HORNBILL

1982 (3)

BOMBAY NATURAL HISTORY SOCIETY

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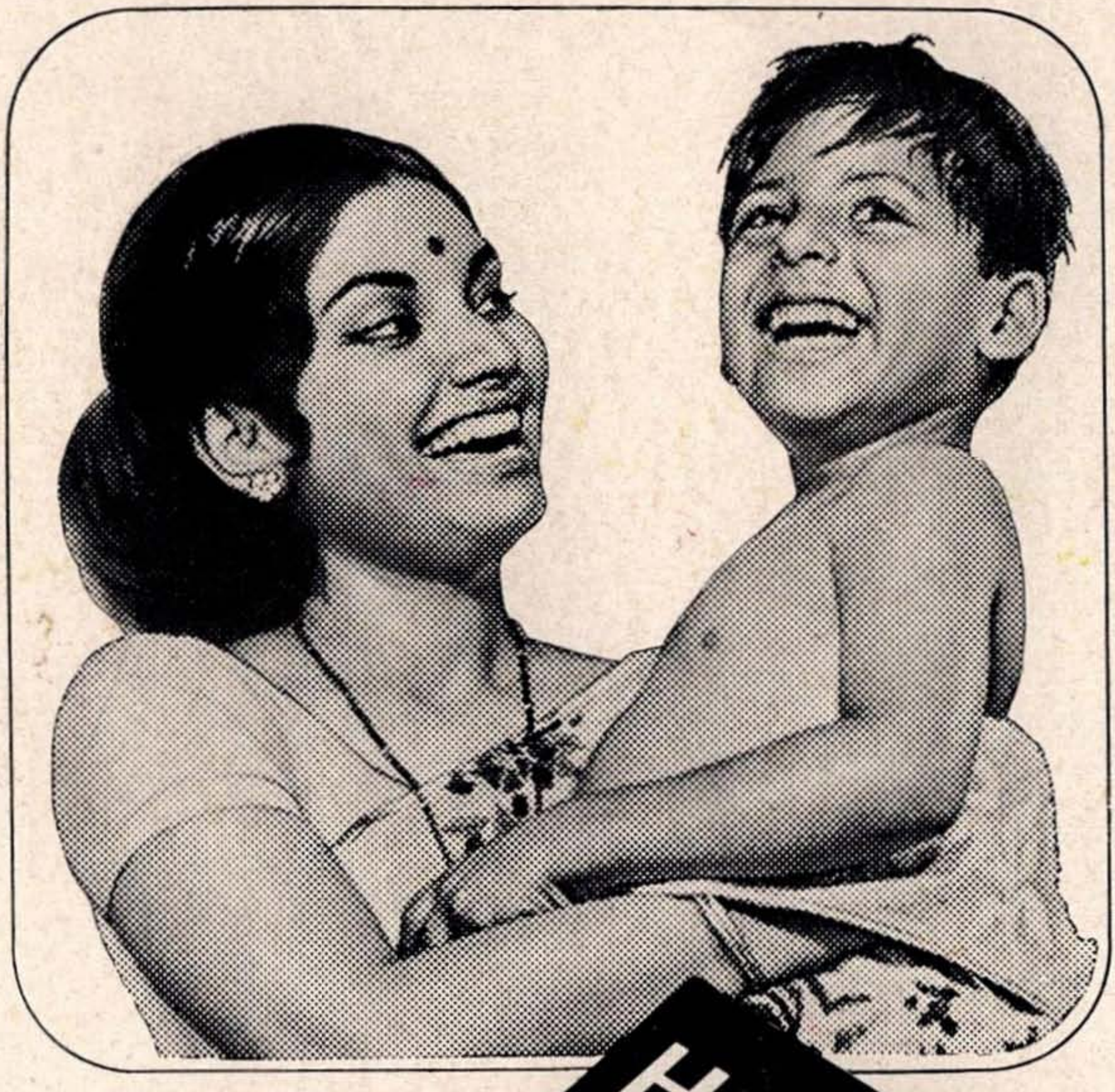

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The Society was founded in 1883 for the purpose of exchanging notes and observations on Zoology and exhibiting interesting specimens of animal life. Its funds are devoted to the advancement of the study of zoology and botany in the Oriental Region. The Society also promotes measures for conservation of nature.

Membership of the Society is open to persons of either sex and of any nationality, proposed and recommended by one or more members of the Society; and also to persons in their official capacity, scientific societies, institutions, clubs, etc. in corporate capacity.

Members receive during a year three issues of the *Journal of the Bombay Natural History Society now in its* 79th volume, and four issues of *Hornbill*, the Society's popular publication.

Advertisements for publication in *Hornbill* are welcome. Rates : Inside full-page Rs 500/-; half page Rs 250/-; back cover Rs 1000/-.

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The first annual subscription of members elected in October, November, or December will extend to the 31st December of the year following the election.

Write to :

The Honorary Secretary
Bombay Natural History Society
Hornbill House, opp. Lion Gate
Shahid Bhagat Singh Road
Bombay 400 023.

EDITED BY

J. C. DANIEL
S. A. HUSSAIN
J. S. SERRAO

EDITORIAL

It is a matter of some pride and satisfaction that India has not lost a species since the Cheetah became extinct in the late forties. This is inspite of the fact that Conservation had a low priority till quite recently; human population had increased 100 per cent since Independence; and forests had been hacked to pieces by the Forest departments in the name of progress and the desire to keep up with the Joneses practising 'modern' forestry in the West. In this context two questions need to be considered. What were the causes for conservation in the past?; and, what is the future for wildlife in India?

Conservation was the result of three main causes in the past. The most effective was preservation through a religious taboo. The best example is the protection that the Peacock receives in Gujarat and Rajasthan. The species has become so abundant and tame that it is virtually impossible for it to become extinct. The second and equally effective cause is the protection that a community extends to wildlife in its area such as protection given to the Blackbuck by the Bishnoi community in Rajasthan and the protection to colonies of breeding birds such as the Vedanthangal Bird Sanctuary in Tamil Nadu and several other small breeding colonies in south India by the neighbouring village communities. There is also the sentimental protection that the Sarus Crane receives in a large part of its distribution in appreciation of the the bond that keeps a pair together. The third cause for conservation was the protection that rulers of the erstwhile Indian States extended to species peculiar to their State such as the lion in Junagadh State, Kashmir Stag in Kashmir and Manipur Deer in Manipur. It is reported that in the past, any one caught poaching Manipur Deer had his hands chopped off. Such drastic remedies are frowned upon in a democracy. In the present day the best method of conservation is the strong sustained interest of organized groups. We would cite as examples the preservation of viable populations of the Nilgiri Tahr in the Nilgiris, through the active interest of the Nilgiri Wildlife Association, and in the High Ranges of Kerala by the High Range Game Association. These populations would have been wiped out except for the protection they had from the organized groups of sportsmen. It is an encouraging and healthy sign that conservation organizations are now identifying themselves with particular species, for instance the Tourism & Wildlife Society of India (TWSI) in Jaipur for the Great Indian Bustard, the Bastar Society for Conservation of Nature at Jagdalpur for the Wild Buffalo, and the Wildlife Association of Ramnad District, Rajapalaiyam, Tamilnadu for the Grizzled Giant Squirrel and for the Dugong. In the interest and enthusiasm of such organisations lies the answer to the second question

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FEEDBACK

'A count of Flying Fox roosts'

Your request for information about Flying Fox roosts in India, expressed in *Hornbill* 1980 (3), pp. 10-11 drew my attention. I have a long-standing interest in, and appreciation of these animals. During 1970-71 I made extensive observations on the social and reproductive behaviour of a *Pteropus* roost in a village just outside of Bangalore. I can offer a good deal of behavioural information on these marvellous creatures, and have been intending to write up my observations for the *Journal* (which I still hope to do some day).

The roost that I studied was a large one for this region, with a population that varied from 200 to 1200 during the period of my observations. The site included several species of trees, and the bats seemed selective primarily in terms of *height,* not species, of roosting trees. The taller trees, which were all used, included banyan, tamarind, bamboo and some others with which I am not so familiar that produced pods and nuts. One of these is known as *seegay mara*[1] in Kannada.

Since I studied this roost, the site has been taken over for construction of a factory building. When I visited in 1977, only a few bats remained in some of the original trees, and 300 or so had apparently relocated in another grove (not previously used by bats) within 1 km.

I know of only two additional (and much smaller) roosts within a 20 km radius of Bangalore. It is my impression that the populations are not large, and that their threat as pests to fruit crops is minimal.

On the other hand, the roosts that I have visited are (or were) stable in size and location according to reports of villagers. All three had been associated with their present village for as long as anyone could remember, and reportedly for hundreds of years. The villagers hold a healthy respect for these flying mammals, and protect them. The bats are considered by some to be sacred (at least while in their roosting areas, even though the animals might be hunted when off-site and used for food). The villagers report that the flying foxes help to control cholera, and offer other protections to their village. Damage to the roosting trees themselves is not sufficient to prevent their growth or the stability of the roosting site. Trees in the roosting site flower and bear fruit and seed, and are prized by their owners as productive, particularly the tamarinds. The oldest banyan tree at my study site was mature and healthy, and had a trunk girth in the order of 15 metres.

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[1]Possibly the southern tree, *Sapindus trifoliatus* = *S. laurifolius*.—EDS.

To anyone who has seriously observed these animals, it is clear that they are extremely intelligent. They are keenly attuned to their environment, highly social, and very sensitive to other species and to changes in their surroundings. They have a highly sophisticated system of social interaction and vocal communication, using at least a dozen different types of vocalizations to which other individuals respond behaviourally. The mother-young relationship is close, stable for prolonged periods, and has significant *emotional* content. The social organizaion within the roost, and the mating system, are very specialized and, as far as I am aware, *unique* among animals including other chiropterans.

In my examination of the scholarly literature I have been impressed with how little is known about this species, and little appreciation has been shown for it by field biologists and amateur naturalists alike.

I feel strongly that the fine and long-standing tradition of respect that the village people have for flying foxes should be supported and re-affirmed by the Society and other organizations that appreciate the true value of balanced natural ecosystems. *Pteropus* and its relatives represent distinctive unique fauna of India, and should be protected. In reaching a position on this, the Society and other groups should not be unduly influenced by possible attempts of fruit growers to blame their crop problems or economic anxieties on the flying foxes.

BARRY BEAN

Associate Professor of Biology

Lehigh University
Pennsylvania 18015, U.S.A.
May 29, 1981

contd. from page 2

we posed at the beginning of this editorial. It is unlikely that we will lose any more species if there is sustained concern but it is inevitable that wildlife, especially the large species whose needs often clash with that of man are likely to be restricted in numbers and distribution. It is time that such species found their groups of friends to foster their survival.

It is time now to think of renewing your membership of the Society for the Centenary Year 1983. Have you considered a gift membership subscription? Student membership costs Rs 25/- (Rs 10/- entrance and Rs 15/- annual subscription) while joining and Rs 15/-for subsequent years. Student members get four copies of the Hornbill *free of cost, and can participate in the field trips and excursions arranged by the Society.*

A Year at Bharatpur's Keoladeo National Park

The Keoladeo National Park, on the Gangetic Plain of Northern India, lies at the heart of an ancient civilisation. It is only a short distance from the temple city of Vrindhavan-Mathura, the Taj Mahal and the Moghul Emperor Akbar's old capital at Fatehpur Sikri. But throughout the ebb and flow of an often violent history that has swept these plains for millennia, the Keoladeo has remained, and is to this day, a rich enclave, a retreat, for a variety and number of birds found in few places on earth.

At first these riches of wildlife come as a surprise, for physically the National Park is not imposing. It is a flat patchwork of marshes and woodlands only 29 km^2 in size. The annual rainfall is 660 mm and on average there are only 36 rainy days a year. The vegetation that this climate usually sustains is a semi-arid scrub. Yet in Keoladeo there are a few pockets of true forest where majestic kadamb and jamun trees form a closed, interlocking canopy. Elsewhere babuls, which are a kind of *Acacia*, are the dominant trees with *ber, Zizyphus sp. and khejri* adding variety. Parts of the National Park have saline soils which are almost bare of grasses and other ground plants but which nurture the dense *piloo Salvadora* sp. bushes.

The woodlands surround a low-lying bowl of varied wetlands ranging from deep, dark water through marsh, choked with grasses and sedges, to expanses of soft, slick mud beloved by shore birds. The wetlands are sub-divided by narrow, tree-lined dykes which are ideal walkways for the human visitors.

Extravagantly populated by migratory birds in winter and overwhelmed by nesting species during the monsoon, the marshes are an exuberant expression of nature's richness and burgeoning force. Yet the marshes are man-made and to this day man-maintained.

Water collected in Ajan Bund, which is just outside the National Park, is let in twice a year and is distributed through a system of canals and sluice-gates. The first time water is let in is a few weeks after the beginning of the monsoon. This is usually in mid July. The marshes are then filled and lure the many birds that come to nest. The fishes get a new lease of life. The second time water enters is in autumn when Ajan Bund is drained so that its area can be cultivated.

This system was devised in the 1850's by the then Maharaja of Bharatpur, whose private reserve it was, to improve his duck shooting. Successive Maharajas enlarged and refined the system till Bharatpur became the most famous duck shooting place in the whole of Asia. In those days one or two lavish shoots were organised by the Maharaja every winter. Emperors, kings, shahs, viceroys, maharajas and nawabs came from all over Europe and Asia to massacre the ducks and geese. In one shoot which took place on the 12th of November, 1938, a party of 39 guns

The Sanctuary in summer

Photos: S.H.A Yahya

Above. *Painted Storks fishing and two satiated Adjutants in the background.*
Below. *A Flapshell turtle in search of water*

Photos: S.H.A Yahya

with the Viceroy Lord Linlithgow in the lead, killed 4239 ducks and geese.

In 1956 the management of the reserve was taken over by the Forest Department of the State of Rajasthan. It became the Keoladeo Ghana Bird Sanctuary. In 1981 the Sanctuary was declared a National Park—the Keoladeo National Park.

About 350 species of birds and an impressive array of mammals and reptiles have been identified in the National Park. Why such a profusion and diversity of animal life in so small an area?

First of all Keoladeo has a great variety of habitats. In the drylands they vary from tall forest to virtual desert and the wetlands, as already mentioned, range from deep water to mudflats. Each habitat and each niche within it has its own complement of species. The second reason for the diversity of life is the changing seasons. Winter brings innumerable migrants from as near as the Himalayas and as far as the Arctic Circle in Siberia. These migrants include flycatchers, warblers and redstarts, as well as the better known ducks, shore birds and eagles. In the monsoon, from June to October, there is a different influx when thousands upon thousands of storks, spoonbills, ibises, egrets, herons, cormorants, darters, jacanas and others come to nest on the replenished marshes. Besides these two invasions there is the constant presence of the resident birds, the barbets, woodpeckers, rollers, bee-eaters, mynas, lapwings, kingfishers...Thirdly the National Park is one of the last more or less natural (though by no means undisturbed) areas left on the western edge of the Gangetic Plain which was once an unlimited storehouse of birds and other wildlife. The birds of this once vast area of marsh and scrub have become concentrated at Keoladeo and have given it its special magic.

A day in mid May is a good time to begin the year at the National Park. At first light, before the sun rises, it is warm though not yet hot. The air is dry, the ground-cover without dew. Deep in the woodland, under the protective arms of a *piloo* bush the two eggs of a pair of Stone Curlews are pipping, ready to hatch. The peeping of the young, still imprisoned in their eggs, is clearly audible and the parents are restless. Frequently they stand up on their long legs and inspect their scrape-in-the-ground nest through huge yellow eyes.

The air is still, but laden with the fine dust swept from arid lands to the west in earlier storms. The sun rises, a hot white disc burning through the dust and filtering through the stark branches of the now leafless babul trees. Within minutes the coolness is dispelled, it is hot with a dry clean heat that is not oppressive. Black Drongos, Bluecheecked Bee-eaters and Wiretailed Swallows dart after flying insects. But soon it is too hot for the insects to move about and the birds sit panting in the imperfect shade of babul and kadamb trees. A Little Green Bee-eater, its colours flashing in the light of the rising sun

continues hunting a little longer and takes its catch of bees, wasps and dragonflies to its young in the coolness of a burrow drilled into a sandy rise. Ring Doves and Green Pigeons sit on eggs on flimsy nests screened by the leaves of jamun and neem trees. They do not pant, but frequently they fly to the edge of the marsh to dip their beaks in the water and drink deeply.

By mid-morning it is 40°C. The Stone Curlew sits tightly on her eggs at this critical time of hatching: should the eggs be exposed to the dry heat the young would die in the shells. Finally the first chick struggles clear of the egg-shell and lies struggling damp and exhausted in the nest-scrape. The parent half rises and closely inspects the squirming body. Carefully she picks off and eats the small fragments of shell. The larger pieces she flings away. In this atmosphere the chick soon dries, becoming a fluffy brown of the same general pattern and colour as the fallen dry leaves around it. Within the hour it is tottering on unsteady legs, panting like its parent and pecking at twigs and pieces of earth. The second parent walks, almost slinks, stealthily to the nest to take over from his partner. Briefly the pair are at the nest together watching the second egg hatch. Then the relieved partner slips silently away.

By now the sun has reached its zenith. The air is no longer still. Gusts tear and rattle the dry pods on the babul trees, dance in whirls of dust across the bare earth of those parts of the marsh which have dried. Gusts soon give way to a continuous strong wind and eventually a gale. A pall of dust, like hot dry mist, obliterates the sun but not its heat. In this inferno, right out on the cracked dry soil of an open plain, sits a Redwattled Lapwing on its four eggs. Out there exposed to the relentless sun the temperature is well over 50°C. The problem for the lapwings is not to keep their eggs warm, but to cool them. Every 45 minutes or so the pair change over at the nest. The new arrival walking slowly, warily over the baking earth and keeping an eye out for marauding crows and kites, has soaked its belly feathers and arrives still wet. The sitting bird remains tightly in place until its partner is only one step away, then it rises still shading the eggs from the fierce heat. Not until its partner is sitting on the eggs, cooling them by as much as 9°C with its wet feathers, does the relieved lapwing step away and fly off to the cooling waters of the nearby marsh.

By mid-afternoon the storm abates, leaving a pale grey powdering on the cracking dry vegetation. The air partially clears. The scent of dust remains until some future rain will wash the skies clean.

The marshes seem an anomaly in this landscape of dry trees and wilted grass. They are green with growing waterplants and sedges, but much reduced in size. Only pockets of water remain, mere remnants of the teeming waters of the monsoon and winter. Fish are concentrated in these stagnant backwaters. Large fish which were safe in deep wide

pools now live precariously, retreating to the protection of fallen trees or the roots of a submerged kadamb.

As though aware of the plight of these fishes Adjutant Storks, absent from the park at other times of the year, now congregate in these last pools. Like parties of undertakers with their hands behind their backs they march through the shallows, knifing through the water with their pick-axe beaks. Not many of the large fish escape their methodical, inexorable attacks.

A few remaining migratory birds from the cool Himalayas and Siberia, irresolute but brilliant in their breeding plumage, add splashes of colour: Bluethroats, Yellowheaded Wagtails, Spotted Redshanks, Shovellers, a Wigeon, Brahminy Ducks. Immaculately white and silver in the frayed and soiled landscape, twenty Brownheaded Gulls briefly pause on their migration.

The sun sinks as white and hot as it rose. As the last glow seeps from the sky, flight after flight of Sarus Cranes, huge dark shapes, fly in and settle in the pool with the gulls. Long after it is dark the cranes' trumpeting voices carry over the cooling earth. In a hollow in a large babul beside the pool a Collared Scops Owl brings a moth to its young. A pack of jackals howls in the distance.

May progresses with unrelenting heat and dust. Some days the temperature rises to as high as 47°C. But towards the end of the month there is a change. The humidity in the air rises and there is now dew in the early mornings. But heat remains intense and so the weather gradually becomes more oppressive.

All migratory birds from the north have left. But other birds now arrive or are transformed. On the marshes Pheasant-tailed Jacanas resplendent in breeding plumage are more and more common. Their haunting calls of "mee-oo" and "mee-oomp" ring out, sounding like rain and seeming to implore the rains to come. Cattle Egrets arrive in increasing numbers and are wearing their orange-brown nuptial plumes. Paddy Birds have changed their drab, streaked brown plumage for deep maroon-brown set off with long plumes including a white crest.

As if not to disappoint the confidence of the newly arrived birds, dark clouds gather on the afternoon of the last day of May. At dusk a thunder storm unleashes itself on the National Park. The fury of wind, rain and lightning is spent in less than 30 minutes. But the sky is wiped clean. Stars sparkle once again in the night sky after being hidden by a veil of dust for months. There is the pleasant smell of damp earth in the air. Insects come out of hiding. More birds in breeding plumage arrive—Large-, Median- and Little Egrets and several score of Openbill Storks in immaculate black and white. Life stirs anew at Keoladeo.

But it is a false start. The cooling effect of the first storm is only tem-

Summer deaths *Photo*: S.H.A Yahya

porary. A week later its effects have disappeared. And so it continues till the end of June. A storm, then heat again. But the numbers of egrets, storks, jacanas and now Purple Moorhens are still increasing. The heat cannot repress the flush of green in the woodlands. A Pied Crested Cuckoo calls its "pee pee piu"—a true indication that the monsoon is only a few days away. The Redwattled Lapwings have hatched their chicks and have taken them, in the coolness succeeding a thunder storm, to the edge of a marsh where the young, fluffy and confident, run after minute water insects.

On the last day of June another thunderstorm builds its clouds over Keoladeo. As if sensing that this is a different storm Koels, Brainfever Birds and peacocks fly to the tops of the highest trees and call in clear, far-carrying voices. As usual the storm strikes in the afternoon and drenches the National Park. But this time after the fury is spent, it remains overcast. Low clouds scud over the marshes and woodlands. Dawn is grey, cool and wet. The monsoon has broken.

(To be continued)

STANLEY AND BELINDA BREEDEN

Walking along a stone-and-sand paved pathway outside Narayanapuram village, near Madras, I suddenly stopped as we passed the unfenced village well. Chockalingam, my Irula tribal companion, had called out the magic words *aathoo amai.*

I saw the reptile then, well camouflaged among the waterweeds, stretching out its neck for air. As I moved closer to focus my camera, it kicked its hindlegs and exposing its astonishingly white plastral side, disappeared gracefully into the water without causing a ripple.

I had been looking at the Southern Flapshell Turtle, *Lissemys punctata granosa,* one of the three subspecies ranging in Sri Lanka and peninsular India up to Bengal. It is edible and is a much favoured food in the region it is found.

Chelonians—turtles, tortoises and terrapins—have developed hard shells around their body as a protective covering. Only the head, neck, tail, fore- and hindlimbs are exposed. When cornered by predators they withdraw these vulnerable parts into the shell. Although some turtles and terrapins can give a good bite, they rarely act offensively.

The soft shell turtles are primitive reptiles and do not have a thick hard shell with a complete plastron (underside shell). The flapshell turtles have developed flaps of circular thickened skin to cover their fore- and hindlimbs after withdraw-

A young hatchling *Photo:* J. Vijaya

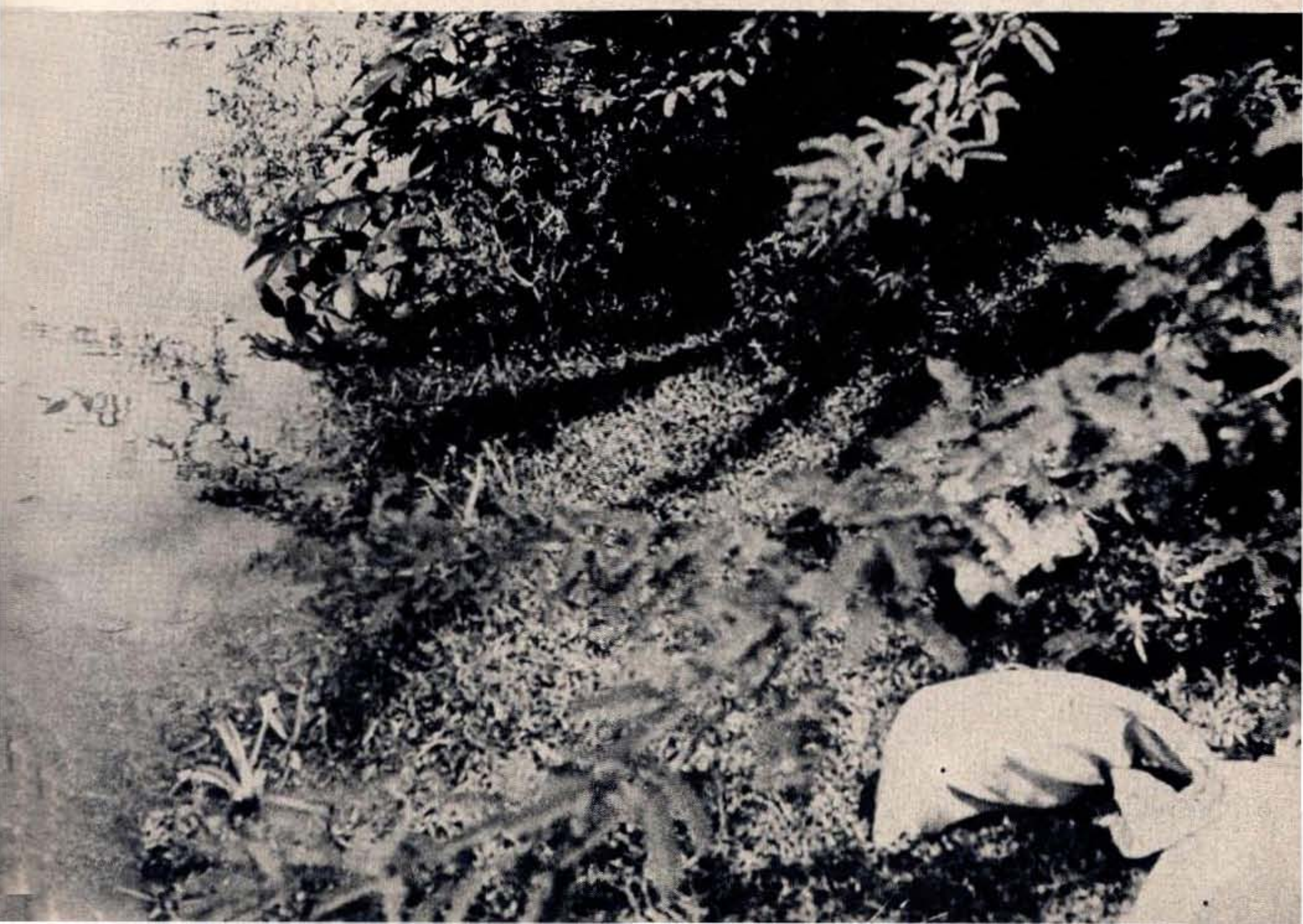
ing them. The carapace (the shell on top) is a thin hard layer covered by skin and the plastron has been reduced to callosities or small hardened areas.

These turtles are carnivorous by diet feeding on tadpoles, small frogs, earthworms, crabs, snails and fishes. They are often found burrowing into the soft mud by the waterside or in the waterbed. They can stay under water for long periods. I once timed it for fifteen minutes but the Irulas have noted longer intervals.

One of their most endearing features is their long neck, almost the length of the carapace. The snout is tube-like in shape with the nostrils placed at the tip. While concealed under sand or murky waters, the neck alone can be stretched to reach air. Like all turtles they strike the most picturesque pose while basking in the sun with their necks stretched to the fullest, pointing skywards. The necks are very useful when the turtles get overturned. They stretch the neck, plant the head on the ground and using it as a fulcrum, flip themselves right side up.

Nesting behaviour among these turtles is a fascinating feature. Like most turtles here, they nest in winter months. After the first rains in September they leave the water's edge and climb to firmer ground. A few metres away from the water they choose a good protective clump of bushes, mostly of thorny plants, like *Carissa carandas* or *Prosopis juliflora*. In the midst of these

Nest habitat with Prosopis juliflora *bush near water* *Photo*: J. Vijaya



Eggs—hardshelled and spherical *Photo*: J. Vijaya

bushes a small patch is cleared of grass and weeds. Chewed grass and weed stalks have been found stuffed into the nest chamber. The nest is a shallow pit, about 10 cm deep and 7 cm across, dug with the help of its short hindlegs. 3-8 spherical shelled eggs are laid, the size of ping-pong balls. Strong evidence of the turtle having beaten the site with its body have been noticed. The earth at the nest site shows impressions of the turtle body shape.

The turtle eggs are incubated for a period of nearly 9 months, hatching in the following summer. During this interval they may fall prey to mongoose, jackals, monitor lizards and above all to human beings. Perhaps to overcome this danger, developing eggs have been seen in the oviduct along with the eggs which are about to be laid, suggesting that dual or triple nesting may take place in a single season.

Hatchlings are bright eyed miniature replicas of the adults about 4 cm in size. Unlike the adults they are not timid but lively and fast moving. Flapshells live in different kinds of water bodies like stagnant pools, ponds, streams, rivers, all of which seem to suit their mode of life.

The meat of the Flapshell turtle is considered a delicacy in most of its range. Around Madras the Irula tribals organise turtle hunts in the nights just after the rains. The turtles buried on the water's edge are dug out, they are boiled alive in a cauldron till the flesh is cooked soft and the shell is ready to peel. These boiled turtles are much relished.

In Bengal, in the Midnapore district, these turtles are considered sacred. A webbed hindfoot is bored through to keep them roped to stakes near village ponds. These captive turtles are said to guard the household against evil spirits. However, in most parts of Bengal it is sold in the markets as a much favoured food.

J. VIJAYA

Sizes and shapes of hailstone in India

In a paper on Hailstorms in India between 1851 to 1855, it is stated that the "largest hailstones seem to be from 10 to 13 inches (in circumference) and to weigh from 9 to 18 ounces"; in another paper where hailstorms in India during the fifteen year period 1883-97 are discussed, there are some storms listed during which the largest hailstones weighed over 2 lb. Indeed, hailstones in India sometimes attain such a large size and fall in so much abundance that besides the destruction to standing crops and damage to property, cattle and even human beings are stoned to death and the havoc caused may even seem almost incredible. When hailstorms occur they are frequently on their mettle to surpass those of Europe. Cases are on record when hailstones of five inches or more in diameter have wiped out a whole village, destroying all life, man and animal; and in Simla ordinary corrugated iron roofing show daylight through cracks in it overhead after the passage of a burst of hail. There are also reports on record of hailstorms during which many buffaloes in a large area in Kathiawar were killed when hit by large hailstones. A remarkable example on record is that of the hailstorm which occurred in Peshawar on the 28th March, 1928, when a number of picketed aeroplanes kept in the open were severely damaged by very big hailstones. During a hailstorm, said to be the severest in living memory, which swept over Meerut (U.P.) on the 14th January. 1938, at 2 p.m., some hailstones were reported to be bigger than golfballs and fell with machine-gun rapidity, piercing the tiled roofs of many houses. In January, 1939, showers of hailstones, which caused three deaths, great damage to crops and loss of a large number of cattle, fell in Jakhaura and the neighbouring villages in Jhansi district (U.P.); some of these hailstones were reported to be as heavy as three pounds. On the 19th January, 1950, hailstones of the sizes of cricket balls fell in a mountain village 42 miles northeast of Jammu, injuring 12 persons. The classical example of a devastating hailstorm, is, however, that of the storm on the 30th April, 1888 in the Moradabad district which cost about 250 human lives. All these reports indicate that hailstones larger in size than the limits of 5 inches in diameter and 1½ lb. in weight given as the maximum size and weight from aerodynamical consideration, have fallen in India. Hailstones weighing as much as 7½ lb. (5 times the above limits), reported to have fallen in the Nirmal Taluk of Adilabad district (Hyderabad) on the 17th March, 1939, should, however, be considered as exceptional even in India.

It has been doubted whether the spherical form of hailstone was really the predominant form and it was suggested that hailstorm consisting of "jagged lumps of ice" did much damage in the Northern Transvaal

in 1936. In India too, not much attention has so far been given to the shapes of hailstones, but it was noted that their forms are so seldom regular, that it is rarely possible to deduce the one face from the other. However, the size of hail is in a great majority of cases, either referred to as equal to that of objects like "plum", "betel nut" "lemon", "potato", "apple", "orange", "eggs" (hen's, duck's, dove's pigeon's, etc), "tennis balls", "large mango", "coconut", etc, or is expresed in terms of the diameter or the circumference of the hailstone. These accounts indicate that spherical or approximately spherical is the common form of hailstone in India. In a few cases only, the size of the hailstones has been described in a different way, e.g. as "½ square inch", "2 square inches", "1½ inches cube", "size of a pice", "large ice flakes", etc. There are also a good number of cases where no other description excepting the weight of the stone is given; it is possible that in these cases the form of the hailstones was not spherical. The speculation that jagged and irregular stones would do the most damage seems very probable. There are a few destructive hailstorms on record during which "large ice flakes" fell and caused considerable loss of life and property. At the same time, there are many cases on record where stones reported to be spherical, resulted in the greatest devastation possible.

Hailstones observed in Moradabad district were approximately spherical in shape; and on a few occasions they had an almost flat circular form or the shape of a double convex lens. On one ocasion during January, 1941, a few hailstones only in a large collection made during a rapid shower of hail were found to have rather an uncommon form more or less resembling in shape a round-headed nail 1″ to 1½″ in length and ¼″ in diameter, the size of the head being ½″ to ¾″ in diameter; the shower lasted only for about 15 minutes and no damage was done.

The frequency of days with hailstorms in India has been examined and it has been suggested that the phenomenon of hail should be regarded as a risk to agriculture, to which the methods of insurance may be applied for safeguarding the interests of the farmer by insuring his crops against hail-damage.

Adapted from an article by K.S. Agarwala in the Indian Journal of Meteorology and Geophysics, *Vol. 1 (1949), pp. 309-311.*

ERRATA

Hornbill **1982** (2), p. 31, for *Pancratium* sp. in the caption of the bulbous lily, read *Crinum* sp. The error is regretted.

BIRDWATCHER

Birdlife in Wales

Mr Toby Hodd, the author of the recently published GRASSES OF WESTERN INDIA writes in a letter dated July 1982: "I hope that the BNHS is managing to help conserve wildlife during these difficult times. In Britain more people than ever are helping to conserve wildlife and the Royal Society for the Protection of Birds now has 200,000 members compared with 50,000 in 1968. But despite the increased army of conservationists the changes in farming practices and demands for wood are greatly accelerating the destruction of Britain's wildlife habitats.

The Red Kite of which there are only 27 breeding pairs left—all found in Mid-Wales received a setback this winter because of the coldest weather this century which froze all its dead prey solid so that they could not eat. At least 20 and possibly as many as 50 birds died but fortunately they were mostly non-breeding birds. This summer the same number of pairs have nested as before—27. Unfortunately at least 2 have been robbed by egg collectors in the Tregaron area less than 10 miles from here (Llangeitho). But the pair of Red Kites at Llangeitho has successfully fledged two young, so I expect the kites will hold their own.

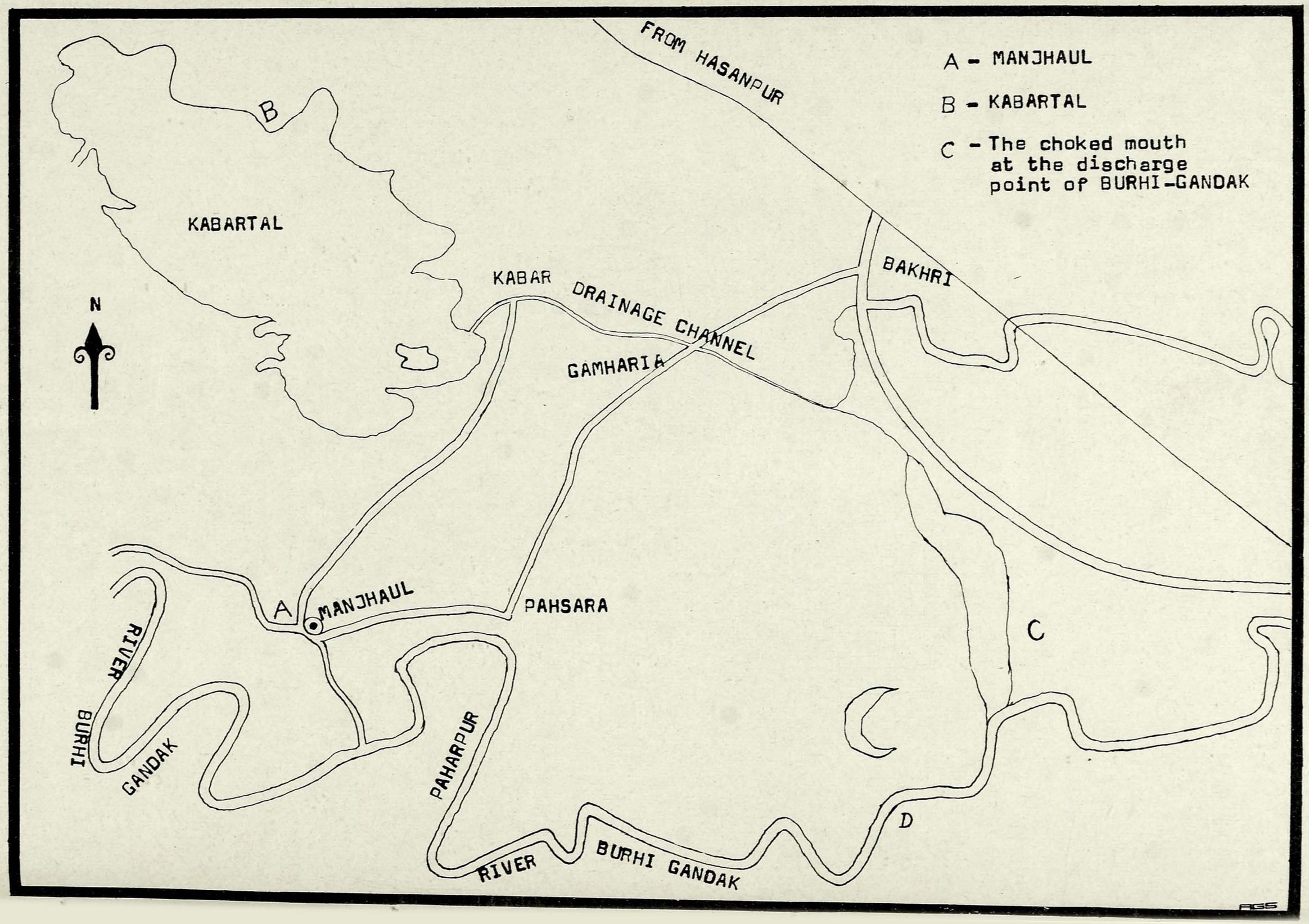
Bird massacre in Manjhaul

Kabar Lake in Begusarai district, Bihar, with an area of 22,500 acres, is the largest wetland area in N. Bihar. Migratory and resident birds use this lake. In the Society's *Journal* (Vol. 68 (1), April 1971) there is a report on the ringing of migrant duck including the banding of 567 common teal in Monghyr district. (Begusarai has been carved as a district out of Monghyr.) Among these 24 were recovered in East Siberia, including the shovellers (*Anas clypeata*) ringed during February-March 1964 at Manjhaul.

S.K. Jha, the Divisional Forest Officer of Darbhanga who knows the Darbhanga-Purnea-Saharsa region well, informed me that there are many wetlands of varying size in the region which are occupied by migratory birds in winter. Hasanpur-Rosera area (Darbhanga), Amdabad, Mansah (Katihar), Birpur Barrage (Kosi) and Ragopore in Saharsa district are some examples. On Purnea-Saharsa Road, 5 km from Purnea there is a tank (*c.* 4 acres in extent) which is full of ducks in winter. The above examples are merely illustrative.

Ducks and teals wintering in the numerous wetlands in Darbhanga-Saharsa-Purnea region (including Kabar, the largest jheel) belong to the East Siberian population.

This year I visited Manjhaul and the adjoining Kabar Lake between the period 25th January and 28th January in the company of S. K. Jha, the Divisional Forest Officer, posted at Darbhanga (not very far from Kabar). On 27th January there were 200 birds (coots, common


A - MANJHAUL
B - KABARTAL
C - The choked mouth at the discharge point of BURHI-GANDAK
FROM HASANPUR
KABARTAL
B
N
KABAR DRAINAGE CHANNEL
GAMHARIA
BAKHRI
A
MANJHAUL
PAHSARA
RIVER BURHI GANDAK
PAHARPUR
C
C
D
RIVER BURHI GANDAK

Above. *Rows after rows of nylon nets fastened to bamboo poles are embedded in the soft lake bed to trap the wintering birds, residents too.* Below. *A view of the trapped birds in the net. The nets sag but do not submerge in water to save the birds from drowning.*

Photos: S.P. Shahi

Above. *A Sahani fisherman disengaging birds entangled in the net.* Below. *A scene of the Manjhaul market. On 2/th January there were nearly 200 birds (Common Teals, Coots, Pintails, Shovellers and Pochards) in the market for sale.*

Photos: S. P. Shahi

Above. *Ducks being displayed for sale along a National Highway.* Below. *A picnicker proudly displays to the photographer the birds he shot. On 26th Jan. 1982 several boats with such men were shooting all day in the lake.*

Photos: S. P. Shahi

teals, pintails, shovellers and pochards—both red crested and white-eyed) in the Manjhaul market for sale. Manjhaul is barely 6 km from the lake shore. *Sahanis*—traditional fishermen and bird trappers—of the village estimated that some 30,000 birds are netted in November, another 30,000 in December, some 5000 in January and another 2000 in February. In all 70,000 birds, including ducks and teal, are netted and sold in Manjhaul market alone, each winter. They believe that this accounts for nearly 50% of the wintering duck and teal. This would mean that at present nearly 150,000 of such migratory birds winter in Kabar. The selling price ranged between Rs 10/- per pair for common teal to Rs 40/- for a pair of pochard (*lalsar*). Birds arrive in the market by 8 a.m. and are sold out in less than two hours.

Birds are netted with very thin nylon nets fastened to long bamboo poles embedded in the soft lake bed (photos 2 and 3) in the dark fortnight of each winter month (Nov.-Feb.). The *Sahanis* take them out from the nets by 5 a.m. and bring them to the *hat* (market) for sale.

Years ago, a drainage channel to discharge the lake water into Burhi Gandak river was constructed (the drainage channel is shown in the map). This worked efficiently for a long time and a large area of the lake was cultivated for paddy. Yet, quite a few thousand acres at lower contours remained under such shallow depth of water as to be ideal for the migrant birds. When I visited the area in January this year, the drainage channel was not functioning. At the junction of the drainage channel and Burhi Gandak large quantities of silt had choked the mouth (marked C in the map), with the result that even in late January the lake had at some places over ten feet of water, is neither fit for paddy cultivation nor shallow enough for the birds to feed on the weeds. Villagers complained that when they grew paddy, more birds used to arrive for wintering, Disuse of the drainage channel since a number of years has harmed both the cultivators and the migrant duck and teal.

No one in this locality bothers about the Wildlife Protection Act 1972 (the Act came into force in Bihar in 1974/75). On 26th January a number of picnickers in boats with shot guns were shooting all day long, and one of them—a Government officer obviously unaware of the Act—proudly displayed his kill to be photographed (photo 4).

North Bihar is an important wintering abode for the U.S.S.R. waterfowl and the migrants deserve better protection than what they receive now.

S.P. SHAHI

Bird catching frog

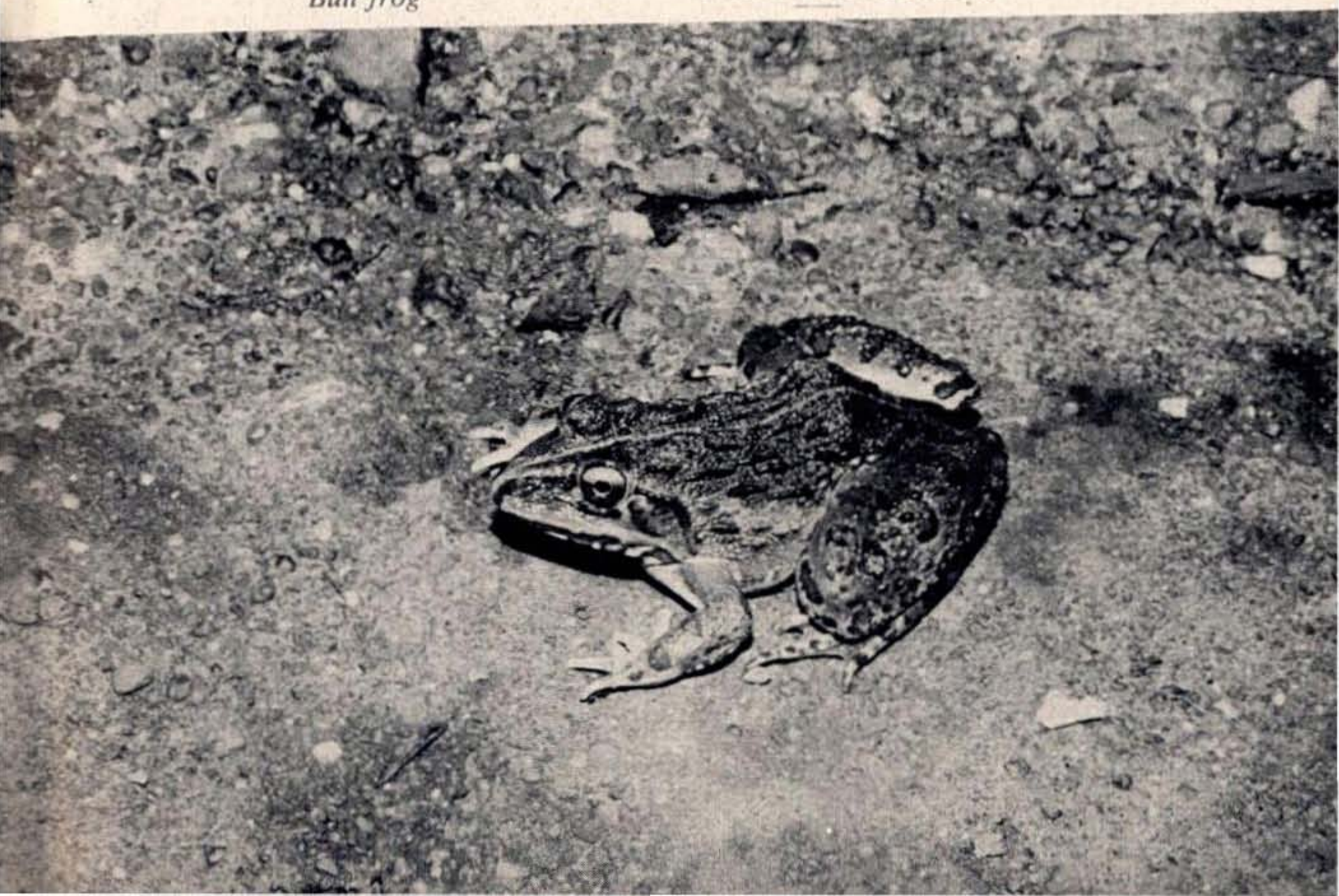
During the 1979 nesting season, I had been keeping a close watch on the nest of a pair of Spotted Munia (*Lonchura punctulata*) installed in the thick ivy (*Hedera helix?*) covering the front wall of the house. The nest, of course, was of typical munia fashion—globular and about 8 ft from the ground. At about 11.15 a.m. on 9th November 1979, I noticed one of the parent birds coaxing the fledglings into emerging from the nest on to a short thick ivy branch just outside the nest, and it was a satisfying sight to see 5 youngsters lined up in a row on completion of the exercise. Shortly thereafter, the parent bird took off followed in quick succession by all the 5 fledglings in a straight line across the small lily pond in the garden with a bougainvillea as the target on the other side, some 40 ft away. The young birds managed to maintain a height of about 6 ft from the ground and 4 of them just managed to reach their destination. The fifth met with disaster. As it was crossing the pond, it suddenly lost height and plummeted down on to one of the water lily leaves. As I rushed to rescue the bird, it slipped fluttering into the water and was immediately grabbed by the resident bull frog and dragged to the bottom.

This was the first and only occasion in my birdwatching experience when I have seen this happen but I am sure there must be other cases which may have been noticed but gone unrecorded. My notes on this episode indicate that there had been four earlier sallies (noticed by me) but all of them confined to the nearer side of the pond and, of course, much shorter.

N. S. TYABJI

Photo: L.D. Kehimkar

Bull frog



SAROJ RAJ CHOUDHURY IN MEMORIAM

Saroj Raj Choudhury at the Gharial pool at Nandankannan Biological Park, Bhubaneshwar

Photo: D. K. Lahiri Choudhury

The late S. R. Choudhury, author of the article 'Tranquilising a tusker' died suddenly on 4th May 1982 from a massive cardiac arrest.

Choudhury was an extraordinary forest officer, quite of a different mould, particularly in his interest in wildlife. Choudhury was a sportsman, and a person very much involved with wild animals. The many orphaned wild animals which reached him in his tours of duty found a happy home with him. The most famous among these was the tigress Khairi whom he raised from a cub to adulthood, and gave her the freedom of his beloved Simplipal forests. Choudhury was an outstanding field director of the Tiger Project, and the Simplipal Tiger Reserve owes much to his care and attention.

Tranquilising a wild tusker

Berhampur is a coastal city in Orissa, close to the border of Andhra Pradesh. To the southwest of this city lies a range of hills spreading north-south to the Eastern Ghats. This is the Ramguda reserve of moist-deciduous forests. Two tuskers were permanently resident in these hills, and there was seasonal influx of a few small family groups of elephants from the Eastern Ghats annually during the winter.

To the east of Ramguda R.F. stretch the coastal plains of Ganjam district for a distance of 35 km to the river Rusikulya. These plains are intensively cultivated and the coastal fringe is planted with casuarina, cashew and coconut. Not far from Rusikulya is the district headquarters, Chatrapur, 21 km from Berhampur.

Prior to December 1981 the people in these populated plains had never seen wild elephant in the free state. On 20th December 1981 the bigger one of the Ramguda tuskers was reported from Aliabad and Karapada villages near river Rusikulya. He had come out to look for seasonal supplement to the forage available in the gradually shrinking habitat. In his search for food he had broken a large number of trees, taken paddy from the fields and also bananas from the plantations on his way. People had seen him. In large crowds they had tried to chase him away. He used to move off leisurely in silence without any agonistic demonstration. He was ultimately made to get back to the hills, by the joint action of the Divisional Forest Officer, Ghumsur South Division and the Superintendent of Police, Ganjam. The last evidence of his presence was his spoor, heading back to his hill home, on 23rd December.

The same tusker appeared again at village Badakushasthali on 30th January 1982, about 5 km to the northwest of Berhampur. His movements were watched. Emboldened by his previous experience, he continued his depredations over a much wider area. However, he was never aggressive though he did get into villages and often appropriated stacks of paddy. Complaints poured in from all sides, as he moved towards Rusikulya. It reached such a pitch that there was a move to declare him a rogue and destroy him. At this critical juncture it was luckily suggested by the Divisional Forest Officer, Ghumsur South, Saroj Kumar Patnaik, that perhaps he could be immobilised and captured, instead of being destroyed. The equipment and necessary drugs were available with me in my capacity as the Field Director, Similipal Tiger Reserve. I was therefore requested to try to capture the tusker by immobilisation. If successful it would also open up an entirely new efficient method of capturing wild Indian elephants.

I began operations on the 10th of February. The tusker was then in

the vicinity of village Agasthi-Nuagan near Rusikulya. The Divisional Forest Officer, Saroj Patnaik had been monitoring the movement of the tusker through the entire period after he had been first reported. When I reached the spot at 2.30 p.m., the tusker had just moved out of sight. Further search did, however, succeed in locating him inside a casuarina plantation about a kilometre to the east of the village. More than 200 local people including many boys, had surrounded him, when I approached him within 10 m, the tusker started moving towards me, walking leisurely, without any belligerence. I stepped aside a few paces and put a 5 cc dart with a thin but long 2 mm cannule, on his left rump, firing it at 3 m from a Dist Inject pistol, at 4.40 p.m. The dart had in it 5 ml of M-99 (Entrophine hydrochloride 1 mg/ml), a very dangerous drug, which acts on human beings at a potency said to be 10,000 times that of Morphine.

When hit the tusker started running in the direction he was facing, the dart sticking to his rump. Everyone present gave chase. He looped back along the edge of the coast towards the village and continued running for about 50 minutes till he suddenly dropped on his right side, at 5.30 p.m., about 200 m to the west of village Agasthi-Nuagan. Before he went down, he must have covered more than 3 km, in criss-cross loops over the coastal sands in the casuarina and the cashew plantations. The spot where he lay immobilised was inside an open cashew stand. The tusker was kicking his legs and trying to lift his head. I gave him 5 ml M-99 and then pulled the dart out from his rump and checked. The syringe cartridge had misfired. Only half the dose, i.e. 2.5 ml of M-99 had been injected. The tusker continued kicking his legs long after the injection. It was then given a further 2 ml of M-99 added with 2 of Acepromazino, the tranquiliser, intramuscularly. Within a minute he was in deep sleep at 6.00 p.m. His pulse was 80/min. and respiration 9/min.

His hind legs were shackled by an iron chain secured with bolts and nuts. To the loop of the shackle in between the two legs, a sisal rope was doubled and anchored to a thick old casuarina stump. The antidote to the drug, M-50-50 was then given, 10 ml intramuscularly at 6.45 p.m. in two doses. He stood up at 7.25 p.m. From his sluggish movements it appeared that there was still some hangover from the tranquiliser which had no antidote. Plain water and water mixed with jaggery were placed near him in two separate buckets. Bananas were offered, which he did not accept. A dozen of these were also kept near him. He was watched by all till 1.00 a.m., when I left for Bhubaneswar. He was christened 'Agasthi', after the village where he had been captured. Early next morning when the Divisional Forest Officer, Saroj Patnaik, returned he found the site empty, of both Agasthi and his watchers. The rope with a piece of the shackle chain lay where the tusker

had been tied. Searching around, Patnaik came across the watchers who were spooring the trail of Agasthi. After midnight the tusker had become active, pulling this way and that to break the chain. At. 2.30 a.m. they heard the sharp crack of the snapping chain, and all ran for their lives. Later they returned to find that Agasthi had gone. From his footprints they guessed that he was moving west, perhaps beyond Chatrapur. After hearing them Patnaik organized search parties with four groups, three moving in jeeps and one tracking on foot.

I returned at 4.00 p.m. All the groups came back and met me an hour later. They had not found any trace of Agasthi. In the meanwhile, information was brought by local people that the tusker had been seen in 'Hadusahu Tota', a large mango grove of about 1.5 sq. km in extent, 4 km to the west of Chatrapur. A thick railway chain used in coupling wagons was borrowed from the Station Master at Chatrapur and also stouter sisal ropes from the State Electricity Board. Operations had to wait till the following morning.

By lunch time the next day, an all out search with 5 jeeps had drawn blank. After lunch Patnaik suggested extending the search further west in the direction of the tusker's previous route of return to the hills. All the jeeps fanned out in that direction, at 3.00 p.m. The jeep driven by Patnaik carried the chain, the immobilisation equipment and of course myself. A little before 4.00 p.m. he pointed out to me a sizeable bamboo grove, almost a forest, about a kilometre away near village Gurunthi, where on the previous occasion while Agasthi was returning to the hills, he had entered and remained the whole day till evening. Any amount of shouting and other threats by a large number of people had not been able to budge him out of that cover. He had come out on his own only after dusk.

On hearing this, I urged Patnaik to drive straight and fast to the spot. When we reached the spot we found another batch under a forester driving in. I sent the forester and his boys to track on the western and southern fringes to see if there were any signs of the tusker entering the cover. I then made the 5 cc dart ready and taking the pistol with me carried the drug separately. I took all the others with me to check the northern and eastern sides. Both parties met at the far side of that forest. Neither had seen any evidence. An old footprint of the same tusker was shown to me on dried mud at the northeastern fringe of that forest. I divided the parties into five groups and spreading them along the farthest long side, asked them to comb the forest through towards the jeeps, as I was convinced that Agasthi was hiding in the grove even though we could not find any sign on the hard ground. I and Patnaik entered the forest in the direction of the footprint. Moving carefully, scanning all round, particularly against the sun, we proceeded slowly forward. We had hardly gone 40 m in when suddenly Patnaik whispered from behind, "There, there, he is standing

there". I looked in the direction he was pointing and found in a shaded tunnel of thick foliage, the massive outline of Agasthi with only his two white tusks visible clearly, his trunk held straight down and his eyes watching the two of us coming towards him. We stopped and turned back, and called the others out. I then loaded the dart syringe with 5 ml of M-99 and taking the pistol, I and a forest guard went towards the tusker.

On reaching the spot where we had found the tusker, I saw the tunnel empty. I cast around for the tusker but it appeared to have melted into thin air. The forest guard began to doubt if the tusker had really been seen at all. It had happened so often in my experience with elephants in the Indian forests, a huge animal vanishing from one's view like a phantom.

Then suddenly both I and the forest guard saw the tusker move at the northwestern corner of the bamboos. Agasthi must have shifted from the dark tunnel into the much better lighted open bamboo, while I was getting ready to dart him.

I asked the forest guard to get back, while I took a detour to get behind the tusker. Through a small gap in the mesh of bamboo twigs I was able to place the dart on the fleshy, left rump, of Agasthi, at 5.10 p.m. The range of the pistol cartridge was 18-25 m and I had fired from hardly 10 m. The dart smacked in with a heavy thud, and the tusker immediately started moving at a fast walk. I followed trailing him through the thorny bamboos, trying hard not to lose sight of him, and ignoring the thorns that ripped my clothes, scalp and body. I suddenly saw the tusker turn behind a big clump, the dart still sticking to its rear. I bumped into an intertwined barrier of bamboos and by the time I crawled through, Agasthi had once again vanished.

I continued trailing in the direction I had seen the tusker turn. A few minutes later I found him standing on a footpath under a single bamboo clump. The dart had been brushed off by the bamboos. I and the forest guard stood 20 m away waiting for him to go down. Agasthi stood unconcerned with leisurely movements of his trunk and his foreleg.

Twenty minutes passed by. Agasthi was still standing. I then loaded another 5 cc dart with M-99 and going to within 5 m of the rump of the tusker, fired in the second dart at 5.35 p.m., close to the first hit. With a jerk the tusker immediately started walking and after about 20 m the dart slipped off. I picked it as I followed him, confident that the tusker would not be able to go far. But he did, rambling and rather uncertain as to which way to go. Thrice he tried to cross the open fields to the cover of a large mixed mango grove, 2 km away on the route to his hilly home and those standing in the open field turned him using scout whistles and sometimes shouting.

After the third series of such signals, I started running to catch the tusker in the open and as I ran one of the forest guards standing to

the west whistled, while Patnaik called urgently, saying that Agasthi had fallen. It was 5.55 p.m.

Every body converged on the tusker lying across a high ridge in the paddy field, very close to the edge of the forest. He was lying on his left side, his forelimbs spread over the ridge to the right, his head leaning to the left and his hind-quarters kneeling and belly on a lower terrace below the ridge. As long as he lay in this manner on his side and not on his sternum, there was no problem of suffocating. Had he not stumbled on that high bund, he would perhaps have continued to move a couple of minutes more, and in so doing if he had entered and fallen somewhere inside the forest, it would have been impossible to have had found him in the dark.

It was getting dark. There was no light except two mangy electric torches. Agasthi was moving his hind limbs and his trunk. I checked the syringe of the second dart I had picked earlier. There was still 1.5 ml of the drug in it. The tusker must have had got 3.5 ml of M-99 from that dart, but how much was it from the first was anybody's guess. The syringe cartridges were apparently not building up enough pressure to push the plunger through the whole length. The tusker had not been fully immobilised. I therefore injected into his hip muscle 1 ml of M-99 and 2 of Acopromazine, at 6.10 p.m. Within a minute Agasthi settled into deep sleep, more because of the tranquiliser. His pulse was 70 and breathing 6 per minutes, rhythmic, restful and regular. It got too dark to see anything without the torches. Two forest guards had been sent to the nearest village, about 3 km away, to fetch a couple of kerosene pressure lamps. The other jeep had been sent to find and bring at least the jeep which was carrying the rope. The railway chain was brought from the jeep and the tusker's hind legs were shackled with it in the same manner as had been done at Agasthi-Nuagaon, 20 km away to the northeast. Loops on his leg were secured with thick bolts and double nuts.

Thereafter it was a long wait for the jeep to come with the rope. The tusker remained in restful sleep. More than one and half hours after his fall there was still no sign of the jeep headlights. I told Patnaik that they should now wake Agasthi up and allow him to move shackled. That way, he could be easily followed and immobilised conveniently again next morning. No one appeared to be happy with that suggestion.

I was still in two minds when we saw three pairs of jeep headlights, heading towards us in a line about 2 km away. Ten minutes later the thickest rope was tied around the tusker's right hind leg and the other taken twice round a big bamboo clump and finally fixed tight.

I then injected 9 ml M-50-50 at 8.05 p.m., a presumptive over dose of 1 ml. Later on, after the lost dart had been found in the forest, it revealed that only 1.5 ml of M-99 had been injected in the first hit. The over dose therefore of the antidote was 4 ml, almost double.

Agasthi moved his head at 8.07 p.m., his trunk at 8.11 p.m. and his legs at 8.15 p.m. Intermittent movements continued thereafter till he made successive efforts for nearly five minutes and finally stood up at 9.00 p.m.

There was no sign of hangover. From the very moment he got up on his legs he started pulling the ropes and pushing the bamboo clumps in his attempt to break loose. Pressure lamps had been brougnt. Water was offered in a pitcher which the tusker did not accept. I with Patnaik remained to keep watch with a few of the forest staff. The rest, left for the towns to organise for the following day.

Next day at 10.00 a.m. Agasthi started taking sugarcane straight away from hand. All appeared well with him, looking as if he had settled down, accepting the rope and the food. An approach road for the jeep was made to the point of capture. It was proposed to be widened later for a low trailer truck, with the hope that the tusker could be immobilised and winched up his side onto the trailer and then carried to some more convenient site for follow up rehabilitation in captivity. On the evening of that day, the 12th of February, everything looked well set and Agasthi settled. All were confident that the tusker would not be able to break the chain. But, strangely enough he did, once again.

At past 6.00 p.m., tea was being organised and the staff had started cooking their meals. Agasthi became suddenly very restless. He put his back legs apart on either side of a cluster of bushy bamboos and pulled forward. Leaning over his front legs he thrust his head deep inside the neighbouring bamboo clumps. He pulled not at the rope but the loop of the shackle chain against the bushy cluster. I suggested that Agasthi be allowed to do whatever he wanted till he became thoroughly exhausted. So very confident was I of the chain and the rope this time. And as I was telling this to Patnaik, I saw the tusker coming out of the clumps of bamboo with the loop of the chain on his right hindleg opened free. The rope was still there holding on to the leg. I ran for the brief case and hastily fumbled for the 5 cc dart and the drug, trying to get the pistol ready. While I was loading the dart, keeping an eye on Agasthi, the tusker gave a tug at his leg rope, and to my horror I saw the noose slipping. In the dart I put a 7-10 cc syringe cartridge to make sure that the entire 5 ml of M-99 got fully injected, and hastily jamming the dart into the pistol, ran towards the tusker.

Just then, as if everything had been preordained to perfect timing, the noose slipped and the tusker was off with Saroj Patnaik, the Divisional Forest Officer and Bairagi Prusty, the Asst. Conservator of Forests running behind him and all the others with them, through the thicket on the southeastern side. I ran too, inspite of my age. The ponderous silhouette of the tusker shuffled on with his chain clanging over the sods of the ploughed fields. The tusker had pulled free exactly at 6.30 p.m.

Now and again it looked as if there were only a few more yards for me to catch up and fire, but those few more tantalisingly remained unending, through nearly three kilometres. It came to such a pass that after we had travelled in a wide arc over those deeply ploughed fields east through north to the west, I had to be helped by Binayak, up every ridge that came in our way. Luckily at that critical moment of fatigue I saw the jeep standing loaded and ready to join the chase. I jumped in and had the jeep driven towards the fusker, and again as luck would have it, Agasthi moved nearer to that side where the jeep track which had been cleared that morning. He could be seen fully lighted in the headlights. A forester, three forest guards and Bairagi Prusty were running behind him. He was heading in the direction of his hills. As if pretimed in perfect synchronisation, the jeep caught up with him at a point where he would take a turn away from the track. I jumped out and asking the driver to keep the headlights on the tusker ran down the high ridge of a ploughed field, and was just able to catch up when the tusker stumbled across the far ridge of that field. It was the last chance. The tusker was fully lighted by the jeep. I fired from hardly three metres at 7.30 p.m. and saw the dart hitting squarely on the right rump, but surprisingly it recoiled and looped back to land behind me. Such was the powerful impact of the 7-10 cc syringe cartridge in the 5 cc dart without a barbed cannule. Three forest guards and a forester who had seen the dart hitting held on to the tusker's trail, guided mainly by the clang of the chain still fastened to his left hindleg.

Dejected beyond measure I searched and found the dart lying in the field, unscrewed the cannule and felt the plunger being pushed out with the residual pressure of the syringe cartridge. I slowly walked back to the jeep, not sure about what my next move should be.

We drove on to check the canal bank in the direction which Agasthi and his chasers had gone, and saw nothing. We then returned along the same bank and met Saroj Patnaik coming in another jeep. The first thing Patnaik asked for urgently was M-50-50, apparently. When the 5 cc dart was ejected from the tusker's hip, a spray of atomised M-99 blew on to the faces of Bairagi and Binayak. Bairagi told me that immediately after getting the spray he had spat on his palm and rubbed the saliva over his face which he wiped off with a handkerchief, and he had also asked Binayak to do the same. The forest guard continued to run after Agasthi while the Asst. Conservator came to the jeep of the Divisional Forest Officer to inform me about it. He told me that after getting sprayed he had felt uneasy for about 5 minutes, which subsided afterwards. I placed a couple of drops of M-50-50 on Prusty's hand and rubed it into his skin, at 8.30 p.m. The feeling was largely psychological as both had been perspiring heavily and there would be no dermal ab-

sorption—wiping with the kerchief was good enough.

I then discussed with Patnaik the probable routes that we should check to get to the tusker and his chasers. Patnaik said that the way back home for Agasthi lay across the Bhanjanagar road, close to Berhampur on its western side. It was decided, therefore, that the jeeps should go there to plan the next move. We drove both jeeps to the Ratanpur crossing 7 km from Berhampur, on the Bhanjanagar road, reaching there at 9.00 p.m. Patnaik planned to send one jeep to Berhampur, the second towards Bhanjanagar and the third back to the Gurunthi camp site. The remaining two were to watch the road and wait for information.

We were still on it when we saw something faintly like an elephant crossing the road, a little to the north of where we were standing. The jeeps were turned that way, and as they did, all of us in the jeep saw the waving torch lights in the field about 200 metres to the northeast. The very next moment we saw the tusker heading towards the road. His chasers shouted at the top of their voices asking the people on the road and the jeeps to block the way of Agasthi. A large crowd had soon gathered on the road. The two jeeps kept moving up and down and so did the people shouting at the tusker to prevent him from crossing the road. Agasthi turned along the roadside towards Berhampur. I charged a second 5 cc dart with M-99 and loading it in the pistol. I ran to catch up with Agasthi. Taught by my last experience I had put a 0-5 cc syringe cartridge. Binayak was still there behind Agasthi and he would help me climb those extra high ridges in the crop fields nearer Berhampur. A few minutes later I was able to put the dart on the tusker's hind quarters at 9.40 p.m. Agasthi continued running up and down on the roadside towards and away from Berhampur. The people on the road and the jeeps managed to prevent him from crossing it.

I then loaded a third 3 cc dart and running behind the tusker put that dart into his rump, at 10.05 p.m.

Twenty minutes later the tusker suddenly fell forward as he climbed over the high bund of a paddy field on the southern edge of the Ratanpur-Nimkhandi road. I found him squatting on his hindlegs with his forequarters resting sideways on his left shoulder. I passed the end of a thick rope through the gap under the tusker's hindleg and ran sufficient length of it out to double both the ends of the rope for the tug and then put all hands available including many of the local men to pull while I positioned the left hindleg to ease the rolling over of the tusker's rump to his left side. With a couple of hearty pulls the immobilised tusker was rolled smoothly, flat on his flank.

Movements in his legs and trunk had not stopped; I checked the two darts which I had pulled out. The 5 cc one was half empty. The 3 cc dart had injected full. The tusker had got 5.5 ml of M-99 from the last two, presumably not much from the first.

I then gave him one more millilitre of M-99 with two of Acopromazine. Agasthi soon settled into deep sleep.

The thick chain was still tied to his left hindleg, and it was that which clanged all the way through 16 km of his run from Gurunthi to Ratanpur to guide the four running behind him on that dark night over open fields, thick groves, and the two tanks he had waded across. In the larger, second tank, he had taken a swim for about ten minutes with only his back ridge visible above the glaze of the water surface. There the tusker had drunk at 8.30 p.m.

I wound the free end of the chain around the right hindleg and secured it with a reliable bolt and double nuts and tied the two ends of a thick sisal rope to the legs, above the chain and taking the doubled end of the rope added a further lead through a narrow pipe culvert to fix it to a leg on the other side of the pipe. There was no tree or any other thing near by to anchor.

I injected 10 ml of M-50-50, intramuscular at 11.45 p.m. Forty minutes later Agasthi was still fast asleep. A further 3 ml was injected at 12.25 a.m. Twenty more minutes pased by, Agasthi was still asleep. His pulse then was 62 and respiration 8 per minute, restful and regular.

It was past 1.00 a.m. in the small hours of the morning on 14th February. Agasthi had not woken up yet. The huge crowd waiting patiently to see him get up, felt so very anxious that they enquired loudly, if he would get up at all. Although some movements had been noticed, particularly in the opening of his eyes and the twitching of the tip of his trunk, the time lag appeared to be too long. At 1.20 a.m. the tusker suddenly jerked his head and in a single movement stood up, and a spontaneous 'Hurrah' went up from the crowd.

Agasthi started walking towards the road and as he did, the lead of the rope through the hume pipe was gradually shortened to make sure that he would not stumble down over the nearer edge of the high ridge of the field in which he was standing.

Slowly, the crowd dispersed. The forester Paban Naik and the three forest guards Binayak Panda, Raghunath Dora and Sashibhusan Patnaik who had shown commendable tenacity in keeping up the chase of the tusker for nearly four hours, were the first to be let off to go back to the city. A couple of the Ratanpur villagers offered to keep the night watch in a jeep. All others returned to Berhampur, reaching there at 4.30 in the morning.

We were back at 9.00 a.m. The tusker was standing on the middle of the road, holding up the traffic on either side. About 50 metres to the north of the road there stood a single banyan tree in the open field. I untied the lead rope and pulled it out through the hume pipe and took its end towards that tree. Adding another rope to it I wrapped it around the tree. Every body gave a hand, assisted by many from the

large crowd of local people who had also come back to help. They pulled Agasthi towards the tree while the others stood behind him and shouted to make him move. He did at long last, slowly, and slowly the turn of the rope round the tree was shortened when the people pulled. Once he started moving he came towards the tree, and as he climbed up the last ridge nearest the tree the rope was quickly tightened and tied firm.

The sun was dropping behind the Karandimal hills in Agasthi's homeland in the west when the wind changed direction and blew from that side. The tusker stood on the high bund of the banyan and lifted his trunk to pick the smell of home. He strained forward with all his might to break the ropes on his legs. Now and again he leaned forward over his front legs and strained with his entire body weight of over four tonnes, so much so that his hind legs were lifted up and stretched straight in line with the ropes. He continued so almost through the night without taking any of the branches placed near him.

After the sun was up next morning, the tusker appeared to have calmed down. He accepted his food —sugarcane, plantain stalks and ripe bananas. In the evening again came the wind from his hill home and Agasthi became restless like in the previous night. At 9 p.m. an old cow elephant, Lakshmi of the Amar Circus, was brought by truck from Buguda, 60 km away to the northwest of Ratanpur. The mahout of Lakshmi was afraid of bringing her near the tusker. She was unloaded and kept about 150 metres away on the roadside. The following morning, on the 16th, I asked the mahout to bring Lakshmi near Agasthi. He did, with great hesitation, repeating now and again that she would be gored by the huge wild tusker. Agasthi did nothing of that sort. As Lakshmi came nearer him he stretched out his trunk in the same way as we would our hands to shake. Lakshmi stretched her trunk too, in response to his advances, and came slowly nearer and nearer till the tips of their trunks touched and ultimately got interlocked in the true style of handshake, high up in the line of their lifted faces. In no time they became good friends, Lakshmi standing close to Agasthi and sharing the banyan branches piled before him. The tusker who had not accepted those branches started picking up a few, but he was more keen for the sugarcane. Early that afternoon the second 'kumki' Radharani, sent from Nandankanan reached Ratanpur.

When Radharani came, she did not greet Agasthi the way Lakshmi had done. She was taken close to the tusker, but instead of facing him she stood with her back towards him. Agasthi lifted his trunk and sniffed her in the same way the peripheral herd tuskers do to the females, when they visit their herds. Radharani was shy, but she certainly was a greedy female. For, after a little while, she turned towards the banyan branches and pulled out as many as she could from those lying in front of Agasthi. Later on she did the same way of ap-

Above. *In training at Khalicote, Orissa.* Below. *Freshly captured elephant tied to trees.* (Udaigiri-Khandgiri caves, Orissa, 1st Century B. C. to 1st Century A. D.)

Photos: D. K. Lahiri Choudhury

A wild tusker tied up for training

propriating the grass given to the tusker. Radharani continued feeding avidly. Her face turned slowly towards Agasthi who lifted his trunk and smelt her face, and in the end he put the tip of his trunk into her mouth. Radharani did not stop eating. Their friendship was thus established, and ever since then she has been his most trustworthy companion.

I had cabled immediately after recapturing Agasthi on 13th February, for Jatin Rawa, the head mahout of Manas Tiger Reserve. Jatin is the most experienced mahout in training adult wild elephants captured in Assam. His father had been killed by his own tusker. Jatin has lost all his front teeth while giving training to one of the wild-caught tuskers. After reaching Berhampur he went straight to Agasthi's camp and took over the management.

Jatin had told me that he would be starting the training of Agasthi with the usual puja on Tuesday, the 16th of March. On the 16th morning, he had two pits dug in each west line, 4 metres apart, each 1.5 metres deep. Into these pits he put two sal logs each 4 m long and 1.2 m in circumference. After these posts had been thoroughly rammed in Jatin made Agasthi to stand in line between these two, facing east. Radharani stood close to his right side and the attendants guarded on his left with a couple of long spears. Guna did the most tricky and patient job of harnessing Agasthi to the front post. Sitting on Radharani's back he made her come close to the tusker's head and there he started patting Agasthi and talking to him softly. A little while later, he could put the rope around Agasthi's neck. The neck rope was tied firmly to the post and with a further lead to the tree. After the neck rope was fixed, Jatin tied each of the tusker's hindlegs to the back post and then bound these two together with figure of eight, lashing by a third rope. His forelegs were similarly tied by Jatin to the front post and to each other. Agasthi settled down and soon enough started taking food as usual.

That afternoon Jatin organised the 'Puja'. He had prepared the place for the puja on the high bund near the banyan tree close in front of Agasthi. There he planted five bamboo sticks in a line and to each he tied a strip of red flag. Along that line he placed three plantain leaves. On two of these he arranged six offerings each and three on the third. Each offering consisted of sprouted Bengal gram and green gram, soaked unboiled rice and cut pieces of bananas and sugarcame. Along the line of flags he put a number of burning joss-sticks and then lit five ceremonial wicks in the earthen lamps. The puja offering included bundi, cigarette, ganja and country liquor.

When everything was ready Jatin, wearing yellow ceremonial clothing, took a live pigeon and holding it in both hands he chanted mantras and after finishing his chantings opened his hands and allowed the pigeon to fly away. His next puja was in the form of Hindu rites. After that he

took the first country cock which he sacrificed making 'hallal' in the Muslim way after reciting the 'kalma'. Of this first cock he did not cut the neck through completely as he did sever the remaining four in the Hindu way of sacrifice.

After the pujas were over Jatin tied a rope harness over the body of Agasthi which he called the necklace.

At long past dusk Agasthi was fed in the company of Radharani. In eight of the twelve boluses made for him, about two pegs of the country liquor were soaked in. He took six and flung the seventh over his shoulders. The last two were shared by Radharani and Lakshmi. Jatin said that the alcohol would take the fatigue off his limbs.

Next day, on the 17th, he started the training of Agasthi. Guna, Bijay and a few others including a couple of forest guards, helped him in handling the tusker. They patted, rubbed, stroked and talked to him while they also used small bamboo wedges to poke him when he appeared restless. That evening Jatin climbed on the back of Agasthi. He clung to the necklace rope while the tusker tried at first to shake him off his back. Four burning torches were held around him and gradually brought near while Jatin started singing and others spoke their words of assurance to the tusker. Agasthi stood calmly without fear, but Radharani moved as far as her leg chain permitted.

Agasthi was catching up fast with his training. Jatin proposed that he should now be taken to the tank, about 200 metres to the east, on the side of Ratanpur-Nimakhandi road. Everything was organised to take him there the following day on the 26th.

Jatin wished to take Agasthi to water only when it was sufficiently hot by about 11 a.m. not in the cool hours of the morning. Accordingly, preparations were made at 10 a.m. of the 26th to take him to the tank. Body ropes were fastened tightly around Radharani and Lakshmi the second 'kumki' elephant. The neck rope of Agasthi was unfastened from the post and tied to the body rope of Radharani who remained close beside him on his right side. Lakshmi stood a little away from him to his left, her body rope tied with an extra piece; to the neck of Agasthi. The shackle chain on his forefeet had been removed earlier. Jatin tied a figure of eight lashing, around the tusker's hindlimbs above the stifle joints, which was held up in position by tying it to the necklace rope. This was important to restrict the free movement of his hindlegs during his walk to the tank. All other ropes on his legs were removed.

The procession started at 11 a.m. with Lakshmi as the vanguard and Radha walking close beside Agasthi. Jatin sat on the withers of the tusker, nearer his neck. One man moved backwards holding an iron tipped bamboo staff near the tusker's trunk. Two others holding similar staffs walked on his left side. A fourth formed the rear guard. Agasthi was docile, beyond expectations. When they reached the tank,

all the three entered into it without hesitation, their mahouts gently guiding them into knee deep water. The tusker stood calmly when he was given a good splashing by the people around him. After about five minutes they returned to the camp where the tusker was roped to the posts.

The following day, on the 27th, Agasthi appeared as if he were waiting for his trip to the tank. After Radharani and Lakshmi had taken their positions and his neck ropes had been tied to their body ropes, the tusker turned in the direction he was to move, immediately after the ropes had been untied from his front legs. He was taken leisurely with intermittent halts when Jatin gave him commands which he was made to respond to. At the end, when Agasthi got into the tank, he felt the water first with the tip of his trunk and selected the cleanest patch to dip it in and then drew the water which he lifted into his mouth and drank, three times, leisurely and relaxed. He appeared to be enjoying the splash bath, more so when Jatin gave him the scrubbing on his back with the continuous splashings by the people standing in the water around him. The return journey was smooth and happy, with Jatin singing merrily on Agasthi's back. The tusker did not resent to his being tied again to the posts. Immediately after the reroping was over, he stretched out his trunk asking for the bananas and sugarcane. And thus Agasthi seems set for a long useful life in the company of his human friends. He is thought to be only 30-35 years old, well built, with a shoulder height of 2.6 metres.

SAROJ RAJ CHOUDHURY

Sambar—India's largest deer

Size varies considerably with locality and strain, but the sambar is difinitely the largest of all Asiatic deer and seems to attain its best development in India. Stags are taller than hinds and usually much heavier; a very big stag may stand some 56 inches high and weight 700 lb, a small adult stag only 48 inches in height, and 450 lb in weight, or even less. There is no direct correlation in stags between body size and antler development: some very big stags may carry comparatively poor antlers.

Sambar are much less gregarious than chital or barasingha, and are often seen alone, especially the stags, or in family groups of a fawn and its mother, sometimes accompanied by a yearling, evidently the adult hind's young from the previous year.

Sight is acute, and the ability to see small movements and even to make out stationary objects is good. I have never been able to get close to sambar by stalking them prone over open ground when the wind was in my favour, though chital can be aproached in this manner. The sense of hearing is also acute, the animal being able to distinguish between normal and suspicious sounds. Smell, of course, is the paramount sense.

Sambar are versatile in their feed, browsing leaves and twigs, eating tree bark, grazing on a variety of herbs (mainly tall grasses) and consuming quantities of forest fruits. After a forest fire, they are probably the first animals to seek out the fresh sprouts of grass—other animals wait till the new grass has sprouted a little higher.

These notes are extracted from Mr M. Krishnan's excellent series on India's Wildlife published in the Society's Journal. *The photograph on the cover is by Mr S. A. Hussain and was taken at Bharatpur Sanctuary.— EDS*

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