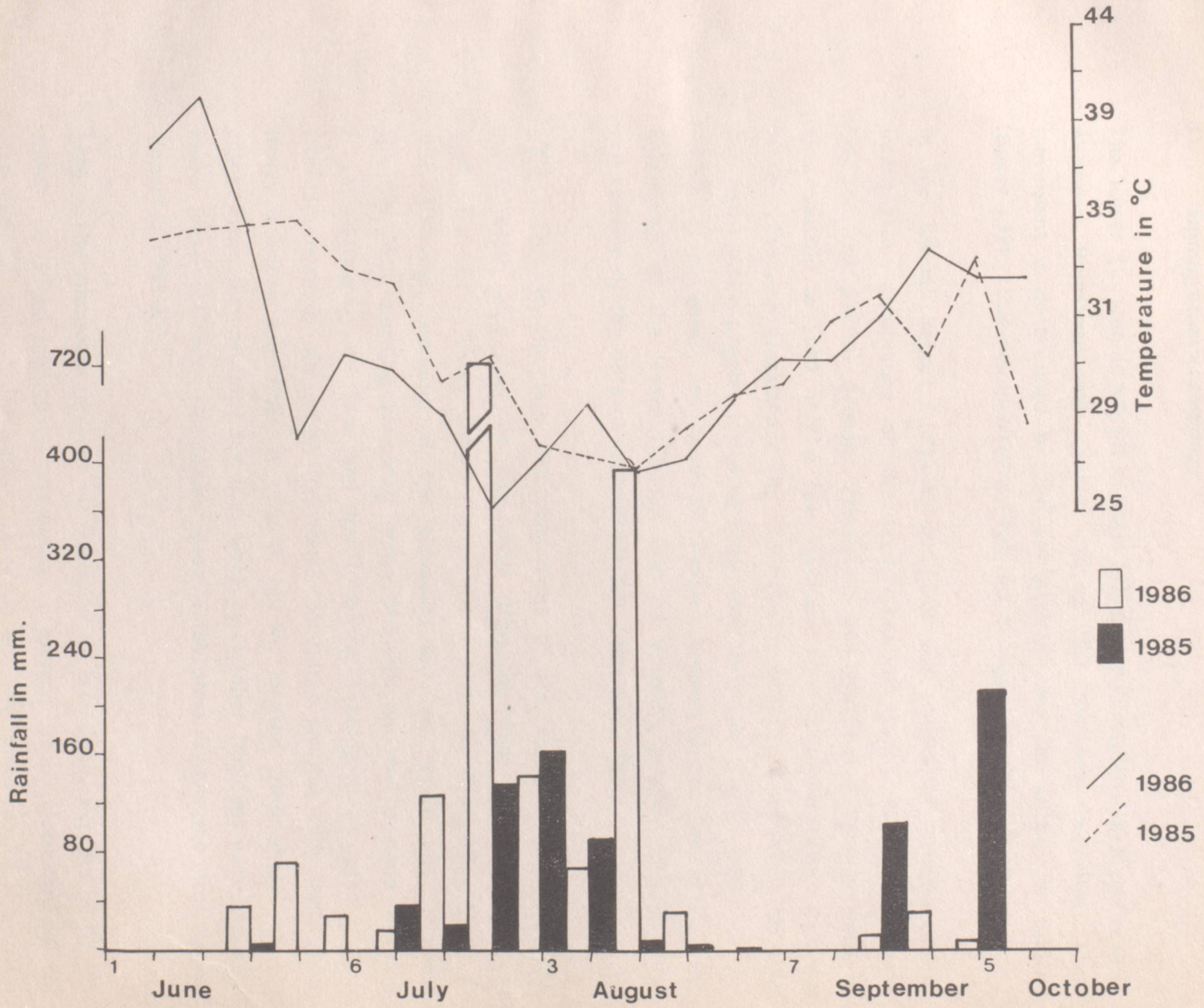


Fig.1 Meteorological data of Sailana : 1985 & 1986

C. Immigration chronology

The lesser florican is known to visit grasslands in eastern Madhya Pradesh, southern Rajasthan and Gujarat during the monssons to breed. Their movement is determined by the precipitation and the pattern of rainfall (Baker 1921, Dharmakumarsinhji 1950, Ali & Ripley 1969).

In the Annual Report I:1984-85 we gave our preliminary results of the immigration chronology of the lesser florican to its breeding grounds. Due to the partial drought conditions and the late commencement of the monsson in 1985 only a few floricans arrived at the study area and in the adjoining grasslands. The monssons of 1986 however began on time and there was a greater influx of birds into the area. Many years of research is necessary to have an indepth knowledge of the immigration chronology of the lesser florican into its breeding ground. The following is a resume of the data collected both for 1985 and 1986.

1985 : Due to the late commencement of the monsoons and the poor precipitation only four or five male floricans were seen in our study area. The first heavy showers took place only on 25th July. Prior to this, thorough scanning of the grassland did not reveal any floricans. On the 26th morning following heavy showers we saw a male florican, It rained heavily on 27th and the following evening we located a male florican, possibly the same individual. Similarly on the 29th there were heavy showers and when it cleared up we located three males on one ridge. From then on until the first week of October floricans were regularly seen, more so once territories were established. (Also see the Annual Report I: 1984-85).

1986 : The monsoons arrived on schedule in late June. For the first few weeks it rained copiously, promising a bumper crop. However, by the last week of August, the skies cleared up and the remainder of the season was quite dry (see Fig.1).

Unfortunately this year due to unavoidable circumstances we reached our study area at Sailana on 22 June, a week after the start of the monsoon. From the 23rd until the 28th, a cock florican, possibly the same individual, was regularly seen. Following the rains on 30 June, two males were seen until the 5th of July. After the rains on the 5th night, four floricans were seen on the following morning. Three of them were males. The fourth bird (sex unidentified) was seen flying high, over tree-tops, into the oncoming rain clouds, the general direction being from east towards west. Dharmakumarsinhji (1950) wrote that the floricans arrive in the Kathiawar peninsula following a general direction from southeast and east to northwest and west.

From the 7th to the 30th of July, one to three male floricans were seen. In the last week of July there was heavy rainfall which almost exceeded in that week the total precipitation of 1985. Following these rains, five males were located on 31st July and by the 3rd of August there were seven male floricans in our study area. No doubt atleast four males had arrived with the rains at the end of July. By the 12th of August, there were atleast nine males within the study area. Between 14th and 18th August there was once more a spell of torrential rainfall, following which a total of 11 male floricans were counted within the study area. The marked increase in the florican population after a period of heavy rainfall, further confirms our finding that the florican's movement into the breeding grounds is closely related to the southwest monsoon (see Fig.2)

After this the population of males in our study area did not increase but decreased to ten due to the predation of one individual. Until the end of September, eight to nine males were seen almost daily within their respective territories.

The first hen florican was sighted on 4th July and after this a few hens settled in the area. The pattern of immigration seemed to be similar to that of the males. In the second week of August we estimated atleast six female floricans but due to their secretive and wandering habits, accurate figures of female populations are very difficult to assess.

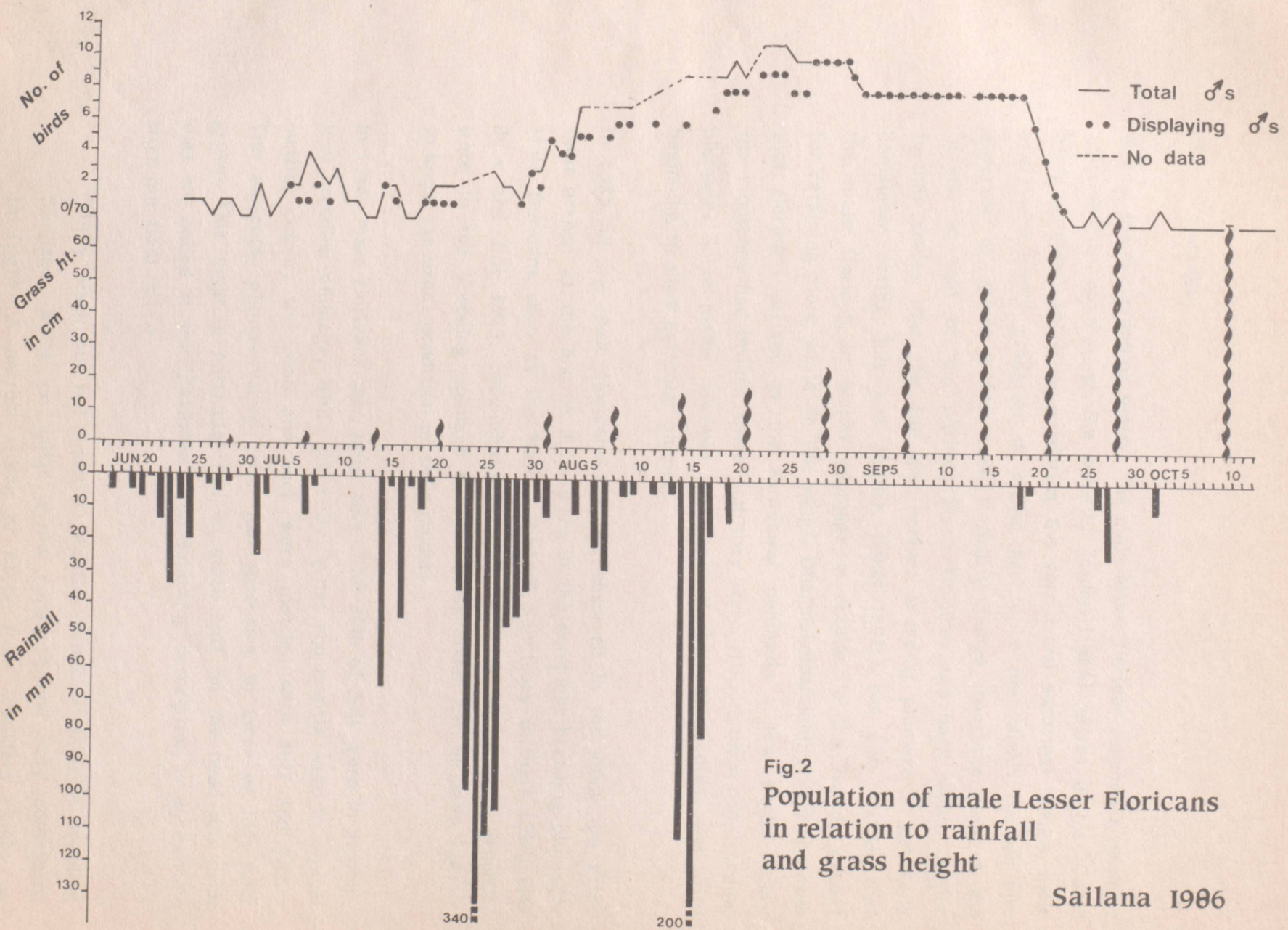


Fig.2
Population of male Lesser Floricans in relation to rainfall and grass height

Sailana 1986

D. Plumage

During the non-breeding season, the male lesser florican assumes a plumage very similar to that of the female. Jerdon (1864) writes in his 'Game Birds of India' vol II that "during the vernal and autumnal moults, male birds with every gradation of colour are to be met with". He has also observed at Jalnah a few cock floricans change from the garb of the female to that of the perfect black florican and back again. Jerdon further states that the full and perfect breeding plumage is generally completed during July and August. Baker (1921) has also written that the male florican in winter plumage is similar to the female except for retaining more white on the wings. Dharmakumarsinhji (1950) observed that floricans arrived at the Kathiawar peninsula a few weeks before the monsoons had broken there and they were still in their non-breeding plumage. Some males however had assumed their black dress and were beginning to show auricular plumes.

In 1985 all the male floricans that we observed in the study are after their arrival at the end of July, were in the complete breeding plumage. Male floricans seen at the Karera Bustard Sanctuary in June 1982, and June and July 1985, undoubtedly on their way to the breeding grounds, were in the breeding plumage but the birds could not be seen closely to know the exact condition of their colours.

In 1986, male floricans seen until about the 20th of July were in incomplete breeding plumage. While the belly, wings and mantle were in typical nuptial colour, the head and neck were mottled with buff and black. The auricular plumes varied from just sprouting to more or less fully grown. One male in particular had so much buff on the head and neck that we called it the 'Buffhead'. The following description is an extract from our field notes:

> "Belly black but not lustrous. Mantle vermiculated as in breeding plumage. White on wings seems complete and very conspicous in flight. A narrow streak of black from shoulders climbs up

the back of the neck ending indistinctly below the head. Rest of neck buff, heavily mottled with black streaks at base becoming more spaced out towards the top. Head buff with a few black streaks. Plumes present but just sprouting".

The other two males in the area varied closer to a complete breeding plumage. One male had only a few buff streaks on the sides of the head and along the crown, and a buff ring around the eye.

'Buffhead' interestingly enough was seen to display prior to acquiring its complete breeding colours. It was also the most pugnancious of the three males seen during that period; always chasing away any male that it saw. 'Buffhead' was also observed chasing a female in the typical courtship display (see Annual Report I for courtship behaviour).

On occasions when 'Buffhead' was observed preening it spent many moments scratching its head, cheeks and chin vigorously with its foot. However, by the time territories were established by the 20th of July, all the territorial males observed were in their complete breeding plumage. One male seen at another grassland in the third week of August had buff on the head and neck and with relatively short plumes. It was possibly a first year male. In 1984 also, a male with plenty of buff streaks on head, neck and belly was seen well into the breeding season. This male was non-territorial and was undoubtedly an immature florican.

At the end of the season in the last week of September we found moulted feathers within the territory of a male. Possibly the males begin to change their plumage back to their female-like garb prior to leaving the breeding grounds and complete the change on their way to the wintering areas.

E. Habitat Utilization

Regarding the habitat of the lesser florican, Jerdon (1864) writes, "The lesser Florikin frequents long grass in preference to any other shelter.

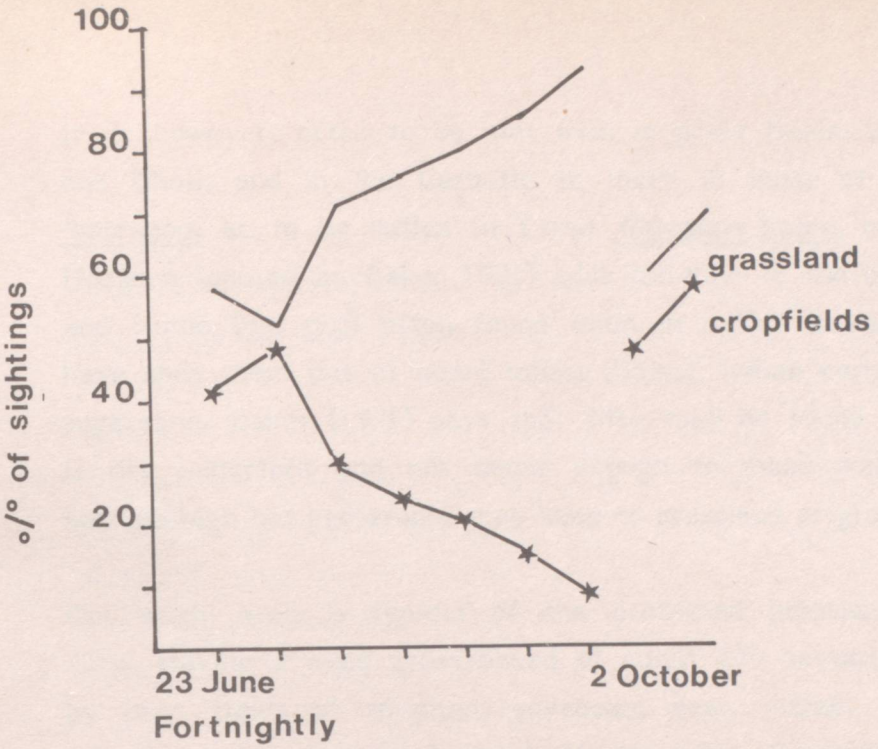


Fig.3 Sightings of floricans in cropfields & grasslands 1986

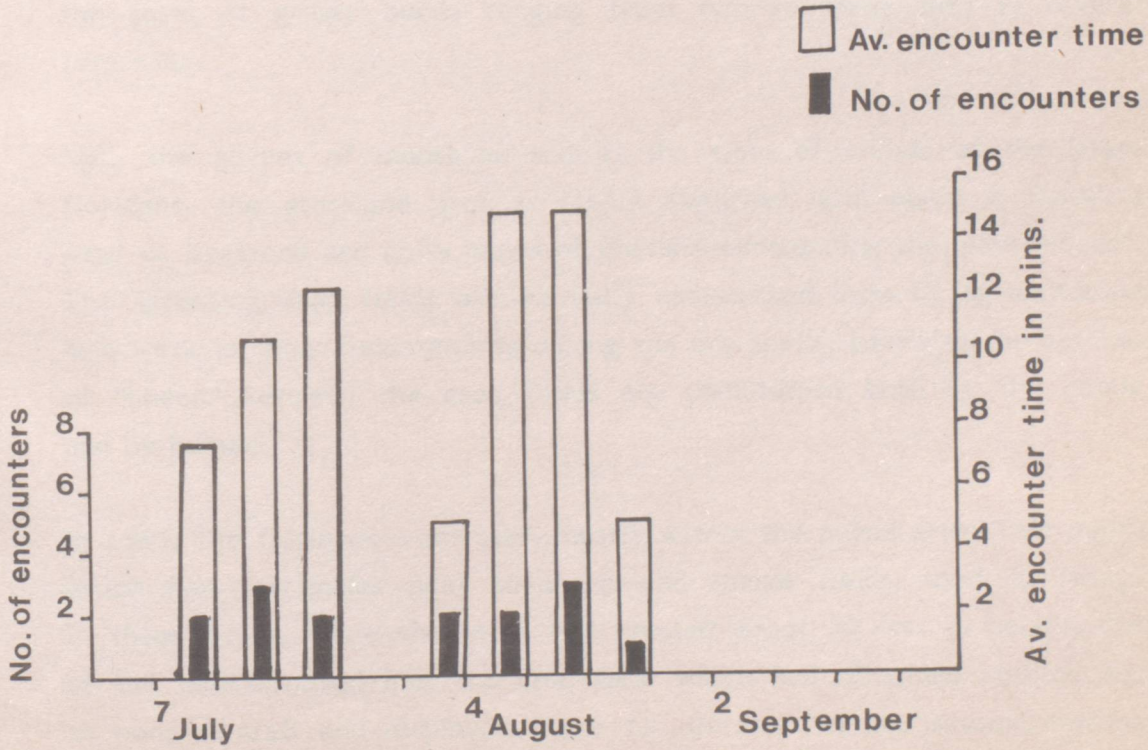


Fig.4 Agonistic Interaction: 1986

It is, however, often to be met with in grain fields, in fields of Cotton and Dholl, and in the Carnatic so much in those of the grain called Warragoo, as to be called in Tamil Warragoo kolee, or Warragoo Fowl." Hodgson (quoted by Baker 1921) adds hill-rice to the crops they frequent and Hume (op. cit.) often found them in millet fields. Other sportsmen have shot them out of pearl millet (Bajra), Indian corn, wheat and young sugarcane. Baker (1921) says that they may be found in any crop which is dry underfoot and not dense enough to make walking difficult and not too high but preferably they keep to grassland or grain fields.

Our study area is typical of the protected grasslands of the present time. Having a main grass bheed of about 250 hectares, it is surrounded by crop fields of sorghum, soyabean, daal, maize, and cotton. These are the main monsoonal crops of the area. Sugarcane and certain varieties of dry paddy are also present. Interspersed amidst the crop fields are patches of "bheed" ranging in size from a fraction of an acre to about five acres. The division between the crop fields are also in the form of grassy bunds ranging from two to three feet to several feet wide.

With the advent of monsoons and at the time of arrival of the lesser floricans, the grassland area is highly disturbed with about a thousand head of livestock and noisy bands of graziers overrunning the main "bheed". The sprouting crop fields are virtually undisturbed even by agriculturists who work in their fields mainly during the dry spells. Likewise the patches of "bheed" between the crop fields are undisturbed both by the cattle and by humans.

In 1985, the floricans were seen mostly within the bheed area. Two males which had territories near soyabean and maize fields, used to forage in these fields. Once the grass had crossed about 50 cm. in height, one of the males moved into the crop field which had remained stunted due to poor rainfall and displayed there for the rest of the season, moving into the surrounding tall grass when disturbed and during the heat of the day.

In 1986 however, floricans were more often seen amidst the crop fields and occasionally in the "bheed" in the pre-territorial period. On being disturbed/flushed they invariably flew into the crop areas. However, even amidst the crop fields the floricans preferred patches of "bheed" and grassy bunds on which there invariably was a profusion of Butea bushes.

In the main "bheed" also, floricans were more often seen in areas where there were plenty of Butea bushes. This year few males established early territories amidst crops but once there was adequate grass cover in the "bheed" area, there seemed to be a shift of territories into the grassland (see Fig. 3). However, observations on marked birds are necessary before any conclusion in this regard can be arrived at.

Interestingly, the birds preferred the crop areas during the day when disturbance by livestock in the "bheed" was maximum. After the cattle had moved out at about 1600 hours, birds could be seen wandering back towards the grassland. Similarly birds could be seen moving away from the "bheed" in the morning as the cattle came for grazing.

Floricans were seen in most of the crops of our study area but soyabean-maize and daal seem to be the most preferred. Sorghum too was frequented. On occasion we have seen both cock and hen floricans entering a shoulder-high sugarcane field. Once grazing was stopped (about 15 July in 1986), floricans were more often observed in the main "bheed".

F. Territoriality

While rainfall determines the immigration pattern of the lesser florican, the height of grass, therefore indirectly the rainfall, appears to determine the advent of territorial behaviour among male florican. At our study area (Naulakha bheed), as reported earlier, grazing is allowed for three or four weeks after the break of the monssons as a result of which the grass remains low in height. On the other hand, in a private 100 hectare "bheed" at Hazariya, about five kilometres from our main study area,

cattle grazing is stopped as soon as the monsoons start, as a result of which the grass grows rapidly. In the first week of July, the grass height average at Hazariya was 13 cm and two cock floricans were already showing territorial behaviour. On the other hand at Naulakha the grass height crossed 10 cm only in the last week of July about which time territories were being established. In 1985 also we have noticed that territories were established only when the grass height had crossed 10 cm. It would therefore appear that when the grass cover is good, the cock floricans are induced to settle into particular ridges and establish territories. However this is only a preliminary conclusion. We need more data preferably on radio-collared birds to find out the habitat preference of the male lesser florican for the establishment of territories.

It seemed one ridge was the most preferred for the establishment of territories. This was the one to be occupied first, both in 1985 and in 1986. Other males seem to occupy vantage points overlocking these prime display locations. This was further substantiated by the fact that it was on this ridge that most of the agonistic behaviour was observed. Females were also most frequently sighted on this ridge, and of the five nests located 3 were also on this ridge.

The distances between territories ranged from 275m. to 450m. We have followed the contours of the land while measuring distances, therefore the actual distance between the territories of two rival males would be less.

The end of display and the breakup of territories occurs quite abruptly. In the last week of September (1986) the male floricans stopped display almost simultaneously, (see Fig. 2) . Attempts to flush birds from within their territories were largely unsuccessfull.

G Activity Rhythm

Major activities of birds involve the expenditure of considerable amount of time and energy. To survive and reproduce effectively a bird must budget its activities over the annual cycle so that activities such as moult, reproduction and migration which are a major drain on the bird's energy resources, do not coincide (Pitelka 1958). It has been suggested that minor fluctuations in the time budgeting could alter the reproductive success of an individual (Orians 1961, Verner 1965). However, a time budget would be variable as the bird adjusts to the environmental condi - tions, no two of which would therefore be alike. Through time budget studies, peaks and trends of the various activities and in particular reproduction can be easily understood. As this study on the lesser florican is basically conservation and management oriented, it is therefore imperative to know the various nuances of the breeding period, in particular the peak display periods and the factors affecting it. We give here our preliminary findings on this aspect of the lesser florican.

Methodology : Initially we tried to study the florican continuously throughout the day but this proved to be quite difficult. Being a small bird and prone to wandering during its pre-territorial period, it was not easy to follow the floricans for an extended period of time, especially when it moved in areas of Butea bushes or amidst the crop fields. So we completed a sunrise to sunset cycle in two days, i.e. from sunrise to noon and from noon to sunset or we took up observations a little prior to the time of losing the bird (on the previous day). Inspite of this many time budget observations were abandoned due to the birds going out of sight. Data given is only from those days when the birds were observed for almost the entire daylight period.

Only one male florican was watched at a time and if lost, we started watching another male or tried to locate the lost individual. Enough data of the females could not be collected due to their secretive nature. Once territories were established, time budget studies became much easier as the males were always present either within or close to their territories.

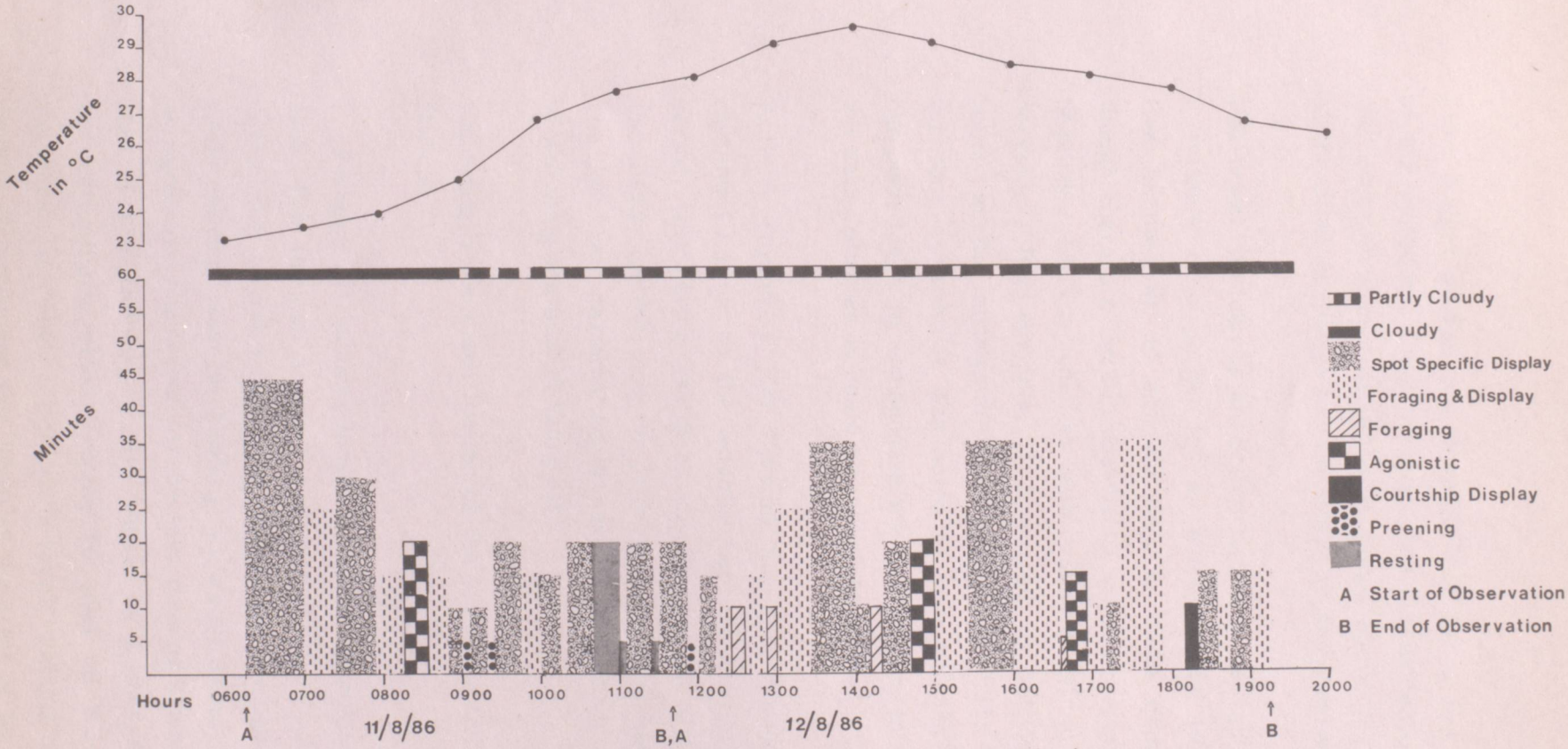


Fig.5 A Daylight Activity Pattern in the Lesser Florican

Time budget studies are possible only for a few weeks after the onset of the monsoons. Once the grass has crossed about 30 cm one can locate the cock florican only when it jumps above the grass in display. Most of the other activities remain hidden to the observer.

The lesser florican is an active bird and we had some problems alloting a suitable time period for an activity unit. However, we have taken five minutes as an activity unit to make computing the data easier though there are certain drawbacks which are explained under the various headings. Activity changes were rounded off to five minutes wherever necessary. For example, if a change in activity took place at 17.34 hours, in the histogram it is shown as 17.35. Or if the bird preened for four minutes, it was noted as five minutes in the histogram. Care has been taken to compensate the loss or gain in time whereever possible. All data collected is based on unmarked birds.

Activity rhythm : The florican has five distinct patterns of activity rhythm: (i) prior to the establishment of territories, (ii) early territorial period, (iii) during the peak display period, (iv) during the decline of the display period, and (v) prior to departure from the breeding grounds. The last two patterns could not be studied in detail due to difficulty in watching the bird in tall grass.

Following is the classification of the various activities of the male lesser florican :

1. Foraging : It includes those activities associated with the search for food. The florican wanders over a wide area prior to territoriality, and within the territory once the display has started. Typically, the florican while moving may on flushing an insect creep upto it and peck it in an egret-like manner or can be seen dashing after a particular grasshopper that it had flushed. It also pauses by bushes to scrutinize the leaves for caterpillars, often jumping to snap up those above its reach. As we cannot say when a florican is simply walking or foraging, the commencement of movement was taken as the start of foraging.

2. Display : The male lesser florican has an attraction display in the form of a jump. The males display soon after arrival into the breeding ground but the activity is inconsistent and site fidelity is absent. Once the territory is established, display becomes the major diurnal activity and the males can be seen or heard displaying throughout the day, especially under cloudy or cool weather (Dharmakumarsinhji 1950; Ridley et al. 1985; this study; for a detailed description see Annual Report I-1984-85). Each jump lasts about one second from the time of take-off to landing. Intensity varies from one to 15 jumps over a five minute period. At the peak of its breeding season, a male florican will jump well over 400 times a day. We have classified display into (i) Foraging and Display (FD), and (ii) Spot-Specific Display (SSD). Owing to the variable number of jumps over an activity unit, the intensity (i.e. number of jumps) has not been taken into account here.

i) Foraging and Display (FD): After the establishment of territories the male florican displays while foraging within its territory. Most jumps are on the move and there is no spot fidelity. Therefore, even if the male florican foraged for a minute or two while displaying, or jumped while foraging, that activity unit was taken as FD.

ii) Spot-Specific Display (SSD): As the season progresses, the male florican displays increasingly from favoured jumping spots. Due to the incessant jumping, the ground at these spots is trampled bare of vegetation. If the male florican displys for an entire activity unit from a single spot, that activity unit has been taken as SSD.

3. Courtship Display : Seen in association with the female, it includes all the time spent by the male in sexual chases and displays. It is primarily a chance activity, occurring only when a female moves close to a male or into his territory.

4. Agonistic behaviour : Displays which express a mixture of aggression or threat and fear or avoidance are called agonistic behaviour (Burton

1985). Agonistic behaviour is mostly seen among males when they come near each other, or when one male enters the territory of another. This behaviour is more commonly seen in the pre-territorial period when the birds are moving about and chances of encounters are higher. (see Fig. 4). Once the territories are established, agonistic behaviour is generally not seen. Similarly, this is occasionally seen at the end of the season when the territories are breaking up and a male wandering about prior to departure comes in contact with a male which is still territorial.

On occasion the cock florican was seen to threaten other species of birds like crows and harriers. These threat displays are very brief and hence not included for analysis. It has been dealt with in some detail in the previous report.

6. Preening or Maintenance activities : Preening is seen mostly in the early breeding season. In 1986 cocks which had arrived in a somewhat incomplete breeding plumage spent more time in preening. As the molt was completed and the birds become territorial, preening as an activity was less sustained and was mostly seen as an occasional adjustment of a few feathers.

Once the grass is tall enough to hide the bird, activities like preening are difficult to see. In the last week of September birds begin to molt again and preening was seen frequently when the cocks were observed from the hide. We have insufficient data regarding the time spent in preening and the condition of the plumage prior to emmigration of the floricans from their breeding grounds.

7. Resting : Being an active bird, the florican does not spend much time in resting. During the heat of the day, however, the birds used to rest in some shade. The bird may rest by simply standing stationary, looking around or may squat and tuck its head into its shoulder. During cloudy and cool weather, the florican is mostly active throughout the day. When it rains, the florican usually runs and stands in a hunched posture

on the leeward side of a bush. This too has been taken as resting though it is somewhat a forced rest due to the weather condition.

Floricans generally roost at dusk in open space, a little away from bushes. Data on this is very limited. The florican however was never seen to roost under a bush.

8. Disturbance: As the grassland is open to grazing for the first few weeks after the onset of the monsoons, there is a considerable amount of disturbance to the florican in this period. Generally when the grass is short, the bird hides from danger by squatting in a depression or behind some mound.
(see Fig.5 for a type histogram of an activity rhythm)

Discussion

The changing activity rhythms of the lesser florican differentiates the breeding season into (i) pre-territorial, (ii) territorial and, (iii) post-territorial periods. The territorial period can be further classified into a) early, b) peak and c) end territorial periods. The changes in activity are closely related to precipitation, height of vegetation and the increasing day temperature.

1) Pre-territorial period : After arrival and until the establishment of territories the floricans spend most of its time foraging. Not yet site specific, the floricans can be seen wandering all over the study area, frequenting both the grassland and crop areas. While the males may display, it is not yet a consistent activity. This wandering enables the floricans to visit and select various possible display sites. Agonistic interactions are frequently seen due to the greater probability of one male coming in contact with another while wandering. (see Fig. 4)

In 1985, preening showed a minimal variation (2.5 % to 0.68 %), while in 1986 it varied from (8.5 % to 0.64 %) (see Fig. 6). This was due to the

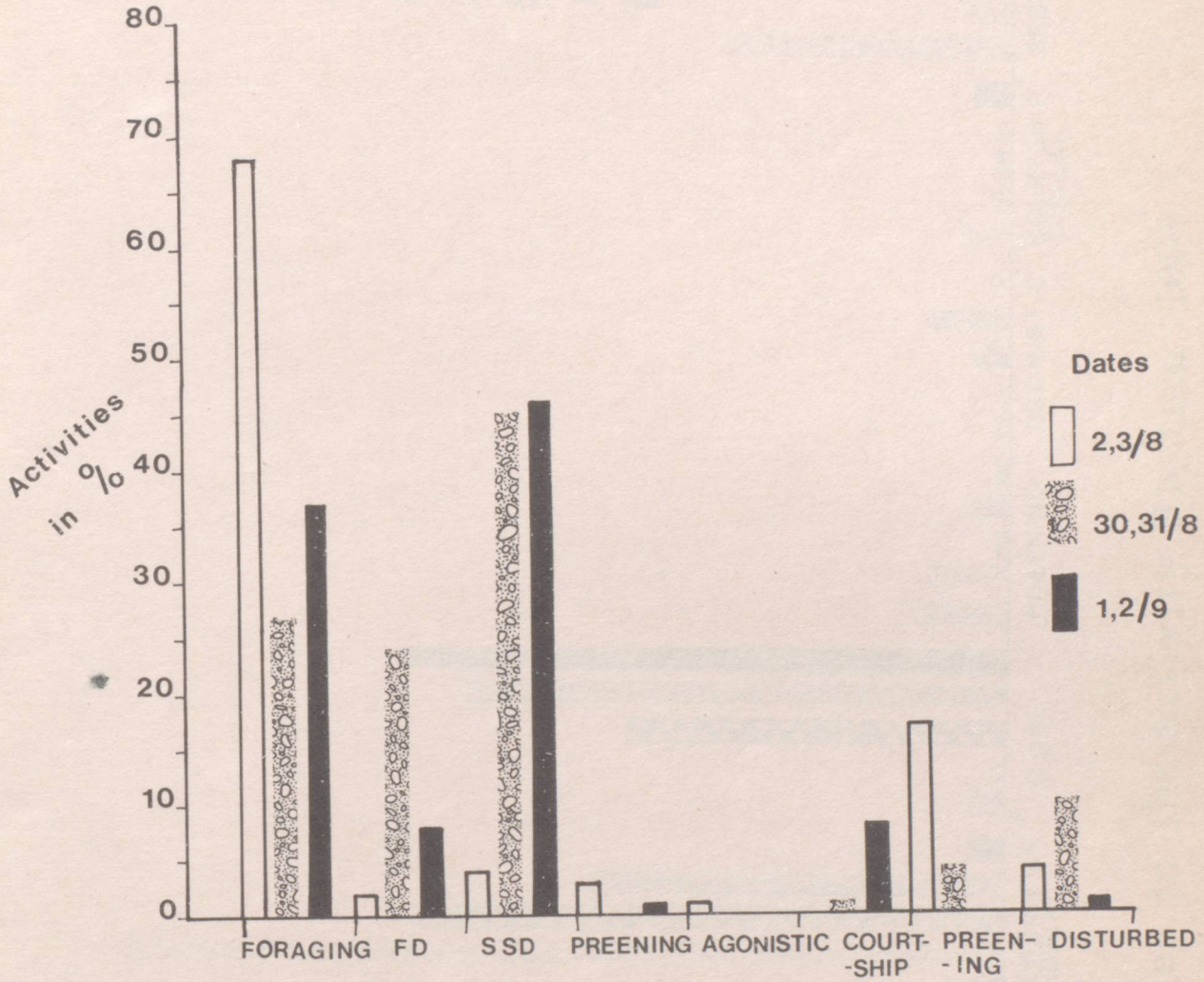


Fig.6 **Changes in the Activity Rhythm : 1985**

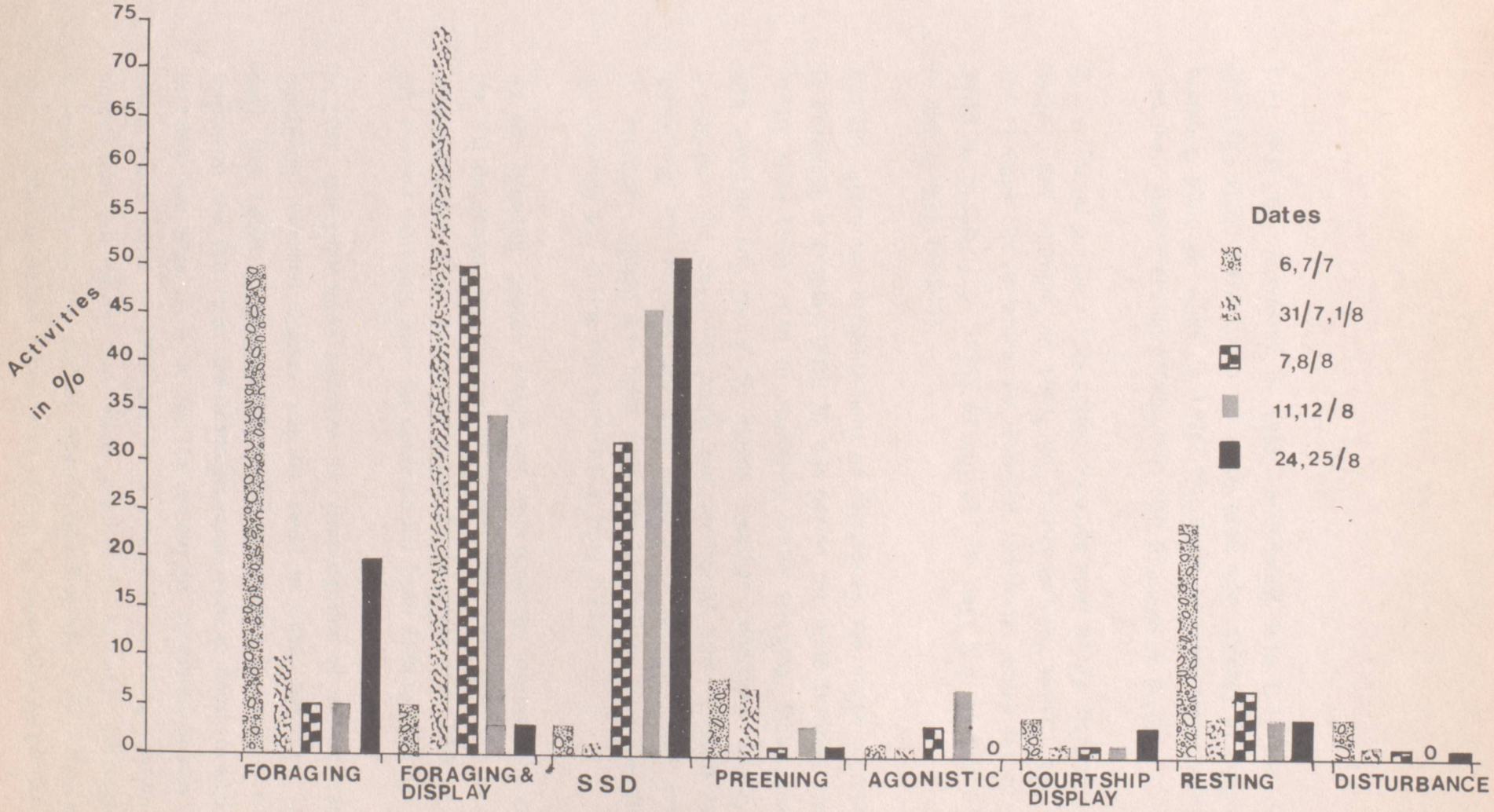


Fig.7 **Changes in the Activity Rhythm : 1986**

fact that the monsoons in 1985 commenced late (i.e. end July), the floricans which arrived into the study area were already in their complete breeding plumage while in 1986, the early arrivals were still molting into their final breeding colours (see also Plumage pp 9-11).

2. Territorial period : This period occupies most of the florican's breeding season. For example, in 1985, the floricans were seen in the grassland for 71 days out of which we recorded territorial males for 42 days (i.e. 59.15%). Similarly in 1986, 67 out of 101 days (i.e. 66.3%) were spent in display (see Table 1).

Initially after the establishment of territories the major diurnal activity is Foraging & Display (FD). In this period the male florican spends most of its time (over 70%) in displaying while foraging. Males are not yet site specific and owing to cloudy weather conditions display is seen throughout the day. FD helps the territorial bird in demarcating and 'patrolling' its territory and also helps it to identify those spots within its territory which are best sites for displaying. Spot-specific display is relatively low during this period (i.e. only 2.5%).

As the breeding season progresses, spot-specific display increases while the FD decreases. By the end of August, the male floricans in our study area displayed from particular spots for a little over 50% of the day, FD dropped markedly over the same period from 75% to 21% (see Fig.7).

In 1986, the time lapse between the first sighting of the florican and the maximum recorded display was 63 days. In 1985, however, it was 46 days (see Table. 1). In both years, display reached the peak at end August inspite of the fact that the monsoon rains were a month behind schedule in 1985 (see Figs. 1, 6 & 7). The ascent to maximum display was very much more rapid in 1985 due to a shortened breeding season. We also noted that all nests that were monitored, hatched, corresponding to a peak display at the end of August (see Nesting, p 22) indicating that most of the copulation takes place during the peak display period.

Table I : Chronology of events 1985-1986

Year	First shower	First sighting of the florican	First display jump	Stoppage of grazing	Peak Display	Last sighting of the florican
1985	25 July	26 July	2 August	15 August	Last week of August	5 October
1986	16 June	23 June	4 August	16 August	-do-	2 October

Table 2 : Activity Rhythm 1986.

	Pre-territorial			Early to Peak territorial period →											
(In percentage)	Morning	Midday	Evening	M	MD	E	M	MD	E	M	MD	E	M	MD	E
Display (SSD)			16.67	2.5			35.71	26.67	31.25	53.33	51.66	33.33	62.5	35	62.5
Foraging Display(FD)				67.5	65	91.67	61.9	46.67	50	33.33	20	53.33	33.33	13.3	16.67
Foraging	52.63	46.67	56.25	22.5	11.67			11.67			10	2.22	2.1	31.7	20.83
Agonistic		3.33			1.67				8.33	8.89	6.67	6.67			
Courtship Display		3.33	8.33			2.08	2.38					4.44	2.1	6.67	
Preening	2.63	13.33	8.33	5	16.67			1.67	2.08	4.44	1.67			1.67	
Resting	44.74	25	10.42		5	6.25		13.33	6.25		10			10	
Disturbed		8.33		2.5					2.08					1.67	
Mean temp for period (in °C)	23.75	27.2	28	24	27.3	26	24	29	26	24.6	28.5	27.75	24	27	25.6
% of cloud cover	100	100	100	100	90	75	80	50	100	90	50	80	75	50	50

(Morning 6-10 am. Midday 10-3 pm. and Evening 3-7 pm).

We divided the day into three time zones (i) Morning, (ii) Mid-day and (iii) Evening. To understand the peaks of the various activities we calculated the percentage of every activity for each time zone(Table 2). In the pre-territorial period, foraging was more sustained in the morning (52.63 %) and evening (56.25 %) as against mid-day (46.67 %). In the territorial period we see that foraging begins to peak in the mid-day hours (Table 2). This is largely due to the morning and evening being occupied by SSD or FD. In this period, the florican spends a considerable amount of time in foraging while displaying (FD) and hence the percentage of foraging (as an individual activity) remains low until FD decreases and Spot-Specific-Display increases. At this time foraging increases with a mid-day peak (31.7 %). The morning and evenings have a Spot-Specific Display peak of 62.5 %. Similarly, resting in the territorial period is maximum at mid-day in relation to the hottest part of the day.

At the decline of the season the maximum day temperature climbs over 30°C thus restricting the display to early mornings and late evenings. The hot noon hours are generally spent in resting or foraging. Due to the height of the grass the activities at this phase of the breeding season are very difficult to observe.

The lesser florican appears to follow a bi-modal activity rhythm which is less marked under cloudy or cool weather and more so under warmer conditions. In the following season we will continue to monitor the floricans behavioural patterns in relation to the weather and other ecological factors.

H. Nesting

The lesser florican appears to be a promiscous species and the male florican plays no part in incubation and the rearing of the chicks. Of the seven nests that we have studied so far, two were found in 1985 and five in 1986. Of these six were present within the grassland and one in a stunted unweeded maize field. This nest was later preyed upon, probably by a crow.

The first nest that we found in 1986 was on 28th August. It had two eggs. Later, on 30th, two more were found in the same nest. Hatching occurred early on the 22nd day of incubation and the hen florican soon left the nesting site with her precocial chicks (see Table 3).

Calculating the dates of laying from the dates of hatching, we find that in all the nests the eggs were laid between 21st August and 6th September, corresponding to the peak of male's display (see Time budget, p 14), and at the time when the grass was tall enough to effectively conceal the female and her eggs.

Our observation of the female florican on the nest is limited but we found that the hens preferred to avoid detection by sitting tight on the eggs until almost trampled upon. The tribals of the area often trap female floricans by throwing a net or basket over the hen while she is incubating.

We have no observation on the relation between the hen and her chicks but they appear to remain in the grassland for a longer period than the males. While the last male was seen on 2nd October, a female with fledged chicks was flushed in early November. They were put up from a harvested area of grass close to an unharvested grass patch. In the third week of November, the grassland had been completely harvested and the hens and chicks were not seen. However, it is possible that they had moved into the crop areas.

A: A female florican on the nest. B: Newly hatched chicks.

Photo: Ravi Sankaran

Table 3 : Lesser florican nesting data at Sailana: - 1985 and 1986

S.No.	Year	Date of finding	Date of Laying (last egg)	Date of hatching	Average height of grass		No.of eggs	Distance from nearest male	Within or outside territory	Comments
					At laying time	At hatching time				
1.	1985	16 Sept.	2 Sept.	23 Sept.	25 cm	64 cm	4	115 m	within	--
2.	1985	19 Sept.	31 Aug.	21 Sept.	--	28 cm	3	--	within	--
3.	1986	28 Aug.	30 Aug.	20 Sept.	26 cm	65 cm	4	114 m	within	--
4.	1986	30 Aug.	--	--	--	--	3	--	outside	Preyed upon
5.	1986	5 Sept.	21 Aug	14 Sept.	19 cm	52 cm	4	100 m	within	--
6.	1986	17 Sept.	6 Aug.	27 Sept.	35 cm	73 cm	4	75 m	within	--
7 *	1986	After harvest	--	hatched	--	--	--	95 m	within	--

Date of laying calculated from incubation period (21 days)

General grass height of the study area

* Only egg shells found

Out of the seven nests studied by us, six were within the territories of male floricans. The distances between the nests and favourite jumping spots of the respective males, ranged from 75 to 115 metres. As the species is possibly promiscuous, it is unlikely that a 'bond' exists between a male and a female. Generally, the nest site was on the slope of a ridge. In the little bustard (Tetrax tetrax), Schulz(1985) has stated that an important factor for the choice of nesting site is the precondition that the female can return to the nest without being detected by the males. As in the lesser florican the males 'harass' the female, possibly the selection of the nesting site within the territories would require similar advantages. The height of the grass therefore would play an important role in the nest site selection because the hen can move undetected to and from the nest.

Without the use of radio telemetry any detailed study on the hen lesser florican and its relationship with the chicks would be virtually impossible to undertake.

I Natural Predators

The larger birds of prey can be a threat to the floricans. Baker (1921) stated, "It (florican) would seem a favourite prey of wild as well as tame falcons and eagles, for Hume also says that one of the very few specimen he obtained from Etawah district was killed by a Bonelli's eagle (Hieraaetus fasciatus fasciatus) after he had flushed it". Jerdon (1864) occassionally killed it with a laggar (Falco biarmicus jugger) but generally with the Shaheen (Falco peregrinus peregrinator). However, Dharmakumarsinhji (1950) found "it practically impossible for the falcons to catch them" without the aid of men to flush the florican.

In our study area the raptors met with are blackwinged kite (Elanus caeruleus), pariah kite (Milvus migrans), shikra ? (Accipiter sp.), buzzard (Buteo sp), Bonnelli's eagle (Hieraaetus fasciatus), harriers (Circus spp), short-toed eagle (Circaetus gallicus), laggar (Falco biarmicus), redheaded merlin (Falco chicquera), Indian kestrel (Falco tinnunculus) and great horned owl (Bubo bubo).

From our observations it appear that the florican is wary of a typical raptor flight as evidenced by a male florican hiding from a redheaded merlin and once from a pariah kite. In both instances the raptors involved would be incapable of taking an adult florican. On a few occasions we have seen harriers being threatened by floricans as well as floricans being flushed by harriers (see Annual Report 1). We have evidence of a male florican being killed by a raptor, in all probability by a great horned owl.

Ground predators like jackal (Canis aureus) and fox (Vulpes bengalensis) would not be much of a danger, unless the florican is caught unaware. The danger from ground predators is mainly to the incubating hen, eggs or chicks. One nest was preyed upon, probably by a crow (Corvus sp.)

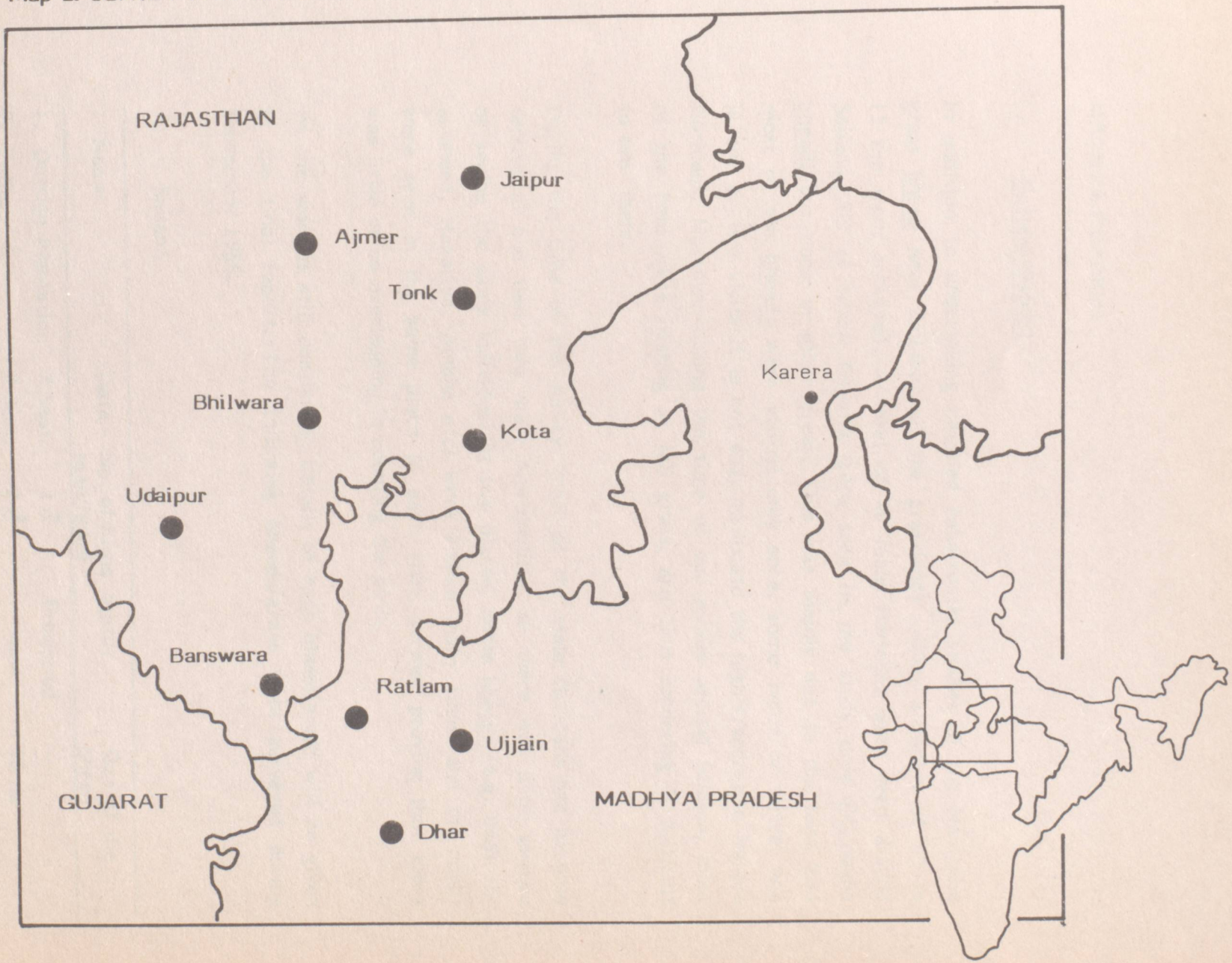
LESSER FLORICAN SURVEY IN MADHYA PRADESH AND RAJASTHAN

Owing to the failure of the monsoon rains in Gujarat and northwest India in 1985, we could not do the survey as planned (see Annual Report I-1984-85). The monsoons failed again in 1986 so very few floricans were seen (Shivrajkumar, pers. comm.; Mundkur, pers. comm.) and again we had to postpone our Gujarat survey. However, in western Madhya Pradesh, rainfall was normal and a large number of floricans arrived in Ratlam and Dhar districts. Monsoons were normal in the initial stage in eastern Rajasthan (i.e. Kota, Bhilwara, Ajmer, Tonk and Udaipur) but by mid-August it became dry. By the time we could survey Rajasthan in September, most of the areas were totally dry and the floricans had moved away. Therefore a correct assessment of the florican population could not be made.

Following data were recorded for each area visited:

1. Name and size
2. Date and time of visit
3. Weather
4. Number of floricans reported
5. Number of floricans seen by us
6. Sex ratio
7. Type of habitat: a) grassland, b) scrub, c) grazing area
8. Status of the habitat: a) protected, b) partially protected, c) unprotected.
9. Main disturbance to the habitat
10. Crop pattern of the area
11. Flora/fauna of the area
12. Distance from nearest bheed (= Grassland)
13. Miscellaneous notes

Map 2. SURVEY FOR THE LESSER FLORICAN IN MADHYA PRADESH AND RAJASTHAN (1986)



MADHYA PRADESH

1. Ratlam district

In addition to undertaking detailed behavioural studies in the Naulakha grass bheed near Sailana, all the grasslands within a radius of 10 to 15 km were surveyed. A total of 46 male floricans were seen around Sailana. Six or seven females were seen in the study area (Naulakha bheed) but none in other areas. This was mainly due to the fact that most of the bheeds were visited only once, some twice or thrice, and in one or two visits it is not easy to locate the highly secretive female floricans. Moreover during the time of our survey around Sailana, most of the hens were nesting in tall grass, and thus rendering it difficult to see them.

During the time of the survey, most of the male floricans had become territorial and thus they were site-specific, so there was little chance of seeing the same individual in two places. Some bheeds (e.g. Badshah-ki-bheed, Hazariya, Ambha etc) were visited many times and the cocks were seen in the same place in each visit, further proving that there was little or no overlapping in counting the birds.

As the work is still continuing, details of each bheed/areas will be given in the final report. The following bheeds/areas were surveyed during September 1986.

A. Sailana

Name	Date	No. of birds seen/heard	Status	Size of the bheed
1. Outside Plantation	7 Sept.	1 ♂	Protected	--
2. Pallia	7 Sept.	2 ♂	-do-	50 ha
3. Dhamnod	8 Sept.	2 ♂	-do-	c. 300 ha
4. Hamirpada & Tejpuria	9 Sept.	1 ♂	-do-	c. 100 ha

5. Arwa	9 Sept.	3 ♂	-do-	--
6. Khokri (Badshah ki-bheed)	10 Sept.	1 ♂	-do-	50-70 ha
7. Vijay Ramjiki bheed	11 Sept.	2 ♂	Protected	--
8. Uplaba	11 Sept.	5 ♂	-do-	--
9. Naulakaha (Study area)	--	11 ♂ 6-7 ♀	-do-	250 ha
10. Nanchu	--	3 ♂	-do-	100 ha
11. Shikarwadi	--	2 ♂	-do-	75 ha
12. Eastern corner of Shikarwadi	--	3 ♂	-do-	50-70 ha
13. Beyond Badshah-ki-bheed and Shikarwadi		2 ♂	-do-	--
14. Ambha plantation		4 ♂	-do-	
15. Hazariya		4 ♂ 1-2 ♀	-do-	100 ha

In addition to this, five to six males were reported to have been seen in Daulatpura and one male in Karya bheed. We could not go to these areas.

B. Jaora

According to Mr P M Lad, Conservator of Forests (Wildlife), two cock floricans were seen about four kilometres from the town, and three in Bharatsinghji-ki-bheed. On 10 September, we visited another good florican area called Ringnod near Jaora and saw four males.

2. Dhar District

Ratlam and Dhar districts constitute the main known florican areas in Madhya Pradesh. The M.P. Forest Department has declared a florican sanctuary in Sardarpur tehsil of Dhar district (see Annual Report I: 1984-85). According to Mr Lad, who did a census of the florican in the second week of September, 45 males were seen by him in the Sardarpur

florican sanctuary and nearby areas. The breakdown of sightings is as follows:

Gumanpura	3
Bhilkhedi	3
Tarkendi	12
Chadawad	26
Panpura	2
Total	45

3. Ujjain district

a) Naulakha bheed (12-13 September)

Seven kilometres from Ujjain town on Maksi road is a large grassland (160 ha), known as Naulakha bheed. This grassland is now divided into four plots due to the construction of Shri Synthetic Factory and a dairy. The grassland is totally protected and is an ideal habitat for the florican. According to forest guards, two floricans were seen in the early monsoons for a few days. We spent two sessions (morning and evening) in this area but could not see/hear any florican. There are two more bheeds- Piplia and Kesuni - in the area where we could not go.

b) Ghatia to Dhannakheri

According to a forest guard in Piplia-Hajri nursery, on Ujjain-Agar road, a few floricans were seen in grass bheeds between Ghatia to Dhannakheri, a distance of about four kilometres.

4. Shahjapur district

a) Badghaon vallage, Agar tehsil

One hen florican was caught and released in mid-September 1986 from

a private bheed near Badghaon village. The villagers came across the bird on the nest while cutting grass. We met one of the villagers who had caught the bird and he told us that the floricans come every year in this area but they had stopped displaying by the time we visited the area on 4 October.

There are some large bheeds in this district which need surveying in the early monsoon. Talab-wali-bheed (96 ha) is about one kilometre from Agar. Two large bheeds (each about 100 ha) were seen seven kilometres from Agar on Sarangpur road. As the season was quite late (4 October) and the time was not suitable (14.30 hours) we did not stop in these bheeds for surveying.

RAJASTHAN

The lesser florican is seen in certain parts of eastern Rajasthan, mainly Kota, Ajmer, Tonk, Bhilwara, Banswara and Pali districts. We surveyed four districts - Kota, Ajmer, Tonk and Bhilwara. Owing to the failure of monsoons, the floricans did not stay in their breeding grounds, and thus we could locate only two males in Shahpura tehsil of Bhilwara district. Nevertheless, we got reports from atleast four more areas where they were seen in the early monsoons in 1986.

1. Kota district

a) Sourson buld or Kundanpur bustard sanctuary (18 September)

A Closed Area under the Wildlife (Protection) Act has been declared near Kundanpur village in Baran tehsil for the protection of the great Indian bustard. A male florican was seen in 1981 in this area (see Annual Report I:1984-85). As we have reported earlier, due to heavy grazing pressure, not much of the grassland is left and the florican can be seen only in the early part of the monsoons. According to some villagers,

one male florican was seen jumping near Niyani village during a rainy spell of eight days. The bird was present in the early monsoons in a private grassland where grazing was banned for two months. By the time we went there, grazing had been started and the area was highly disturbed.

b) Mandane village (19,20 September)

One of the best grasslands seen in Kota district was 28 km from Kota on Dara road near Mandane village. Till the early 1960's this was a government grassland but now it belongs to farmers of Jeetia, Makunpura, Mandane and Kasar villages. This 200 ha grassland is now subdivided into private plots; each plot is enclosed by a stone wall. The grassland is totally protected and on our visit in September, the grass was about a metre high. A few crop fields of jowar, bajra, mung and groundnut were seen around the grassland. It should be noted here that these are the crops in which florican is frequently seen foraging in our study area in Sailana. Though we could not see or hear any florican during two sessions in the Mandane grasslands, the area is perfectly suitable for this species. More visits to this grassland are planned in the next monsoons and some naturalists of Kota were contacted to keep an eye on this grassland.

2. Bhilwara district

a) Shahpura (21 September)

This is one of the most famous florican areas in Rajasthan. According to Raja Dhiraj Sudershan Deo Singhji of the former Shahpura Estate, floricans are still seen in almost all the extent grasslands in this tehsil. Nesting is regularly noticed and last year a nest with four eggs was found in Bada bheed near Shivpura village, about five kilometres from Shahpura. Five males were reported from this bheed in 1986. On the morning of 21 September, we saw one male and heard another.

Like Sailana, there are many private grasslands in Shahpura tehsil. The main crop of the area during monsoon is groundnut, jowar, mung, and udad. This is the most promising area in Rajasthan to be developed as a florican sanctuary, on the pattern of Sailana and Sardarpur florican sanctuaries of Madhya Pradesh.

B. Kalsane: (24 September)

Eight floricans were seen by us in Kalsane area in 1984 (see Annual Report I:1984-85, p 47). We again visited the area on 24 September and about an hour in the late evening was spent there but we did not hear or see any florican. According to the watchman, floricans had stopped jumping about a week back. The floricans at Sailana had also stopped jumping (except sporadically) during the same time.

3 Tonk district

a) Dinghara and Rampura villages (23,24 September)

The local name of the lesser florican in Tonk and certain parts of Ajmer district is 'Beedwan'. The bird is well-known and mainly seen in the crop fields. Even a nest was found here two or three years ago. In 1986, according to local sources, many floricans were seen around Dinghara and Rampura villages in the early monsoon period. However, when it became dry by mid-August, most of the floricans left the area. By the time we visited the area in late September, crops were withering due to lack of rain. Two sessions (morning and evening) were spent in surveying the area but the birds were neither seen nor heard.

4. Ajmer district

a) Sonkhaliya Closed Area (22 September 1986)

A few floricans being sighted every year near Sonkhaliya village which

is declared a closed area for shooting for the protection of the great Indian bustard. In August, the bustard watchmen saw three floricans jumping in the area, and a few more were seen in a plantation area in Nazirabad-Kekri road. A nest was located in 1985. Locally the florican is called as 'Kharmoor' - the same name is used in Sailana area.

We also stopped in many places between Sonkhaliya and Tonk (route: Sonkhaliya-Kekri-Bagera-Basu-Tora-Tonk) to enquire from farmers. A few of them had seen the bird within the last four or five years. Owing to its characteristic call and peculiar jumping habit, the lesser florican is easily identified by villagers in most of the areas where it breeds. Moreover, many people identified the bird by its local name as soon as the photograph was shown to them. Therefore, we think the information given by the locals was reliable.

THE LESSER FLORICAN SURVEY IN ANDHRA PRADESH : 1986

The only recent records of the lesser florican in the non-breeding season are from Ranga Reddy, Medak and Kurnool districts of Andhra Pradesh. A female florican was shot at Inderesham village about 10 km north of Patancheru on the 1st of November 1984. Further to this there were a few unconfirmed sightings of floricans by birdwatchers near Patancheru (Siraj Taher, pers. comm.). The latest was a male in the non-breeding plumage which fell into a house in Asifnagar, within Hyderabad city, at about 8.30 pm. It had a gash across its breast, presumably by flying into an overhead wire. Coincidentally, this bird too was found on 1st November (1986). Both the floricans were found at locations within 50 km of each other.

To locate the wintering areas of the florican, parts of Andhra Pradesh and Karnataka were surveyed in November-December 1986. Areas surveyed earlier (see Annual Report I) were generally not visited during this survey. The following places were visited:

ANDHRA PRADESH

1. Medak district

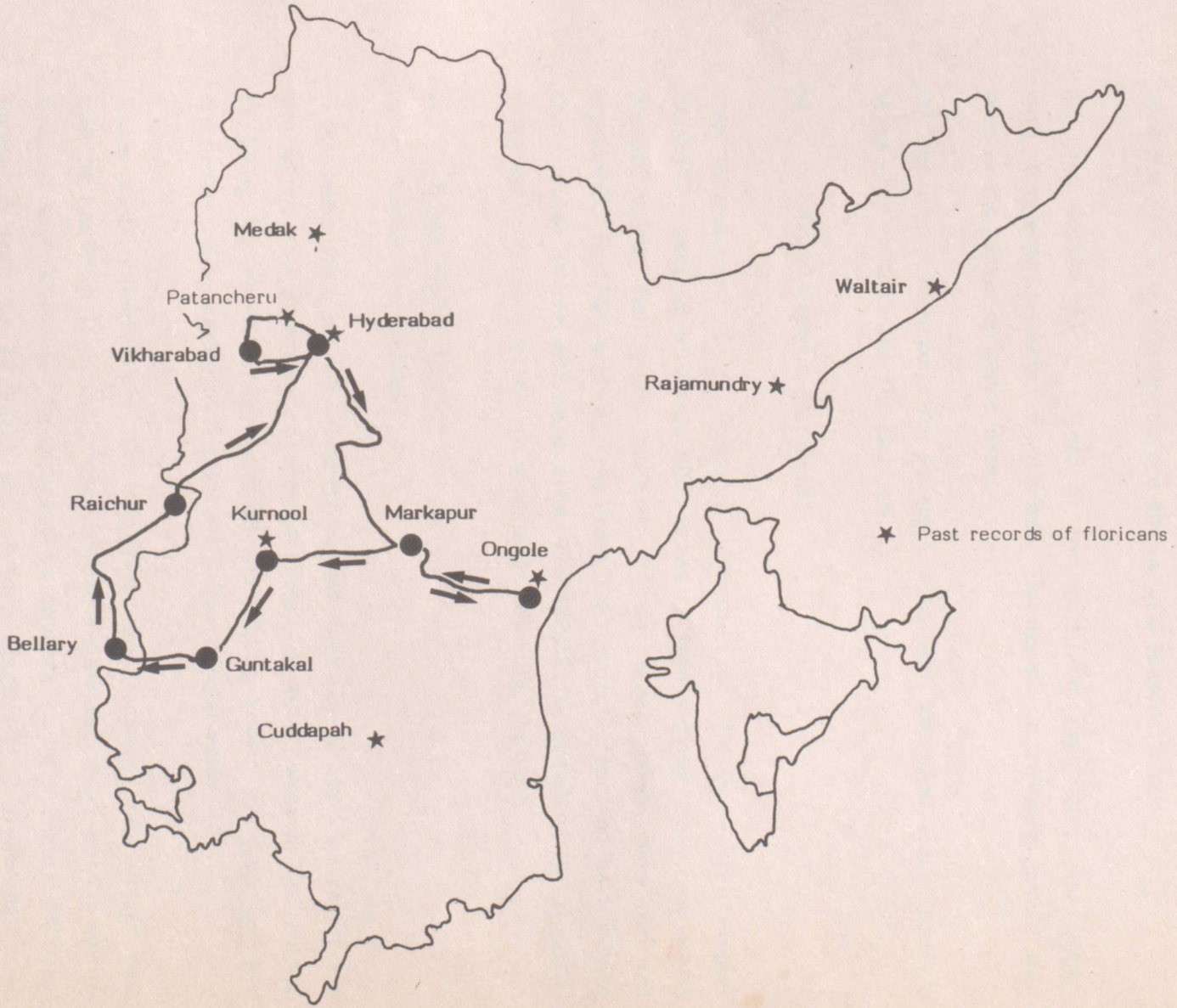
a) Inderesham village near Patancheru

This area was visited in the earlier survey also. A female florican was shot here in 1984. The area can be roughly divided into three types of habitat.

i) Scrub: There are extensive scrubland, varying in density and height, adjoining and west of Aiynur village near Inderesham. As we moved further west, the patches of grazed area became smaller as the scrub became denser.

ii) Prosopis area: Tracts of grazing land dotted with Prosopis scrub are present north-west of Inderesham village. Further east, the topography

Map 3. SURVEY FOR THE LESSER FLORICAN IN ANDHRA PRADESH (DECEMBER 1986)



becomes gently undulating before ending in a seasonal river.

iii) Crop fields: At the time of the visit, the main crop was jowar, with scattered pockets of oilseeds. Harvested or ripening paddy was seen in the better irrigated areas.

Of the three habitats, the Prosopis area and the crop fields appears to be most suitable for the florican.

b) ICRISAT campus, Patancheru

The International Crop Research Institute for the Semi-Arid Tropics (ICRISAT) consists of about 3000 acres of land varying from crop fields (Bengal gram, red gram, millets), marshy areas, lakes, woodlots and grasslands. In 1985 birdwatchers from the Institute reported having seen the florican in the grassland area. The habitat is excellent for florican, especially the fairly extensive grasslands adjoining the lake.

2. Ranga Reddy district

a) Vikharabad-Marpalli

From Sadasivpet on the Pune-Hyderabad highway up to Vikharabad and beyond we saw numerous patches of grasslands which were in the process of being harvested. These patches are locally known as 'Kanchas' and are protected by agriculturists for their commercial value.

While most villagers did not recognise the florican, one villager said that he had seen it in the jungles beyond Yerawalli village but his identification was doubtful. The entire area appears to be a highly degraded forest. Fifteen to 20 years ago shikaris (hunters) of Hyderabad used to shoot deer in these areas.

There were some good grasslands on the Vikharabad-Thandur road near Deogadda just before the Anantgiri hills. On the Vikharabad-Pargi road

near Pudur village is a vast grassland with scrub jungle known as Dammagunum. None of the tribal trappers interviewed knew the florican.

b) Chevella

The habitat becomes typical of the great Indian bustard as one approaches Chevella from Vikharabad. Around Gundala village the landscape is of vast undulations with crop fields (Bengal gram and oilseeds) interspersed with tracks of grazed grasslands. The great Indian bustard is present here albeit in small numbers. The bustard is well-known and we were told to come in the monsoon when the bustards are easily seen. In 1985 a bustard was reported to have been shot here and in the monsoons of 1985, an aged shepherd saw ten birds. A farmer said he saw two bustards about three months back. The florican was not recognised by the locals but there are some good grassland patches between Chevella and Chilkur on the Hyderabad road that seem promising for the florican. We could not see any florican during our short visit.

c) Pahadi Sharif, Mamadipally

Grasslands exist within the sheep breeding farm but due to good protection the scrubland is gradually reverting back to forest. The total area of the farm is 2000 acres, most of which is unsuitable for florican. We did not see any bird there.

On the Mamadipally-Shamshabad road there are a few excellent grasslands, especially around Anantharedddy-Gudum. Most of the area is under crop (jowar, oilseeds and grapes) or scrub jungle. Florican is likely to be present here.

3. Kurnool district

a) Rollapadu

The Rollapadu bustard sanctuary comprises of about 800 acres of grassland as a core area and has a population of 50 to 70 bustards which are generally

seen during the monsoons. The BNHS has a field station here to study the ecology of the great Indian bustard. The lesser florican is also occasionally sighted in Rollapadu. One bird in the eclipse (female) plumage was flushed in October 1986. On our visit we were shown moulted feathers of the florican collected at the end of November, which were later identified as that of a male florican.

According to an expert bird trapper (now reformed and appointed as a bustard guard), five years ago, a male florican was seen displaying in a groundnut field but now the displaying birds are not seen in the area.

4. Prakasam district

Based on old records (e.g. Tostem, 1887) we visited parts of this district. Due to relatively low numbers of livestock, we found that almost all uncultivated areas had standing grass of 10-20 cm in height, interspersed with some scrub. Harvesting is not practised here and the livestock of surrounding villages graze on these 'semi-protected' grasslands. This region was once well known for its tobacco and cotton but due to recurrent pest attacks vast tracks of the country have been converted into commercial forestry of Casuarina and Eucalyptus.

There are good grasslands around Markapur especially between Kadiripadu and Mekallaripalli villages. Apparently due to scanty rainfall in 1986, the grass growth was not as luxuriant as usual. On the Podilu - Ongole road near Velluru village a few grasslands of over 75 hectares are present. However, even though the habitat comprising of grasslands and crop fields seemed good for florican, none of the villagers or the shikaris knew the bird.

5. Guntakal district

The 'neel-shikaris' of Guntakal who know and trap bustards knew the

florican by its shikari name 'Dhabor'. However, their description of the florican and its behaviour was not very accurate. Obviously they were not very familiar with the florican.

We visited Malligelli village around which there are extensive crop fields prodominantly of sorghum. A few blackbucks are present and the presence of bustard was confirmed by the shikaris of Guntakal. However, if a population exists it is highly threatened as the shikaris regularly trap birds in this area.

6. Mehboobnagar district

We passed through this district and saw undulating landscape with low hills. The area is very open and Sorghum is the predominant crop. There are reports of the great Indian bustard from Kodangal, Narayanpet, Achampet, Gadhwal, Wanparti and Jatproll talukas. The habitat appeared suitable for the floricans as well.

KARNATAKA

1. Bellary district

We visited two camps of 'neel-shikaris', one at Bellary and the other at Kampli. They identified the florican as 'Dhabor' and described it as a smaller version of the great Indian bustard. Winter onwards was the season of the lesser florican. Curiously they could not recognise the male florican in the breeding plumage but accurately described its display. They insisted that the male in the eclipse plumage did the display. Now rare in the area, the florican is occasionally flushed from cotton or sorghum fields. We could not see any florican in the area.

Conclusions

The lesser florican has been recorded from Medak, Hyderabad, Waltair Rajamundry, Kurnool, Ongole and Cuddapah areas of Andhra Pradesh

(for review see Annual Report 1, pp 5-16). Unfortunately the literature does not say as to what kind of habitat they utilize in the non-breeding season.

From our studies at Sailana, Madhya Pradesh, we find that the florican are as much at home in crops like millet as in the grassland. Considering that whereever we went in Andhra Pradesh sorghum was the predominant crop, the wintering habitat of the lesser florican could well cover most of State.

Apart from Jampa the Chowkidar at Rollapadu, none of the Skiharis or villagers we interviewed in Andhra Pradesh knew of the florican. Most of the 'neel shikaris' of Raichur and Bellary areas of Karnataka recognised the florican in its non-breeding plumage. They also said that the best season for seeing the florican was in the winter. These observations may indicate a southward migration for wintering in the lesser florican.

The biggest lacuna in our studies is the lack of knowledge of the post breeding movements and habits of the florican. In the coming years, areas which seemed promising for the lesser florican (during the survey) will be thoroughly investigated.

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