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

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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

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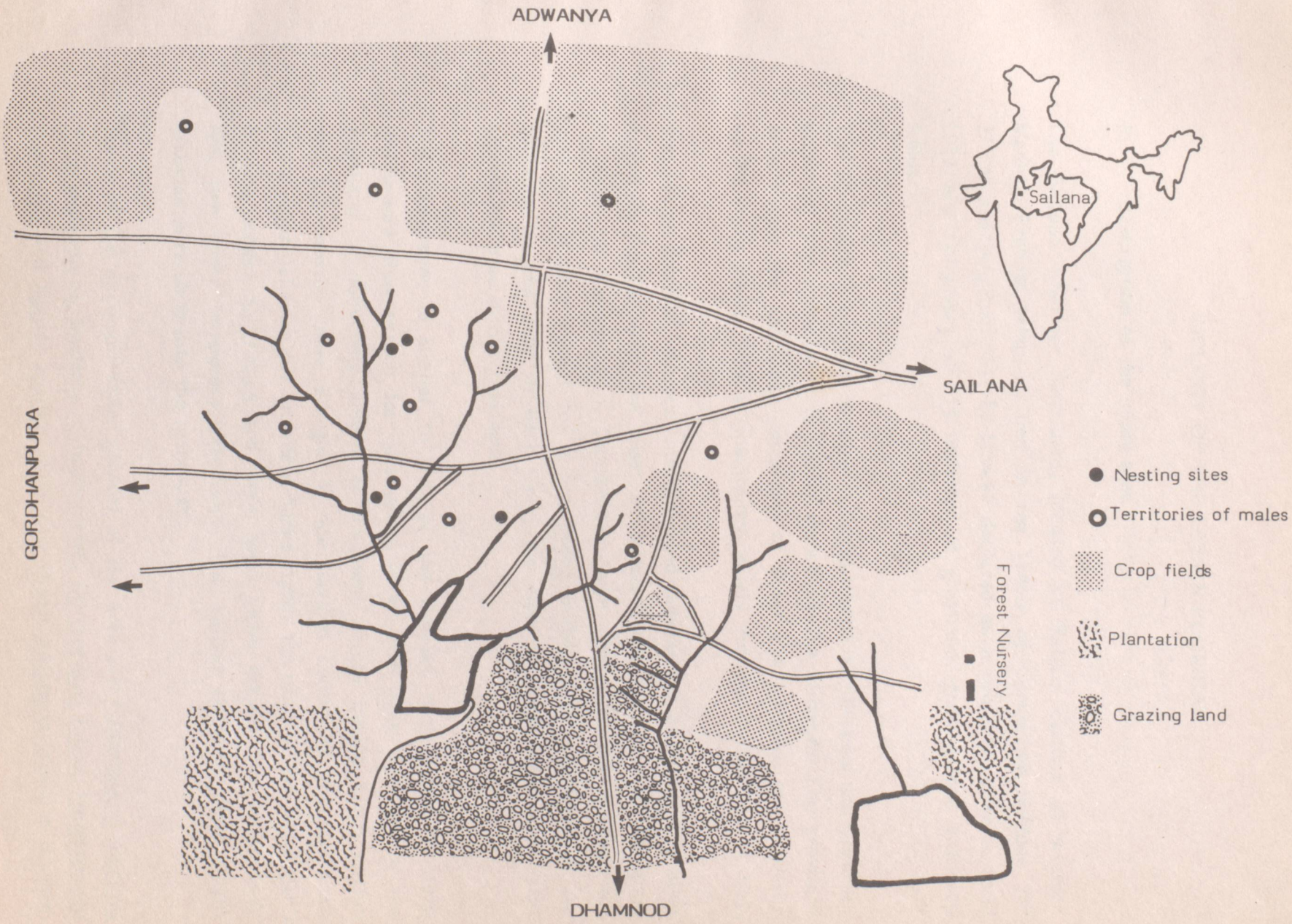
During our studies and surveys, we received valuable assistance and cooperation from many persons. We wish to record our sincere thanks to Mr P.M. Lad, Conservator of Forests (Wildlife), to Mr S.P. Mishra, Chief Wildlife Warden of Madhya Pradesh, to Mr D.R. Verma, Divisional Forest Officer, Ratlam, to 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.

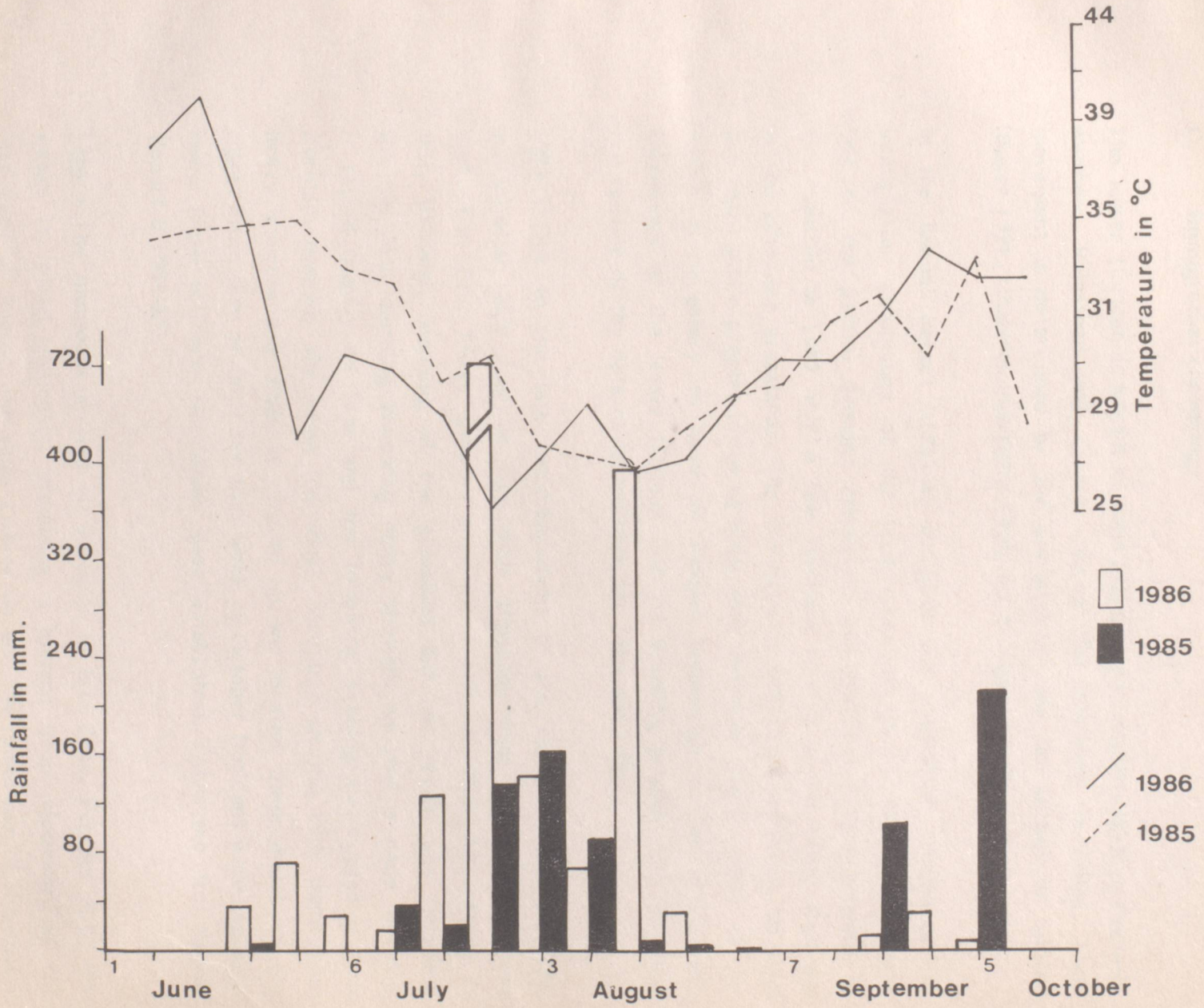


Fig.1 Meteorological data of Sailana : 1985 & 1986

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.

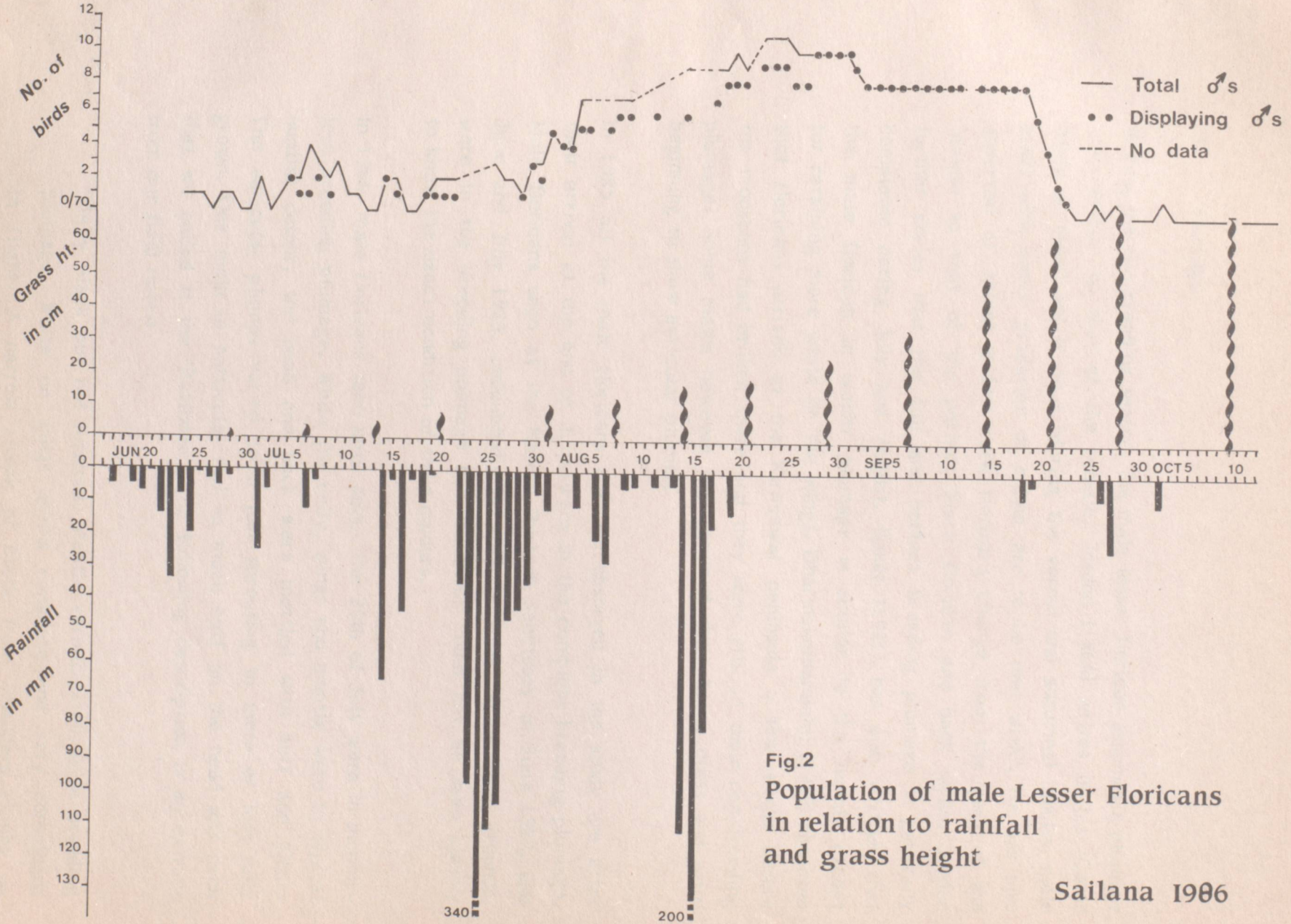


Fig.2

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.

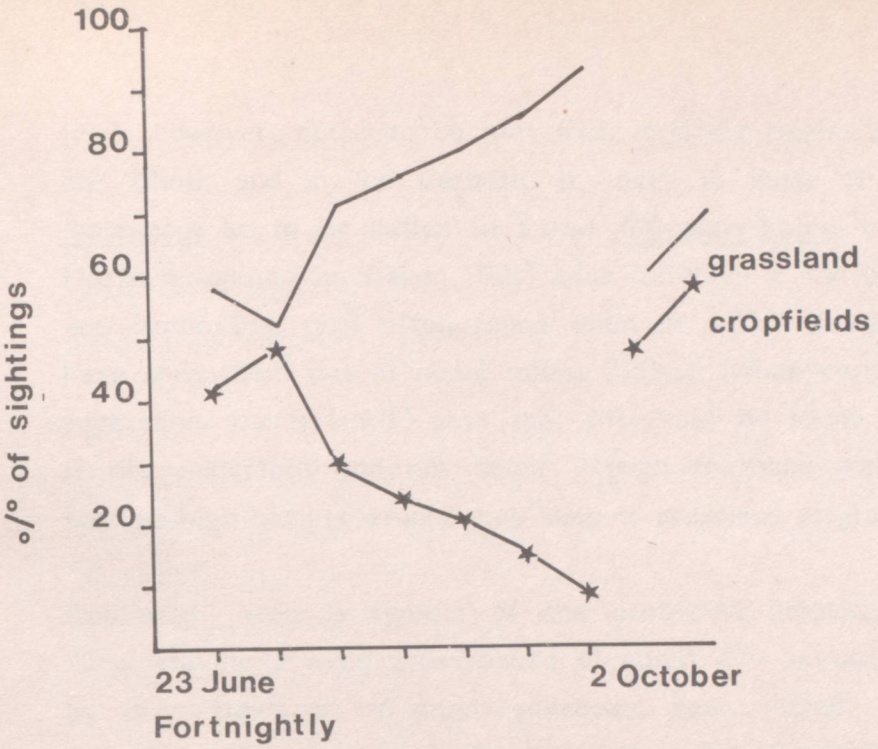


Fig.3 Sightings of floricans in cropfields & grasslands 1986

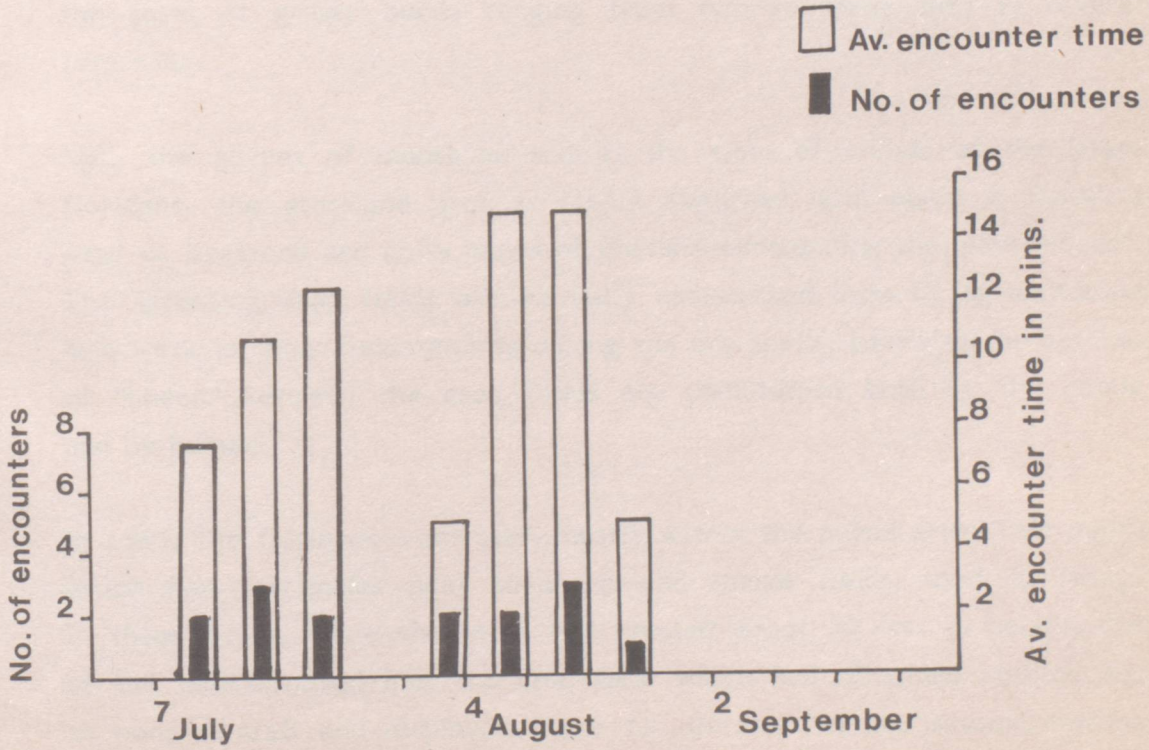


Fig.4 Agonistic Interaction: 1986

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.

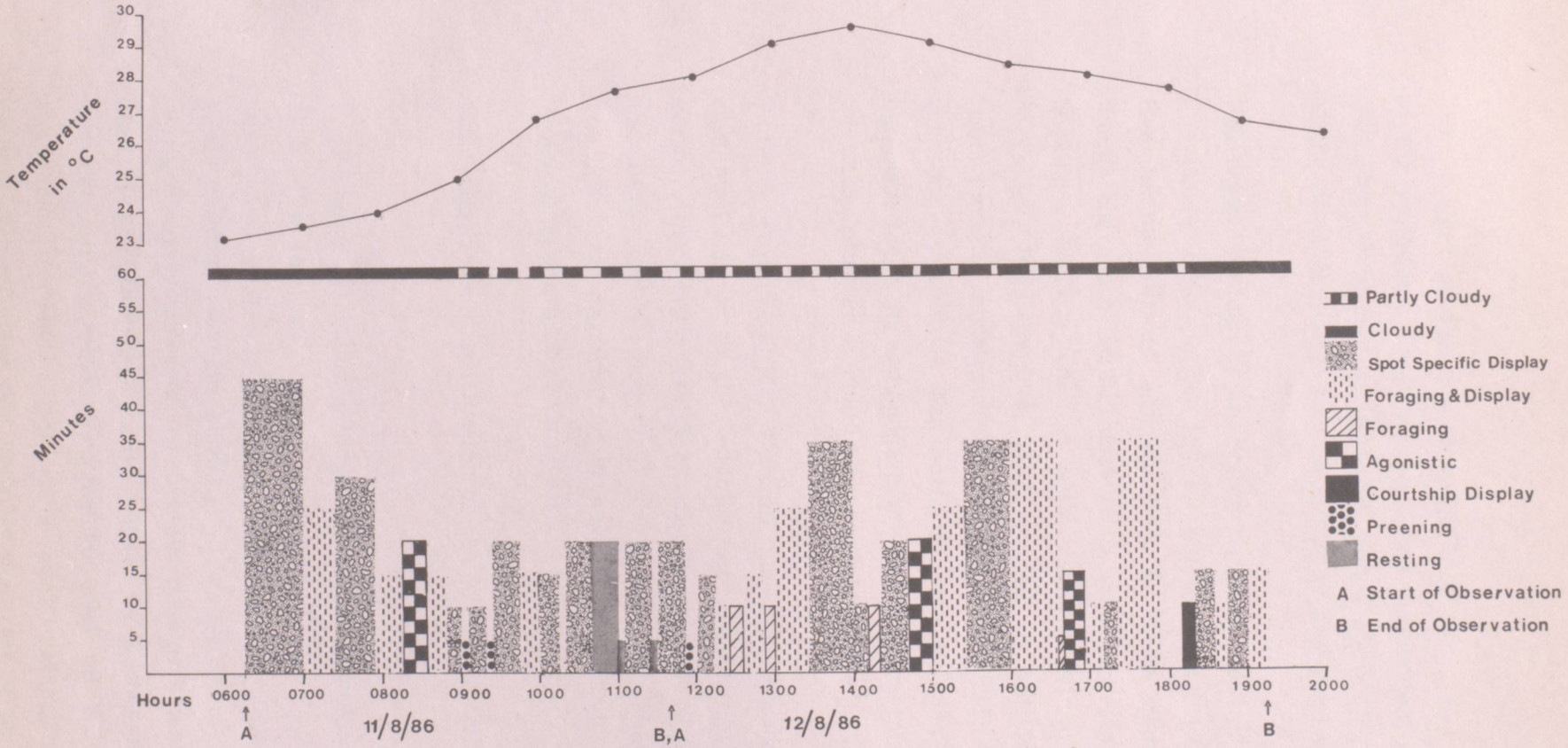


Fig.5 A Daylight Activity Pattern in the Lesser Florican

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

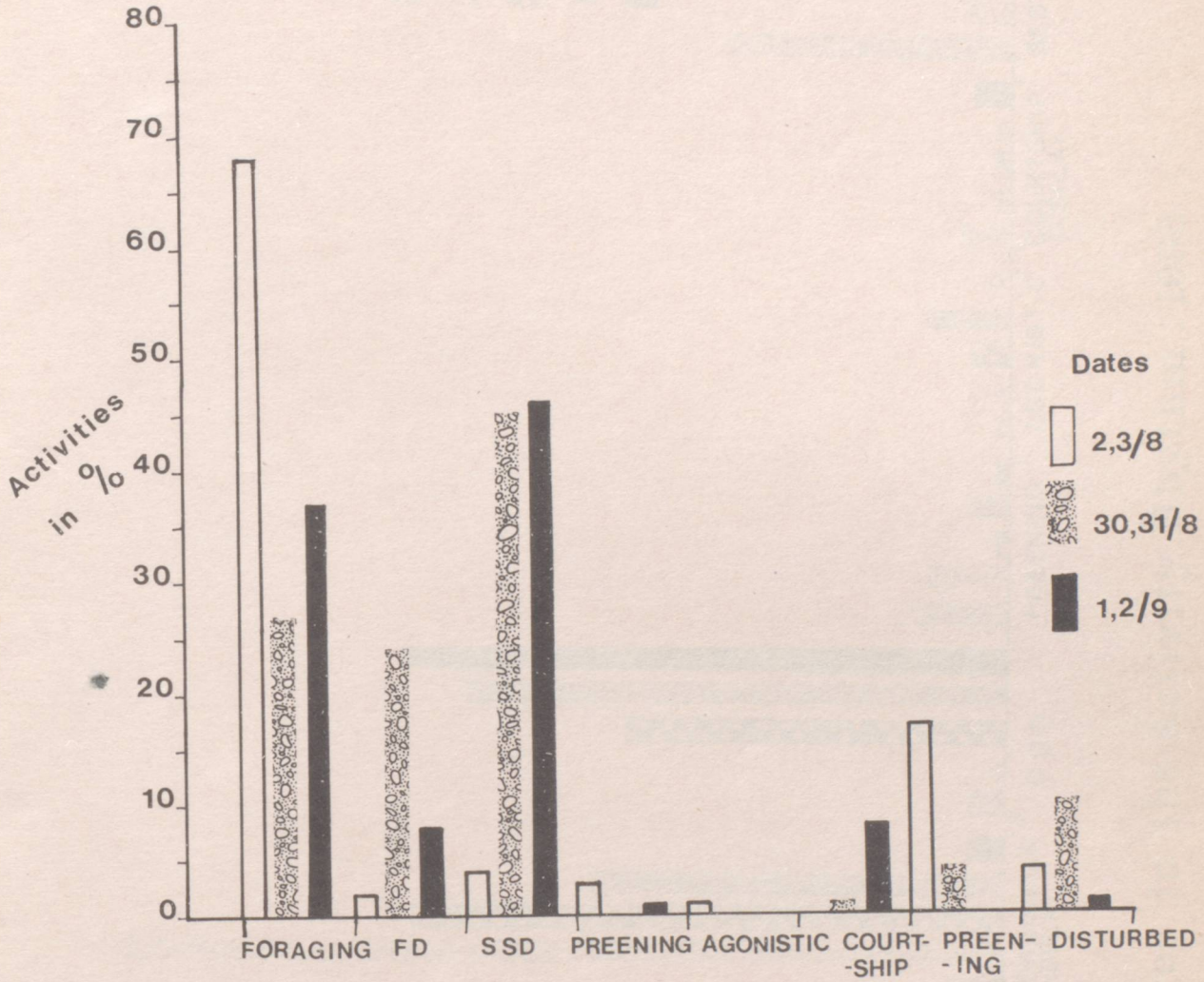


Fig.6 **Changes in the Activity Rhythm : 1985**

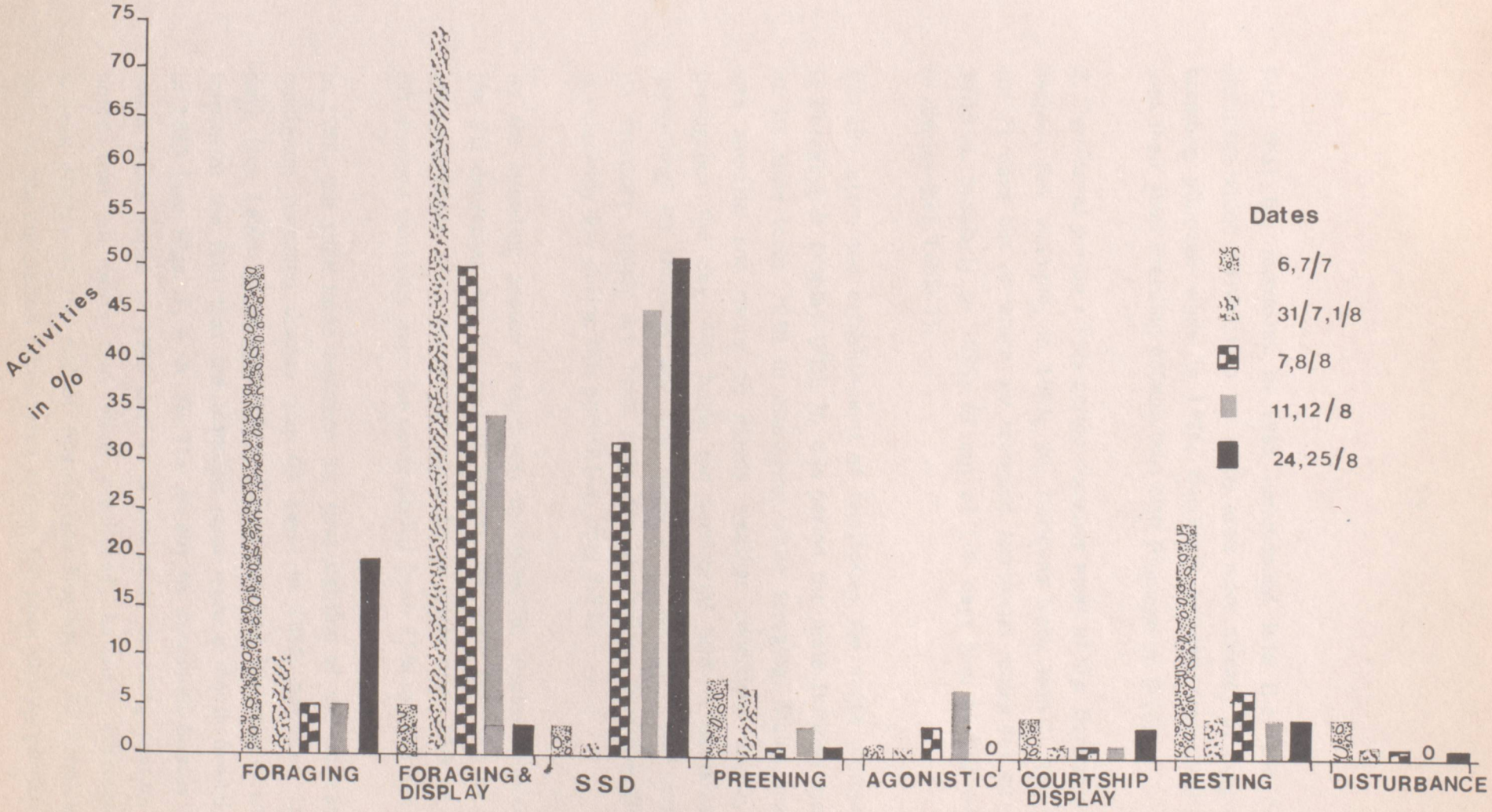


Fig.7 **Changes in the Activity Rhythm : 1986**

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.)

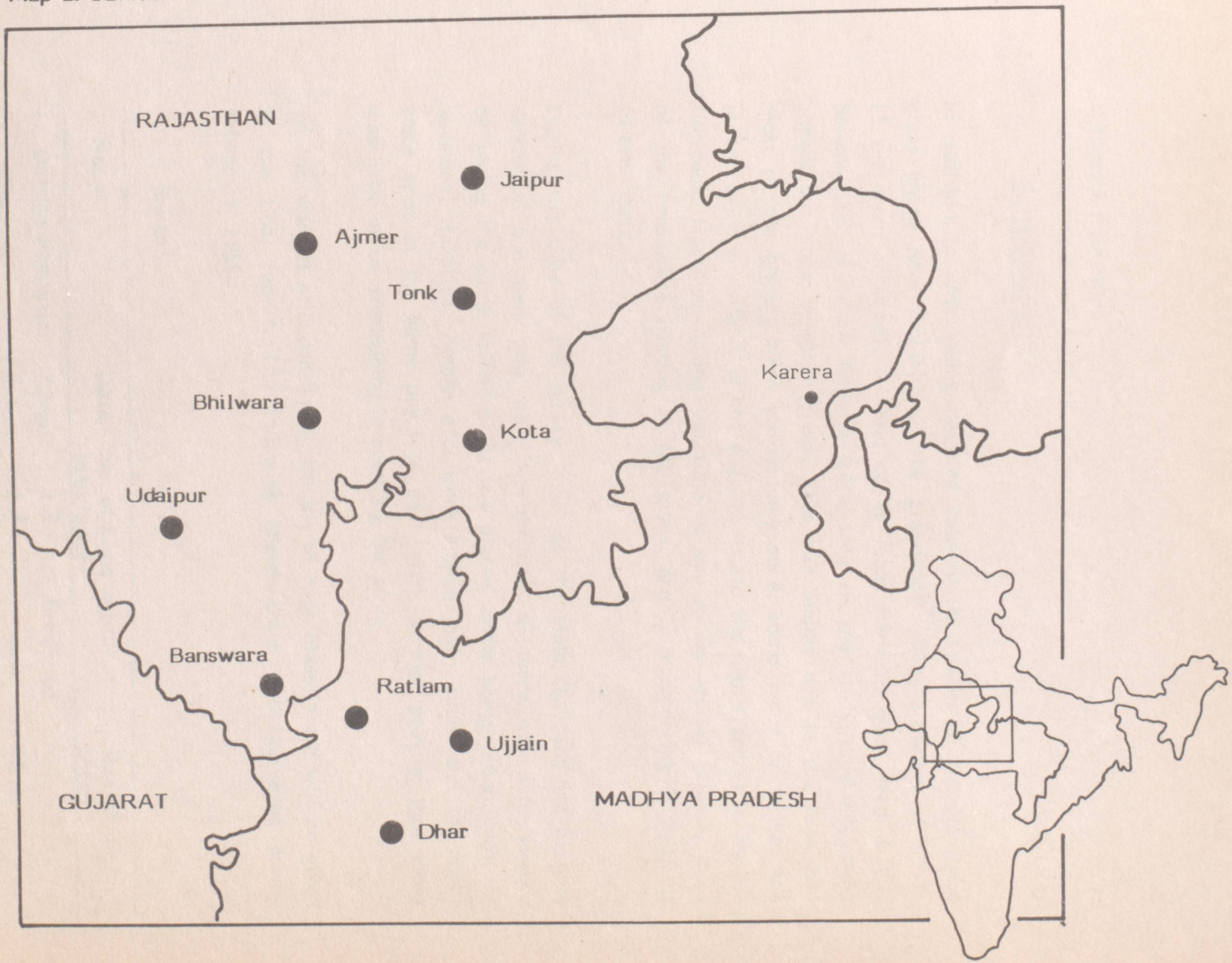
LESSER FLORICAN SURVEY IN MADHYA PRADESH AND RAJASTHAN

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

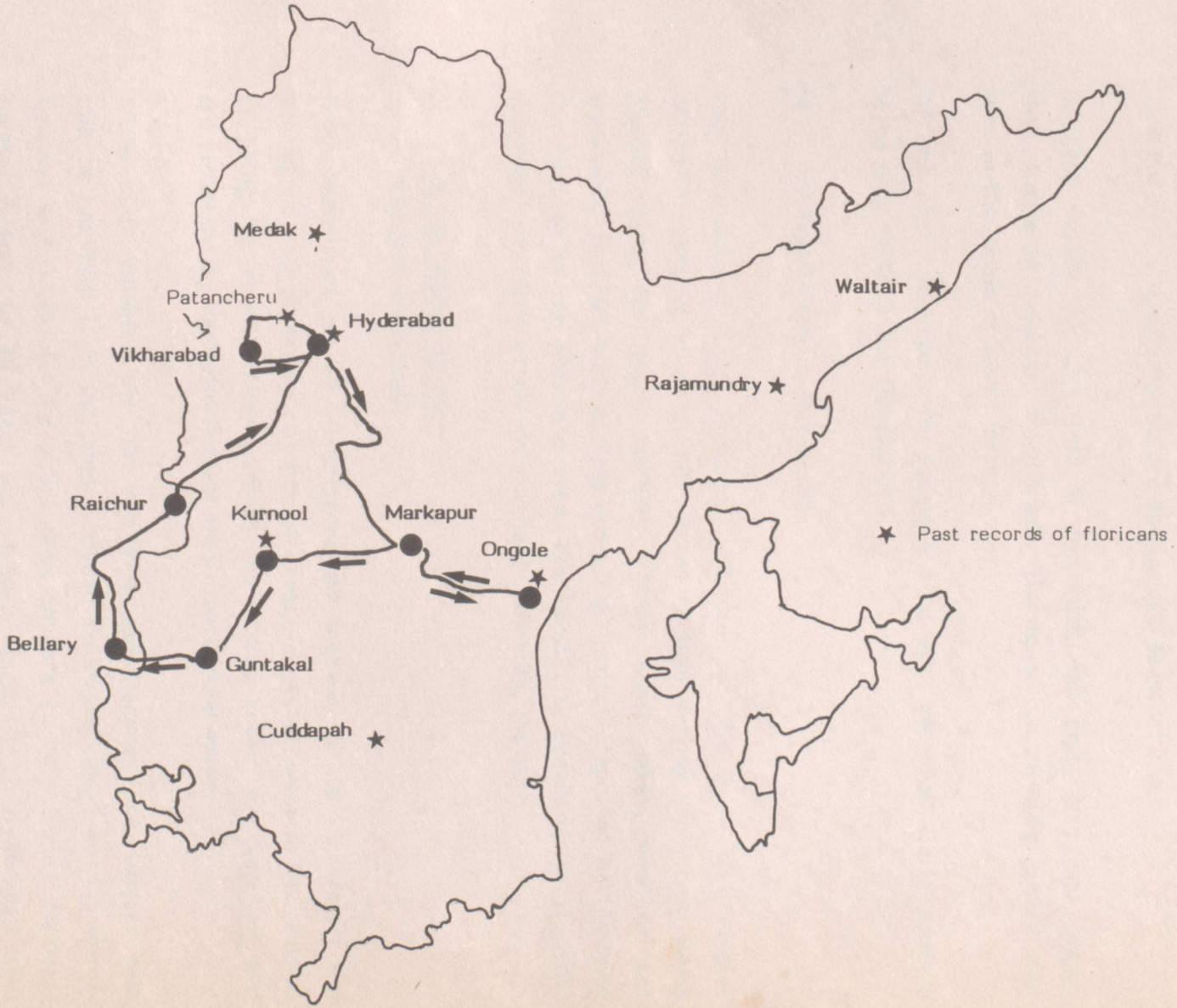
a) Inderesham village near Patancheru

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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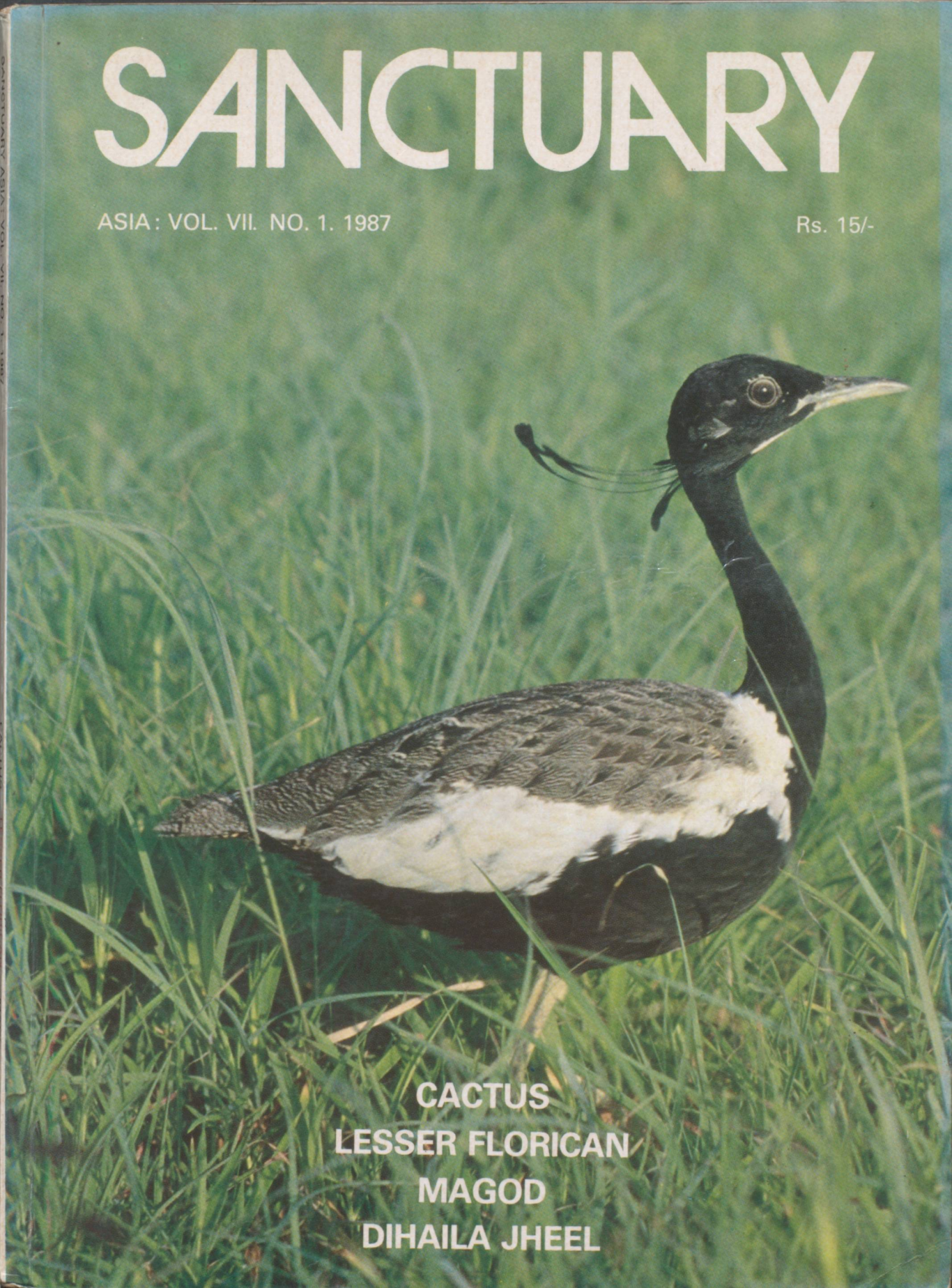

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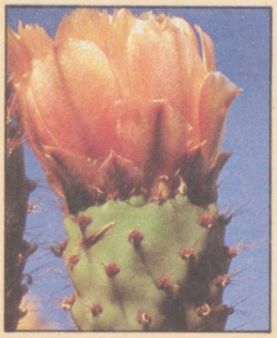


14.

Cacti have been, both anatomically and structurally, modified to survive in harsh, arid climatic conditions. In a well-illustrated, comprehensive account, T.A. Davis describes these amazing succulent plants and their colourful flowers.

26.

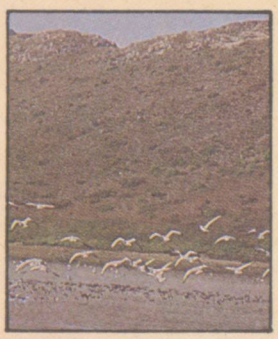
India's open grasslands are shrinking steadily, putting the future of several fascinating birds in jeopardy. One such bird is the lesser florican. The author, Ravi Sankaran describes his studies on this bird. A male lesser florican adorns this issue's cover.

38.

"Bashful and awesome," is how Renée Borges describes the forests of Magod in her account. Forests that have only recently been saved from an ill-conceived hydro-electric power dam project.

50.

Since migratory birds have become almost synonymous with Bharatpur, a number of other equally spectacular tiny jheels have been ignored. One such jheel is the Dihaila jheel described in vivid detail by author, Asad Rafi Rahmani.



Commentary

The terrible toothache

An enormous body, two overgrown teeth, and an upper lip which joins the nose to form a trunk– these are the evolutionary tools which the world's largest land animals have used to survive for millions of years.

Today, the elephants are dying. By fragmenting their habitats and killing off the best of their breeding stock for ivory, we have effectively destroyed the species' chances for future survival.

"No big deal," would be the response of the 'realists'. "What are a few elephants in the larger scheme of things?"

How true. But if you consider the fact that, in addition to elephants, we will probably be destroying a new life form every ten minutes, the 'larger scheme of things' defence comes scrappily apart at the seams.

It's not just elephants that are dying– so is our land. If only our leaders would come out of their dream state, to acknowledge that habitat destruction is the root cause of our peoples' misfortunes, we would still have a chance to improve our lot. If not, what amounts to a terrible toothache for the elephants could soon prove to be a terminal headache for India.

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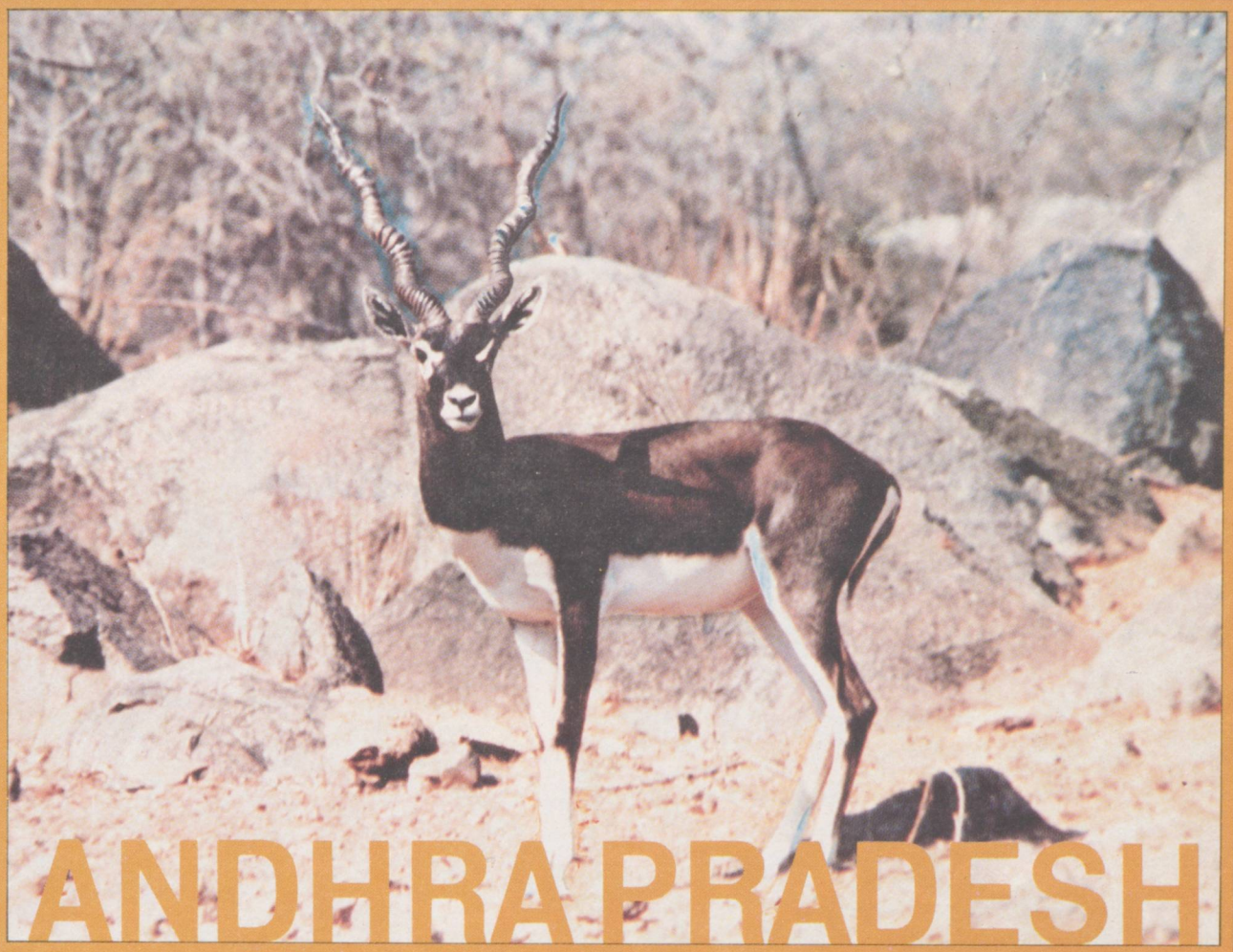

ANDHRA PRADESH

Where the visitor is 'caged' and the animals are free!

Nature has lavished her wealth of fauna in the lush, verdant forests of Andhra Pradesh. Wildlife is found in abundance in the various sanctuaries of the state. The Srisailam Reserve, the largest of its kind in India, is the home of the majestic tiger. Panthers, Sambar, spotted deer, the graceful black buck... and several exotic species of birds, thrive in this natural habitat.

Picturesque lakes dot the landscape of Andhra Pradesh. Pakhal, Ramappa, Laknavaram, near Warangal. Pulicat near Madras, and Kolleru in West Godavari. Each year, migratory birds flock at these lakes to present a colourful display of plumage. Pelicans, ducks, cranes... winged envoys of nature, frolic joyfully on these waters. Wild boar, bison, nilgai, pythons and other species of wildlife are found at the Pakhal and Eturnagaram game sanctuaries in Warangal.

The Nehru Zoological Park at Hyderabad, one of the best in Asia, is the habitat of nearly 2500 animals and birds. The lion safari park is sprawled over an area of thirty acres. A bus ride takes you around the park where the magnificent beasts roam unfettered. Of course you are protected

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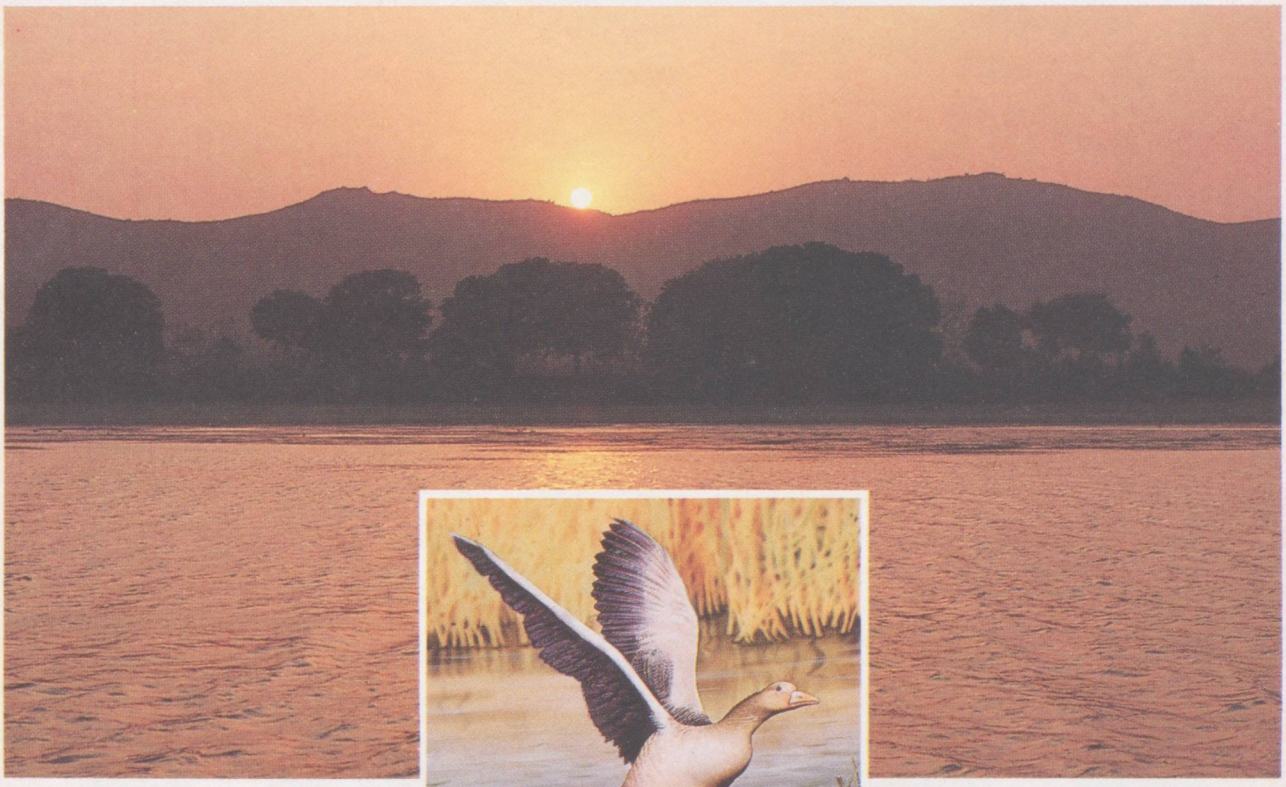

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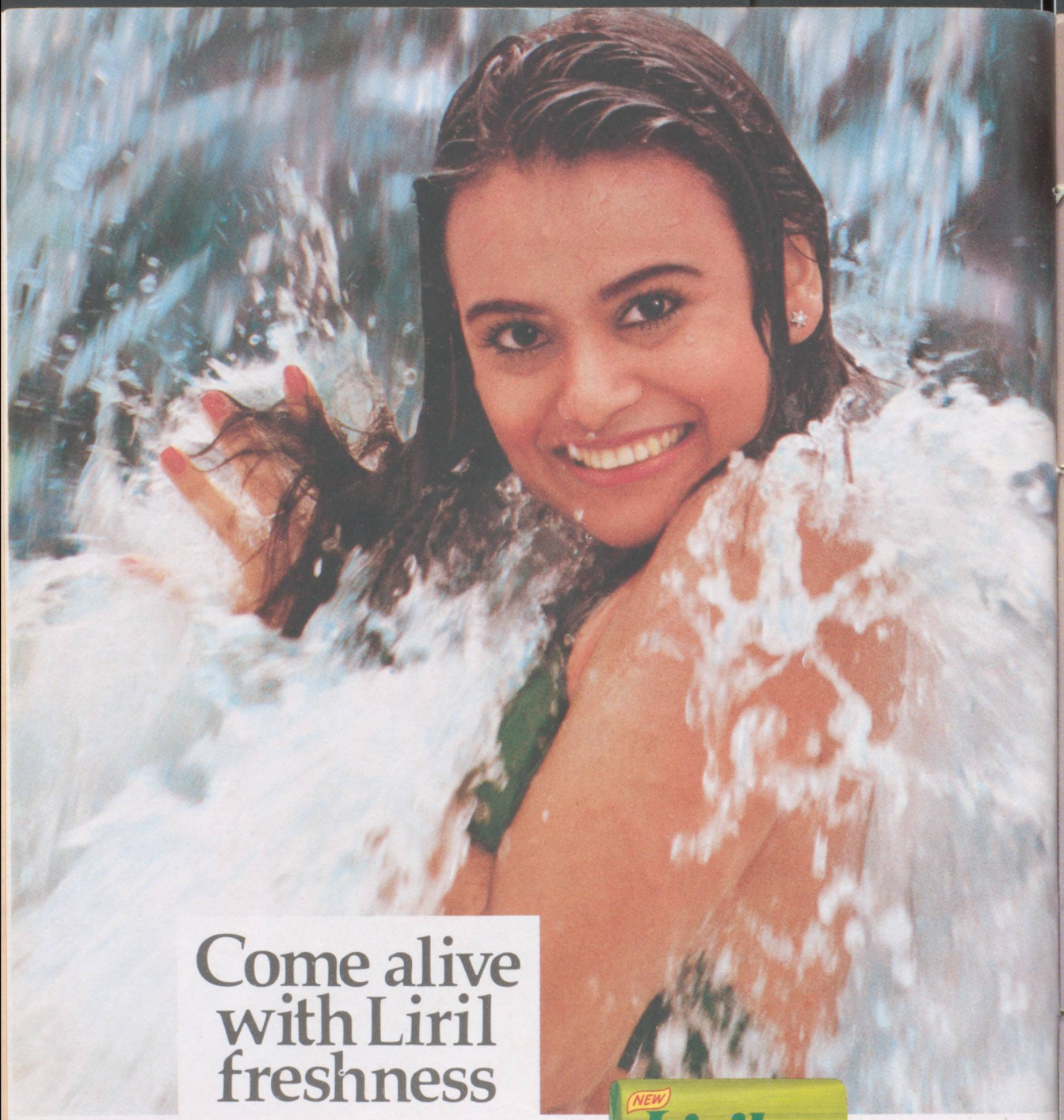

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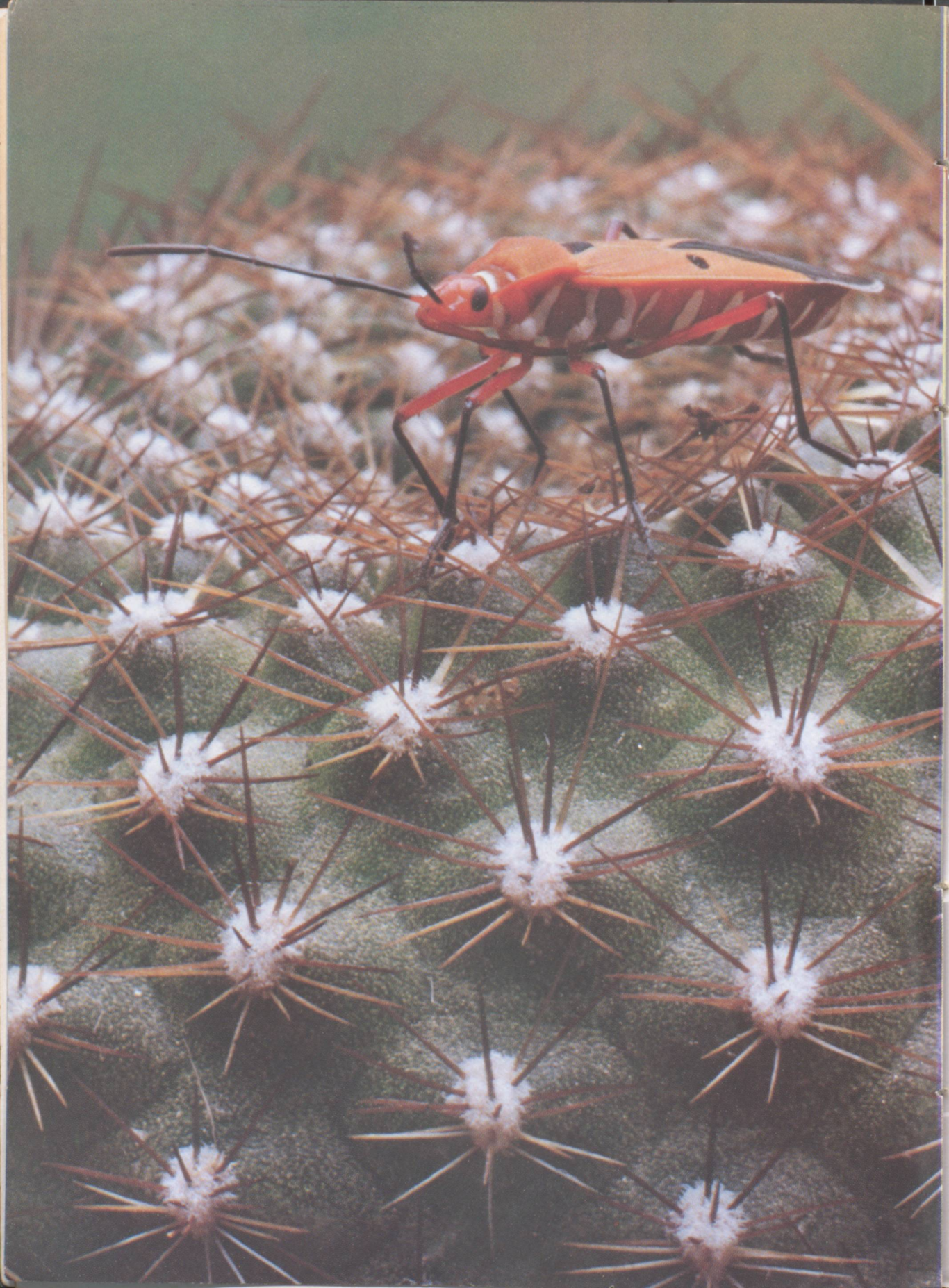
Cactus

Text by T. A. Davis and photographs by K.K. Agrawal



The carpet of sharp, prickly spines **(facing page)** on the specialised cactus stem surface, has more important functions than serving as a defence against grazing animals. They help in collecting water and keeping the plant cool. Cactus spines occur in clusters, forming a thick, interlaced protective web around the plant-stem **(above)**, thereby reducing the surface area exposed. These spines are borne on round-to-oval areoles–a striking feature of cactus plants.

In the enormous plant kingdom, is found a group of plants that has both, structurally and anatomically, been modified to withstand the rigours of climate. Known as succulents, these fleshy-looking plants have evolved the ability to store water in their roots, stems and leaves. Though succulents have always enjoyed a certain measure of popularity, it is the cactus, which is a succulent plant, that is most admired. This has led to the emergence of cactus clubs and societies, the world over. On the other hand, cacti are also violently disliked by some, most of this dislike arising from misunderstandings, as plants belonging to the family Euphorbiaceae that produce a poisonous milky latex are often confused with cacti as they resemble each other. Even true cacti, therefore, come under suspicion.

The cactus plant is a gift from South America. It is reported to have been first brought over to Europe by Christopher Columbus. Records reveal that the cactus came to Europe as far back as 1635. However, when these spiny plants first came to India is not known. Indians, especially the Tamils do not have many good things to say about cacti. They equate a cactus to a thieving woman, referring to both as 'kalli'. In India, however, only a species each of *Cereus* and *Opuntia* of true cactus are seen in the wild. All the other 'kallis' belong to the family Euphorbiaceae of which the rubber tree is also a member. The family Cactacae, comprising about 2,000 species, is one of the largest plant families, divided into Pereskieae, Opuntieae and Cacteae tribes. While all cacti are succulents there are numerous other non-cacti succulents belonging to families Euphorbiaceae, Crassulaceae, Agavaceae, Apocynaceae, Asclepiadaceae, Liliaceae and others. Cacti may also be divided into the four following categories according to their appearance.

1. Plants that still produce leaves in addition to displaying the characteristics of cacti.
2. Plants that produce leaves, but in most cases lose them very quickly.
3. Plants that bear rudimentary leaves similar to scales, or have no leaves at all.
4. Plants with stems resembling leaves, botanically known as cladodes.

Cactus flowers **(facing page)** add colour to the predominantly drab desert landscape.

All cacti are xerophytes and adapted to dry conditions. Another striking feature is that they produce numerous areoles—round-to-oval structures ranging from 2-10 mm. in diameter. From these locations, spines as well as future flower buds (also vegetative shoots) develop. The stems of cacti with persistent leaves are woody, since the leaves are the organs through which they transpire and carry out photosynthesis. On the contrary, in cacti that do not produce any leaf, transpiration and photosynthesis are performed by the stem. Cacti have several adaptations to reduce transpiration and to economise their water reserves.

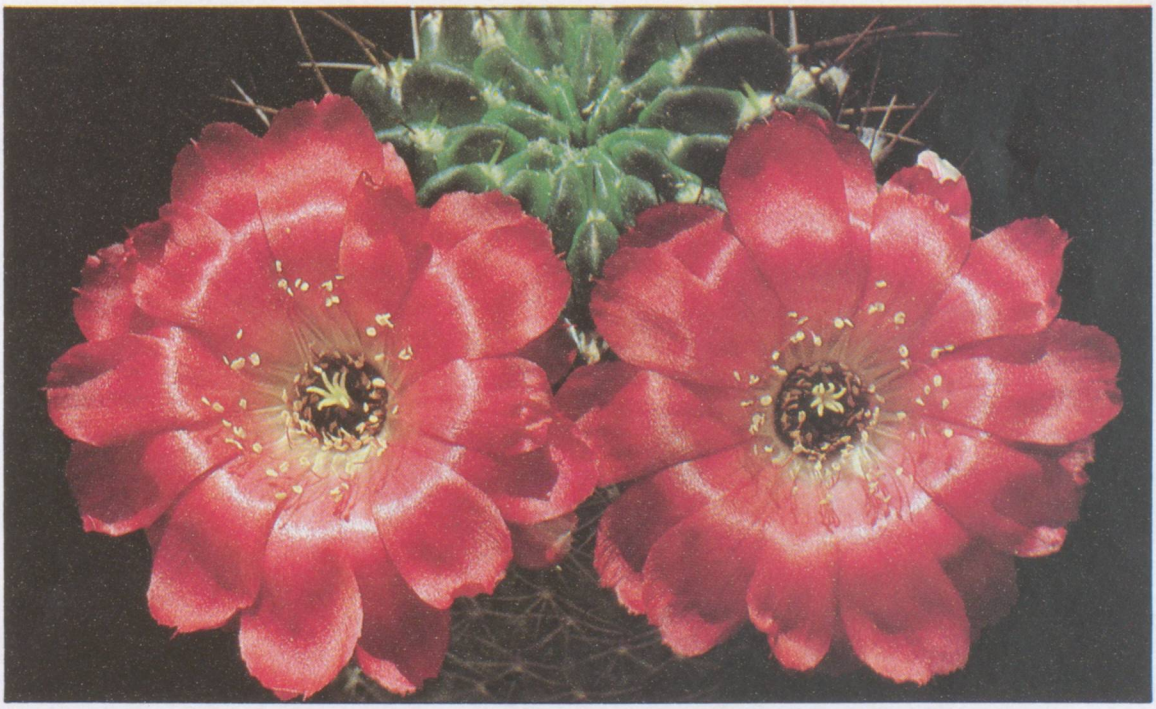
Some cacti appear more attractive when they fasciate into monstrous forms as a result of attacks by insects or bacteria or due to physical causes. Such a character, being non-genetic, cannot be reproduced through hybridisation.

Cactus flower

The flowers of cacti, in their multiplicity of shapes and sizes, add colour to the plants. Most white-flowered species are night-blooming while the others open during the day. The flowers are distinct because of the profusion of perianth lobes in which a gradual change in colour and size from the outermost to the innermost lobe is apparent. Hence, there is no clear-cut demarcation between calyx and corolla. Though the flowers are solitary, several flowers on the same crown bloom simultaneously, making the head more conspicuous. The petals, so also the sepals, in many species are oval, lanceolate, obtuse, acuminate and even dentate. The petals and petaloid sepals may be white, yellow, red, violet or light blue. The outer petals may display shades of green or brown. The flowers are generally regular even though some of the hanging ones, as in *Phyllocatus hookeri,* are slightly asymmetric. Since the perianth and stamens are inserted on top of the almost spherical ovary, the flower is considered inferior. The ovary also bears areoles, thorns, spines or hairs which protect the young fruit

T. A. Davis

The cactus stem **(top)** is a highly specialised structure. Covered thickly with spines, it is the stem that usually performs the vital functions of transpiration and photosynthesis normally carried out by leaves. Grains of chlorophyll pigment are located in the epidermis. Though cactus flowers are solitary, the simultaneous blooming of several flowers on the same crown **(above)** makes the plant head more conspicuous. To survive in dry and difficult terrain, the cactus must be able to absorb as much water as it can.



To survive in dry and difficult terrain, the cactus must be able to absorb as much water as it can. The combination of a sturdy and well-developed tap-root system and a fleshy stem **(top)** makes it possible for a plant to collect and store water. A plant filled with water is plump and can survive as long as two years of drought. Some even release a little water from their reserves, in a form of 'sweating'. Cactus flowers **(above)** are generally regular and are distinct, because of the profusion of perianth lobes that display a gradual change in colour and size from the outermost to the innermost lobe. They are considered inferior flowers because the perianth and stamens are inserted on top of the almost spherical ovary. The numerous stamens have long filaments (different colours for different species), making cactus flowers all the more attractive.

from parasites. The numerous stamens have long filaments (different colours for different species) which make the flowers more attractive. The united style which ends in five free stigmata, is longer than the stamens. Some species of *Opuntia* have sensitive stamens which close over the style and stigma when touched. The inferior ovary develops into a berry containing numerous small seeds. The ripe fruits themselves are bright red or yellow and they adorn the cacti for weeks. However, not all species and varieties will flower in a given location if optimum conditions are not available.

Natural habitat

Practically all the members of Cactaceae belong to South and North America, where differing climatic conditions, ranging from tropical to polar, prevail. These extreme climates favour the growth of various kinds of cacti which get weathered and modified in their morphology to cope with such conditions. One conspicuous adaptation noticed in cacti is their capacity to cope with long periods of drought. Some can survive in extremely warm and dry climatic conditions, such as those prevalent in Arizona. Cacti species that grow in warm but damp and wooded areas, like *Epiphyllum,* cannot cope with the conditions in Arizona for even a week, and when I was in the adjoining state of New Mexico, photographing some blooming *Opuntia,* I could not bear the dry heat there for three hours! *Cereus* and related members have adapted to low rainfall, tropical areas where they thrive unharmed by even the two-or-three-month-long rainy season. Here they flower a number of times a year. Plants in a locality bloom synchronously. Cacti may also be categorised according to their habitat, into:

Plants from desert or semi-desert areas; plants from mountainous habitat; plants from steppes and grasslands; and plants from tropical or sub-tropical forests. There are, however, exceptions to this arbitrary grouping. For example, *Opuntias*, the largest genus of Cactaceae are found in the true deserts of South, Central and North America. From the Old World, the species *Opuntia dillenni* (or *Opuntia horrida*) spread and proliferated to many countries as a weed, a menace to agricultural lands in Asia and Australia. Fortunately, this troublesome weed has been controlled by the sap-sucking scale insects.

The tallest cactus, saguaro (*Carnegiea gigantea*) which can grow to a height of 15 m. is a true desert cactus with its native home in a small town called Sahuarita, near Tucson, Arizona. This giant cactus is a familiar sight in regions from Tucson east up to the Gila desert and stretching northwards up to San Francisco and the Colorado plateaus. These cacti like intense sunlight and very dry soil during their dormant periods. During the vegetative period, however, they require abundant water.

The central plateau of Mexico ranges in altitude up to 2,000 m. Here, several species of cacti and other succulents flourish. In summer, the region is extremely hot, while in winter there is occasional snowfall. In such areas, the difference between day and night temperatures, during the hot months, is substantial, and so a certain amount of humidity results from the cooling of the soil. The difference in temperature between the very hot days and the cold nights has induced the protective tissues of cacti and succulents to be adequately fortified, or to produce additional defence mechanisms, such as surface wax or hard spines.

In the mountains of Bolivia and northern Argentina, cacti grow from an altitude of 3,630 m.,down to the plains. Many species of cultivated cacti come from this region, the popular ones being *Rebutia, Lobivia, Parodia, Cleistocactus, Haageocereus,* etc. *Lobivia* is reported to do very well at an altitude of 3,000 m., enjoying direct sunlight, uninterrupted by shade. The mountains of southern Brazil, Paraguay and Uruguay give shelter to many species of *Cereus*, some of which are popularly cultivated. The attractive *Gymnocalycium* in red, yellow and greenish-brown forms, grafted over green cacti, are very popular throughout North America. This species prefers a habitat ranging between mountain and forest, requiring more shade

and richer soil than desert cacti. Some globular and cylindrical cacti grow in the flat coastal regions of the West Indies. Although these species do not appear to differ from desert cacti, they enjoy different growing conditions. Even during months of relatively low rainfall, the atmosphere here remains humid.

For success in maintaining some species of cacti, especially the Andean and Peruvian species, one requires a sound knowledge of their natural conditions and habitat.

Economic importance

Cacti are not very important, economically. However, some of them are regarded as magnificent ornamentals; several cacti species adorn parks, botanical gardens and home gardens. They are often entered in exhibitions and like works of art, similar to Japanese bonsai plants, cacti are even auctioned. Dry *Cereus* stems are used as planks and pillars in village homes when good quality wood is not easily available. In grassless regions, the flat branches of *Opuntia* are used as forage after the portions bearing spines are sliced off. In Mexico, young *Opuntia* stems, once the prickles have been stripped off, are fried and eaten. The same is boiled and eaten in Texas. It is reported that sailors in the 17th and 18th centuries ate boiled branches of *Opuntia* to prevent scurvy. And it is a common sight in the street markets of Rome, to see people selling 'Indian pear' which is the fruit of the prickly pear (*Opuntia ficus-Indica*). These fruits are attractive and very sweet. Other species of *Opuntia* cultivated for their fruits are *Opuntia tuna, Opuntia streptacantha and Opuntia cardona.*

Cacti fruits are also sold in Mexican markets where the local *Cereus* fruit is popular. The fruit of the giant saguaro is also edible even though harvesting them from such tall shoots (upto 15 m.) poses quite a problem. Strawberry cactus (*Echinocereus* sp.) also yields edible fruit, and from the stem of *Echinocactus,* an edible watery pulp, somewhat similar to watermelon, is obtained. In many villages of South India, a species of *Cereus* known as 'foreign cactus' (to distinguish it from the local

T.A. Davis

A four-metre tall *Carnegiea gigantea* plant at the New York Botanical Garden. This true desert cactus species is the tallest growing cactus in the world, and can attain an impressive height of 15 metres.

Euphorbias) forms an effective barrier plant to protect young horticultural plants from cattle, and is also used as a hedge for farmlands. However, when the spines are pared off, these succulent stems become a delicacy for goats and cattle. The profusion of greenish-white flowers the cactus produces three to four times a year, livens up the boundary walls. Local *Opuntia* plants in South India are grown beneath mango and cashew trees to prevent children from pilfering the fruit.

Cultivating cacti

Cacti can best be grown in modern glass houses where day and night temperatures, humidity and light are regulated to suit the requirements of the plant. Since such attention cannot be offered in homes, cacti cannot be successfully grown as an indoor plant. If there is inadequate light and heat, the plants grow thin and weak and do not produce strong spines. They may also start rotting due to bacterial or fungal action. Large windowsills, or glassed verandahs that receive adequate sunlight are suitable for keeping cacti. The plants should be raised in small pots containing a layer of dry gravel, and watered

Some 2,000 species of cacti make the family Cactaceae one of the largest plant families. Because of brilliantly-coloured flowers **(facing page** and **above)** cactus grafting and display has today become a popular art among cactus enthusiasts; this hobby is even encouraged by certain commercial houses. Grafting cacti has one distinct advantage in that a cutting grafted onto a sturdy, healthy stock grows much faster than if it were to remain on the original plant.

very sparingly. Cacti prefer shelter if they are to be grown outdoors. The shelter may be a plastic sheet, cloth, glass or even tarpaulin. Choice of material depends on the kind of cactus to be grown and local weather conditions. Excessive sun and rain should be avoided; hail can severely damage these delicate plants. In cold places, cacti require heat, especially during the nights. When it is hot it is advisable to shift the cacti into the shade for a couple of hours each day. In the tropics, the plants obtain adequate light and fresh air. When they are kept in glasshouses or closed verandahs, the fresh air may be limited and special blowers or fans should be provided. Plants kept indoors should be shifted periodically out into the open air and direct sunlight so that the tissues and spines continue to grow.

Cacti require well-aerated and drained soil. It is therefore essential to provide them with porous soil. Sand may be used, provided it is not too fine, and all decomposing organic

Continued on page 59

The lesser florican

Text and photographs by Ravi Sankaran

Close to sunset, the sun finally broke through the cloudy skies. It had been tiring looking for floricans through most of a rainy afternoon. Splashing through a narrow stream, still muddy after the recent rains, I walked up the low ridge in front of me. Florican! A hundred metres away, on the opposite ridge, a male florican stood looking around with an air of barely suppressed energy and excitement. Seemingly conscious of his looks,the florican ran his beak through the feathers of his glossy black neck and belly. While the plumes on his head waved in the gentle breeze, he shuffled his feet impatiently as he surveyed the mosaic of emerging green around him. Then abruptly with a flash of white and a sharp carrying rattle, the florican fluttered off the ground before dropping back to the spot he took off from. With an amusingly cocky air, he did that endearing jump twice more, before hurrying away into the fast descending dusk.

Oblivious of the cold rain that followed, I made my way back to the forest nursery that night, my thoughts centred on the elegantly comical lesser florican. I could only look forward, with absolute pleasure, to the idea of having to study and understand the ways of the lesser florican over the subsequent months.

The lesser florican is the smallest of our three resident bustards. About the size of a trim village hen, the lesser florican, like its cousins,the famous great Indian bustard and the elusive Bengal florican, is a bird of open grasslands. However, unlike its cousins, the lesser florican has separate wintering and breeding grounds. The monsoon being their season of love, the floricans migrate to certain parts of Gujarat, Rajasthan and Madhya Pradesh where, with adequate protection, apparently barren stretches of land are soon transformed into vibrant grasslands.

Having had the dubious distinction of being one of the finest 'table' birds,floricans in the past were indiscriminately hunted. This coupled with drastic changes in their habitat in the wake of the human population explosion, makes them endangered birds today. Considering the gravity of the situation, the Bombay Natural History Society as a part of its Endangered Species Project,started a five-year project in 1984, to study the ecology, behaviour and status of these birds. The Project is financed by the United States Fish and Wildlife Service released through the Government of India. With the invaluable support of the Madhya Pradesh Forest Department, we set up our first research station at Sailana, north of Ratlam, to study the breeding behaviour of the lesser florican.

The Naulakha grassland at Sailana is ideal florican country. Having had some amount of forest cover, the area was once the shooting preserve of the Maharaja of Sailana. The mammals have long gone and so have the trees, leaving behind pure grassland habitat. With the changes through time the grassland is now owned by agriculturists from the surrounding villages. The 250-hectare grassland is today a florican sanctuary.

Typical of Central India, the Naulakha grassland, an oasis among vast tracts of agriculture and grazing lands, has a gently undulating landscape. The valleys between the ridges channel rain-water streams into three small reservoirs.

Usually placid as they bubble and gurgle over their stony paths, the streams are rapidly converted into muddy and foaming rivulets after a spell of torrential rainfall; only to revert back to clear innocuous streams in sunny weather. This area, initially devoid of any vegetation but for scattered *Butea* bushes, with good rainfall soon has grass close to a metre tall. Vigilantly protected from grazing, this grassland is harvested by November for its valuable hay.

Signs of the monsoon were everywhere. Neatly ploughed fields hid, in their brown

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palms, seeds awaiting more of that life-giving water. Turned green by the emerging grasses, the rejuvenation of life was evident all around. The monsoon was on time; I was a few days late. In the distance I heard the calls of painted partridges as they echoed challenges at each other. I was sure that the floricans would have arrived and was right, for I soon flushed out a male.

Their breeding requirements being intrinsically related to the south-west monsoon, the lesser florican moves with the monsoon winds. So much so that early arrivals appear 'magically' within the grassland after the first heavy showers. Over the next month or so there are more and more arrivals into the grassland with every spell of heavy rain. In a year of poor monsoon, very few floricans are to be seen, the majority having moved into areas where the rainfall has been more copious.

The attraction display of the male lesser florican is well adapted to its grassland habitat. In the form of an aerial display, the florican jumps to about a metre over the grass, flashing the white on its wings, accompanied by a loud rattle that can be heard upto 500 metres away. While descending, it breaks its fall to the spot of take-off, with partially open wings. Accomplishing a jump in about a second, this makes the florican a difficult quarry for even the swiftest aerial predator, yet announcing its presence to all the females and males around it. Preferring to jump in the morning and evening, a florican will display right through the day under cloudy conditions. At the peak of its breeding season, a male florican will jump *over four hundred times* a day, trampling bare oval patches in the ground at favoured jumping spots.

This attraction display, though ideally suited to its natural needs, unfortunately hangs over the florican like the sword of Damocles. Aided by the repeated sharp rattles and the flashing white, shikaris with guns have been known to wipe out most of the male floricans in a grassland, during one morning shoot. Not to be outdone, trappers, on finding a jumping spot, are assured of yet another bird to hang on their sticks.

Amusingly competitive, two floricans will try and outdo each other in the number and intensity of their jumps. Each time one jumped, it would, on landing, turn to face its nearest rival as if to say, "Let's see you do better." If a female florican were to fly overhead, the males positively lose their self-control. Like jacks-in-the-box gone hysterical they jump rapidly up and down, barely pausing between

The shy and secretive female lesser florican, in contrast to the flashily-coloured male, is a quiet beauty. Cryptic-coloured, an overall fawn-to-buff, she is covered on top with delicate vermiculations. Into a shallow scrape amongst the grass, she usually lays three to four, olive-green eggs, that she incubates and rears all on her own.

Bustards: an overview

Bustards are an ancient group of birds belonging to the family *Otididae*. A varied family, it has 22 species in 8 genera, 5 of which are represented by a single species each (including the lesser and Bengal florican). Where they fit in relation to other birds is unclear. Modern taxonomists place them in *Gruiformes* along with cranes *(Gruidae)* and rails *(Rallidae)*, but it was believed at one time that they were closer to game birds, even ostriches. Bustards have their origin in Africa (still the home of many and the centre of divergence). Present-day distributions cover Europe, Asia and Australia; the Americas have no representative either today or in fossil records.

Medium-sized to very large terrestrial birds, bustards as a rule inhabit open country and semi-desert regions of the world, having amongst them the heaviest flying birds—large male great bustards may reach 18 kg. and the great Indian bustard upto 15 kg. Typically they have short bills, long slender necks, stout bodies with short tails carried horizontally on fairly long legs with only three toes on the feet. Bustards maintain their plumage, which is a friable material called 'powder down', aided by dust bathing, as they lack both a crop and a preen gland. Males are generally larger than females though in the case of the lesser and Bengal floricans, the opposite is true. Possessing a more showy plumage than the female, ornamentation in the male includes crests, moustaches, plumes and the ability to swell the neck.

Preferring to walk rather than fly, bustards are nonetheless strong fliers and are capable of bursts of speed. Most species undergo local movement and some are definitely migratory. The houbara bustard, for instance, migrates from its breeding grounds in the U.S.S.R. and winters in the semi-arid and arid regions of north-west India, Pakistan and other Middle East countries; the lesser florican migrates into Gujarat and adjacent parts of Rajasthan and Madhya Pradesh, during the monsoon, to breed and then spreads out over the rest of the country, the majority appearing to move into Southern India. The great Indian bustard is a resident bird subject mainly to local movements.

The males of most bustard species perform spectacular attraction displays, which serve to attract females and to announce to rival males the possession of territory. Highly varied, male displays range from a balloon type display, as in the great Indian and kori bustards, where the neck is distended into a pouch and loud booming calls are emitted, to a running type of display as in the case of the houbara, at the peak of which it reveals a white fan of breast feathers. The lesser florican and little bustards have a jumping type of display, which has been extended into a sort of display flight in the Bengal florican, the height of the jump being largely dependent on the surrounding vegetation. This type of display has been exaggerated in some African species, like the red-crested and black-bellied bustards, whose aerial displays involve circling above the trees in their savannah homelands.

Due to their specific requirements, bustards are highly vulnerable to environmental changes. Changing crop patterns, increased grazing pressures and the ever-present hunting fraternity have all led to a serious decline in populations. Local extinction has already occurred, as in the case of the great bustard from U.K., and due to the fragmentation of their habitat they have become rare in their former ranges (the Bengal florican is today absent from most of the Indian terai). Though protected by the law in many countries, bustards like the houbara are still relentlessly pursued for sport. Sadly, in our country, most conservation efforts are diverted to forests and 'glamorous' mammals, while a great number of spectacular and unique birds are being steadily relegated to oblivion.

jumps, each desperately trying to attract her into his territory before slowing down to a more sedate frequency once she has passed.

At the forest rest-house, I lie on the bed, mesmerised by the drops of water gathering ominously in joints in the ceiling, before dropping onto the floor. In the night they begin to drip on me, and as I huddle under my raincoat, wet and miserable, I wonder why I couldn't have chosen a more comfortable profession. But at dawn the fresh chill morning air, the sounds of an awakening grassland and the familiar display rattles of the florican, wipe out any desire in me to return to civilisation.

Sitting atop a pump house, I watched a male florican through a telescope as it foraged across crop fields and along grassy bunds. Still early in the season, the maize had only just sprouted. Close by, an Indian roller tried to dispute a perch with a red-headed merlin. Just as the florican crossed a bund, it stopped abruptly. Ahead was another male. Bristling with indignation, the first chased the other, that hurried away. For a while the chase continued, a distance of about 25 metres being maintained between them, as first one then the other would stop to snap up an insect that it had flushed, only to resume running away or continuing the pursuit. After a while the aggressor went his way probably feeling that the other had got the message.

A pugnaciously territorial bird, the male lesser florican cannot tolerate the presence of another male close to it. While 'chases' occur frequently, vicious fights break out when two seemingly equally matched birds come into contact. Assuming ritualistic threat postures by cocking their tails and raising their mantle feathers, they circle and with a flurry of wings rush at each other. Actual combats do not last long, for as soon as one is pushed down it signals the end of the fight. Antagonistic behaviour is seen mostly at the time when territories are being formed and 'borders' are being contested. Once the territories have been settled, the males usually remain close to their jumping spots.

By end August, the grassland is alive with a myriad calls. At dawn, the first sound that greets me is the enquiring 'wheech,' 'wheech' of the rain quails, echoed further away by more of their kind. A painted partridge with its ventriloquist abilities calls gustily from a prominent mound. Within the grass, hordes of insects go about their daily chores; grasshoppers chirp from blades of leaves while dung beetles are busy at a jumping spot, rolling away bits of florican droppings. In the distance, a pair of sarus cranes trumpets and pirouettes with the sheer joy of

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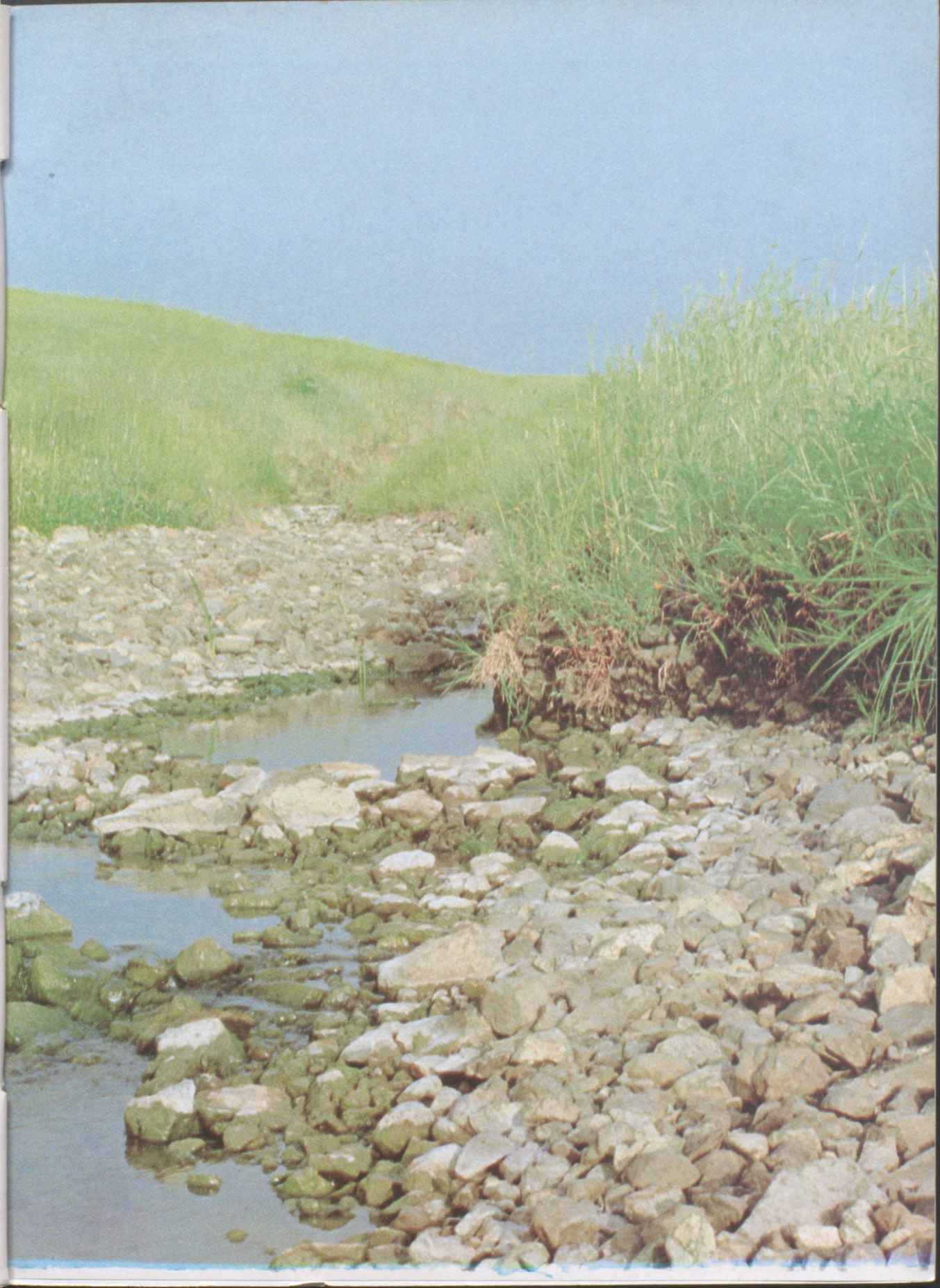
The Naulakha grassland at Sailana **(facing page)** is ideal florican country, where the gently undulating landscape is broken up into a number of small streams. Usually placid, these streams gurgle over their stony paths, during the rains being converted into muddy foaming rivulets. Hordes of insects like the hooded grasshopper **(top)** go about their daily chores amongst the grass, insects being possibly an important food item for lesser floricans, besides grain. A co-inhabitant of the florican's habitat, an alert cobra **(above)** rears its head.



being together. Skylarks sing as they circle overhead; I flush a crested lark on its nest, nestled beneath a stone. A circling whistling teal and a split-second change of partners and I know where they have got their nest. Harriers float effortlessly above the grass, their keen eyes raking the vegetation below for any juicy morsel, and large grey babblers carry on a noisy conversation on an overhead wire. A rustle in the grass and I feel my hair prickle as a cobra moves swiftly away. At dusk the amphibian orchestra begins, a spotted owlet occasionally adding a shrill chatter to it. For some, a day had ended; for others it had only just begun.

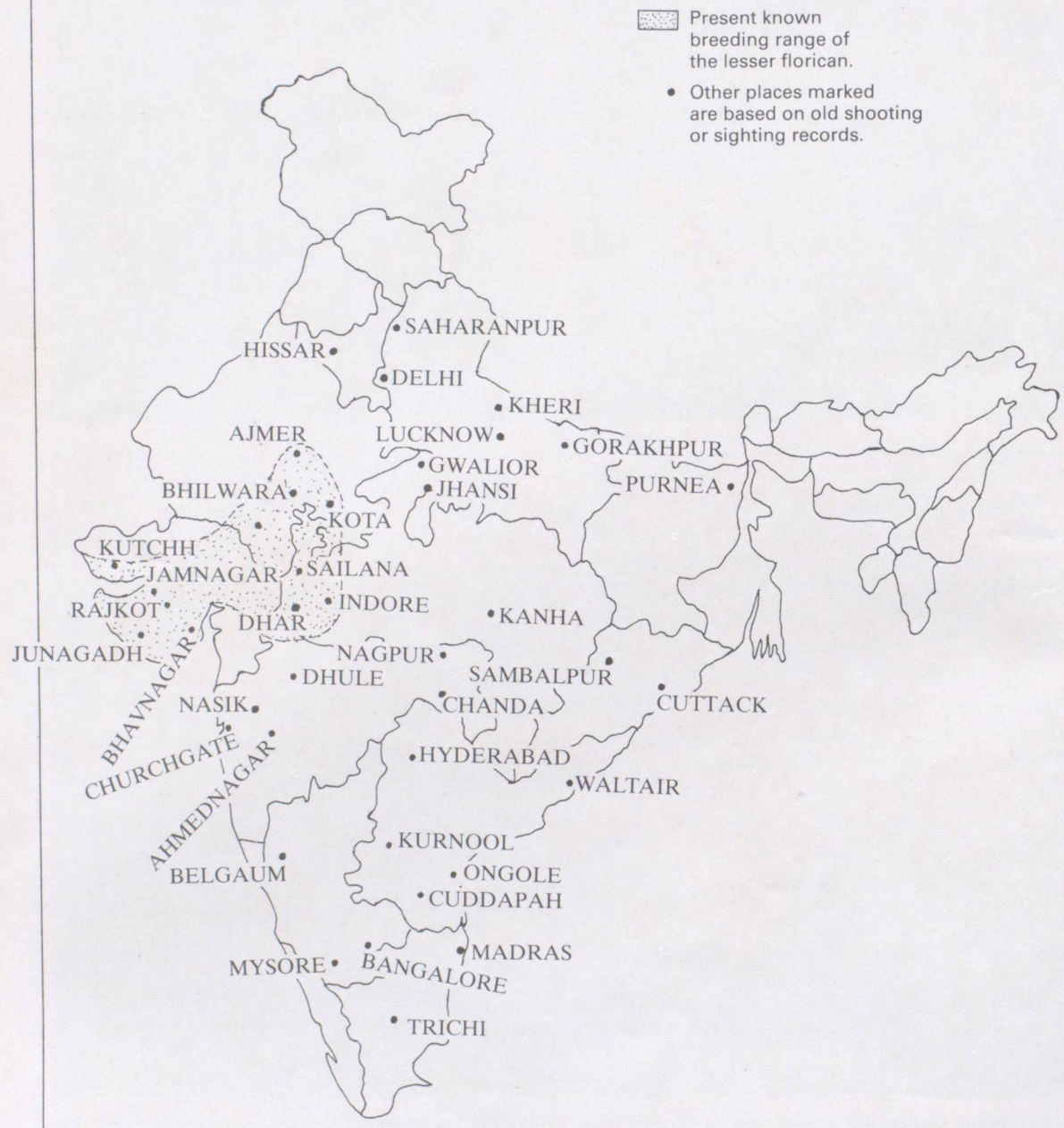
An accomplished avian Casanova, the male lesser florican has a curious display which he performs in the presence of a female. Head outstretched, his neck feathers fluffed up and plumes thrown over his head, a male florican will chase any female that comes into his vicinity. On reaching her, he pauses and jerks his head back to rest almost against his mantle. He then looks towards her, his neck, chin and head feathers still raised, before repeating the entire sequence. Though I haven't seen floricans actually mate, this courtship display appears to be pre-copulatory behaviour. On one occasion, early in the monsoon, I watched a male chase a female florican in this manner for over an hour across sprouting maize fields. His love spurned and finally realising it, he slept off his passion on a grassy bund as the female wandered away, apparently in search of food.

"A pugnaciously territorial bird, the male lesser florican cannot tolerate the presence of another male close to it. While 'chases' occur frequently, vicious fights break out when two seemingly equally matched birds come into contact. Assuming ritualistic threat postures by cocking their tails and raising their mantle feathers, they circle and with a flurry of wings rush at each other."

While the lesser florican is less shy than the other bustards I have become acquainted with, the size and nature of its habitat and terrain make it a difficult subject to study. Shy and wary, the bird hides at the least sign of danger. Often, a florican that I have been following for a few hours has suddenly vanished from sight when my attention was diverted for a few minutes, only to reappear a long way off. When they arrive in the grassland, observations are relatively easy. But with the subsequent alternating rain and sun, the rapidly-growing grass begins to conceal more and more of the bird. Finally, only a black speck or a display jump discloses the location of the male; the female florican is virtually impossible to locate. Once the breeding season is over, the male florican discards his bright, showy garb and assumes the cryptic colouration of the female,only retaining more white on the wings.

In the monsoon of '86 when my guide and mentor, Dr. Asad Rahmani, better known for his studies on the great Indian bustard, came to Sailana, we surveyed all the nearby grasslands. At the end of a week when we tallied the scores, we came up with 49 male floricans. However, this relatively large number in a small area did in no way make us complacent about the status of the florican. We knew that Gujarat, the major portion of the florican breeding range, was experiencing a severe drought and that florican enthusiasts there had hardly seen any

The attraction display of the male lesser florican **(top left, top right** and **above)** is a spectacular one. The bird may jump a metre high over the grass, flashing the white on its wings, accompanied by a loud rattle, audible upto 500 metres away. Accomplishing a jump in a second, it announces its presence to all female and male lesser floricans. Preferring to jump in the mornings or evenings, under cloudy conditions a bird may display all day long, at the peak of its breeding season, a male bird will jump *over 400 times a day,* trampling bare, oval patches in the grass at favoured jumping spots.


Present known breeding range of the lesser florican.
Other places marked are based on old shooting or sighting records.
SAHARANPUR
HISSAR
DELHI
KHERI
AJMER
LUCKNOW
GORAKHPUR
GWALIOR
BHILWARA
JHANSI
PURNEA
KOTA
KUTCHH
JAMNAGAR
SAILANA
RAJKOT
INDORE
KANHA
DHAR
JUNAGADH
NAGPUR
DHULE
SAMBALPUR
BHAVNAGAR
NASIK
CHANDA
CUTTACK
CHURCHGATE
HYDERABAD
AHMEDNAGAR
WALTAIR
KURNOOL
BELGAUM
ONGOLE
CUDDAPAH
MADRAS
MYSORE
BANGALORE
TRICHI

birds. Obviously, most of the birds were in the Madhya Pradesh part of their breeding range, where the monsoon was very much better.

In contrast to the flashily-coloured male, the hen florican is beautiful in her own quiet way. Cryptic-coloured, her overall fawn-to-buff colouration is covered on the top with delicate vermiculations. More shy and secretive than the male, the hen florican rears her young all on her own. Being a promiscuous species the only role that the male florican plays in procreation is to woo any female that fancies him.

The hen florican lays her clutch of three to four, olive-green eggs in a shallow scrape in the ground, in grass that is tall enough to conceal them and her. Being a close sitter, an incubating hen is flushed only when almost trod upon. When news came to me of a nest containing two eggs, my elation knew no bounds. I was able to keep a watch on that nest and calculate the incubation period. Those few short hours that I spent in a hide watching the hen were as memorable as they were intimate. Early on the 22nd day of incubation, the chicks hatched, within a few hours of each other. On their drying, the hen led her precocial chicks into the tall ripening grass, calling them with reassuring croons, the chicks wheezily peeping as they followed her.

There are still numerous aspects of the lesser florican that baffle us. Basic things such as their sex ratio and their longevity are as yet uncertain. Relationships between the mother and chicks and how long they remain together are still unknown. One big mystery about floricans is where they go once their breeding season is over and what they do there. We have as yet only theories and conjectures based on older writings, but given time, the answers to these questions may still be found.

With a ripened grassland, the season finally comes to an end. The floricans have disappeared as mysteriously as they had appeared. That last evening, I sat on top of the ruins of the Maharaja's hunting lodge, drinking in the last rays of a sun setting beyond a golden-brown grassland. As the sky glowed with changing colours, a multitude of questions filled my mind. How long before these few grasslands are brought under the plough or churned to barrenness beneath hordes of starving livestock? Why must we persist in obviously outdated methods of farming our cattle? Would it not be more economical and productive to stall-feed our cattle, letting our overgrazed lands revert back to enormous grasslands that will provide sufficient fodder for our livestock and serve to boost our pitiably poor milk output? Thereby giving a new lease of life both to one of India's most spectacular birds—the lesser florican—and also all the other creatures that inhabit a grassland. □

"In contrast to the flashily-coloured male, the hen florican is beautiful in her own quiet way. Cryptic-coloured, her overall fawn-to-buff colouration is covered on the top with delicate vermiculations. More shy and secretive than the male, the hen florican rears her young all on her own. Being a promiscuous species the only role that the male florican plays in procreation is to woo any female that fancies him."

Magod

by Renée Borges

Every day a few curious travellers on their way to Karwar, Mangalore, Dharwar or Hubli make the 12-km. detour from Yellapur and having reached the Magod colony, proceed another few kilometres to the Magod Falls. Here, the travellers stand at eye-level with the crest of encircling mountain ridges, near an almost abandoned P.W.D. rest-house where people must have once awakened to the sound of the water. The plunge of the Bedthi is not very spectacular these days because of the failure of the monsoon, but when it rains as it should in this beautiful place in the Malnaad, the Bedthi becomes a splendid cataract where one can stand mesmerised for hours. Few viewers know of the long battle over the Bedthi that has been waged and won, making Bedthi, forever, a symbol of victory. Victory to the voice of the people.

The battle began in the late '70s, when the Mysore Power Corporation (now the Karnataka Power Corporation, KPC) announced its decision to dam the Bedthi after obtaining necessary sanctions from the Planning Commission and the Ministry of Finance. This project, had it come through, would have affected the forests and people of the Yellapur, Sirsi and Mundgod talukas of North Kanara. It was vigorously opposed by the local arecanut garden owners—the Havik Totgars—whose plantations would have been submerged. The Totgars Co-operative Sale Society organised a seminar at Sirsi in 1981 to re-evaluate the economic and ecological viability of the project. At the seminar, ecologists, economists, geologists, health experts and a number of knowledgeable and concerned environmentalists arrived at the conclusion that the feasibility report submitted by the KPC to the Planning Commission, on the basis of which the project was sanctioned, was grossly in error—ecological and economic costs had been underestimated in relation to the proposed benefits. After these discrepancies were clearly revealed, the KPC decided to stay its order on the construction of the dam. And so today, the marble foundation stone proclaiming the inauguration of the Bedthi Hydroelectric Project stands neglected at the proposed dam site; crude steps lead down the left and right banks of the river to preliminary dam foundation pillars; a series of bore holes, with their serial numbers long effaced, lie scattered throughout the adjoining forests as do temporary murrum paths built along preliminary survey lines. The Magod colony—a temporary housing and office complex built for the personnel of the Bedthi project—has now been partially taken over by the State Police Department as a training institute. The Totgars are to be commended for their initiative and timely action.

If I were to describe the forests near Magod in just a few words, I would probably say—they are bashful and awesome. Bashful because they are slow in revealing their treasures. (Magod is not the place for someone in a hurry. It must be courted gently, patiently.) Awesome because the straight-boled trees towering upwards have a strangely humbling effect on one. These leafy giants branch high in the sky, elbowing urgently for their own canopy space.

Magod is within the Yellapur Reserve Forest in the Malnaad area of North Kanara, not far from the Dandeli Wildlife Sanctuary. The forest intergrades between being semi-evergreen and evergreen where *Hopea* and *Myristica* mingle with *Holigarna, Terminalia* and *Dillenia*. Giant *Artocarpus hirsuta* and *Diospyros buxifolia* tower over *Cinnamomum, Litsea* and *Aporosa,* while in the undergrowth are the waxy blooms of *Psychotria* and the delicate flowers of *Strobilanthes* and *Melastoma*. Wild pepper (*Piper nigrum*) scrambles up most tree trunks and here and there are the lovely racemes of the orchid *Rhynchostylis* which the local women pin onto their hair as readymade *gajras*. Occasionally a graceful fishtail palm (*Caryota urens*) emerges, heavy with fruit-laden clusters.

The terrain is undulating, sloping down towards the river. Along some mountain faces, the transition between types of forest is abrupt while on others it is imperceptible.

Some eastern slopes are deciduous,and bamboo thickets cover some faces entirely. With an annual average rainfall of about 2,500 mm., the forest is not overhung with moss and epiphytes or festooned with creepers. It is not always wet, as it receives only the south-west monsoon but the atmosphere within is certainly one of high jungle with cane brakes, palms, tiny hidden jheels, huge buttressed trees and spreading figs.

I have lived in Magod for a year, studying the Malabar giant squirrel and have come to care deeply about this beautiful place. Squirrels often became secondary as other distractions moved into my field of vision each day. A pair of tiger bitterns crouch along a misty forest trail and I abandon an early encounter with the squirrels to follow them, watching their strong flight into the trees. They wait there looking incredibly foolish on their long, yellow legs, peering nervously at me until I leave. There is a jheel nearby that is visited by white-necked storks. They will wing over and stalk there among the reeds.

I am routinely recording squirrel feeding rates one hot summer afternoon when the drowsy peace is shattered by the stamp, kick and persistent alarm call of a muntjac buck. I had seen him approach along the trail, ears sweeping in nervous arcs. Squirrels and spurfowl take up the call and I am soon at the nucleus of a screeching, rattling, barking cacophony which only gradually subsides.

Clattering down the road to the Falls one misty morning I am forced to come to a stop. A party of wild dogs is yawning, stretching and completing their early morning functions on the road. One bitch is inquisitive; she approaches the jeep and squats 10 metres from it, watching intently. The others loll around behind. I watch these russet beauties through the mist till they trot away into the undergrowth. A few days later, probably the same pack killed a chital doe,and my assistant, Mahadeva, was able to save her accompanying fawn. We called the fawn Mika (local Konkani for chital) but she too died a few days later, perhaps from an internal injury sustained during the scuffle. Soon after this, Mahadeva's family lost a calf to the dogs.

Barking deer are very common to the area while sambar is more rare and chital only occur around agricultural land. According to the locals, only a decade ago gaur would often ascend from the valleys to feed on fallen kanigeeloo fruit (*Dillenia pentagyna*). Now, however, they do not come. There are even reports of sloth bears mauling villagers—it is said that bears are attracted to dwellings when the jackfruit ripens. It is interesting that in certain areas of North Kanara, captive sloth bears are used to rid cattle sheds of ticks! The bears apparently greedily seek out adult ticks and larvae, and within a short time the shed is pronounced 'tick-free'! Tigers no longer occur here but leopards and jungle cats abound. A few elephants too have occasionally strayed into nearby forests, probably from the adjoining Supa and Dandeli forests.

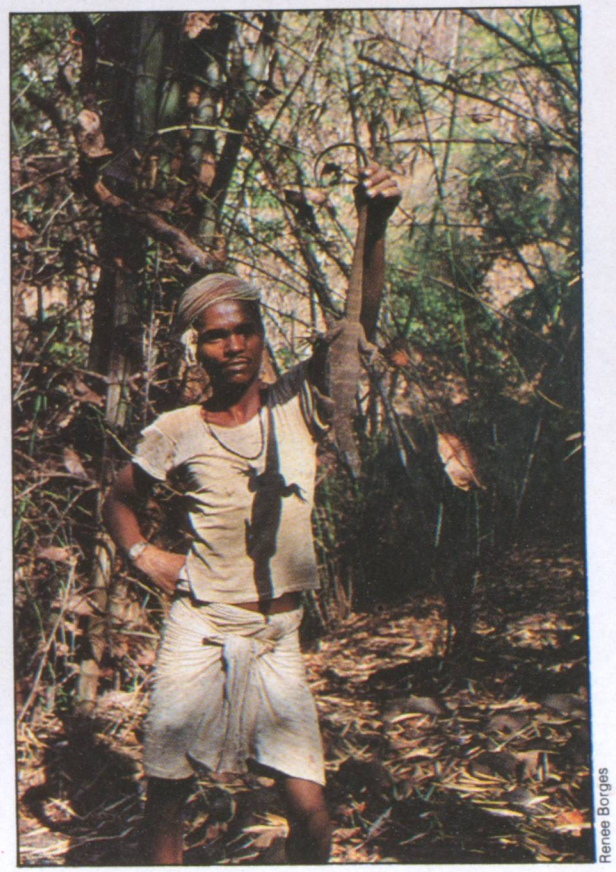
I remember the time I was berating a squirrel, that I had to follow in the pouring rain, when my attention was completely diverted to a burnished, low-slung, trotting form with four exquisitely black-tipped paws—it was a stripe-necked mongoose on a rainy morning round. I have spotted these mongooses several times, sometimes in pairs and they always give me a quick, investigative look before dashing away. This is the largest Asian mongoose and is a deep forest species. Little is known of its habits and ecology but it is reported to also be a scavenger.

When the Bedthi is drying up in summer and the river bed forms shallow pools, scrambling over the smooth boulders to reach the largest pool, we saw the otters. There were six of them, taking turns in diving off rocks or standing half erect in the water, all peering together, like furry periscopes before ducking in again. After much rollicking, they paddled into the reeds, out of sight.

It is an afternoon in winter and my doorbell rings urgently. Standing outside is the local

Ulhas Rane

Ulhas Rane



Renee Borges

Found in the shaded forests of Magod are numerous vocal amphibians, among them this *Rhacophorus* tree frog **(left)**, settled comfortably on a leaf. Small silk-lined circular openings,often seen on mud-walls,are the work of the venomous catleg spider **(top)**, that emerges from its long web-lined funnel, possibly on the lookout for prey. Mahadeva **(above)**, the author's Siddhi assistant, triumphantly holds up a monitor lizard that he has just pulled out of a hole.

'postman', pointing frantically to something in a bag that he is clutching. I open the bag gingerly to find a female frogmouth staring at me with huge orange-gold eyes. I nearly drop the bag in excitement but recover composure sufficiently to photograph the bird and measure certain parameters. The boy mentions casually that he happened to have flushed out a pair of these birds near his home but was able to capture only one. He brought it to me as he thought I would be interested! The frogmouth is a nocturnal insectivorous bird related to nightjars and owls. It is aptly named for its grotesque, frog-like, horny beak and wide, yellow gape. It is considered to be among the rarest birds of the Indian subcontinent and is thought to occur only in thick evergreen forests. Being nocturnal, however, and little-studied, the present status of the bird is uncertain. It is heartening to find that the frogmouth still occurs in Magod and it is strange that it should have been located in a patch of extremely degraded forest.

Images of Magod must include hornbills, my undoubted favourite being the Malabar grey hornbill, which is a raucous, rambunctious bird almost always cackling insanely while hopping about in groups. These harpies with their stout, scythe-shaped bills, have the singular habit of gliding with wings outstretched after a few rapid beats, then appearing to crash into a tree when at the very last instant, the wings are drawn shut and the bird nosedives through a gap in the vegetation. Many a time I have watched such seemingly crazy flights in despair, then breathed a sigh of relief! When *Myristica* or *Flacourtia* is fruiting, the activity of the birds becomes frenetic as they toss fruit down rapidly.

The great Indian and Malabar pied hornbills are also to be found here and are local migrants, probably in search of larger bonanzas of fruit. Both species nest here in the *Myristica* fruiting season. At this time a quiet evening spent by the Falls is always rewarded by good eye-level views of these huge birds noisily flapping to their roosts or foraging in the forested cliffs below. Mahadeva, on one of his many truant forays into the jungle, in search of honey, once found a great Indian hornbill nest and we watched the male feed *Myristica* fruit to his spouse and offspring.

Magod is extremely rich in bird-life and has many interesting deep forest species like spider-hunters, trogons, piculets and blue-bearded bee-eaters. Yellow-browed bulbuls are ubiquitous, hill mynahs and blue-winged parakeets whistle and screech everywhere. When the figs are in fruit, the sad piping of grey-fronted green pigeons and the deep, ominous, "whrap-roo....." of Jerdon's imperial pigeons can be heard near the fruit patches. Hunting parties of nuthatches, scimitar babblers, scarlet minivets, drongos and black-capped babblers are always active, except in the midday heat. Hawk-owls, fish-owls and barred jungle owlets fill the nights with their calls. The butterflies here are equally spectacular. Tree nymphs float lazily near the canopy, Paris peacocks and blue mormons dash about, while Tamil lacewings and palmflies entice with vibrant colours. Clippers fly about with their jerky, scissored flight, through sunflecks, and sometimes a yellow-red dry leaf will appear suddenly to halt in its fall to the ground and cling onto a tree-trunk. Not just an ordinary dry leaf but the expanded wing membranes of the flying lizard, *Draco,* that may often be seen running up trees after landing, yellow dewlaps flicking in and out furiously. The venomous nocturnal catleg spider is common to the forests of Magod, building huge silk-lined burrows in mud banks. Only the intrepid arachnologist would dare investigate further!

For the amphibian and reptile enthusiast, Magod is an exciting place. On several occasions, while drowsily watching a resting squirrel, I have been jolted awake by the appearance of a spectacled cobra or a dhaman only a few feet away from me. Hump-nosed and green pit vipers are extremely common after the rains and there are authentic reports of common kraits and rock pythons entering houses. I have seen the Travancore tortoise

here and was also lucky to discover a fine specimen of the Malabar tree frog. I am sure that a comprehensive survey of the amphibian and reptilian fauna in Magod would reveal many interesting, even unrecorded, species.

And then there are the squirrels—the diurnal Malabar giant squirrel and the nocturnal common flying squirrel. Giant squirrels can be seen and heard throughout the forest, and near dwellings. As a crested serpent eagle swoops low or circles overhead, the squirrel community protests strongly with loud, rattling alarm calls. Huge leaf nests dot the canopy-scape, within each squirrel territory. The squirrels here are well habituated to the human presence and can be watched without much effort. When Magod is blushing in winter with newly-flushed, pink *Cinnamomum* leaves, there can be nothing more beautifully gaudy than the sight of rust-red *Ratufa* gorging on this pink feast.

After dusk, flying squirrels can be observed as they glide, their ruby-red eyes glowing in the torchlight. The local name for this squirrel is *haar-beku* or flying cat. And it does indeed resemble a very large, dove-grey, pampered household feline! It often roosts in tree holes around local houses in the *betta* lands where the trees are spaced further apart and the undergrowth is reduced. Every local dwelling seems to have at least one flying squirrel roost; the inhabitants are only too willing to shin up the tree and demonstrate the fact that a *haar-beku* lives there!

Magod, and the ranges around, are forests of much beauty, holding onto a number of plant and animal species peculiar only to these regions. This, however, is changing slowly, and in a direction decreed by humans. This is because people live throughout the range—Bhats (mostly Havik Brahmans), Nayaks and Siddhis. The Siddhis are the descendents of Abysinnian slaves formerly owned by the Portuguese. They possess small landholdings and have poorer dwellings. Telltale mud paths lead off into numerous valleys in this undulating land where rice, arecanut, pepper, cardamom, sugarcane and bananas are grown in forest clearings. The valleys are fertile, retain water well and can support these crops. Much of this cultivation is on encroached forest land and the government has now regularised encroachments upto the year 1978. The encroachments however continue even today, and it is apparently a common practice to hand over encroached land as dowry! Recent encroachments (after 1978) have also apparently found a way of being regularised. The Bhats are legally allowed to use nine acres of surrounding forest land (*sopinabetta* lands—*soppu* = leaf manure, *betta* = forest land) as a source of leaf manure for every one acre of garden land (*totta* land) they possess. In the *sopinabetta* lands, leafy tree branches are lopped off to form a protective humus-forming layer for the arecanut, pepper and cardamom. The *betta* lands can easily be distinguished by the virtual absence of undergrowth; the trees, mainly *mathi* (*Terminalia tomentosa*) and *honigeeloo* (*Terminalia paniculata*), are spaced far apart, with most of their lateral branches pruned. The *betta* lands are very often badly degraded and this situation has prompted the launching of the Sopinabetta Project in the Hulgol sector of the Sirsi taluka in which the villagers pledged to begin to restore degraded areas and to curb some of their damaging practices.

In each *totta,* cardamom and sometimes coffee is grown in the shade of the arecanut; pepper vines twine around each arecanut palm and coconut palms sometimes fringe lush banana groves. Pineapples and pomelos are also grown. Entering a *totta* is like entering a shola forest—it is cool, dark and quiet. The mud, thatched or tiled dwellings are spacious, cool and scrupulously clean. The people display a courteous hospitality that I have come to admire and love very much. The locals maintain a certain respect for wildlife and their forest and this is evident from some of their rituals. Whenever they widen a crevice in a hollow tree trunk to extract a honeycomb, for instance, they always make an offering of a piece of comb placed outside the hole on a

Renée Borges

Ulhas Rane

Ulhas Rane

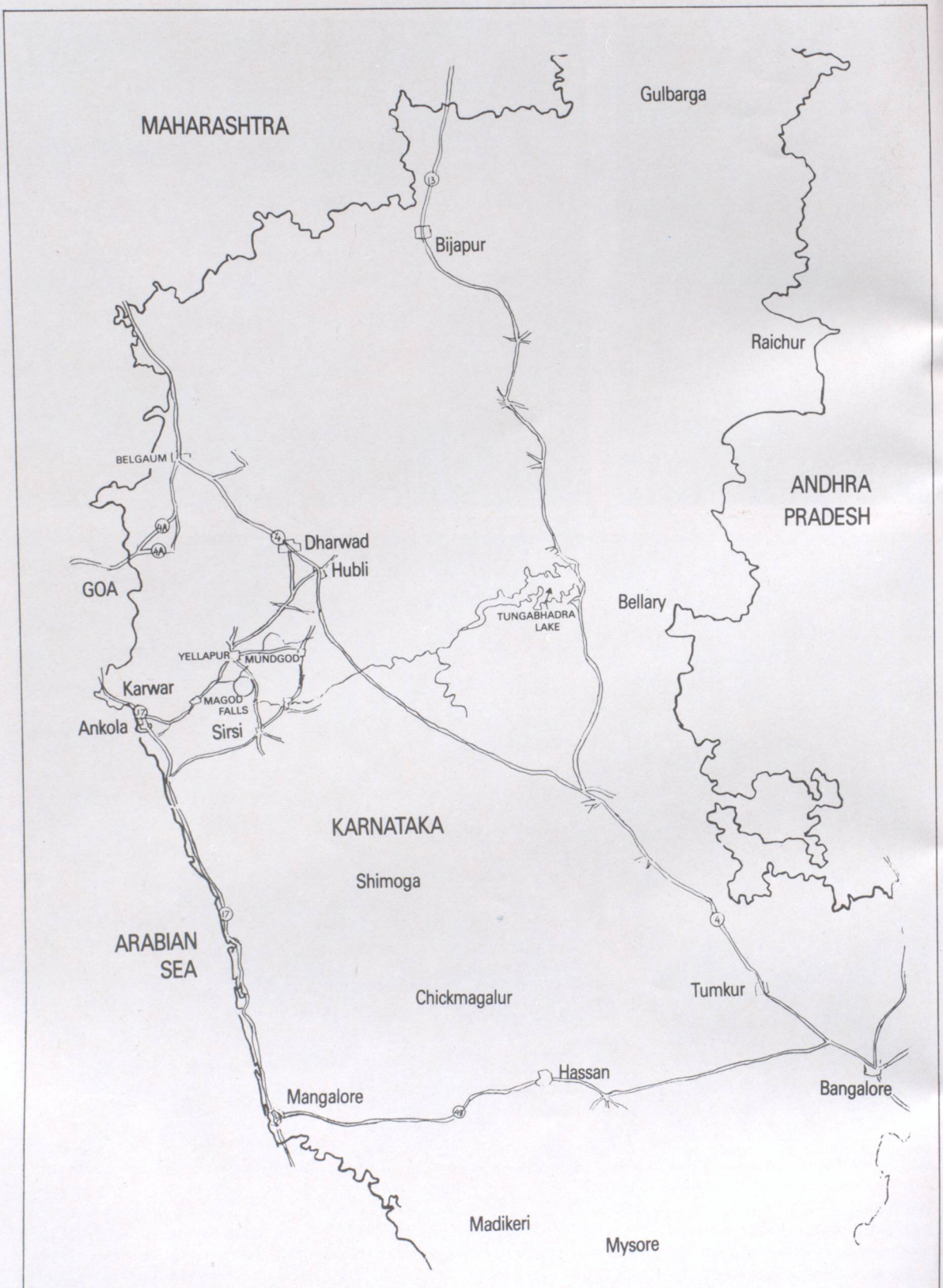
Related to nightjars and owls, frogmouths **(top left)** are considered to be one of the rarest and least-studied birds of the Indian sub-continent. Sporting a remarkably cryptic, dead-wood pattern, they are, perhaps, the most difficult birds to spot in a forest. Mostly arboreal, frogmouths are very shy, roosting among branches by day and hunting for insects and small vertebrates, at night. The birds get their name because of their grotesque, frog-like, horny beaks and wide yellow gape. This particular frogmouth was found by the local 'postman' in Magod– surprising because frogmouths are usually believed to inhabit only thick evergreen forests, unlike the patch of extremely degraded forest it was discovered in. Humid forests are where the maximum species of orchids are to be found. In Magod, bunches of this drooping orchid **(top right)**, locally known as the fox-tail orchid, adorn the hair of many local women. Mud-banks in the forest are home to some very interesting little life forms. One of these is the little spider-hunter **(above)** – a relatively rarely seen bird, that scuttles about on mud-walls in search of insects. The spider-hunter also feeds extensively on nectar from banana blossoms, its long beak helping it probe deep into flower tubes.

Renée Borges

Ulhas Rane

Ulhas Rane

An adult male Malabar giant squirrel **(top left)** feeds on the fruit of *Lannea coromandelica*. Split up into several races throughout its distribution in the Western Ghats, this large and agile diurnal squirrel is a strictly arboreal mammal, rarely descending to the ground. The squirrels in Magod are well habituated to human presence. Areas like Magod are home to a myriad spectacular insects, such as this huge silk moth **(top right)** that may measure over six inches from wing-tip to wing-tip. An inhabitant of the forest, the brilliantly-coloured, white-throated ground thrush **(above)** spends a great deal of time hopping about on the ground, rummaging amongst the leaf litter in search of insects. Its rich, whistling song enlivens the forests of Magod.


MAHARASHTRA
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Bijapur
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BELGAUM
ANDHRA
PRADESH
Dharwad
Hubli
GOA
Bellary
TUNGABHADRA
LAKE
YELLAPUR
MUNDGOD
Karwar
MAGOD
FALLS
Ankola
Sirsi
KARNATAKA
Shimoga
ARABIAN
SEA
Chickmagalur
Tumkur
Hassan
Bangalore
Mangalore
Madikeri
Mysore

Piper leaf, to propitiate the forest deities.

Though the forests surrounding the *tottas* and *bettas* appear relatively undisturbed, only a detailed comparison of the forest composition in the areas surrounding such habitations, with completely protected areas, will reveal the degree of the effects of human presence. Some tree species, those with extremely straight boles and hard durable wood, are selectively felled for use as house posts and columns. This leads to an under-representation of mature reproductive individuals of these species, in the forest. For instance, mature *Diospyros buxifolia* trees are only very rarely found, whereas sprouting tree stumps of immaturely cut individuals are regularly seen. The removal of saplings and treelets in these forests, besides causing a reduction in future mature populations of these species, also results in the widespread take-over of the undergrowth by *Psychotria dalzelii,* a large herb species which chokes the understorey and probably prevents tree species from regenerating.

Though people are an inevitable part of the Magod eco-system, certain measures need to be taken to see that their damaging impact is reduced. In the first place, further encroachment into forest land should be effectively prevented, and people should be educated in the efficient non-destructive use of their habitat. The Sopinabetta Project is a positive step in this direction. Live fencing of thorny or fast-growing species like *Duranta* or *Gliricidia* should be made mandatory, so that fewer regenerating tree saplings are cut for field and house boundaries. People should be encouraged to collect dry, fallen logs or branches from the surrounding forests for firewood, instead of, as is sometimes alleged, ring-barking or cutting live trees and allowing them to dry up and die before being utilised. They should also be encouraged to incorporate a fuelwood plantation within each *totta.* Practices like these, I am sure, will reduce the impact of human habitation and will allow the people to co-exist harmoniously with the forest, allowing it to develop its natural character without imposing much artificial selection on it.

Forests like Magod are places of rare, often elusive beauty where one watches *Hopea* seedlings and *Caryota* saplings with more than the usual sentimentality. These have to compete with forces beyond nature where the odds are more than usually against them.

To me, the future of Magod or places like it, lies in its being viewed and treated as a natural laboratory. Research results obtained after studying hornbills, squirrels, trogons or tree species at Magod, could be extrapolated to the biosphere reserve areas, where understandably active research of all types cannot be allowed, or even to potential national parks and sanctuaries. Much research needs to be undertaken on the reproductive biology of forest trees. We will hopefully soon reach the stage when we realise the folly of forest plantations of Australian acacia, eucalyptus and silver oak. And discover that we need to know more about the *natural forest species* if we want to help them survive, and if we want to introduce afforestation programmes, using more appropriate species. Though the ideal for every conservationist is absolute preservation, we must be realistic and come to terms with the effective management of what is left. This directly points to a basic, urgent need for more basic, urgent research.

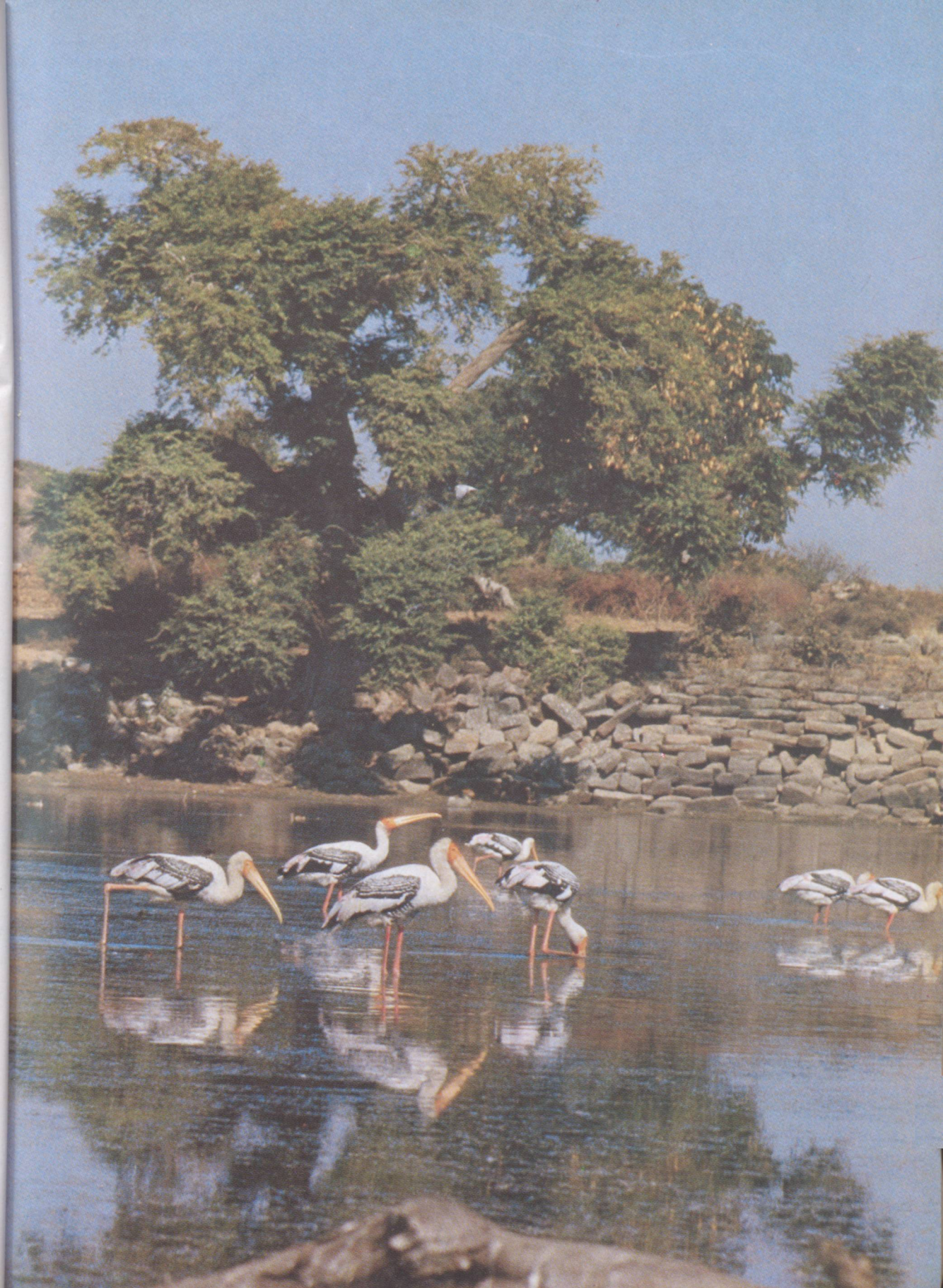
Magod is easily accessible and the locals are friendly, hospitable and genuinely interested, if a little perplexed, by an ecologist's priorities. "How can you afford to spend all your time watching squirrels? Will you earn money? Will it get you a job?", are questions I have often been asked. And I always reply with a query, "Surely you know that a squirrel or a tree is *the* bread of life?" But the questions continue and have now evolved into a ritual which invariably ends with a much dramatised clutching of the heart. But the locals know—at least I think they know now, what I mean! □

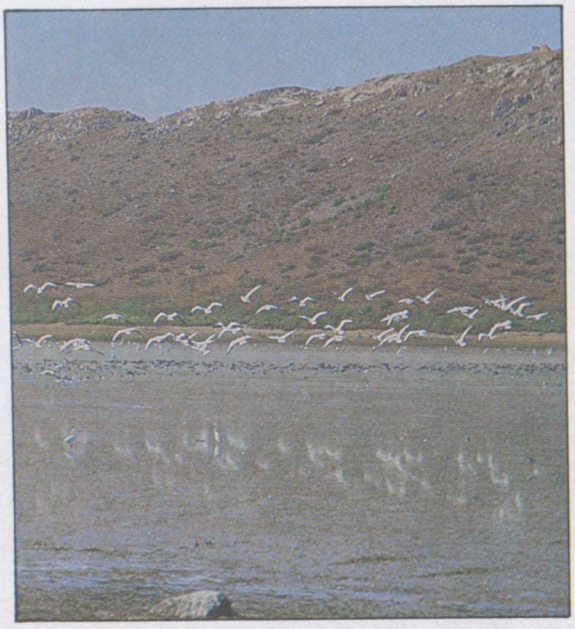
The Dihaila jheel

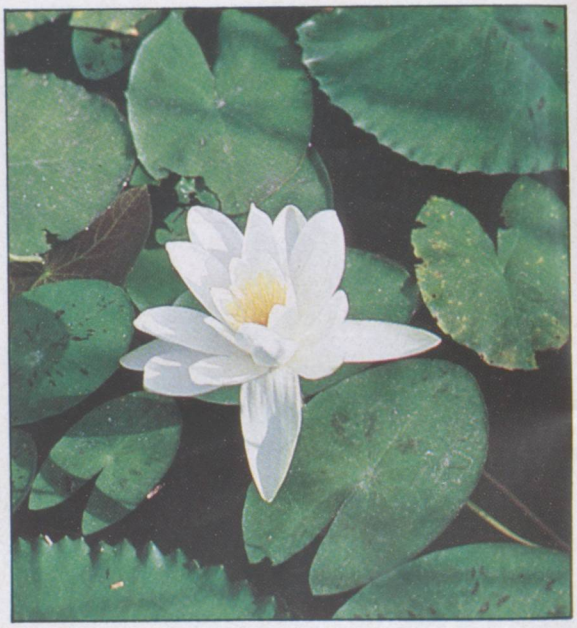
Text and photographs by Asad Rafi Rahmani

Besides Bharatpur there exist in India a number of spectacular jheels that attract tens of thousands of birds. One such jheel is the Dihaila jheel **(above)** discovered in 1982 by the Bombay Natural History Society. Being entirely rain-fed, its size and depth varies from year to year; during a bad rainfall year most parts of the jheel are used for agriculture. Except for Siberian cranes and a few other birds, practically every water-bird found in Bharatpur can be observed at Dihaila, including painted storks **(facing page)**, that feed voraciously on the abundant fish in the jheel. Painted storks are usually most active when the water of the jheel is in the process of drying up, as they make a feast of the fish left stranded in the drying puddles.

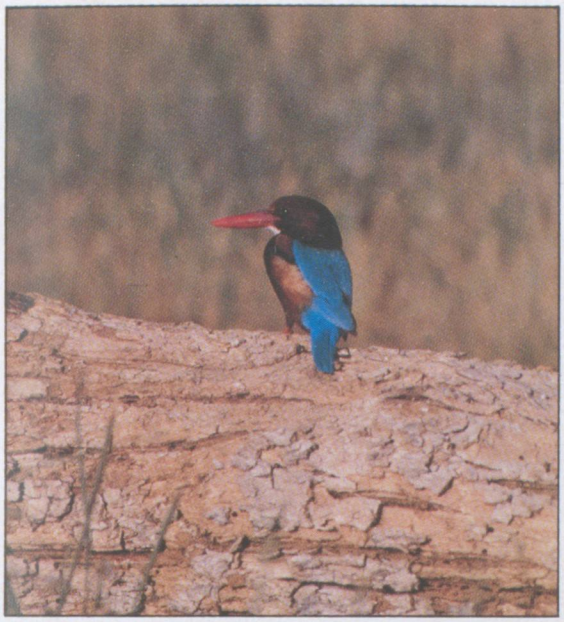
I was rather disappointed when I arrived at Karera in mid-October 1985, to be told by my colleague that only two to three thousand ducks had so far visited the Dihaila jheel. Fortunately, the disappointment was short-lived, for, the next evening I saw between 10,000 to 15,000 waterfowl, and more birds were coming in. The winter influx of Palaearctic birds had begun. For another ten days, there was great movement in and out of the jheel, and when the population stabilised







A flock of barheaded geese flies over the placid waters of the jheel **(top left)**. Nearly 600 barheaded geese and 300 greylag geese were counted in Dihaila in 1986; the birds arrive in November and depart in March. The sight of hundreds of such geese,writes the author, and the sound of their strong calls give one a feeling of exhilaration. Thousands of waterlilies **(top right)** dot the Dihaila jheel between the months of August and November. A group of barheaded geese **(above)** in a *chana* field. These gregarious birds do considerable damage to the standing *chana* crop at Dihaila, both eating it and trampling the fields. They are therefore rightly resented by the local farmers. Perhaps one way out of this problem would be to grow *chana* near the jheel,for the birds. This would minimise the damage done to agricultural fields.



Three species of kingfisher are to be seen in the Great Indian Bustard Sanctuary, at Karera. While the pied and common Indian kingfishers are restricted to water areas, the white-breasted kingfisher **(top left)** inhabits dry terrain too–its diet varying from fish and frogs to insects. A symbol of love and fidelity, the sarus crane, seen here nesting **(top right)** is a majestic bird. Breeding and nesting in the inundated fields near the jheel, these birds are sadly decreasing in number in many areas, owing mainly to the destruction of our wetlands. Fortunately, the population of sarus cranes at Dihaila, remains healthy. The margin of the Dihaila jheel is dotted with pond herons **(above)**, usually seen patiently waiting for an unsuspecting frog or fish to come their way before jabbing and gulping it down.

by the beginning of November, our estimate varied between one to four lakh birds. A mini-Bharatpur was before us.

In the sheer number of birds found there and by its incomparable beauty, Bharatpur has overshadowed all the other wetland areas in the country. Migratory birds have been associated with Bharatpur to such an extent that the two have become almost synonymous. People forget that there are

Continued on page 61

LET THERE BE LIFE

50

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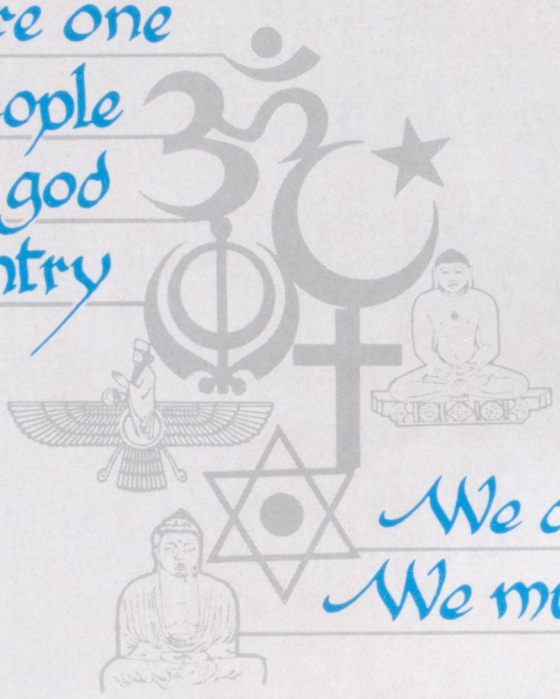

We are indians
We must integrate

"My religion has no geographical limits.
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—MAHATMA GANDHI

AMA - A - 11

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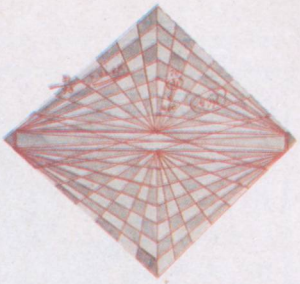

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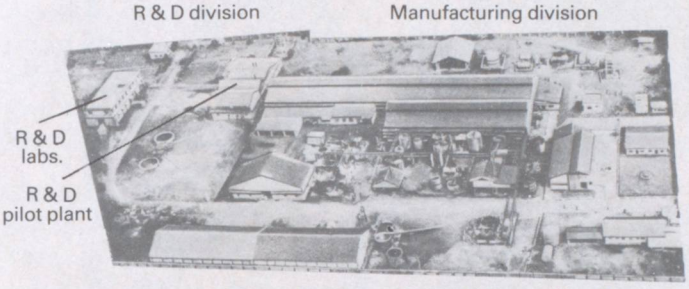
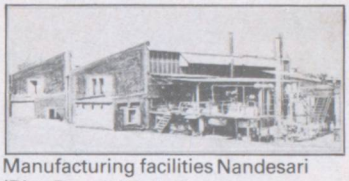


Aerial view of facilities at Edayar (Alwaye) Kerala.

R & D Laboratories
Edayar (via Alwaye)
Kerala.



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matter removed from it. However completely decomposed organic matter may be used; in fact, some species (*Epiphyllum* or *Hylocereus*) require such soil for normal flowering. Young plants will do well if broken charcoal pieces are added to the soil. Cacti require fertilisers, but the nitrogen component in them should be reduced considerably. Phosphorus and potash help the plants grow and flower profusely. However, very small quantities of fertilisers should be used, that too in pellet form, so that it can dissolve very slowly. A few pieces of broken shells may be added for plants that prefer an alkaline soil. Highly acidic soil will harm most species of cactus.

Cacti should be watered during their growing period, but not during the dormant period. There should be enough water to soak the soil as well as the pot, and drain holes in the pot, through which the excess water can run off, should be provided. If the water flows away through the sides of the pot without soaking through the soil at the centre, continue watering the plant. Allowing the cacti into the occasional rain is not harmful, but continuous rain will induce rotting in some species. Do not water the plants when the flowerpots are very hot. Water with too much chlorine and alkaline salts is bad.

When the plants outgrow their pots, they should be transferred to bigger ones. The pot containing the plant should be held upside down and its rim tapped slightly against a firm structure. The whole clod of soil with the plant will slip out. A portion of the root-knot should be trimmed off and the rest placed inside the larger pot with the gap between plant and pot filled with small chips, shell pieces and coarse sand. The soil should be moistened and the potted plant moved to a suitable site. Repotting becomes necessary only once in two or three years since cacti grow very slowly. When young seedlings are to be transplanted from nursery pots, each seedling should be transferred to a small pot without damaging the delicate roots. While repotting, the plants should not be watered if the soil is already wet. In the subsequent three to five days, the pots may be sprayed with water after which a regular watering schedule may be followed.

Although cacti can be propagated successfully through viable seeds, it is safer and quicker if their propagation is done through suckers or cuttings. With seeds one can expect some surprises, or variations. Cuttings may sometimes start rotting from the cut surface, to eventually die. To prevent such a mishap, it is advisable to leave the cutting in the shade for about a week or longer, until the wound dries. If it is thus planted, after the healing of the cut surface, fungi and bacteria will not easily get established.

Pests and diseases

Most cacti die because of fungal diseases that cause the rotting of roots and stem. Those who raise cacti from seeds must have experienced frustrating moments when their delicate plants perish from fungal molds. These plants should be treated with appropriate fungicides. Stems which just start rotting can be saved by trimming away the affected parts, including all the roots, treating them with fungicide and planting them in a new pot with fresh sand, under dry conditions. Among insect pests, scale insects are the most dangerous. It is internationally known that *Opuntia dillenii* was completely eradicated in India, Australia and Madagascar by one of the scale insects, *Cactoblastics cactorum*.

Grafting cactus

Creating attractive cactus grafts and displaying them prominently has become a popular art among cactus enthusiasts. This hobby is encouraged by certain commercial houses which mass-produce cactus grafts with bright yellow or red scions of the type *Gymnocalycium mihanovichii*. Further, some of these scions are exposed to gamma rays to remove the chlorophyll, for more striking effects. These bright red or yellow scions depend solely on their stock plant, usually *Hylocereus* spp. for their nourishment. They however, gradually lose their colour and wither away.

Grafting in the early years was done with varieties with a weak root system or with those species whose natural habitat and climate was

T.A. Davis

The delicate flower of the *Epiphyllum hookeri*. This plant is a familiar sight in Indonesia where it is known as 'Vidjaya Kusuma' or 'fragrant prosperity'.

difficult to imitate under cultivation. Of late, however, grafting is done with many attractive species and varieties with or without weak root systems. Apart from creating special effects from growing one particular cactus over another that differs in form, size and colour, there are other advantages in grafting. A cutting grafted on to a sturdy stock grows much faster than if it remains on the original plant. This facilitates quicker multiplication of precious cacti species. Sometimes, fascinating and similar rare formations are even noticed among original populations. Such rare monstrous forms can be brought to prominence by grafting them on to suitable stocks.

Nevertheless, not all varieties of cacti are suitable for grafting. A scion is normally grafted on to stronger stock. If it is the other way round the plants wither away quickly, due to exhaustion. Epiphytic cacti are most easily grafted, especially on *Hylocereus* spp. This three-winged stock can be grafted with three different scions, one on each wing, to obtain special effects. According to cactus specialists, the secret of successfully getting a graft to 'take' depends on the way the cuttings are made. The wedge-shaped base of the scion must snugly fit the cleft in the stock. No air pocket should be left between the cut surfaces. This will enable the formation of new meristematic tissues that will link the stock and scion. The scion can be held firmly on to the stock by the insertion of a long cactus spine. Metals that will rust should not be used for the purpose. The plant should be kept in the shade and in a dry environment. The scion must be kept in position by elastic bands passed through the bottom of the flower pot. They should not be too tight so as to damage delicate tissues. Within a month, successful grafts can be easily recognised. Spraying the graft with water should be avoided during the first month as this may lead to a fungal attack. But watering the pot at weekly intervals is, however, necessary.

The flowering of a cactus

The cladode-bearing *Phyllocactus hookeri* (whose name has since been changed to *Epiphyllum hookeri*) is a familiar home-garden ornamental in Indonesia, where it is known as 'Vidjaya Kusuma' (or 'fragrant prosperity'). Its large, pendulous flowers, bearing white floral leaves and stamens, bloom during the night almost exactly at 10.00 p.m. A large plant may produce five to ten flowers in one season, all of which bloom simultaneously, on the same night. People who look for a pretext to have social gatherings, make the blooming of the 'Vidjaya Kusuma' a fitting occasion for this, very similar to the celebration of a birthday or a wedding anniversary.

Relatives and friends are invited to watch the blooming of the *Epiphyllum* after dinner. The plant (if in a pot) is shifted to the drawing room and decorated with coloured lamps. If it is outside the house, the area is cleared and special lights provided. Visitors arriving by about 7.30 p.m., after eulogising this 'sacred' cactus, help themselves to cakes, soft drinks, beer or whisky. And by 8 o'clock, the sepals of the plant start unfolding and within an hour, the petals turn outwards. By about 10.00 p.m., the flower is in full bloom and remains this way for an hour. After this, the petals start folding back to their original position. Finally by about midnight, the flower closes—a signal for the visitors to depart. □

The Dihaila jheel

Continued from page 53

hundreds of other jheels—of course, not as spectacular as Bharatpur—which attract tens of thousands of ducks and waders and which play an important role in the conservation of bird-life in India. Unfortunately, most of these jheels are either unknown, neglected or unprotected. Also, as most of these water bodies are generally outside the forests, there is practically no control on shooting in these parts. Only a few jheels like Nawabganj near Lucknow and Sultanpur near Delhi are protected, and both these now attract an increasing number of birds,and tourists.

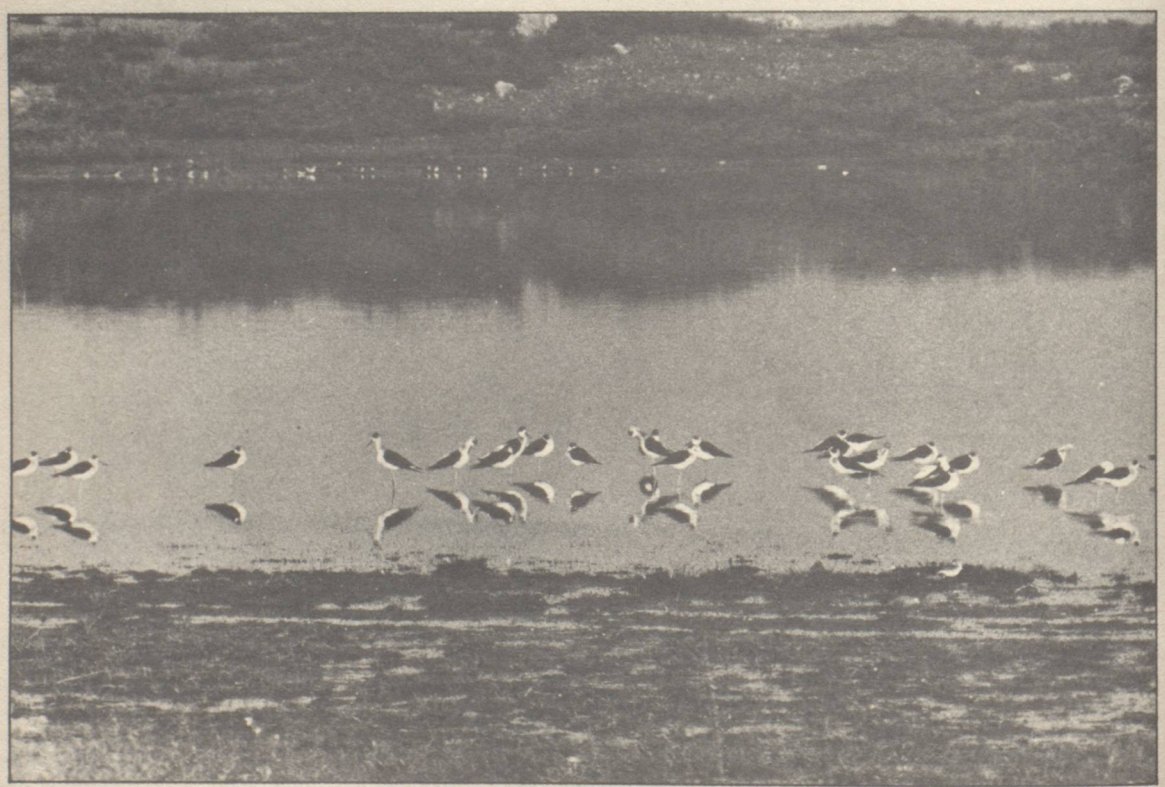
The Dihaila jheel—an exceptionally rich wetland was discovered in 1982 by the Bombay Natural History Society team within the Karera Bustard Sanctuary in the Shivpuri district of Madhya Pradesh. This jheel, situated near the Dihaila village, was however, not unknown to hunters, particularly military officers from Shivpuri, Jhansi and Babina. The local villagers informed me, some of them nostalgically, that military personnel used to camp near the jheel, for five to ten days,and kill hundreds of birds. Coots, egrets and spoonbills were magnanimously tossed to the poor villagers, who incidentally, were also employed to walk into the cold water to chase the birds towards the waiting guns.

After Karera was declared a bustard sanctuary in 1981, all the animals within were afforded protection, and the slaughter of wild fowl in the Dihaila jheel ceased. However, in the winter of 1983, a team of hunters, euphemistically called 'sportsmen', arrived from Jhansi with boats, camping equipment and sufficient ammunition to shoot a few hundred birds. On being told that the jheel was closed for shooting, they flaunted a licence from the Chief Wildlife Warden, who, not knowing that the jheel too fell under sanctuary limits, had given them permission to shoot a few ducks. It was a delicate situation. The hunters were bent on exercising their dubious permission. The local *thakurs* had told us earlier that if outsiders were allowed to kill, they too would shoot birds for food. The *thakurs* used to shoot a few hundred water-birds for the pot, every year until this was stopped in 1981, much to their resentment. (Incidentally, the price of domestic village fowl has gone up in the area because now that is the only bird which can be legally eaten inside the sanctuary!) The jheel is very close to the main bustard area and it was feared that once the hunters camped there, it would be very difficult to stop their nocturnal predation in other areas. A stern warning to them by the sanctuary superintendent, stating that their presence would disturb the highly endangered bustard, for which they could be booked under the Wildlife (Protection) Act, brought the situation under control. This also had the desired effect on the local *thakurs* whose status within the community depends upon the number of guns and the frequency of their use, not always on non-human targets!

The Dihaila jheel

The Great Indian Bustard Sanctuary at Karera has again proved the importance of total environmental protection. Since the 202-sq.km. open land was declared a sanctuary, not only have the bustards increased in numbers, the other wildlife—blackbuck, chinkara, wolf, fox, jackal, etc., were provided with much-needed protection. The Dihaila jheel too is an added attraction.

When I started work on the great Indian bustard at Karera in May 1982, I did not realise that the dusty, over-grazed, flat depression in the main bustard study-area would be transformed into a beautiful bird



A flock of feeding black-winged stilts casts its reflection in the waters of the Dihaila jheel. These gregarious, long-legged waders,unlike many of their shorter-legged cousins—plovers and sandpipers—are able to feed in deeper waters. Even while not feeding, black-winged stilts may be observed standing in the water, preening or, seemingly, just whiling away time.

The Dihaila jheel

paradise,during the rains. We had to leave the place as soon as the rains commenced, in July, because the area was inaccessible. When we returned in October, we were treated to a sight of thousands of ducks and waders, where only a few months ago, innumerable cadaverous cows roamed in search of grass.

Being entirely rain-fed, the size of the Dihaila jheel varies every year. In 1984, due to insufficient rain in the region, the depression was not flooded, except for about ten hectares, near the Dihaila village. Fortunately, in 1983 and again in 1985, the monsoon was normal and the jheel area extended to more than 370 hectares. Rain water from upto five kilometres collects in the depression, and the construction of two bunds by the villagers has further increased its water capacity. The stored water is used for agricultural purposes during the winter. Thus, the villagers have inadvertently created a water-bird haven. Reciprocally, the birds enrich the water with guano. This guano-rich water is utilised for crop-cultivation, chiefly wheat. Moreover, during a drought, when crop yields in most of the surrounding areas are low, the villagers who own land in the jheel, harvest a bumper crop, thanks to the accumulated guano of thousands of birds. When the jheel dries up in March-April, the resulting pasture serves as grazing grounds for the hungry cows.

Except for the Siberian crane and a few reed-loving birds, practically every water-bird found in Bharatpur can be observed at Dihaila. Ducks, sandpipers, storks, ibises, spoonbills, egrets and many others vie with each other for space and food. Even flamingoes have been seen here. In 1983, we counted forty of these long-legged birds. Among the rarities of the region are the great-crested grebe, scaup duck and the black-necked stork. Three or four pairs of sarus cranes also breed in the jheel or in nearby inundated fields.

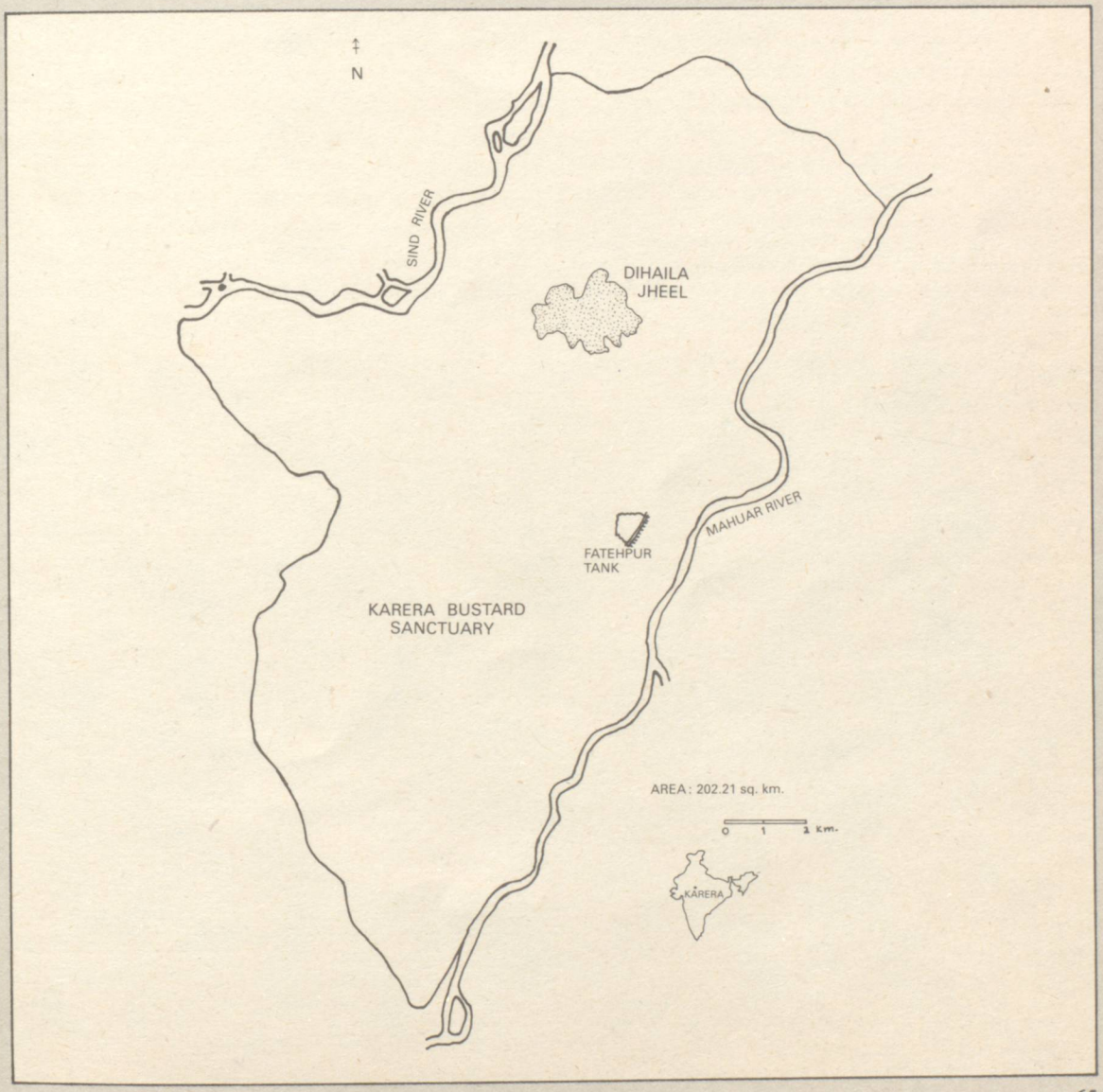
The depth of the Dihaila jheel varies from a few centimetres to three metres. The slow gradient of water produces micro-habitats, conducive to a number of bird species, from little stints to greylag geese. The shallowness and clarity of the water allows sufficient sunlight to penetrate to the bottom, thus resulting in luxuriant submerged vegetation. Thousands of pintails, common teals, shovellers, gadwall, wigeon, garganeys, spot-bills and comb ducks converge upon this jheel, and wherever the water is deep enough, diving ducks, like the several species of pochards (common, tufted, white-eyed and red-crested) are to be found. Between 1,200-1,500 barheaded and greylag geese vocally demonstrate their presence (Dr. Salim Ali considers the call of geese one of the most exhilarating sounds in nature), and as geese are found mainly in large wetlands, their presence here gives one a feel of wilderness and openness. To hear the nasal call of geese, coming over a misty jheel on an early winter morning is quite an unforgettable experience.

The Dihaila jheel

Since geese are highly gregarious birds, congregations of upto 200 birds are not uncommon here. While both species feed on winter crops, barheads, unfortunately, do considerable damage to the Bengal-gram (*chana*) crop. *Chana* is grown all over the sanctuary, as a winter crop, and is also eaten by both the bustard and sarus crane. While the rare bustard is tolerated by the villagers, the geese are rightly resented because not only do they eat crops, but they also trample on them. Because of constant harassment, the movements of barheads to any one particular field were unpredictable, so I was unable to photograph these magnificent birds. During

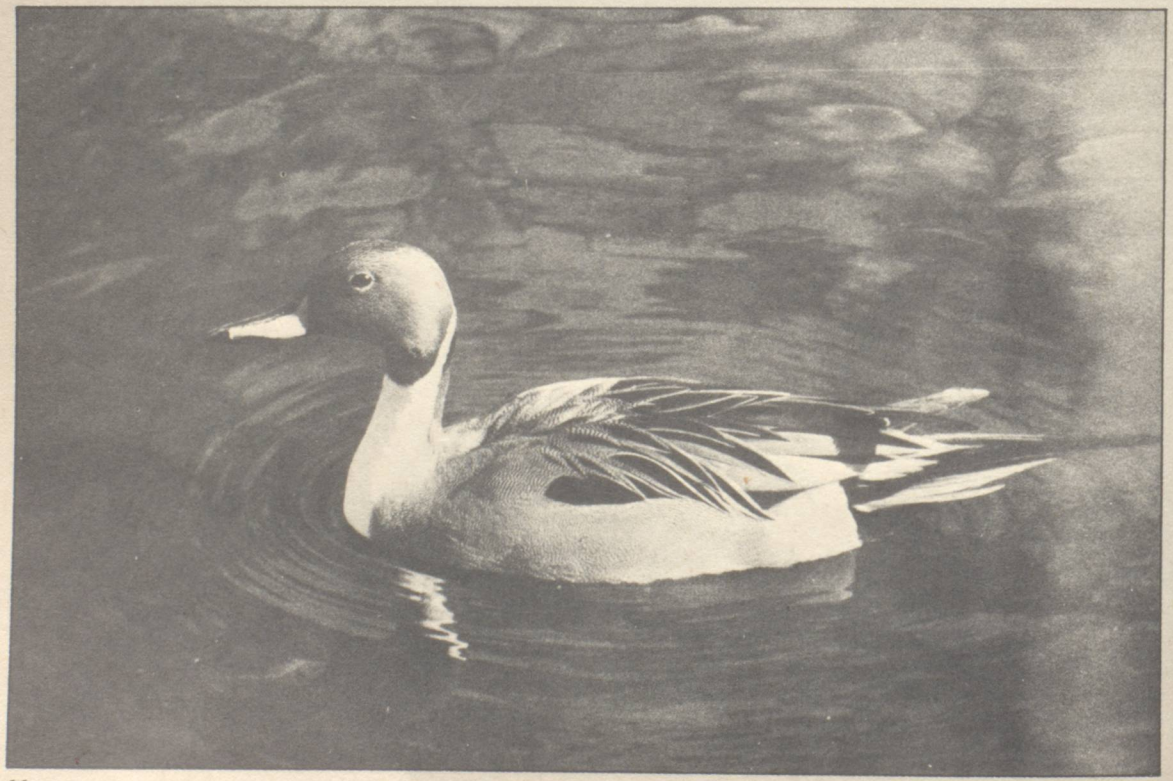
In a year of good rainfall at Dihaila, birds such as egrets harvest this rich aquatic food source, standing with their long legs well submerged in the water– a characteristic trait of herons.

The Dihaila jheel



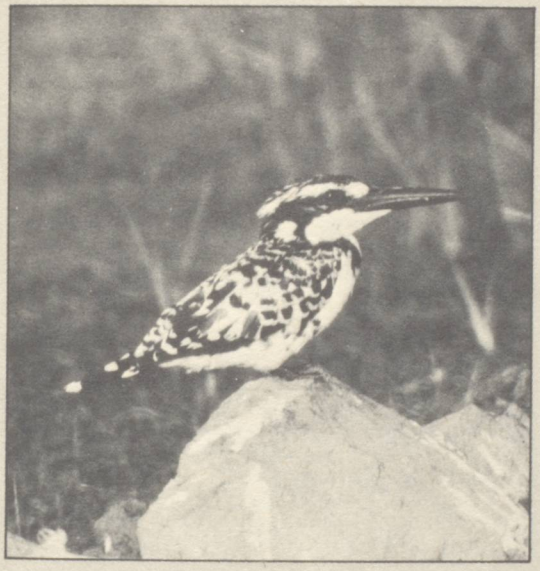
The Dihaila jheel

the first two seasons, whenever I was free from bustard work, I used to be on the look-out for barheaded geese, but the wily birds never obliged me with a photograph. In 1984, I set up hides near two of their favourite *chana* fields, but when I was in one of the hides, the geese were near the other. Fortunately for me, in March, when most of the *chana* fields were already harvested, one field owner lost interest in his partially devastated crop and allowed me and the geese to satisfy our respective passions. Within half an hour of entering the hide, which was in the middle of the *chana* field, I was surrounded by about 200 squabbling barheads. After excitedly



Perhaps the most common wintering duck of northern and peninsular India, the pintail is normally seen in large flocks often associating with other waterfowl. These ducks, while feeding, provide some interesting moments in bird-watching as they up-end in the water; tails pointed up, beaks probing beneath the water for food.

The Dihaila jheel



A handsome bird, the pied kingfisher is a true kingfisher, both in name and habits, for it feeds almost entirely on fish. Settling on a branch or stone, always near water, its hovering and dives into the water are a fascinating sight.

finishing the film, I had to wait for an hour to emerge because the birds were feeding all around the hide, quite oblivious of my presence, and I did not like the idea of disturbing them. Needless to add here, the geese were at their best when there was no film in the camera!

The population and composition of the birds at Dihaila vary from month to month. When the jheel is dry, i.e. between April and June, it facilitates the nesting of red-wattled lapwings and larks. Comb ducks, (*naktas*), spotbills and lesser whistling teals herald the arrival of the monsoon but these birds soon disperse to other areas to breed. By August, little grebes, jacanas and cotton teals start nesting in the jheel and also in the myriad small ponds dotted all over the sanctuary. October sees the influx of Palaearctic migratory birds, with the pintail, garganey, common teal and waders arriving first. By November, the duck population becomes more varied with gadwall, wigeons, shovellers, tufted pochards and common pochards predominating. A sprinkling of red-crested and white-eyed pochards further contributes to the variety of birdlife. Once the barheaded and greylag geese arrive, by October end or early November, they steal the show! Brahminy ducks arrive along with the geese but these ducks generally move separately, in pairs or in small parties. Some brahminis can be seen right upto the end of April when all the other ducks have departed. December and January are the months when all species of migrants may be observed, and during these months there is a decrease in the population of ducks because many birds move out to other water-bodies. By February, when the water becomes more shallow, the population of shovellers increases. This species likes to feed in shallow water on crustaceans, molluscs, water insects and their larvae, along with submerged vegetation. By the end of February, the birds acquire nuptial plumage and are ready to go to their temperate homes to breed. Every increase in the mercury level, serves as an indicator to the

The Dihaila jheel

ducks and waders that their breeding grounds are ready to receive them. And one fine day the jheel is empty of ducks. By the end of March and in early April, egrets and storks assemble to feast on the fish left stranded in the fast-drying puddles. It is not long before the harsh April–May sun bakes the jheel dry. Larks, pipits and lapwings once again occupy the dry jheel.

At present, very few water-birds nest at Dihaila, mainly due to the paucity of cover. Once trees are planted and protected, this jheel will certainly witness the breeding of spoonbills, egrets, storks, ibises and

An army of open-billed storks stands watch on an *acacia* tree in the Fatehpur tank. During a normal year of good rainfall, the Dihaila lake supports a healthy population of these birds.

The Dihaila jheel

A red-wattled lapwing settling on its clutch of three eggs. Having only recently wet its underbody, it will sit on its eggs,so protecting them from the hot rays of the sun and keeping them cool.

cormorants. This was amply proved to me by the discovery of about twenty tightly-packed nests, on two trees in a small pond, four kilometres from Dihaila. The birds of the Dihaila jheel are perhaps waiting for a few secluded trees to start a breeding colony, à la Bharatpur.

Bird-ringing was started at the Dihaila jheel in October 1985, under the Bombay Natural History Society's Avifauna Project. The chief aim of this project is to be acquainted with the population structure and movement of Indian avifauna. It is hoped that this ringing will prove the Dihaila jheel to be an important wetland for migratory birds in the country. With the Central Government's recent concern to save wetlands, I think the Dihaila jheel is a strong contender to be listed under the Ramsar Convention.

Ramsar is a small town in Iran where, in 1971, conservationists concerned with the steady decline of wetlands, met and adopted a resolution named the Convention on Wetlands of International Importance, especially waterfowl habitat; in short, the Ramsar Convention. Till today, about 40 countries, including India have acceded to this convention, and nearly 500 sites, covering an area of nearly 50 million hectares, have been protected throughout the world. Bharatpur and Chilka are the only two wetlands in India listed under the Ramsar Convention. I feel that there is a lot of scope for providing more wetlands with long-term protection. Pakistan has nine such wetlands, and a small country like the United Kingdom has proposed to designate 132 sites. There are hundreds of jheels in North India, especially in the Indo-Gangetic plain, which need recognition as important abodes for waterfowl. A management plan to develop the Dihaila jheel into an excellent bird sanctuary is under preparation by the Bombay Natural History Society. Once this plan is implemented, the Madhya Pradesh Forest Department, well-known for its far-sightedness, will add yet another feather to its cap!

Conserving India's natural heritage

CITES and India

by Samar Singh

Samar Singh, a man who has held a host of high offices connected with wildlife and conservation, authors Conserving India's natural heritage. We reproduce extracts from this book which amply illustrates how intrinsically human survival is linked to that of man's natural environment. The purpose of the book is to stress that whenever our environment has been destroyed, man has suffered. Samar Singh achieves this purpose perceptively and succinctly without going into technicalities, and brings home a plethora of knowledge on conservation both to the layman and the professional.

A major factor responsible for the decline of wildlife all over the world is trade and commerce. International trade in wildlife and products thereof is indeed big business. In the late 1960s and the early 1970s, the size of the trade grew to unprecedented proportions. This aroused such concern that an international treaty was drawn up in 1973 to protect wildlife against such over-exploitation and to prevent international trade from threatening species with extinction.

Known as CITES, the Convention on International Trade in Endangered Species of Wild Fauna and Flora entered into force on 1st July, 1975, and now has 88 countries as Parties. The raison d'être of the Convention is best stated in its preamble in the following words:

"Recognising that peoples and States are and should be the best protectors of their own wild fauna and flora;

Recognising, in addition, that international cooperation is essential for the protection of certain species of wild fauna and flora against over-exploitation through international trade;

Convinced of the urgency of taking appropriate measures to this end....."

CITES covers both wild animals and plants and the member countries act by banning commercial trade in an agreed list of currently endangered species and by regulating and

monitoring trade in others that might become endangered. In a sense, CITES is a protectionist treaty in as much as international trade in species threatened with extinction is severely restricted. It is also a trading treaty in the sense that specimens of species, whose survival is less threatened, can and do enter international trade legally. Thus, CITES aims are in consonance with the World Conservation Strategy launched in 1980.

The provisions of CITES apply to species included in Appendix-I, Appendix-II or Appendix-III to the Convention, which need to be understood.

Appendix-I is expected to include "all species threatened with extinction which are, or may be affected by trade." The criteria for adding species to Appendix-I, adopted by the Parties, specify that if the status of a species is seriously declining it should be listed even if there is only a probability of trade. In addition, whole genera should be listed "if most of their species are threatened with extinction and if identification of individual species within the genus is difficult." The objective of this requirement is to control trade in species, even if they are widespread and common, which look alike and could be confused with a threatened species. So as not to endanger them further, no permits are issued for international trade in these species unless there are very exceptional circumstances.

Appendix-II is intended to regulate international trade in species which are not sufficiently endangered to warrant inclusion in Appendix-I, but which could become endangered unless trade in them is controlled. Its purpose is also to control trade in species which are similar in appearance to and could be confused with those listed in Appendix-I. International trade in these species is permitted with proper documentation issued by the Government of the exporting country.

Appendix-III is meant to provide a mechanism whereby a Party which regulates trade in a species not listed in Appendix-I or II can seek international help in enforcing that regulation. Any Party can list a species in Appendix-III for this purpose. For instance, India has invoked this provision of CITES for seeking international help in controlling smuggling of reptile skins by listing seven species of snakes in Appendix-III.

In addition, CITES clearly stipulates that Member States may enforce even stricter domestic controls than required by CITES, if they wish to give special protection to a listed species or may even ban trade in all their wildlife, as has been virtually done by India in the last few years.

The enforcement of CITES is naturally the responsibility of the Member States, who are required to establish Management and Scientific Authorities for the purpose. In most countries, enforcement of CITES regulations has been entrusted to customs officials. The Member States are also required to submit regular reports, including trade data and statistics, to the CITES Secretariat located in Switzerland. To ensure effective enforcement, the Secretariat—headed by a Secretary-General—acts as a clearing house for the exchange of information and liaison between the Member States and with other authorities and organisations.

On behalf of the CITES Secretariat, data on world trade in wildlife are collected and analysed by the Wildlife Trade Monitoring Unit (WTMU), which is a part of the IUCN Conservation Monitoring Centre in Cambridge, U.K. WTMU also receives and analyses relevant data and information from the IUCN/WWF TRAFFIC* Offices in different countries. Thus, by monitoring the trade closely, WTMU and the TRAFFIC network are able to assist the CITES Secretariat in its work, specially in highlighting the problem areas and issues.

While the Secretariat is responsible for the administration of CITES on a global basis,

* *Trade Records Analysis of Flora and Fauna in Commerce.*

the real decision-making body on all matters related to CITES is the Conference of the Parties, the official title given to a meeting of all the Parties to the Convention. It meets regularly every two years and may hold extraordinary meetings on the written request of at least one-third of the Parties. Its main task is to review the implementation of the Convention and to make such recommendations as it deems appropriate.

The scope of the Conference is wide indeed. The financing of the Convention and the budget of the Secretariat is its direct concern. At every biennial meeting of the Conference of the Parties, the budget for the next two years is approved. When the financial support of the U.N. Environment Programme began to phase out, the Conference met in an extraordinary meeting in 1979 to amend the Convention in order to make the financial contributions from the Parties compulsory. It is also the direct responsibility of the Conference to consider and make recommendations for improving the effectiveness of the Convention. For instance, the recommendation that the Parties should use standardised permits on security paper and stamps arose from the meeting of the Conference held at New Delhi in 1981. The other major responsibility of the Conference is to review and update the lists of species included in the Appendices. In fact, this has been a regular feature of every meeting and takes considerable time and attention in the agenda of each meeting.

In order to facilitate its task, the Conference of the Parties has established several Committees, the most important of which is the Standing Committee. It is a permanent advisory committee with a voluntary membership of nine Parties, six of whom are from different geographical regions and the other three are representatives of the Depository Government (Switzerland) and the Governments of the host countries of the previous and the next meetings of the Conference. The chief mandate of the Standing Committee is to act on behalf of the Parties in between meetings, in accordance with the guidelines or directions given by the Parties. The Standing Committee also oversees the execution of the Secretariat's budget, gives advice on matters brought to it by the Secretariat, and acts as a 'bureau' at Conference meetings. It meets regularly: about twice a year. The other committees—the Technical Committee, the Nomenclature Committee, the Identification Manual Committee, the Ranching Committee and the Threatened Plants Committee—have specific roles and responsibilities and are expected to keep the Standing Committee informed of their work and activities from time to time, as well as to report to the Conference when it meets biennially.

So far, there have been five regular meetings of the Conference of the Parties since CITES came into force in 1975—the first in 1976 at Berne (Switzerland); the second in 1979 at San José (Costa Rica); the third in 1981 at New Delhi (India); the fourth in 1983 at Gaborone (Botswana); and the fifth in 1985 at Buenos Aires (Argentina). During this period, the number of Parties has risen steadily: from 36 in 1976 to 90 in 1986—two-thirds of whom are from the developing world, the producer countries. This is a very important development, which clearly demonstrates the widespread appeal and acceptability of CITES.

India has been in the forefront of CITES almost since the beginning. The Government of India deposited the instrument of ratification on 20th July, 1976, and became Party to the Convention from 18th October, 1976. Thereafter, it has been actively involved in CITES and has played a significant role throughout. Apart from participating actively in each of the five meetings of the Conference of the Parties held so far, India hosted the third meeting at New Delhi from 25th February to 8th March, 1981. This was described by the CITES Secretary-General as "the best attended as well as hosted Conference of the Parties." It is worthy of note that it was for this meeting that the CITES logo was designed in

India. It was liked generally and was finally adopted by the Parties.

A major achievement from India's angle was the important role played by the Indian Delegation throughout the third meeting. Apart from providing the Chairman for the Plenary Sessions, India chaired three important committees and played an active role in the meetings of the other committees set up by the Conference. At the end of the meeting, India was elected as Chairman of the Standing Committee, the most prestigious body of the Convention. In the next meeting held at Gaborone (Botswana) in 1983, India was re-elected to this position for a further term of two years. In a unique gesture, the Parties unanimously extended this term for yet another two years, for a third time in succession, at the Buenos Aires meeting held in 1985. This was an exceptional honour, signifying the confidence and trust enjoyed by India amongst the CITES Parties. It has been my proud privilege to represent the country, throughout this period, on the CITES Standing Committee as well as the Leader of the Indian Delegations to the CITES meetings.

The period between 1981 and 1985 has been the most formative for CITES. During this period, the membership has almost doubled, making CITES the most popular and acceptable international treaty in the field of nature conservation. It is in these years that far-reaching decisions have been taken to improve the effectiveness of the treaty on a world-wide basis and specific measures have been initiated to forge regional bonds and cooperation as well as to plug significant gaps and loop-holes in the implementation of the Convention. It is also during the period that CITES has emerged as an independent financial entity. The recent establishment of a strong and separate Secretariat, with headquarters at Lausanne in Switzerland, is also a development of considerable significance. The role played by India throughout this period, specially as Chairman of the Standing Committee, has not been insignificant.

Perhaps the factor which has contributed most to India's image in the CITES network is its strong and consistent advocacy of conservation and as upholder of the basic philosophy of CITES "founded on the bedrock of deep concern and cooperation between the producing countries and the consuming countries of the world." This was best exemplified at the Gaborone (1983) and Buenos Aires (1985) meetings, where the Indian Delegation spoke out forcefully on these issues and championed, at times almost singlehandedly, the cause of conservation as opposed to consumption. It was in recognition of this role that, in a rather moving gesture, the representatives of more than 30 international and national non-government organisations signed and gave to the Indian Delegation at the Buenos Aires (1985) meeting, the following memorandum:

"To the Delegation of India attending the Fifth Conference of the Parties to CITES:

We wish to express our deep gratitude and appreciation for the diligent efforts of India to uphold the letter and spirit of the Convention, in spite of increasing effort to weaken the treaty.

Your Delegation's untiring work and eloquent spokesmanship in defence of the world's beleaguered fauna and flora are a credit to your country and an inspiration to the world."

There is no doubt that as far as CITES is concerned, a special role and responsibility has devolved on India on the world scene. At home, arising from this added responsibility and in recognition of the need for proper implementation and enforcement of the Convention within the country, there are some important issues which need to be addressed urgently. These are set out below:

— CITES is an international agreement, which must be implemented and enforced both by national policy and law. India's

present Export-Import Policy is well attuned to the overall objectives of CITES. It is very important however that there should be regular periodic reviews of this policy to ensure that the objectives of CITES are not overlooked. The Ministry of Commerce and the Chief Controller of Imports and Exports have to be particularly sensitive to this need.

— The existing Indian machinery for the implementation and enforcement of not only CITES but also other restrictions on trade and commerce in wildlife and its products is neither adequate nor entirely effective. There is need for careful examination of this aspect with a view to identifying existing weaknesses in the system and to work out proposals to strengthen it. It is essential to provide a special cell in the office of the Director (Wildlife Preservation) to handle all work relating to CITES. Since the Director is currently the Management Authority under CITES in India as well as Chairman of the Standing Committee, special international status and obligations devolve upon India to see that it sets an example of conscientiously observing the provisions of CITES. The other immediate need is to provide the four Central Deputy Directors of Wildlife Preservation at Delhi, Bombay, Calcutta and Madras adequate staff for enforcement work.

— The need for close cooperation and coordination between the Wildlife Organisation at the Centre and those in the States as well as the Customs and Revenue Intelligence cannot be over-emphasised. A complete understanding of rules and procedures on both sides and a spirit of mutual help and cooperation must be ensured, specially to check smuggling.

— There should also be energetic and consistent efforts to educate the public regarding the objectives of CITES, and to enlist public support for its enforcement. To attain this objective, there can be nothing better than enlightened public opinion and cooperation. The non-governmental organisations can play a very useful role in this regard and their help and cooperation should be taken.

— Finally, the need for separate legislation to implement CITES in India also needs to be examined for obvious reasons.

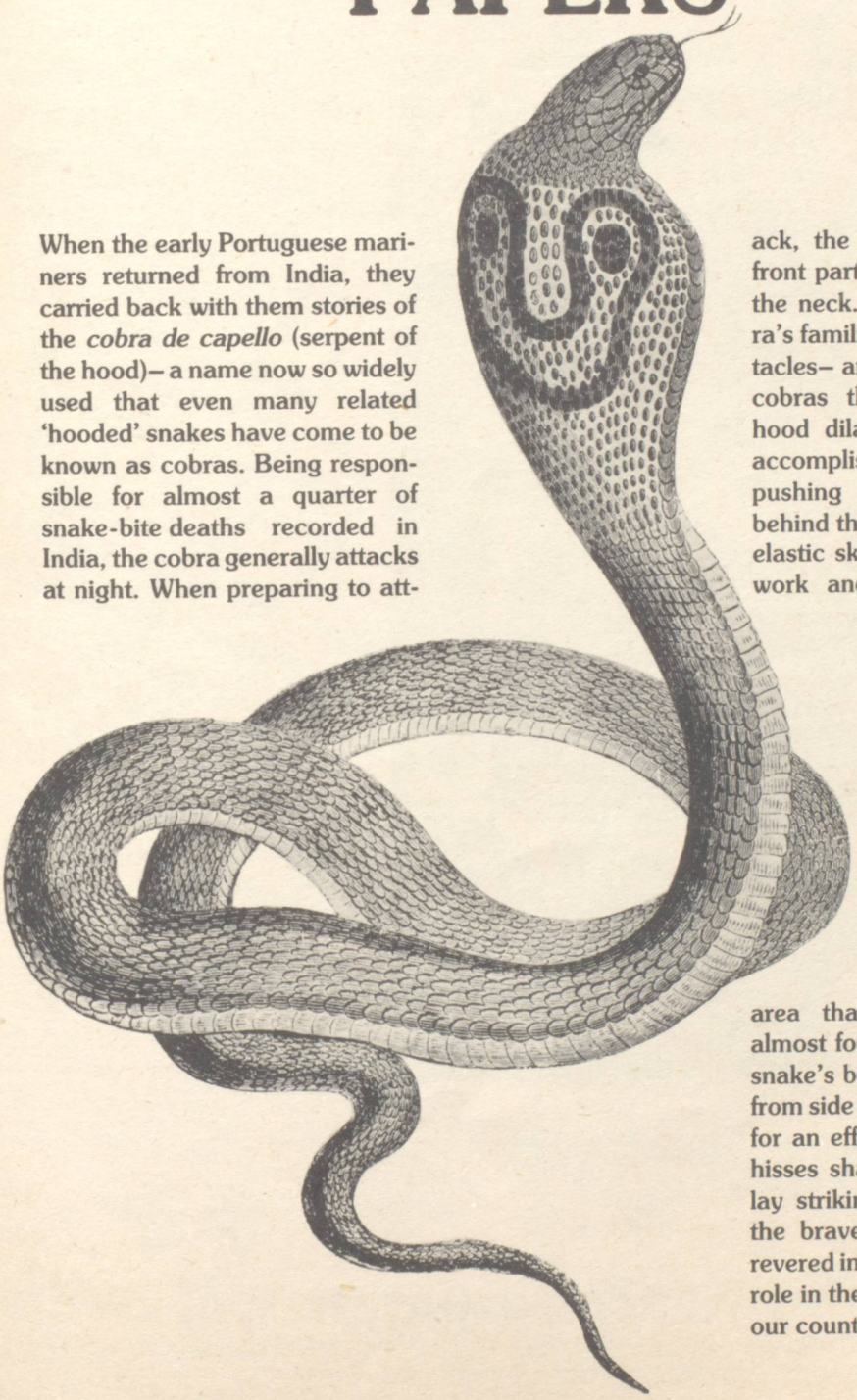
On a global basis, it has to be recognised that CITES has been in force for just over a decade within which considerable progress has been made. Most of the wildlife trading nations have become Parties and many exporting countries are strengthening their ability to control exploitation of their natural resources. The quality of available data and statistics on international wildlife trade has improved considerably and the controls on such trade are being improved steadily to deal with gaps and inconsistencies revealed by the analysis of export and import records. Besides, efforts are being made to strengthen regional cooperation to these ends. These are no mean achievements for an international treaty with only a decade of existence behind it.

On the other side of the balance sheet are some gaps in the geographical coverage; the lack of commitment even in financial terms—on the part of some Parties; the weaknesses arising from slack enforcement and implementation; and the complexity of procedures and appendices. However, the growing awareness amongst the Parties about their responsibilities and the very system established by the treaty, including the involvement of non-government organisations, holds promise for the future. CITES has come of age and can no longer be ignored.

As far as India is concerned, it is to be hoped that it will continue to play the role which has rightly devolved on it on the CITES arena.□

Conserving India's natural heritage, *published by Natraj Publishers, is available in India @ Rs. 150/-*

THE SANCTUARY PAPERS



When the early Portuguese mariners returned from India, they carried back with them stories of the *cobra de capello* (serpent of the hood)– a name now so widely used that even many related 'hooded' snakes have come to be known as cobras. Being responsible for almost a quarter of snake-bite deaths recorded in India, the cobra generally attacks at night. When preparing to attack, the reptile first raises the front part of its body, flattening the neck. This is when the cobra's familiar markings– the spectacles– are clearly visible. Of all cobras the spectacled cobra's hood dilates the most. This is accomplished by raising and pushing forward the long ribs behind the neck, stretching the elastic skin taut over the framework and forming a flattened area that can sometimes be almost four times as wide as the snake's body diameter! Swaying from side to side, as if measuring for an effective strike, it usually hisses sharply, the overall display striking terror in the hearts of the bravest men. The cobra is revered in India, and plays a major role in the religions and myths of our country.

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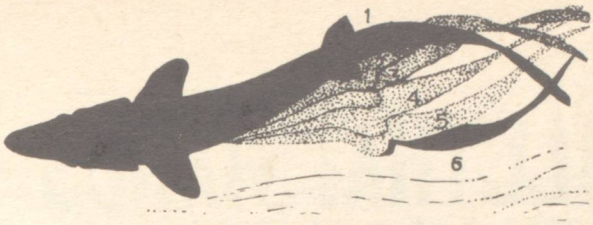
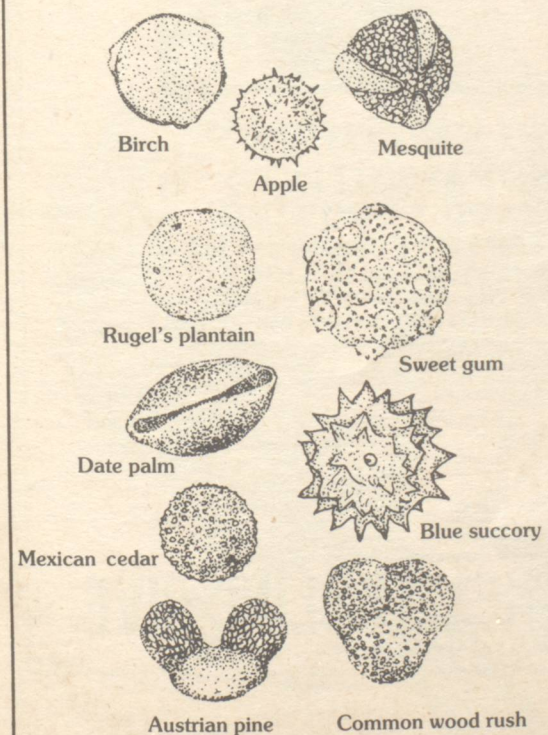


As a fish swims, waves of muscle contractions pass down the side to the tail. These numbers show the sequence of tail movements. When the left side muscles contract, the tail swings to the left.

In the plant kingdom only seed-bearing plants produce pollen. We all know that pollen is yellow or orange in colour, but what exactly does pollen look like? And how is it shaped? Through a microscope, these minute, dust-like granules display an unusual variety of forms, each one unique to the particular species of flowering plant.



Owls that fish

Not all owls feed on rodents, insects and birds. Some species are well adapted to catching fish. Fishing owls are largely diurnal or semi-diurnal. They possess smaller facial discs compared to their non-fish-eating relatives. This means that sight is more important than hearing to these fish-catchers. The legs of a typical fishing owl are unfeathered and like fishing eagles and ospreys, they scoop up slippery fish from the surface, using their extra sharp talons for the capture. On the undersides of their feet are sharp, rough spicules which facilitate a firm grip on the prey.

ALL THAT STANDS BETWEEN DARKNESS AND HER IS YOUR SIGNATURE.

To,
K.S Gupta
The General Secretary,
Lok Kalyan Samiti,
Sucheta Bhavan,
11-A, Vishnu Digambar Marg,
New Delhi - 110002.

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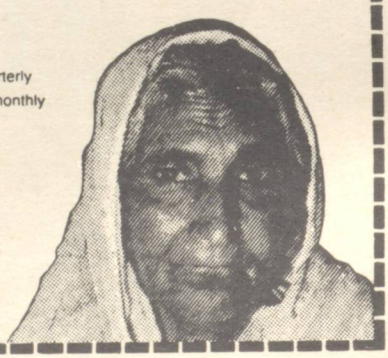

IMAGINE A WORLD OF LENGTHENING SHADOWS. OF VISIONS FADING INTO OBLIVION. A WORLD STEADILY GROWING DARKER. CATARACT. A DISEASE THAT CLOUDS THE LENS OF THE EYE OBSTRUCTS THE PASSAGE OF LIGHT. MILLIONS IN OUR COUNTRY, ABOVE THE AGE OF SIXTY ARE ENGULFED IN THIS FOG. WE, AT LOK KALYAN SAMITI ARE ASKING YOU TO HELP

WE TAKE CARE OF OVER 35,000 EYES EVERY YEAR. WE HAVE ORGANIZED 71 EYE CAMPS IN RURAL AREAS AND OPERATED UPON 3892 CATARACT PATIENTS TO DATE. YOU CAN HELP FINANCE A CATARACT OPERATION. IT COSTS AS LITTLE AS RS. 100/- WITHOUT WHICH THEIR VISION CONTINUES TO GET FOGGIER. AS YOURS IS BEGINNING TO, WHILE TRYING TO READ THIS MESSAGE SET YOUR SIGHTS ON THE NEARLY BLIND. GIVE.

Lok Kalyan Samiti

(Founder: Late Smt. Sucheta Kriplani)

A voluntary, non-political-non-profit health and welfare organization

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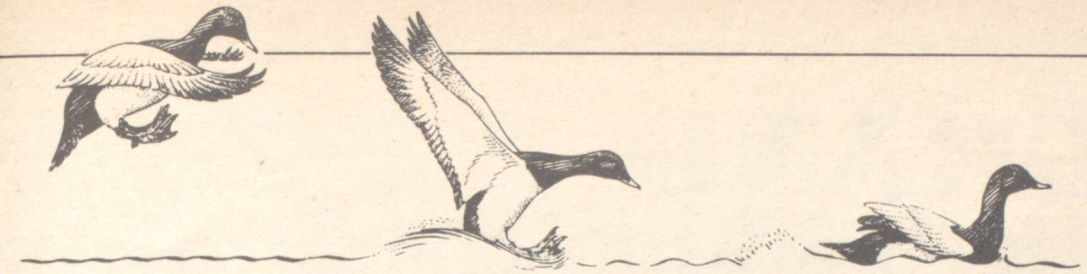
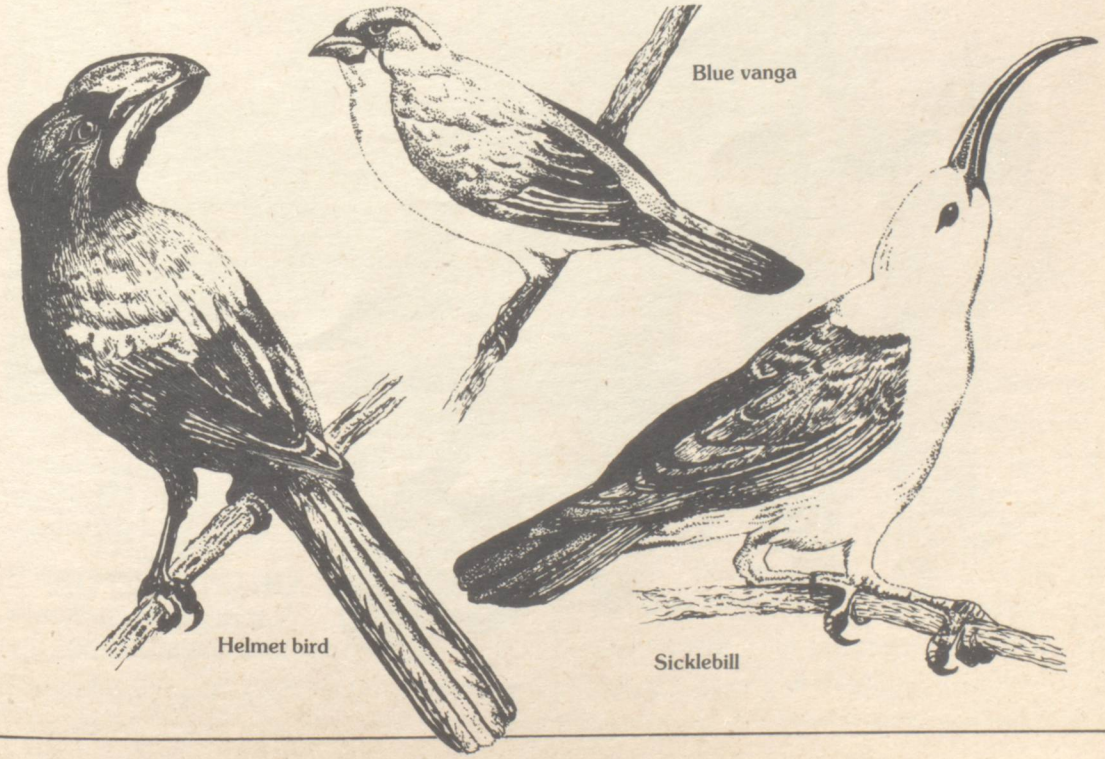


The duck flies low over the water and splashes down, braking with its webbed feet and using its wings to 'backpedal' and reduce speed, to land. While taking off it must get air moving over its wings—to achieve lift. This duck will patter over the surface and flap its wings until it gains enough momentum for take-off.

These three birds are believed to have descended from a single ancestral type. They are the vanga shrikes that are a family of 12 species unique to Madagascar. Over time they developed different bills and feeding habits, allowing them to co-exist without competing for food. The helmet bird feeds on comparatively large prey such as lizards. The blue vanga is an insect-eater and the sicklebill probes into crevices to find food.



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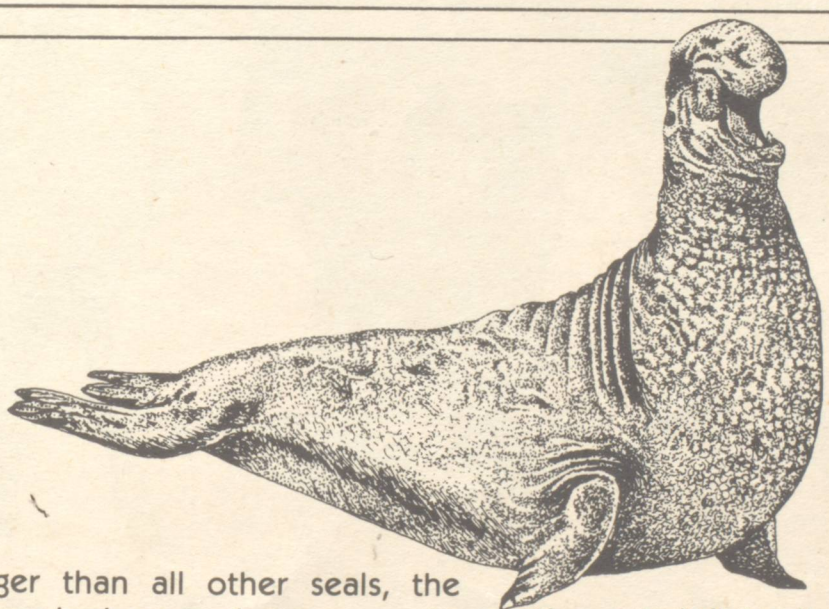
Lizards are cold-blooded, their body temperatures change according to their environs. Desert lizards maintain a constant temperature by several behavioural changes, throughout the day. They bask in the sun in the early morning, to warm-up. Mid-morning they hunt for prey. When it becomes too hot they raise their bodies off the ground to keep cool. By midday they shelter in their burrows, or under rocks, and by mid-afternoon and late day they resume their activities. Later in the day they bask again, absorbing the heat of the fading sun, before retreating into their burrows once again to survive the chilly desert night. There are exceptions, however. The desert iguana of North America is one species that prefers high temperatures and is most active round about midday.



Larger than all other seals, the huge elephant seal may grow to over six metres in length and may measure as much as five metres around its middle. It may weigh as much as three tons. The elephant seal gets its name, not from its size but because of the male's elephant-like trunk. Though this snout usually hangs limply over the animal's mouth, during mating time the male inflates it, lifts it straight up or curved over the mouth, where its roar is amplified. Awkward and clumsy-looking, the elephant seal is nevertheless a graceful swimmer and can dive to over 60 metres. One species breeds in the Pacific, mainly off California and Mexico, the other is found in sub-Antarctic waters.

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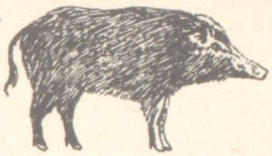
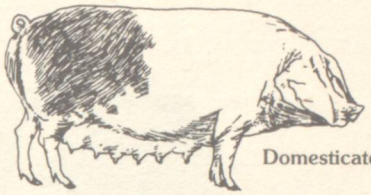
The largest tarsier, a primitive primate, is only six inches long and has a 10-inch-long tail. Tarsiers sleep during the day, clinging to upright branches. Sticky disks on their toes help them cling onto all kinds of surfaces. Nocturnal, they are agile jumpers—leaping to as much as two

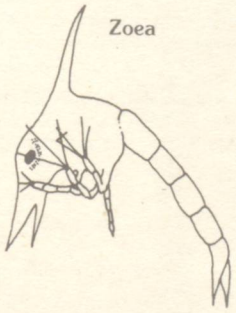
metres from tree to tree. They can cling even to vertical tree trunks. On the ground they hop like frogs, covering over one metre in one jump.

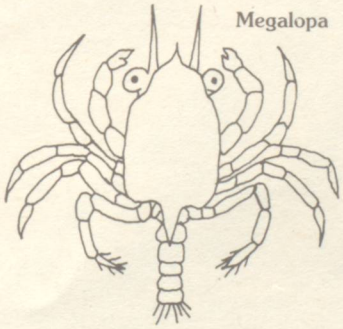


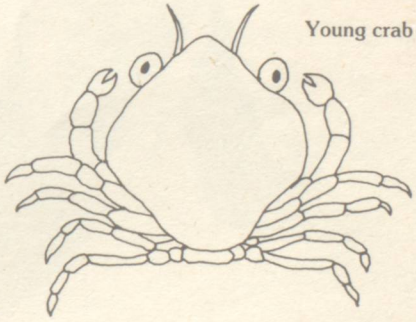


Heftier than its cousin, the wild boar, the domesticated pig has less hair and a rounder snout.

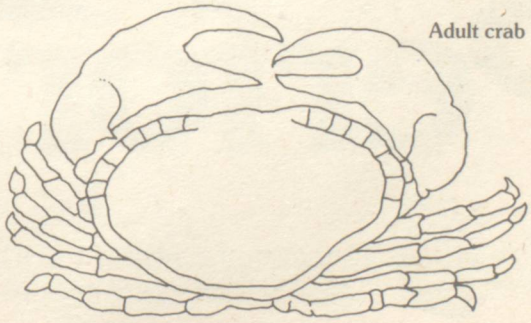
The European song thrush smashes snail shells against a rock to feed on the snail within. The rock is called its anvil rock.







The young larvae of the edible crab are called zoeae. The zoea is free-swimming, and about three or four weeks after hatching, it is transformed into a megalopa larva, which sinks to the sea floor. The megalopa larva changes into a young crab with a shell width of about 2.5 mm. in a few days. Finally, when fully adult, it can measure as much as 30 cm. or one foot across.



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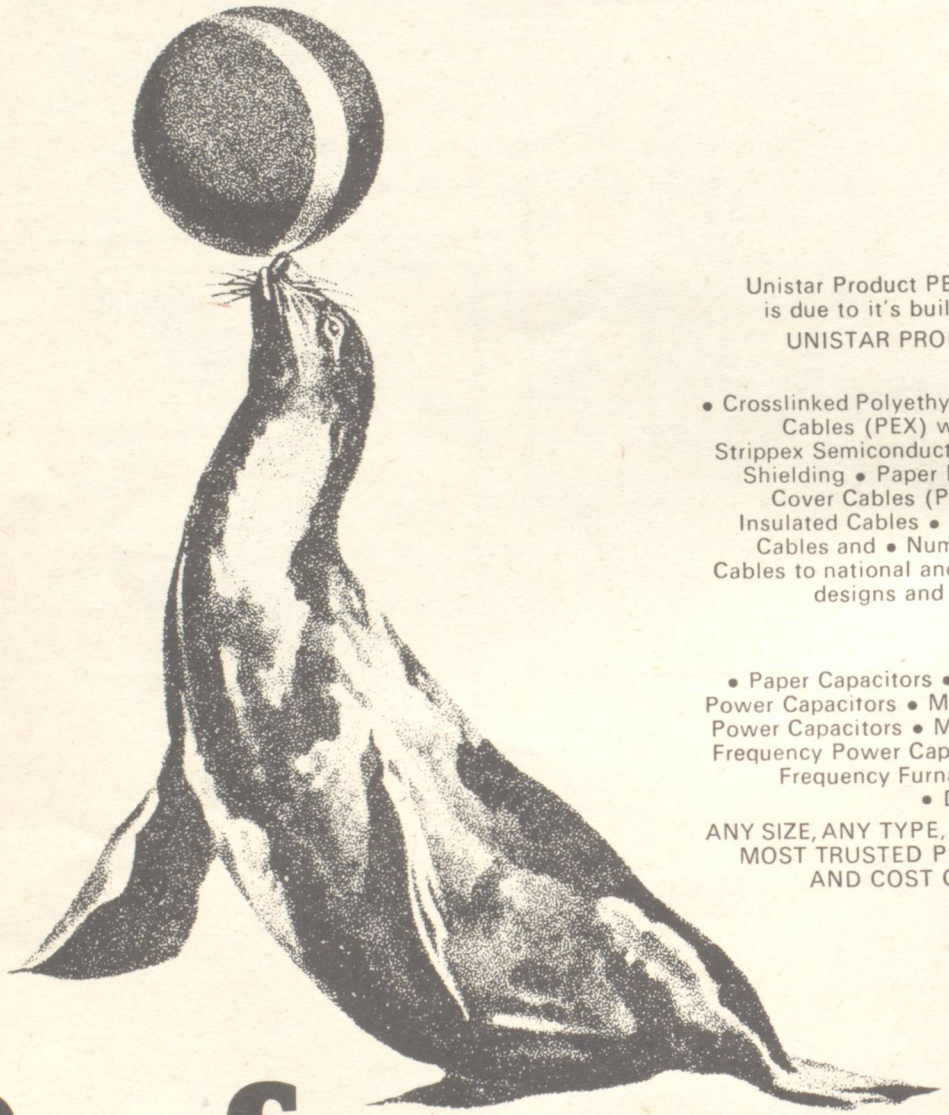

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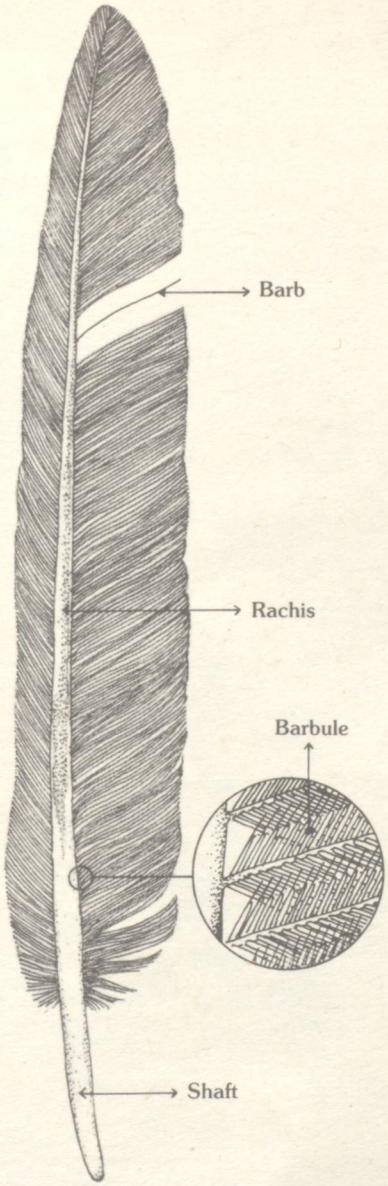


A bird's feathers are so intricately designed that a ruffled feather can magically be restored. Extending from the central rachis are barbs made up of hundreds of barbules—each barbule hooks on to the adjacent ones.

Man has tiny bones in him once meant for a tail, and unworkable muscles once meant to move his ears.

The grizzly bear can run as fast as the average horse.

The koala bear does not eat anything but eucalyptus leaves; it does not even need water.

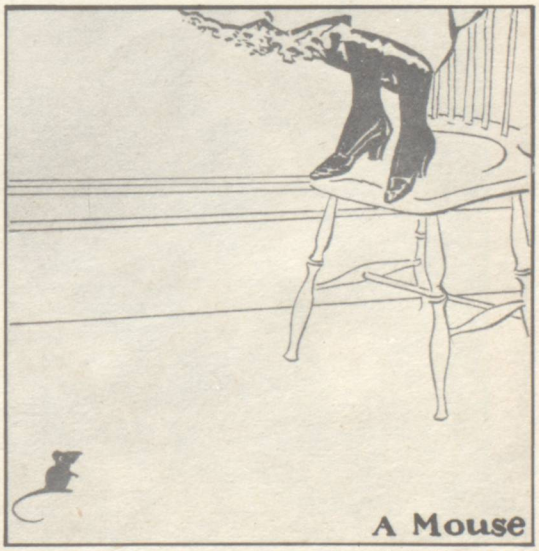
Toads and frogs use their eyes to help them swallow.

Desert snails may sleep for three or four years.

Fleas are necessary for the health of armadillos and hedgehogs. They provide stimulation. Deloused armadillos and hedgehogs do not survive for very long.

The Mouse.

CONSIDER now the Humble Mouse.
He is an Outlaw in the House.
He makes his Hiding in the Wall
And lives upon the Crumbs that fall.
And yet, my Child, although we deem
The Mouse a Pest, he stands Supreme,
The Wonder of Creation's Plan,
The only Subject known to Man
Concerning which we're safe to find
No Woman ever Changed her Mind.



Oliver Herford (1863-1935) was an illustrator whose whimsicality was firm yet delicate. Here is an unchanged reproduction of his original script and illustration.

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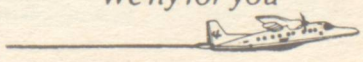

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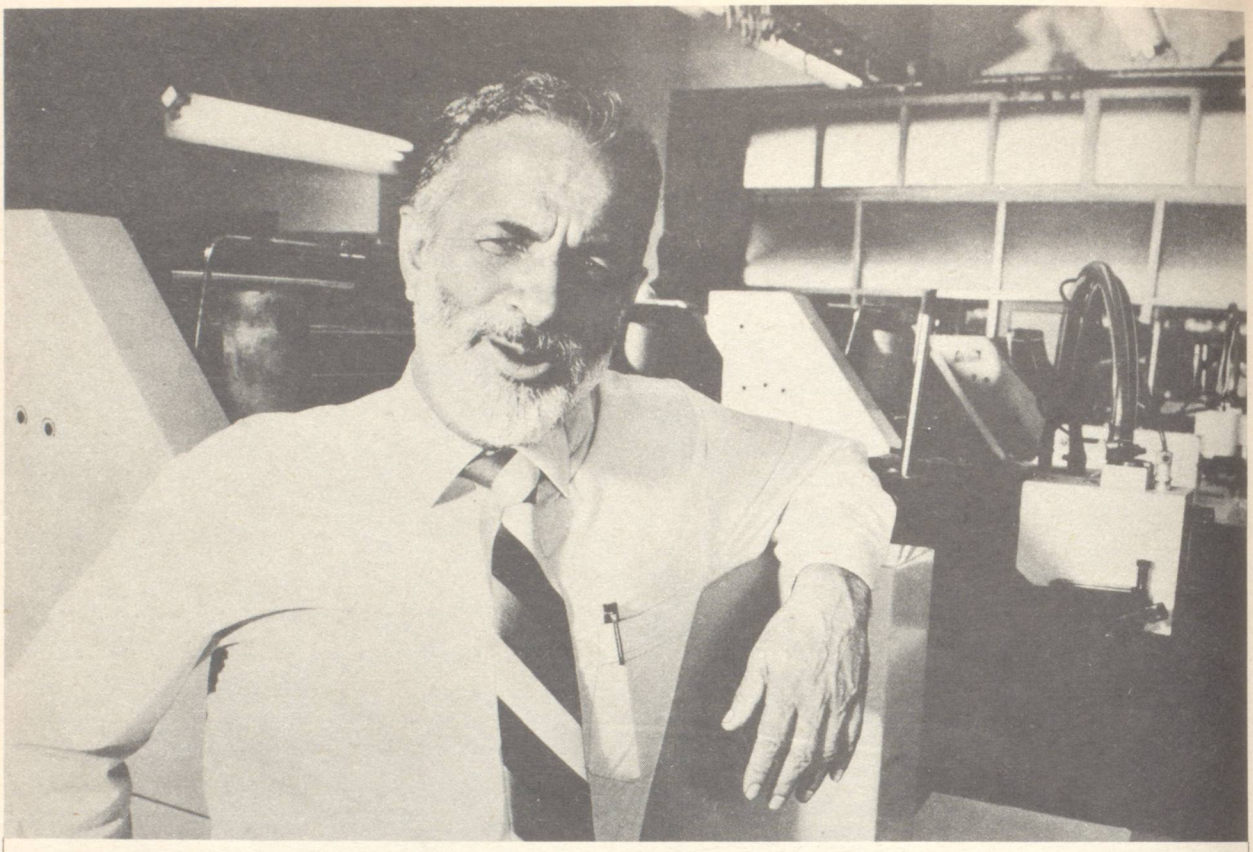

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Sunjoy Monga

ALARM CALL !

Murder most foul!

by Kunal Verma

Bihar often throws up the most bizarre stories, some so brutal that the image, when reported, shakes the entire country. The people in charge, be they politicians or government officers, either deny the report, or they take some action until the uproar has died down. The fact that at least sometimes the matter is taken up by the press is of little consequence to the oppressed, for their voice is very rarely heard. It's just that much more complicated when the victims have no voice of their own—a voice that could speak to the human race on *their* terms!

A flock of cotton teals wheels out of the azure sky, glides for almost thirty metres, and then with a soft splash the birds settle on the large expanses of water which dot the district of Purnia in north-eastern Bihar. The swamps, it would hardly be fair to call them 'lakes', are full of reeds and are ideal for a variety of waterfowl. The water is also littered with upturned earthen pots, or *matkas*, but the birds seem to be fairly comfortable among them, moving about and feeding in the reeds.

Then, very quietly, but abruptly, the teals start

Is mankind moving towards an evolutionary dead end?

Before you read a message on petroleum conservation you should know what is at stake.

It's simple: Should we encourage waste? Or should we discourage it?

Waste leads to an evolutionary dead end from which no species can return.

We cut trees indiscriminately only to face the awful repercussions: the destruction of fresh water catchment areas; the loss of topsoil; the spread of deserts and shortages in fuel and fodder.

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Transport: Improper driving habits and poor maintenance of vehicles.

Agriculture: Pumpsets that are not designed or installed correctly. The improper use of tractors.

At home: Improper cooking habits and inefficient burners and stoves.

The Dead End

With reserves of only 96 billion tonnes of oil and a present consumption rate of 2.8 billion tonnes of oil products per annum ... oil has only 34 years left. By wasting it, we are cutting down the time available to our scientists to develop other sources of energy. New and renewable sources of energy, for instance.

The danger is that we may be left without a viable source of energy in between.

Think about this. Petroleum utilisation needs your wisdom.

Petroleum Conservation Research Association,
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☐ My Home	☐ Kerosene	☐ Cooking Gas
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to disappear. At first, it looks like a teal has dived, as teals so often do, but before a minute can pass, another bird is swallowed up by the water. In a short while, an entire flock of half-a-dozen teals has gone, and the birds nearby are none the wiser. A *matka* starts to move, a bit too purposefully for it to be just drifting, and then like some sea monster rising from its watery domain, a man emerges from under the pot. In his hands, the flock of cotton teals hangs limply,their beaks opening and closing in a frantic effort to breathe.

The man then spends the next few minutes systematically breaking their wings, while the birds desperately try to get away. In another hour, they are being held up by their necks as an offering to the various truck drivers and cars which use the highway. A cotton teal will probably fetch Rs. 20, which is considerably less than what the men all around our 'hero' would make, for they are clutching larger ducks like pintails, large whistling teals, pochards and even the odd purple moorhen.

Besides using a pot to catch birds, the local populace is also adept at laying out nets for birds just below the surface. How many birds are caught in a day, no one can accurately even try to guess, but on the main highway (NH 37), there were at least six different waterfowl species for sale, and there must have been fifty men selling ducks. The number of birds ranged from six to as many as fourteen per man, and even if one was to take a conservative figure, there were over three hundred birds, their wings smashed, awaiting the final wring of the neck which would put them out of their misery.

In neighbouring West Bengal, a few kilometres south of the famous Farakka Barrage, the scene was played out again. This time, other than cotton teals, most of the birds were gallinules. Unlike in Purnia, where the duck-sellers had reacted violently to a camera, the men here even posed for *Sanctuary Film's* cine-cameras. Further south, in the Sunderbans, professional bird-trappers catch a variety of species, among which the ringed plover is the most popular, and even birds like terns are not spared.

If wildlife management has to fit into the scheme of things in our country, it is just not good enough to legislate a few rules and then to forget all about it. Many states have banned shooting as a sport for very valid reasons, but the amount of birds shot during the season would pale into insignificance if one were to compute the number of birds which are killed by this sort of inhuman trapping. What the damage is, in terms of the number of birds killed during the course of a day, is hard to arrive at, but the figure would be absolutely mind-boggling if there *was* a way to work it out.

The bird trade is undoubtedly a tricky problem which cannot possibly be stopped easily. It provides for relatively easy money in an area where poverty is the catchword. Besides, many people have nothing else to do, professional bird-trapping being a full-time job, with some people even referring to it as their 'family business'. Besides, in an area where there is a drastic shortage of meat, ducks provide a fantastic and much cheaper alternative.

Yet, it is imperative that something be done to control the indiscriminate killing. On the one hand, we spend crores setting up national parks and reserves to protect birds and animals, only to slaughter them the moment they step out of the sanctuary. For them (the birds), the boundary of a reserve can never have any meaning, and just as well. Both the state governments have to somehow reach across to the people, and only by appealing to their own sense of fairplay can they hope to achieve anything at all. When they will try and stop this slaughter, one can't say, but the longer they wait, the greater the number of birds held up by their broken wings for the trucks and cars that pass by.... ☐

Illustration by Gulam Hussain

In recent years there has been a growing awareness of the need to understand the ways of Nature. The BNHS pursues this quest for knowledge through various scientific and field surveys. To find out more about how you could be involved and to keep abreast of the latest developments in the field of Natural History, write to us today.

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READER'S FORUM

Please accept my heartfelt thanks and congratulations for capturing a most uncommon and remarkable event in the forest (*Sanctuary*, Commentary Vol. VI. No. 3, 1986).

Raghavendra Dikshit,
Balrampur.

We have really enjoyed the past issues of *Sanctuary* and, like yourselves in India, we also in South Africa are trying to save wildlife, to see animals again as prolific as they once were in their natural habitat.

V.L. Good,
South Africa.

Members of our organisation were delighted to see your magazine. It is superb! They do not believe that such a beautiful and purposeful magazine is being produced and designed entirely in India.

We request you to devote some more pages to Reader's Forum through which many more unknown but significant facts will be revealed.

B.B. Reddy,
Friends of Nature,
Andhra Pradesh.

I am a reader and fan of your magazine. The articles are matchless. I would like to know why such a good magazine is being published as a quarterly; you should bring it out every month.

Rakesh Bhatia,
Bombay.

I was quite impressed to read *Sanctuary* which I think must be the best in India as far as nature and wildlife photography is concerned. Congratulations!

Sanat J. Shodhan,
Ahmedabad.

Aerial seeding is being done in the Chambal ravines every year since 1980. The erosion in the loamy and sandy loam soils here has created the ravines that cover an area of approximately 3,10,000 hectares in Madhya Pradesh alone. This area is increasing at the rate of about 2,500 hectares per year.

Your readers may be interested to know that in the Chambal ravines, *Prosopis juliflora, Acacia catechu* and *Acacia nilotica* are the successful species, with *Acacia nilotica* being the best.

Also, you had published my letter (Reader's Forum, *Sanctuary* Vol. VI. No. 3, 1986) in which I had mentioned how 17 peafowls had been killed in a village Kanarhiya near Indore, in Madhya Pradesh and how three culprits were subsequently apprehended by the police under Section 3 of the National Bird (Protection) Act. While this case is pending, the judgement of another case has been passed.

Class I Justice Shri Gaur sentenced the accused, one Dhanna and four others, to a one-year term of rigorous imprisonment, and fined them Rs. 500/- under the Wildlife (Protection) Act. The culprits had killed a peacock in the forests of Jeta Donger in the Guna district, also of Madhya Pradesh. In case they should fail to pay the fine, their term will be extended by another three months.

Rajiv Saxena,
Gwalior.

Every year, from August to October, hundreds of birds take a fateful dive on moonless nights at Jatinga, a village nestled in the Barail hill ranges near the North Cachar district of Assam. During this time of the year, the Jaintia tribals light petromaxes in open spaces to attract the birds, which plunge down to the ground like dive-bombers. Some die immediately, while the injured birds toddle towards the lights and are clubbed to death by the tribals, who claim some 20,000 birds, every season!

Investigators agree on the point that certain weather conditions must be fulfilled in order to bring about this mysterious phenomenon. The night must be moonless; the wind in the south-north direction. The propensity towards this suicide increases with a steady drizzle or a foggy envelop under a cloudy sky. When these environmental factors are present, the birds are seen coming in hordes from north to south, flying towards the light sources. They circle overhead for some time and then plummet down to die.

Twenty-four species of birds have been identified committing such suicide, which I am told occurs nowhere else in the world. Two species are nocturnal and the rest diurnal. The first wave of birds, that comes in during August-September, comprises seven species including kingfishers, koels and green pittas. The next wave, September-October, of fifteen species includes violet cuckoos, blue rock thrushes, bustard quails and black bitterns.

Does the dazzling light have some magnetic induction like polarisation? It seems to hypnotise the birds into crashing to the ground. But why do the other lights glowing in the nearby railway station or hospital not have the same fatal attraction? Why do they rush only to one particular spot?

Birds have an in-built biological clock, that steers them through thousands of kilometres in the dark of night. Does this clock fail abruptly on a moonless night over Jatinga?

Can you or any *Sanctuary* reader unravel this mystery?

P. Chattopadhyay,
Midnapore.

There are no answers to the Jatinga mystery but what might interest you is that a similar event of 'suicide' in birds has been recorded by naturalists Sunjoy Monga and Ulhas Rane, in a place called Malshey Ghat in the Western Ghats, 150 kilometres from Bombay. Details and comments on this phenomenon were reported in the journal of the Bombay Natural History Society, Vol. 83(I): pages 68-77. They too report this behaviour in birds on highly overcast, misty nights and only during the first few weeks of the south-west monsoon. Many of their observations, in fact, bear striking resemblances to the Jatinga mystery, including a number of similar bird species. They recorded 20 species of birds involved in this peculiar behaviour.

After being out of town for some time, on my return, I was thrilled to receive the latest issue of *Sanctuary*. To say it is simply superb will hardly do justice to describe the contents, lay-out and photographs. My hearty congratulations to your team that produced this issue!

The write-up on Borivli National Park, the articles on the monitor lizards and raptors are excellently illustrated and very informative. Perhaps the extracts on Ranthambhore, though informative, could have contained some more details on tigers, langurs and other wild animals, because what you have published only whets one's appetite and leaves one hungry for more on the wildlife in Ranthambhore. In the past issue there was an exhaustive and superb article on the Kalakadu and Mundanthurai hills. Perhaps you could cover more such sanctuaries.

You are doing an excellent job to help adults and youngsters to learn, love and protect wildlife. I am eagerly looking forward to Vol. VII. No. I, 1987. Again, congrats to your team for a superb end-of-the year issue.

S. Kandasubramanian,
Madras.

It is good indeed to learn that the shooting of your film series on wildlife and conservation, is progressing smoothly.

My sincere best wishes to your team and you for success at every step in your grand enterprise.

N.S. Narang,
Patiala.

The article on Borivli National Park (BNP as we call it) by Sunjoy Monga (Vol. VI. No. 4.) is one of the best written articles I have come by of late, and I was thrilled and rather

proud to read it. He has covered the park and all its aspects pretty well.

We recently trekked the Yewoor trail and the density of the forest cover was simply unbelievable—particularly since it is so close to Bombay.

Coupled with this sense of pride and fascination I felt for the park, I can also sense a fear—fear for the forest, for all its trees and plants, for all its animals—for Bombay is so close to it!

You are aware, I am sure, of the wood-cutting and the illicit liquor distillation that goes on right under everyone's noses. I, myself, saw grass being cut, along the Borivli/Kanheri road, and casually piled onto trucks that come to pick it up. The policemen at the chowky at the entrance (where all vehicles entering are charged) refused to register a complaint and actually threatened us when we drew their attention to the matter. The fact that Borivli National Park is surviving in the midst of Bombay is itself great. But that does not give us a reason to let such acts occur. When the park has been given the status of a national park, commercial activity within it should be totally prohibited.

S. Lakshmanan,
Bombay.

I read in the papers about the sad case of a 133-kg. panther that had strayed into an air-conditioning plant in a government building in Wazirpur near New Delhi. The six-foot-long wild cat succumbed to head injuries sustained when it strayed too close to the rotors of a blower inside the plant. It was captured by zoo officials who fired tranquillisers to stun the animal. It died of its injuries soon after its capture.

First reports of the panther given by some workers in the tool room and training centre in the Wazirpur industrial area were dismissed lightly as 'flights of fancy'. It was only later that pug-marks of the animal confirmed its presence and sent the workers post-haste, seeking help.

Mr. S. L. Nagrath, the Chief Wildlife Inspector, Delhi, said that the animal appeared to be lame and might have escaped from a road-side circus, in Haryana.

Arun Harshwal,
Bombay.

I purchased *Sanctuary* from a local bookstall and found it to be one of the best magazines in our country!

Pravin Gangwar,
Bareilly.

I had the opportunity to go through an issue of *Sanctuary* and I must say that your magazine has made a definite impact on people at large, over its five years. The editorial content, that covers various aspects of the flora and fauna of Asia, is well-balanced in its presentation. However, I feel that the inclusion of a small section on the inter-relationship between animals, birds and man in terms of their benefit as biological controls as well as hazards to human health, would add a useful new facet to the magazine.

Dr. B.A. Gadgil,
Bombay.

We receive *Sanctuary* regularly and are happy to see that the initial excellent standard of the paper, colour photography, and variety and quality of its contents are being maintained.

Loreto House,
Calcutta.

I receive all my copies of *Sanctuary* regularly, and I enjoy reading them very much. The photographs and illustrations are excellent, so also the reading matter. God bless your undertaking!

Ann Rose,
West Australia.

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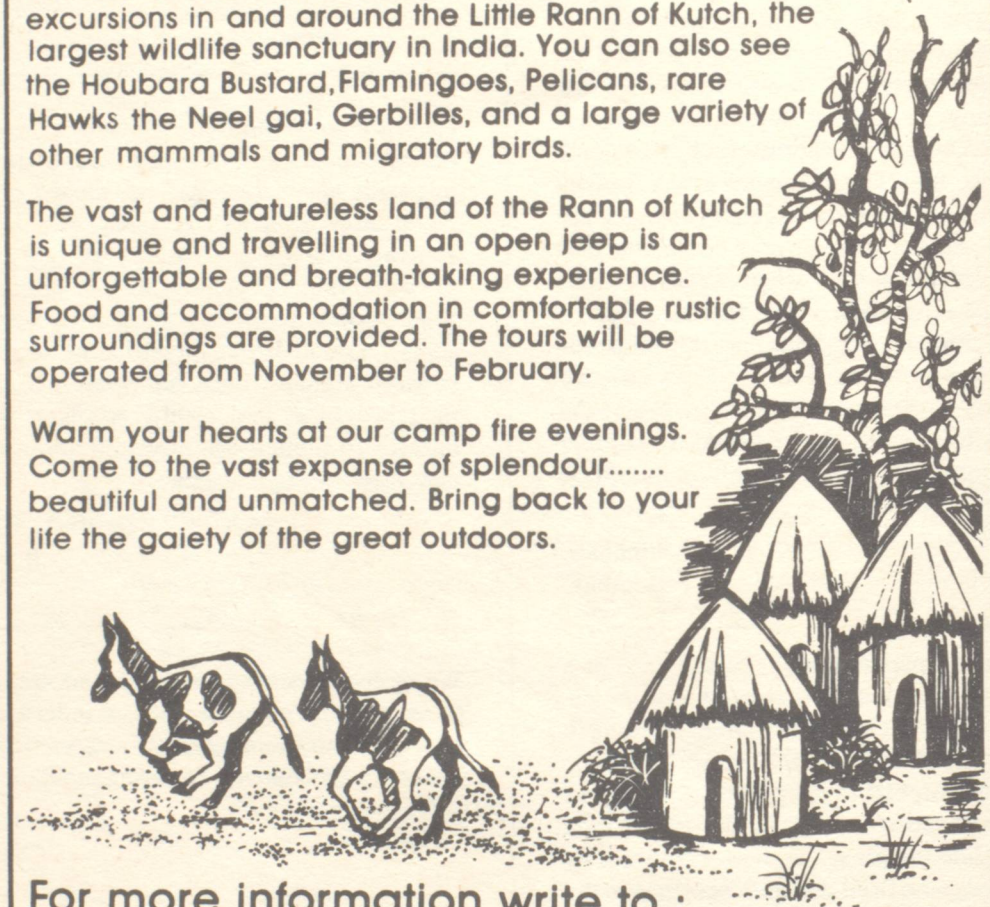

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CONFESSIONS

of a Husband

"I came home every evening dog-tired... only to find my *biwi* busy in that damned kitchen.

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And that made me and my *biwi maha khush,* because once I was home from office we had all the time in the world together.

Not only did these great-looking insulated dishes keep food hot until we were ready for it... but also helped save on reheating costs. (Believe it or not the saving made the Casseroles completely **COST-FREE** in a few months!)

The Eagle Casseroles sure put the *masala* back in our marriage!!"

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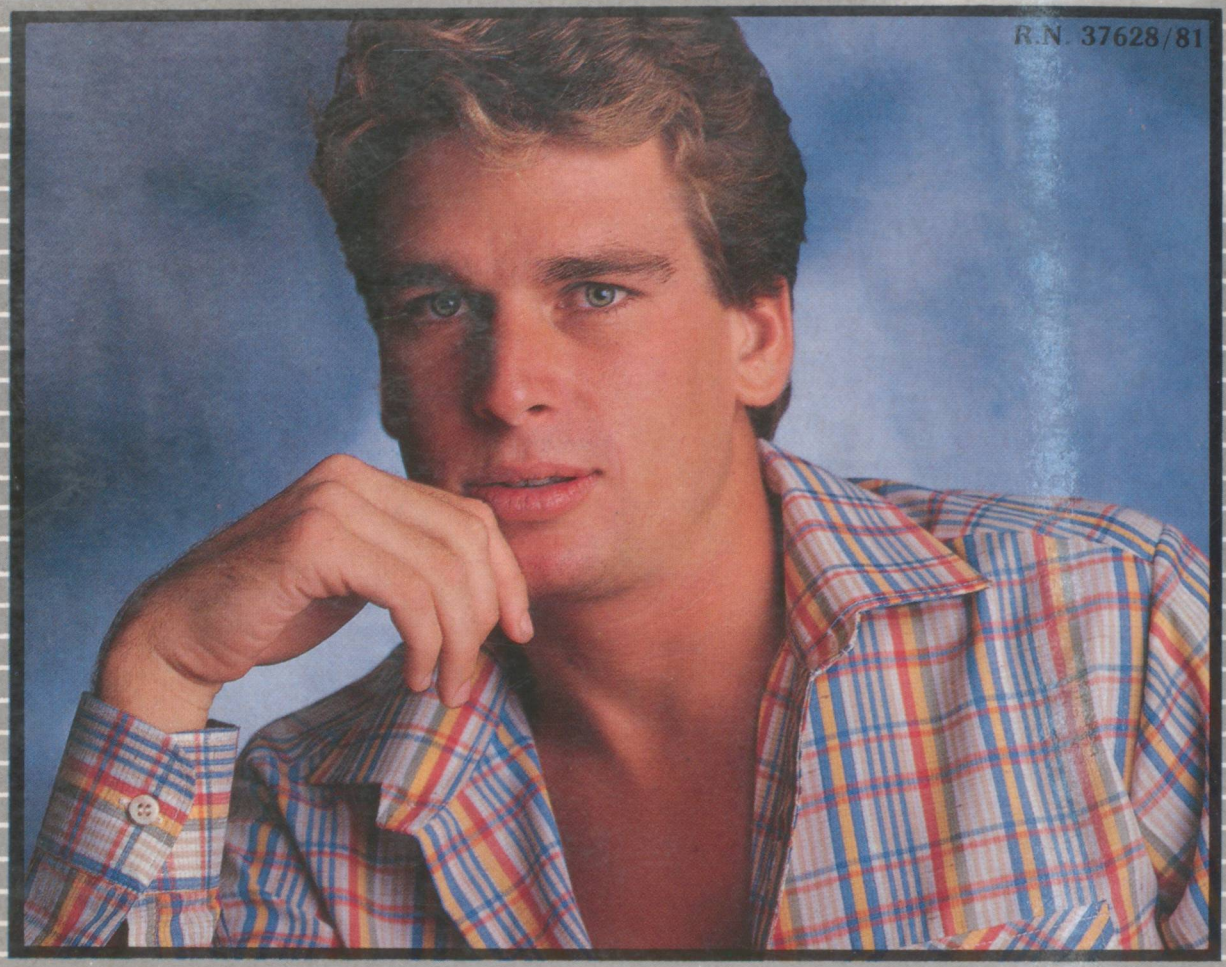

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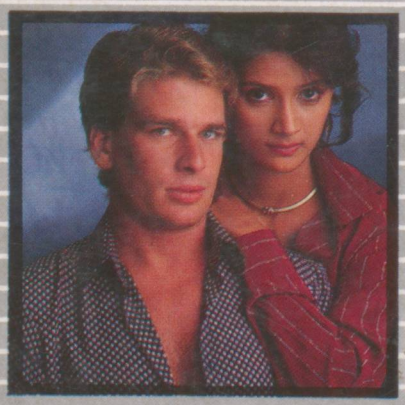

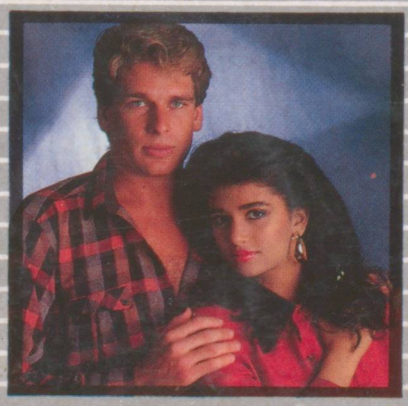

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