

# Hornbill

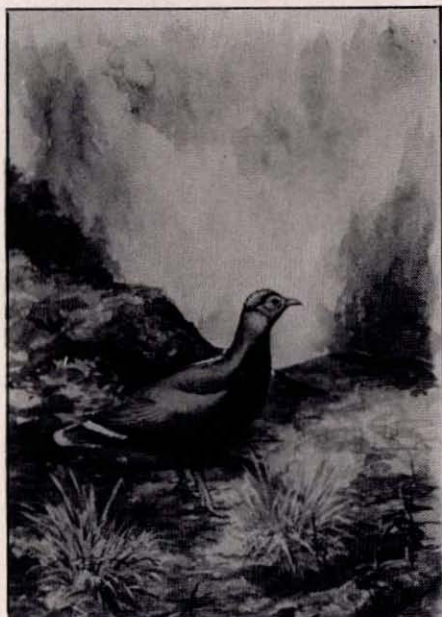
1992 (4)



BOMBAY NATURAL HISTORY SOCIETY



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# Hornbill

1992 (4)

## EDITORIAL

### Curiosity killed the bat

Should biologists collect specimens for research? The argument has raged for years, with biologists and some conservationists on one side, and animal rights activists on the other. Our view is that the biologist is usually right. But sometimes, as in the case of research on bats, one wonders.

Bats are notoriously hard to study, because they are small, swift and usually nocturnal. Field studies on ecology or behaviour are particularly difficult. With a few notable exceptions, Indian batmen specialise instead in laboratory-based studies, usually on breeding biology. Specimens are captured and dissected, and the tissue contents analysed, often yielding valuable results. Unfortunately, some researchers go overboard, collecting and cutting up specimens with a zeal that borders on irresponsibility. It has been pointed out, not without reason, that these feverish efforts lead frequently to Ph.D.s or research papers, and only rarely to genuine advances in bat conservation.

Large scale collections have persisted for decades, and in some cases have probably contributed to local declines of some species. The Kanheri caves in Bombay are one example. There were 2000-3000 fulvous fruit bats in the caves last year. Today, there are less than 100. Several factors could be responsible, but in the absence of convincing evidence to the contrary, the chief cause is believed to be over-enthusiastic collection of specimens. Collections are typically made twice (sometimes thrice) in a season, and anywhere between 100 and 400 bats may be taken each time. According to one estimate, a Ph.D. requires some 600 bats, and some diligent scholars use up even more.

Suitable roost sites are becoming fewer, for a variety of reasons. And as colonies shrink in size and number, the collector's hand falls more heavily on those that remain. Robbers' Cave in Mahabaleshwar, and several other sites in Maharashtra, may go the way of Kanheri. Even more disturbing is the prospect of Wroughton's freetail bat being similarly treated. The entire known world population of this species is restricted to a single group of caves near Belgaum (see *Hornbill* 1992(3)). While there are no formal proposals yet, several researchers have expressed interest in ascertaining the nature of the bat's insides. After all, a detailed biochemical study of an extremely rare species would be a major scientific scoop. Whether such a study should indeed be done, and to what purpose, is for the scientists concerned to decide.

It is neither possible nor necessary to eliminate collections altogether. Conservation schemes would certainly benefit from detailed biochemical studies. And limited collections will not affect populations of common species (such as the fulvous fruit bat) in the long run. But what is disturbing is the apparent disinclination of many researchers to objectively evaluate their methods of study, or to aggressively pursue methods of minimising potential collection-related damage. One such method is widely accepted in theory: collections should be restricted to sites with large populations, so that the capture of a few specimens does not affect the viability of the colony. In practice, however, proximity of a bat roost to the research laboratory and ease of transport tend to be given undue weightage, and remote but otherwise suitable sites are under-utilised.

The scientist is a privileged person. But if his vocation is to discover, his duty is to discover with a sense of humility, with the conviction that he is merely an observer, not an intruder ... that it is the subject of the study, not the study itself, which is important.

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Slater's monal pheasant  
(*Lophophorus slateri*), male  
Painting by Carl D'Silva

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# NIGHTMARES FROM A DREAMLAND

Text and photographs by MADHUSUDAN KATTI

*The overcrowded minibus trundled down the east Himalayan mountainside enveloped in dense monsoon clouds. The road disappeared in the fog barely 30 m in front of us, and occasional ghosts of oak trees loomed by the roadside in this fantastic, ethereal dreamland. As we rounded a corner underneath a rock overhang, a streak of reddish brown dashed onto the road from the mists below — a young serow!*

**B**RAKES SQUEALING AMID cries of "Stop! Stop! Don't let it go....", the bus came to a sudden halt just beyond where the serow was first seen. Instinctively, the serow sought refuge uphill, only to get stuck under the overhang. The bus emptied out in a mad rush, and I watched in horror the crazy melee that ensued: a motley crowd of native Mishmis and 'outsiders' (Nepali, Assamese, Bengali) was brandishing machetes (*dao* in local parlance) and hurling rocks at the poor creature trembling beneath the overhang. As a few lads started scrambling up the rocks, the serow suddenly jumped through them. A huge leap across the road and it was bounding down the slope. A strapping Mishmi jumped after it barefoot, but the serow was gone in a flash.

The 'hunt' was over almost as soon as it had begun. The quarry had escaped, but not unharmed, for one man was showing off a smear of blood on his *dao* — he had slashed at the animal's legs as it whizzed past him. Strangely enough for this place, but luckily for the beast, no one had a gun that day! "We could have made chutney out of it!" someone exclaimed. I realized that I was perhaps the only person on the bus aware that we were inside a wildlife sanctuary. And this was not an unusual event in this protected area!

Indeed, we were in Mehao Wildlife Sanctuary, one of barely half a dozen wildlife reserves in a state boasting of the highest forest cover (over 60 per cent) of all states in India: Arunachal Pradesh, the mysterious north-east frontier. I was winding up a six month (January to June 1992) biodiversity survey of the sanctuary, funded by the Biodiversity Support Program of WWF-U.S.A. To me, Arunachal Pradesh had once conjured up a magical world of rainforests, a perfect, tranquil world untouched by the destructive cynicism of technological progress. But these six months had been a continuous rude awakening. Every day brought fresh horrors, and the conviction that this was a frontier of a different sort — a frontier where some of the last battles between technological man and the wilderness were being fought.

**I**HAD COME HERE knowing that the lowland rainforests of Assam had been eaten away by human greed and that the foothills of the eastern Himalaya all through Arunachal were now

under assault. This knowledge had fuelled my urgency in wanting to visit this frontier before its treasures were completely plundered, and to make a tiny start towards comprehending it — at least begin cataloguing this vast library for future readers.

These six months had been unforgettable. Absorbing the scents and sounds of the forest of a clear winter morning on the shores of Mehao lake, following the fury of week-long rain, it was possible to become oblivious to the ravages of development. In the magical wonderland around the lake, one could wrap oneself in the mysteries of the forest, and pretend that man had not yet invented saws and guns.

The mellow, mournful whistles of the hill partridges and the cackling of the occasional laughing thrush formed part of a background orchestra against which unfolded the great call of the hoolock gibbons, which would whoop and yodel in family choruses for an hour or two every morning. While the infinite shades of green cooled the eyes, a spark of red from a trogon or a flash of lilac from an orchid catching a sunbeam penetrating the dark canopy would stimulate the mind.

But the calls of the gibbons were always punctuated by the sickening thud of axe on wood and the din of the sawmills in the foothills. And the nights were often rendered sleepless by nagging doubts: How long before we destroy these oases of peace and quiet and beauty?

These forest libraries can teach us a great deal, if only we can stop to study them. Even our short survey had yielded lists of over 250 tree species and about 300 birds in this one sanctuary alone — still barely scratching the surface of biodiversity. Within this short time, I was only beginning to uncover some of the fascinating tales this forest library held — and already many seemed doomed to a tragic ending.

**O**NE MORNING IN JANUARY I was delighted by the sight of a green cochoa near Sally lake — a rare beauty that had not yet been recorded with certainty from Arunachal. But my delight at seeing this bird and making a 'first record' was short lived, for the next morning the rest-house chowkidar's son walked in with the bird in his hand, victim to the ubiquitous slingshot that accounts for the superficial lack of

birds in bird-rich Arunachal.

It is not uncommon in this land of over 500 bird species (the most diverse avifauna in India) to hear complaints, even from forests officials (especially from outsiders) that so few birds are seen. Everything from a sunbird upwards is killed and eaten not only by the natives (who meet their protein requirements this way) but also by the representatives of the more 'civilized' outside world. And boys seem to be virtually born with slingshots in their hands. I never saw another green cochoa in the next five months.

The mammals of the area share the same fate as the birds: almost everything is hunted even though the native Mishmis consider deer hunting taboo, and have seasonal restrictions. There are too many outsiders with scant respect for tribal beliefs, whose practical philosophy seems to be: "If it moves, shoot it; if it doesn't, cut it." Everything from squirrels and civets to takin and red panda are hunted, their flesh eaten, and their skin and skulls often sold to trophy-collecting defence personnel. During my stay in Mehao, five takin were killed in one slaughter near the salt lick below Mayodia, not far from where the serow escaped. This is one of the few places in

Arunachal where takin are regularly observed at altitudes below 2000 m during winter — but for how much longer?

**T**HE LOWER FORESTS once abounded in several species of monkeys: two or three species of macaque (Assamese, pig-tailed and perhaps stump-tailed) and the capped langur should be common, according to the books. But in six months we saw Assamese macaques only at higher altitudes far from human habitation, pig-tailed macaques once near Sally lake, and no langurs at all. All these primates are also hunted on sight. But the plight of the other common primate of this area, the hoolock gibbon, is even more poignant. Protected as they are by native mythology, which holds them as kin to man (which indeed they are, being the only other ape we have in India), gibbons are condemned instead to watching their homes being destroyed under them as they cling to their beloved canopy.

These agile acrobats of the canopy are hopelessly clumsy on the ground and even small gaps in the canopy — a few trees felled — can effectively cut them off. More and more families of gibbons are



The empty shell of a hollock tree. It was cut down, then abandoned because it turned out to be hollow. When these giants fall, they bring down several smaller trees with them; and these are rarely considered in official estimates of logging damage.

thus becoming confined to small scraggly islands of forest cut off from the more continuous forest of the sanctuary. Being largely frugivorous, gibbons are naturally restricted to lower altitude forests that contain year-round sources of fruit — the same lowland forests that are being wiped out by humans who, ironically, protect the gibbons! Even if the remaining islands have year-round fruit for the present generation of gibbons (unlikely in itself) their descendants will have nowhere to go — literally!

**T**HE HOLLOCK (not hoolock) is yet another symbol of what is happening to the lowland forests. This magnificent hardwood tree was one of the most abundant and characteristic trees of the Dibang valley forests until the timber trade discovered its economic value. Within barely a decade and a half of logging, most large individuals of this tree have been removed. Today it is rare to come across a hollock tree that is over 200 cm in girth.

I could carry on about Temminck's tragopan or the spotted linsang that I came across only as skins, the bears that I saw only as decorations on *dao* cases, or the elephants that once ruled this district but are now nowhere to be found. And you would have to multiply these tragedies a thousand fold to fully appreciate the magnitude of what we are losing — for I haven't even mentioned the hundreds of startlingly beautiful butterflies and orchids, or the myriad unsung plants and insects that make this forest what it is.

It is easy to feel overwhelmed by the task of even merely cataloguing this library — an army of biologists would require many years to study it. But the only armies now visible (and busy at work) are those of loggers and hunters — and of course the Indian Army! Biologists and conservationists haven't even joined battle at this frontier. It seems we will be left clutching a fragmentary catalogue, or simply the ashes of this living library, for much of it will probably vanish within the next decade.

How did things come to such a pass? How have we, despite two decades of proud conservation efforts through Project Tiger and more, allowed, during these same two decades, this pillage to continue? Will the fabled rainforests of the north-east pass into history, a mere footnote to the saga of India's 'technological progress and development'?

**A**RUNACHAL PRADESH is rich not only in biological diversity, but also in human cultural diversity. Over a dozen distinct indigenous tribes have peopled the valleys of this region, drawing sustenance from the riches of the rain forest. The Idu Mishmis (one of three subgroups of the Mishmi tribe) that surround Mehao have historically lived in the upper reaches of the Mishmi hills, sustaining themselves through shifting cultivation on steep slopes, hunting and collecting forest produce for their own consumption and trade in the Assam valley.

Until recent years, they were largely self-sufficient and priests of the Idu Mishmis were repositories of considerable knowledge about many plants and animals and their uses as food and medicine. Their best known medicinal product is the Mishmi teeta (*Coptis teeta*), a small plant whose roots are used to treat a variety of digestive ailments — a highly prized plant that is becoming rare due to over-exploitation, and one yet to be discovered by modern medicine. Even though modern science is only just beginning to take notice of this forest library, the native people had evidently studied many of its books.

**T**HEY HAD ALSO developed a cultural system of regulating resource use through taboos and seasons, which was perhaps wholly sustainable — until external forces disturbed the equilibrium. Apart from the taboo on hunting hoolock gibbons and deer that I mentioned earlier, they restricted meat eating by women of reproductive age (from puberty through menopause). Hunting was further limited to village territories and trespassing into neighbouring territories was punished. Seasonal festivals focusing on particular species provided another level of control.

Such regulatory cultural practices developed independently among all the major tribes in Arunachal with considerable local variation: Arunachal is a treasure house for students of human behaviour as well. Indigenous wisdom was not only limited to using forest produce, but also made agriculture possible on the steep slopes and unstable soils of the eastern Himalaya. The traditional jhum (shifting) cultivation practiced in Arunachal was an example of the fine art of natural farming. Several varieties of rice (with some 500 wild varieties, Arunachal is

a cornucopia of wild rice genes) and millet were grown in mixed crops without the use of ploughs or chemicals. Not only did they understand when and where to plant these mixed crops, each variety of rice (from a single crop) had different uses — cooked differently or fermented into varieties of alcohol (*apong*), integral to their diets.

The indigenous people had lived for centuries at some natural equilibrium, in harmony with the forest. But however romantic this lifestyle may seem to us, theirs was undoubtedly a harsh existence, for they were always at low population densities — until 'development' discovered them. This is the bright face of our development, the noble face that aims to improve standards of living and bring people the fruits of modern science. It is the face that wants to 'assimilate' the tribal people into modern culture and not leave them as living museum pieces for anthropologists — or so our leaders love to tell us.

**B**UT BEHIND THIS mask lie the same greedy market forces that lure innocent tribals with the glitter of technology and the glamour of dubious political power, only to ruin the very basis of their existence. For that is what our development amounts to: a mixed blessing at best and a monstrous chimera at worst. The results of this development are there for all to see — in the happy government statistics and the becoming faces of successful tribal (and outsider) businessmen and politicians, as well as in the devastated landscape and the slow death of native culture and wisdom.

The Idu Mishmis began to be drawn into the mainstream development of India during the late 1960s, after the Chinese had awakened our government to the existence of this frontier. 'Development' first came in the guise of improving communications (roads and bridges) for defence purposes, largely implemented by the armed forces.

Once roads cut through forest, can loggers be far behind? The timber trade proliferated in north-east India particularly during the 1980s when forests elsewhere had vanished, and really boomed in Arunachal towards the end of the decade following a ban on felling in Assam. Meanwhile the government actively lured the Mishmis (as also other tribes) down from the interior to the foothills and plains where they could benefit from development and could also be administered more easily. This

#### MEHAO WILDLIFE SANCTUARY

The 280 sq. km Mehao Wildlife Sanctuary lies in Dibang valley district of Arunachal Pradesh. The altitude ranges from 450 m (near Roing, the sanctuary headquarters) to about 4000 m, with some spectacular gradients. Most areas above 2600 m are snow-bound between December and March. With an annual rainfall in excess of 3000 mm, Mehao is covered mostly with broad-leaved sub-tropical evergreen forest with a few conifers appearing above 3000 m, mostly on north-facing slopes.

A bridle path from Abango (19 km east of Roing) takes one on a gruelling 15 km trek, including 10 km of very steep climbing, through dense rainforest to Mehao lake (alt. 1600 m, area 2.5 sq. km) which forms the heart of the sanctuary, and is surrounded by undisturbed rainforest. This lake was created by the 1952 earthquake in the district, and being cut off from other water bodies has not yet been colonized by fish. The idea of introducing fish to the lake is occasionally mooted, but has been wisely and resolutely resisted by the present Divisional Forest Officer in charge of the sanctuary.

Over 250 tree species are found in the sanctuary, the most diverse genera being *Ficus* (figs), *Elaeocarpus* (including 'rudraksha') and *Litsaea*. Mehao is home to over 300 bird species (with the list still growing) and the highlights include five species of pheasants (monal, Temminck's tragopan, peacock pheasant, kaleej and red junglefowl) and most members of the most colourful plate in the Pictorial Guide (Plate 80).

The recorded mammalian fauna, apart from species mentioned earlier, include tiger, leopard, leopard cat, Himalayan black bear, yellowthroated marten, spotted linsang, red panda, barking deer and sambar.

In Mehao, there are rest-houses at Sally lake (4 km from Roing) and Mayodia (56 km by road, but just 5 km as the crow flies) and a wooden hut at Mehao lake. To reach Mehao one must cross the Lohit river at Dhollaghat (50 km north of Tinsukia) and cover the remaining 40 odd km between Sadiya Ghat on the north bank and Roing by bus. On the way, at the border between Arunachal and Assam (at Shantipur) you go through the inner-line check gate — if you have a valid pass.

These passes are issued (usually for seven days to tourists) in advance, either at Itanagar or recently (apparently) from Arunachal Liaison Offices in Delhi, Bombay or Calcutta. The 100 km journey from Tinsukia to Roing can take one whole day — so stock up on a good deal of patience, so essential for travel anywhere in the north-east. And don't forget your leech-proof gaiters!



was facilitated in the Mehao region by an earthquake in 1952 that wrought extensive damage.

**T**HESE MOVEMENTS loosened the traditional ties between the people and their land and forests and this umbilical cord was attacked even more severely once the timber trade came in. The government, in a rare flash of wisdom, recognized the rights of the natives to their forest resources, and through inner line restrictions, barred outsiders from exploiting them directly.

But in its revenue orientation, it forgot to nurture their earlier ties with the forest. So the natives themselves, encouraged by the Forest Department, became partners in the trade, setting up over 100 sawmills all over the state. Though 'owned' by natives, these sawmills, as indeed all phases of the timber operation from felling to marketing, are actually run by outside businessmen — generically referred to as 'Marwaris' — who allow barely 5-10 per cent of the profits to circulate among the native 'owners of the forest'.

But even 5-10 per cent is far more money than the Mishmis have ever known, and because it comes easily and provides access to consumer goods, they are rapidly abandoning their traditional lifestyles —

to 'assimilate' into our developed societies as citizens of the timber-permit raj. While they do have political 'independence' (only native Arunachalis can be residents of the state), the Mishmis are rapidly becoming completely dependent on the market for day-to-day existence, to the extent that even rice is now imported as shifting cultivation is given up. Maruti Gypsies and timber trucks are the two ubiquitous symbols of this 'development', and the new easy life is eroding the native culture.

Alcoholism and crime are becoming rampant. The elder medicine men and priests (destined to be the last repositories of forest lore?) find no young apprentices, even as no new education or wisdom is replacing the old system.

**W**HILE THE GOVERNMENT in Itanagar celebrates the revenue from timber, the edges of the forest are being eaten into, leaving a loose, weed-covered soil that washes away in the torrential rains. Once narrow, verdant streams are now boulder-strewn stretches hundreds of metres wide, and even the state capital is frequently cut off by landslides and avalanches caused by treeless slopes of loose soil. The formidable lowland forests of Dibang valley have given way to barren,



This sawmill near Injono village, just outside the sanctuary, presumably processes both legal and contraband wood. The sawmill manager laments that the logs are getting smaller each year.

weedy stretches with an occasional relict tree, often half-burnt, standing like a pathetic apology from the loggers.

Mehao is today hemmed in by 15 sawmills which legally eat forests outside the sanctuary as their main course, and consume illegal timber from the 'protected' foothills for dessert. While the Forest Department permits 1000 trees (or 500,000 cubic feet of wood) to be extracted annually in pursuit of revenue, at least half as many more are felled illegally inside the sanctuary. And this does not include the incidental damage caused when each large tree falls.

The boundary drawn on the Forest Department map is neither understood nor respected, and the meagre, untrained, ill-equipped sanctuary staff have virtually given up trying to protect the forest and its wildlife. I myself saw two hectares of forest inside the sanctuary boundary (according to the Forest Dept. map) being bulldozed at the behest of a local politician, right under the forest officials' noses! All the notifications and schedules under the Wildlife Act appear to have little meaning at this frontier, where everyone from the government to the naive natives rush to maximize short-term profits — for the 'outsider' middlemen! Clearly, good intentions alone cannot save these rainforests.

**W**HAT WILL HAPPEN in another 5-10 years, when the forests and the biodiversity vanish forever and much of Arunachal is transformed into a degraded, wet desert? What will become of the next generation of Mishmis (and other Arunachalis) once the timber trade withdraws after sucking their future dry? The devastated lowlands only highlight the fragility of any 'natural harmony' between man and nature when modern market forces and consumerism launch their assault.

If native wisdom failed to check this rape, can we replace it with a new wisdom, based on a more rational understanding of man's relationship with nature, and a new appreciation of nature's wonders? Isn't this implied in the holy covenants being pledged by our government to protect our natural heritage? Laudable as these commitments are, they carry a hollow ring in Arunachal. Here, the solemn oaths of Rio are drowned by the din of the sawmills that continue to proliferate under the blessings of the same government. And one is left pondering the

#### THE MECHANICS AND ECONOMICS OF LOGGING

Logging in Arunachal Pradesh is regulated by a system of timber permits issued every year by the Forest Department, ostensibly to needy tribal families. A single permit allows a family to extract one tree or 500 cubic feet (cft) of wood in order to meet its requirements. In practice, permits are now a means of distributing political patronage, issued on the basis of ministerial recommendations rather than assessment of need.

Each forest division has a predetermined quota of permits to be issued annually and the revenue obtained through this is substantial: in 1991-92 Roing division alone netted royalties worth Rs. 2.5 crore by selling permits for 100 trees.

Once a permit is issued, the Forest Department verifies the individual tree selected for felling, after which it is cut, usually with hand-saws, into manageable logs which are dragged by elephants to the nearest road and thence to the sawmills in timber trucks. The sawmills then export the processed wood (as poles/planks or plywood) to markets as far away as Bombay and Madras.

A typical sawmill may process up to 100,000 cft annually to net profits of up to Rs. 15 lakhs for the 'Marwari' who runs the sawmill, while the tribal licensee-owner of the mill may get some Rs. 2 lakhs as rent. The following example illustrates the distribution of profits in this trade, for a Class A timber species (such as champa, hollock or bola), which are the ones most sought after from around Mehao.

The Mishmi permit holder usually sells the permit (one tree or 500 cft of wood) to a middleman for Rs. 15-20 per cft, thereby saving himself the trouble of the remaining operation. The middleman invests another Rs. 10-15/cft on labour and transport, pays royalty of Rs. 65-70/cft to the Forest Dept. and then sells the logs to the mill at perhaps Rs. 135/cft. The final consumer in Bombay may end up paying up to Rs. 700-800/cft (for bola or mulberry).

And as for the future — hardwood species are now dwindling, and the focus is shifting to plywood. Major companies like KitPly and National Plywood have already set up large mills in Arunachal Pradesh.

words of Latin American writer Eduardo Galeano:  
"Dreams and nightmares are made from the same materials. But this particular nightmare purports to be the only dream we are allowed: a development model that scorns life and adores things". ■

*Madhusudan Katti is an alumnus of the Wildlife Institute of India. He is now enrolled for a Ph.D. at the University of California, working in India on the biology of warblers.*

# Rollapadu Revisited

RANJIT MANAKADAN



Ravi Sankaran

I HAVE RECENTLY BEEN posted back to the Rollapadu Wildlife Sanctuary in Kurnool district, Andhra Pradesh, under the BNHS Grassland Project. Things have changed, some for the better and some for the worse, since I worked here for four years (August '84 to July '88), studying the great Indian bustard under the Society's Endangered Species Project; see *Hornbill* 1987 (1).

The area has been granted the status of a wildlife sanctuary, thereby making it much easier to obtain funds for the sanctuary's development, and give more teeth to enforcement of wildlife protection laws. In addition to the Visitors' Information Centre and two watchers' quarters, there are now residential quarters for a forester and a guard, plus a rest house for tourists (earlier one had to stay at Kurnool, a good 50 km away). The long awaited monetary compensation to villagers for the land acquired for establishment of the sanctuary has been paid.

Negative developments are the price of land — up from Rs. 6,000 per acre to Rs. 26,000 today (too bad I did not invest in land in 1984!). As a result, many of the wooded areas outside the sanctuary are being cleared for cultivation. Where date palms once garlanded the flowing streams and offered refuge to many animals, there are now only burnt stumps. The waters of the streams are now diverted to newly created fields; no more can the fishes move upstream to breed, nor are there pools above which bayas can hang their pendulous nests.

CHANGES IN WILDLIFE populations are obvious, especially in the case of blackbuck. There were 17 animals in 1985 and 38 in 1988. During a census in July '92 I counted total of 130 (the Forest Department estimate is 275). But this increase is a mixed blessing. The sanctuary was primarily intended for the great Indian bustard, and local feeling against the sanctuary (a result of damage done by blackbuck) could work against the bird. Villagers complain about crop-raiding and seek compensation, and there is a demand that the core areas be fenced off to keep the blackbuck in the sanctuary and out of the fields.

The possible solutions to this problem are another aspect of our study. Two have been suggested by earlier studies — total removal (the blackbuck population has risen in many areas and the species should no longer be considered endangered) and

yearly culling. And unless the problem is solved quickly, ill-will towards the sanctuary will grow, as it did when villagers' lands were acquired.

Wolves too have increased in number. Three of them are seen almost daily in one of the protected plots (core areas) in the sanctuary. There are now increased reports of predation of goats and sheep by wolves. The night before I arrived, a pack of wolves ran amok and slaughtered 26 sheep of an unguarded flock. But much as the wolf is hated, the blackbuck is hated even more. Added vigilance by shepherds can either totally stop or at least reduce sheep killing by wolves. In many cases, the whole or major portion of the carcass is retrieved after a chase, and taken for the cooking pot or ends up in the butcher's shop. In the case of blackbuck, a man has to stand guard over his crop day and night, for months at a stretch.

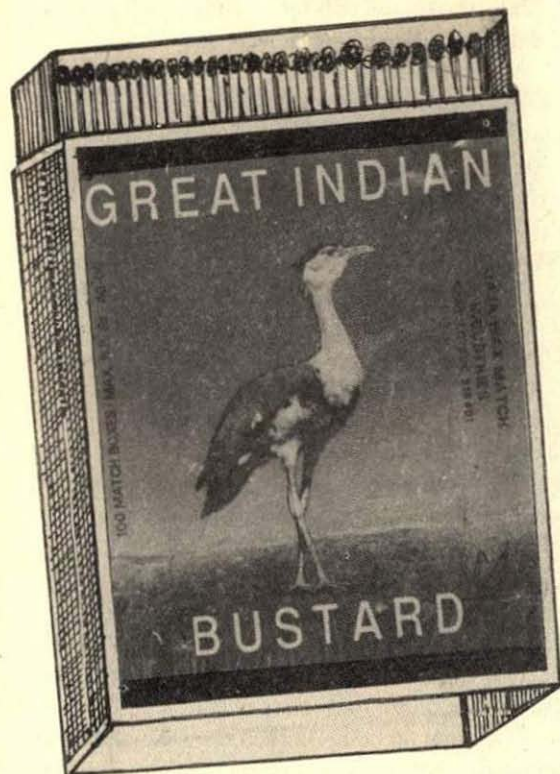
WHAT THRILLED ME most was the increase in numbers of the dainty fox. Earlier, a single pair flitted across the grasslands. Some months ago, I came across more than half a dozen during an evening's walk. Their hurried flight on being startled (as if they had seen a ghost) and their 'only nose' and 'all ears' posture in the grass as they eye you from a distance, are quite comical — and altogether delightful.

They seem to rely mainly on a diet of grasshoppers, small rodents and pods of the Indian laburnum tree (*Cassia fistula*), judging from their droppings and observations in the field. Foxes seem to have made maximum use of the enclosures, using the trench-cum-mound walls of the enclosures (meant to keep livestock out) for fox-holes! No wonder they say, 'as cunning as a fox'.

There was a new, but short term, addition to the sanctuary. A wild boar, that probably strayed from the nearby Yerramalai hills, took up residence on the banks of a shrub-lined stream in one of the core plots. He probably found the cover inadequate, and the daily presence of the watchers going about their duties, too much for his liking. So, after a week of digging about and snorting at equally startled watchers, he left for better and more peaceful climes.

NOW, COMING TO the prima donnas of the sanctuary: the great Indian bustards. In spite of good breeding records every

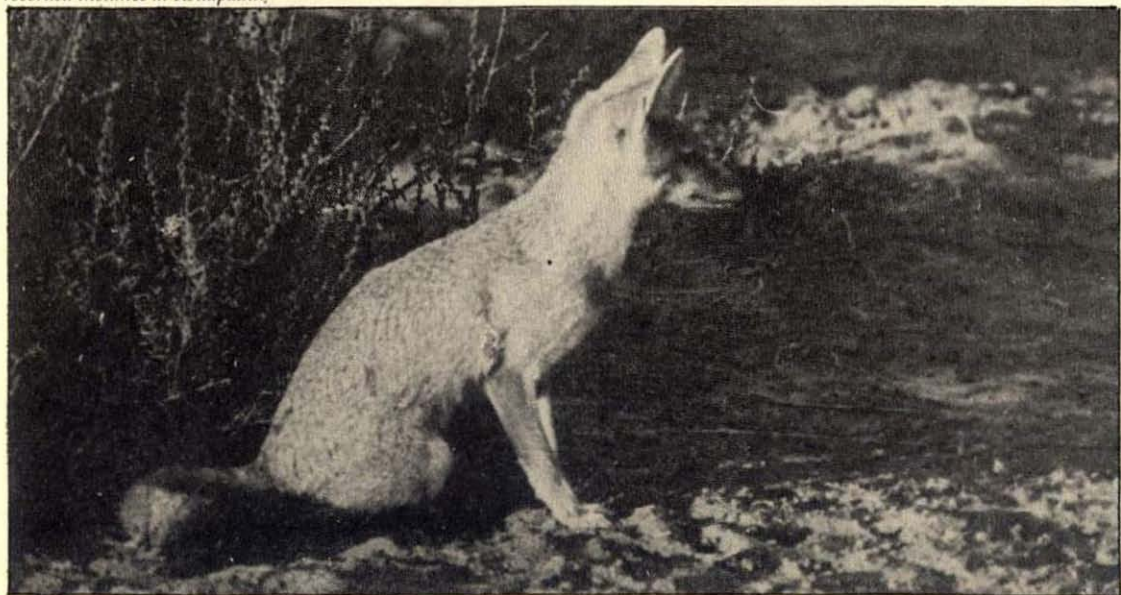
The lesser florican, one of India's most endangered birds, was the subject of a six year study by the BNHS. This photograph was taken in the grasslands of Manas. Rollapadu holds a smaller population, and the reduced frequency of display and nest sightings is a matter of concern.



Ravi Sankaran

The great Indian bustard (shown more accurately on pg. 10) is the *raison d'être* for the Rollapadu sanctuary. Local villagers have more or less adopted it as their mascot. And these matchboxes outsell most rival brands by a wide margin.

The Indian fox (*Vulpes bengalensis*) is smaller, lighter and far more widely distributed than the related red fox. Its distribution includes much of India south of the Himalayan foothills. Foxes are known to sneak away with bustard eggs, though there is no recorded instance at Rollapadu.



Ranjit Manakadan



E.P. Gee

*The barheaded goose is a winter visitor from central Asia: the only breeding areas in India are in Ladakh. The first arrivals are in October, and flocks are seen till mid December*

year, the results are not reflected in the numbers seen. I count about 20 birds daily — about the same for the same season during my earlier study. But a puzzling change is the courtship display of the dominant male. The display was every bit as spectacular as I remembered it. But instead of displaying only during the major (September to November) and minor (April and May) breeding seasons, they now disport themselves at their traditional display arenas throughout the year.

The sanctuary personnel are delighted: the cock is the saving grace for them, when no other birds are seen, when tourists and officials arrive. The 'bat-tameka pakshi', as it is called in Telugu, is the mascot for the buses of the Nandikotkur depot. And Great Indian Bustard brand matches sell like hot cakes!

The other unexpected bonus was the highly endangered lesser florican. It was sighted on a few occasions during our absence, but no displaying cocks or nests were detected as earlier. Demoiselle cranes and barheaded geese are still reported to be regular winter visitors. The cranes arrive in thousands, making severe inroads into the jowar crop. Their arrival is looked upon with grave foreboding by the farmers, but is welcomed by the local trappers, who snare them in jowar fields. But a bagged crane has to be handled with care — the lightning thrusts of the lance-like bill are meant, as Ian Fleming put it, for your eyes only.

The geese feed mainly on the leftovers of the groundnut harvest. The farmers don't particularly mind, and shikaris love the geese, for they are a

prized quarry. In spite of the vigilance of Forest Department personnel, hunting for cranes and geese goes on the sly, as much of the sanctuary's area is cultivated and under private ownership.

**T**HE DATE PALMS in the protected plots are now as tall as a man. Outside, they do not live long enough to reach this height; they die a slow death due to the frequent incisions at the growing shoot to tap toddy. Protection works in many ways. It is fascinating to see how a bit of conservation can change the way animals behave. The blackbuck, which would earlier flee at the approach of a person a good distance away, are now too 'lazy' to even walk off, and when pressed, trot sedately away. Spotbilled ducks, flushed from a stream, soon return to settle some distance away, knowing that no guns await them.

Centuries ago Manu said, "Where women are respected, the gods dwell". I feel he should have mentioned animals instead of women. We will have to realise that animals too have a right to live and live freely, without constant fear of man. Will that day ever come?

Camp Rollapadu has just started, and I hope for good hunting — for data on the grasslands of Rollapadu, and the animal and plant communities they support. ■

*Ranjit Manakadan is a biologist at BNHS. He has worked on bustards, on the ecosystem of Pt. Calimere in Tamil Nadu and on Bird Migration. For his Ph.D., he studied the impact of commercial salt production on bird communities (and particularly pelicans) at Pt. Calimere.*

# LETTERS

Sir,

I would like to recount some folklore of Mayurbhanj district of Orissa, in connection with the article on owls published in *Hornbill* 1992(2).

In our society it is forbidden for a married lady to touch her husband's elder brother, or his clothes, or any article he uses, to talk to him or even to look at him; nor is she allowed to show her face to him. These rules were probably instituted to prevent the development of illicit relationships. The ban also extends to leftover food — and is enforced partly by superstition. It is strongly believed that if a married woman eats food left over by her husband's elder brother, then she is reborn as an owl after her death.

The screech of an owl is thought to be a bad omen. It is also a common belief that to scare the owl away, a pinch of salt should be thrown into the fireplace (where it 'explodes' with a crackling noise). I have experimented several times, but the salt does not serve the purpose at all.

**Ramakanta Das  
Bhubaneswar**

Sir,

To the north of Tulsi lake in Bombay there is an artificial channel running from north to south for 1.5 km or more, intended to collect some of the run-off water from the hills and empty it into the lake. The channel is provided with stone walls and is about two metres deep and equally wide. For most of the year it is dry and littered with fallen leaves, with an occasional hardy shrub.

I have often walked along the west bank of this channel (but never during the monsoon), but have rarely seen birds, mammals or snakes within it. I once did see a Russel's viper on the opposite bank, and on another occasion a red spurfowl chick sitting motionless on the dry bed, so well camouflaged among the leaf litter that I spotted it only after seeing an adult bird fly upwards.

On 27th October 1991 I was therefore surprised to see a young sambar, somewhat bigger than a goat, within the channel, perhaps 600 m away from the nearest exit. When spotted it started running towards the lake. I did not expect to see any more of it. However, several minutes later, when I came within

sight of the lake there was the sambar, at a small puddle 60 m away. It was facing away and hadn't seen me. Hoping that it would move back along the channel, I took cover behind the shrubbery on the bank.

Within a minute or two the sambar did start moving in slowly, stopping every now and then to sniff the air. I stood up as carefully as possible, but it promptly bolted. I concealed myself again. After a brief halt near the puddle the sambar retraced its steps till it halted about 15 m from me. It had probably picked up an unfamiliar scent although it hadn't seen me. There were mosquitoes hovering around my ankles and it was getting difficult to remain crouched, so I finally stood up and revealed myself. The sambar stared at me for several seconds before turning and running towards the lake.

When I returned to the 'crouching point' after lunch, about half an hour later, there was the sambar walking in yet again. This meant it wasn't unduly alarmed by my presence, so why not try to befriend it, I suddenly asked myself. I started calling out to it and gesturing for it to come forward. Naturally the animal didn't know what to make of this. It kept watching, ears pricked forward.

Then, to my great joy, it actually started approaching, and I too moved slowly forward. However, when about 20-25 m away it took fright and ran off for the fourth time, only to stop at its favourite puddle. I climbed down from the bank onto the channel bed and walked part of the distance towards the puddle, beckoning to the sambar. After some hesitation it advanced about 6 m and halted. It stamped the ground once or twice with its foreleg. (Is this supposed to be a warning?) After a short while it suddenly started running rapidly towards me — why, I had no idea. If it was planning to deliver a kick, I had no wish to be at the receiving end.

Evidently the young sambar's thinking was equally confused, for it stopped abruptly about 10 m away, turned sideways, sniffed the air and ran off. This time it did not halt at the puddle but rounded the bend and vanished.

Eleven days later, I visited the channel again, hoping for another encounter. What I saw instead,



M. S. Pradhan

**Ammattekuppe tank, near Sankadkatte in Nagarhole. Should 'non-native' fish species be introduced into a stable, fairly healthy ecosystem?**

within the channel, were the remains of a small sambar which had been killed perhaps two or three days earlier. Most of the flesh had been devoured and only the bottom 20 cm or so of the forelegs were intact. Much of the skin and skeleton were left behind and there were no clean cuts on the body, so this could not be the work of poachers.

It was probably the work of a leopard, which must have found it relatively easy to stalk and kill the inexperienced sambar: the channel offers the prey little hope of leaping onto the bank and making a dash for safety. The young sambar had lost its life due to its inexplicable preference for a hazardous location offering little, if any, scope for foraging.

**Oscar Fernandes  
Bombay**

Sir,

The Zoological Survey of India has been conducting an inventory of the fauna of the Nilgiri Biosphere Reserve. Survey teams from the ZSI's Western Regional Station at Pune have been regularly visiting Bandipur Tiger Reserve and Nagarhole National Park, which form part of the Biosphere Reserve. One thing we noticed during these surveys needs to be debated further.

There are a number of natural as well as man-made water bodies in the buffer and core zones of Bandipur and Nagarhole, in and around which there is a high degree of faunal diversity. During sampling at some of these water bodies in the core zone of Nagarhole National Park, we netted specimens of

exotic fish species like *catla*, *rohu*, *mrigal* etc. along with the native representative fish fauna.

On enquiry, the wildlife authorities of the region confirmed that they had introduced fingerlings of major carps in these tanks. Recent surveys and earlier records have shown that the biological diversity is extremely rich in the Nilgiri Biosphere Reserve. Whether or not the introduction of exotic or 'outside' fish species will affect native populations needs to be examined. Though one is not sure at this stage, such introductions may affect the food chain and interrupt the ecological balance in the *sanctum sanctorum* of the park. In any case, the Wildlife Act does not allow disturbance in the core portion of any conservation area, whether through alterations, modifications or changes of any other sort.

Species must be allowed, as far as possible, to develop and evolve naturally. The introduction of carp in the core zone tanks may lead to some sort of stress on the local aquatic fauna, and perhaps eventually affect population densities. Hence, all possible care must be taken beforehand to protect the indigenous fauna before altering any ecosystem.

**M.S. Pradhan  
Poona**

*Correction:* The article on wild dogs in the previous issue (1992(2)) stated: "... dholes kill more does than stags of chital and sambar." This is incorrect. It is stags, not does, that are preferentially preyed upon. The reasons are explained later in the same article. The error is regretted.





# NEWS NOTES COMMENTS



## Frogs, drugs and cell biology

A chemical extracted from the skin of an Ecuadorian frog has turned out to be a painkiller 200 times as potent as morphine. Biologists at the National Institutes of Health at Bethesda, Maryland, extracted 60 milligrams of material (sacrificing 750 frogs in the process). This was then purified to obtain 24 milligrams of the new chemical, named epibatidine after the frog (*Epipedobates tricolor*). The chemical formula, if you're interested, is  $C_{11}H_{13}N_2Cl$ .

Among the tests used to demonstrate the effectiveness of epibatidine as a painkiller was the so-called hot plate test. Drop a rat onto an electrically heated plate. If it's too hot, the rat leaps away; if the rat is doped with painkillers, it stays on the plate. Most rats will ignore the heat if given a dose of morphine equivalent to 1 mg of morphine per kilogramme body weight. Epibatidine gives the same effect with one-two-hundredth the dose.

The new chemical provided another surprise. When the rats were injected with naloxone, a chemical which neutralises several painkillers including morphine, they did *not* recover their sensitivity to pain.

Epibatidine opens up several new areas of research. For one, it works in a fashion quite unlike any other painkiller, involving hitherto unknown receptors in the brain. A fuller understanding of epibatidine and its mechanism will provide new clues to how the human brain reacts to pain — and obviously the potential benefits of this knowledge are enormous. Secondly, it seems probable that by making relatively simple changes in the chemical composition, a whole new range of analgesics can be synthesized.

Another amphibian that is making its mark on biology research is an African frog, *Xenopus laevis*. For some years geneticists had known that the eggs

of this creature, when mature, contained some chemical that could induce other eggs to ripen, and then wait to be fertilised. The chemical was called maturation promoting factor (MPF). After much painstaking work, the chemical structure and composition of MPF was worked out.

The importance of MPF goes far beyond amphibian reproduction, into human cell biology and even into the search for a cure for cancer. One of the constituents of MPF is a variant of a human protein that plays a key role in cell division. How are new cells created in the body? How do they grow, and then divide? Researchers, particularly those studying the chemistry of cancer, have been struggling for answers, and *Xenopus* may provide some.

## Scream first, fight later

Animal communication, particularly dominance or conflict-related displays, are a fascinating subject. American ethologists recently studied this behaviour in wild stallions. When they (the stallions, not the ethologists) come into conflict they squeal at each other, and by doing so assess each other's fighting ability. The stallion with the longest-lasting squeal is likely to be the best fighter, because a long squeal indicates a large lung capacity.

Biologists from Princeton University studied feral stallions living on an island off the coast of North Carolina, U.S.A. During the breeding season, a stallion defends a group of mares from rival males. The stallions apparently take note of two entirely different signs in opponents: the smell of their dung and the sound of their squeals.

About half the contests are settled quickly, with one individual simply running away. But in other cases, the animals go through a ritual, approaching each other, sniffing each other's faces, genitals and faeces, and then making noises. In four out of five such encounters, these displays are sufficient to settle the contest. Only rarely do disputes turn nasty,

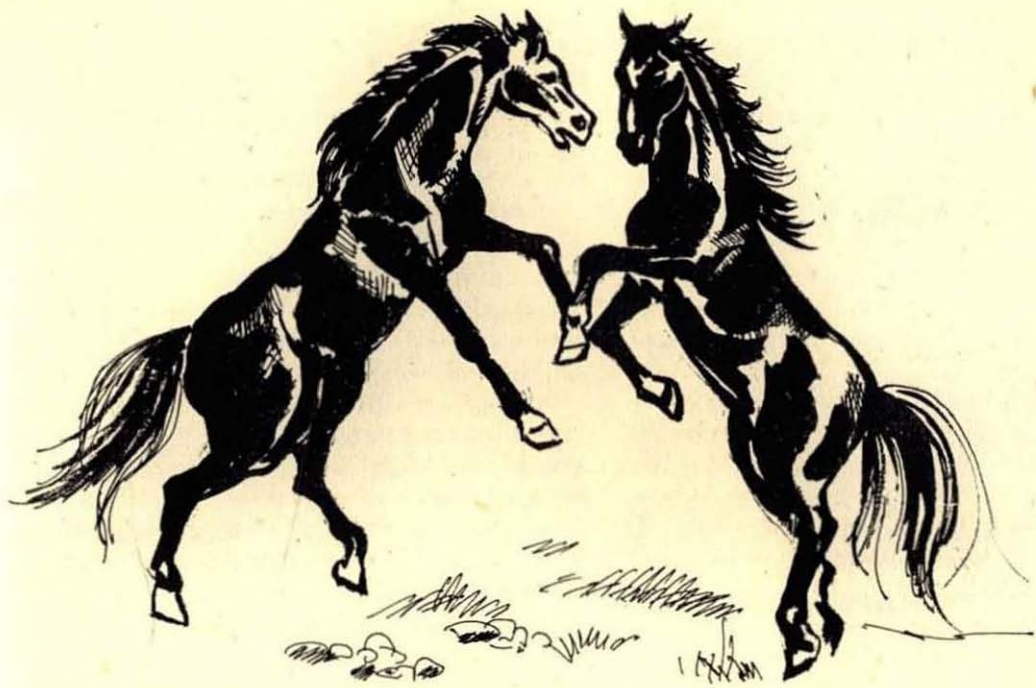


Illustration by Rita Ganguli

with the stallions biting, kicking and rearing up on their hind legs.

But what does a sniff or a squeal mean to a stallion? Scents, particularly of dung, are used to identify individuals, while squeals are used to signal status.

These conclusions are supported by two key findings. First, dominant stallions show a particular interest in the squeals of low-status animals. After a subordinate calls, a dominant stallion keeps his head up for twice as long, regardless of his own dominance status. He is also likely to approach the subordinate animal whether or not it is familiar. The second key finding is that as far as odours are concerned, familiarity is all that counts. Stallions examine the dung of strange males for nearly twice as long as that of males they know.

The researchers conclude that the ritualised smelling and squealing in contests can convey information about fighting ability. Because scents reveal identity, they can also indicate fighting ability among animals that have sparred in the recent past. And because stallions defecate most in the areas they value most, scent can also tell an interloper that he has met the area's dominant resident and will need to fight hard to take over.

Squeals seem to provide information on whether or not the animal can withstand a long fight. The squeals of dominant stallions last about 20 per cent longer than those of subordinates; they start with a high-frequency sound, and maintain three "strong broad sound energy bands" throughout. The squeals of lower-ranking males lack the shrill start and peter out. The squeals of dominant stallions probably reflect their greater lung capacity and stronger thoracic muscles.

Males of most species telegraph information about fighting ability to rivals, in order to force them to back off without actually fighting. But this is the first known case (there are probably many others, still undiscovered) where 'redundant' information is supplied — either olfactory or acoustic signals would do, but both are used. There are two possible reasons.

Firstly, horses have large but overlapping home ranges and so are likely to meet many rivals. Secondly, they are among the few animals to have evolved keen senses of both hearing and smell. Redundancy probably helps to keep the signaling honest — after all, it is harder to cheat about your abilities if they are being assessed in several different ways.

## New Scops owl

A new species of Scops owl has been discovered on the island of Anjouan in the Comoros islands (a group of four islands between Africa and Madagascar). Although a Scops owl was recorded on Anjouan in 1886 — over a century ago — there have been no definite sightings since then and for most of that time, the bird was believed to be a subspecies of the more widely distributed Madagascar scops owl.

It all started when a team of ICBP biologists, camping beside a remote crater lake on Anjouan, heard a weird whistling call, which they at first thought might be a sea bird. They were unable to locate the source of the call. Three visits and two years later, the call was eventually traced to a Scops owl. One bird was trapped, examined and categorised as a separate species, named the Anjouan scops owl (*Otus capnodes*). No population estimate was made, but it is thought that less than 100 pairs survive.

The future for wildlife on the island group seems bleak. Human population density is very high, and the extent of primary forest on Anjouan has dropped from 8260 ha in 1972 to 1109 ha in 1987 (more recent figures are unavailable). The Comoros enjoy a remarkably high degree of biodiversity, and a number of species, particularly birds, are both endemic and rare. There are two endangered mammals as well, the mongoose lemur and Livingstone's fruit bat, one of the world's largest and most endangered bats. Lemurs are something of a regional speciality. All the world's known 16 species are restricted to Madagascar and the Comoros.

Islands often present a difficult conservation problem. Because of the high degree of endemism, there is a clamour for wildlife conservation. And because of the limited area, the clamour is equally loud for land for development or industry. Balancing the two is tricky. Madagascar, for example, has lost much of its forests and its wildlife over the past few decades. Sometimes, tourism can provide an alternative source of income to hard-pressed locals. Fortunately, the Comoros have the advantage of proximity to existing, popular tourist areas. But even if tourism can be sufficiently developed, it is important to regulate the traffic so that ecological damage is minimised — another balancing act.

## Bali starlings

Two years ago, the world population of the Bali starling (*Leucopsar rothschildi*) stood at 18, all of them in the Bali Barat National Park in Indonesia. Fortunately the bird is now better off. Illegal poaching of wild birds (a major cause for their decline) has fallen sharply, and there have been two consecutive successful breeding seasons. The wild population now stands at 55. In addition, a captive breeding programme is doing well.

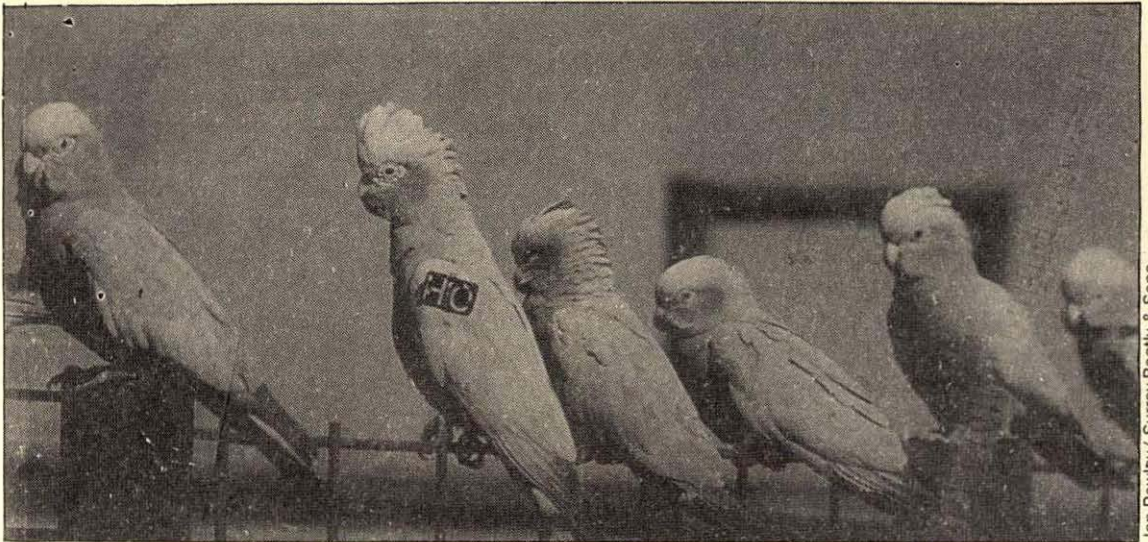
The starling will also benefit from a strict new law in Indonesia concerning the possession of protected animals by private individuals. All protected animals (or parts thereof) now belong to the state and had to be registered before 31st October 1992. Birds that were brought for registration (which may have come from the wild) could be exchanged for captive bred birds, which are likely to be genetically less valuable.

July 1992 saw the start of a new three-year phase of the Bali Starling Project, run jointly by the ICBP and the Indonesian government. The new initiatives include hiring additional staff, preparation of a manual for park guards, and the Jalak Bali (meaning Bali starling) Badminton Cup. If Indonesia's most popular sport cannot succeed in projecting the urgency of starling conservation, then probably nothing can.

## Parrots for posterity

Parrots are perhaps the best known of birds. Keeping them as pets is a tradition as old as ancient Egypt, and through the centuries they have been bred and hunted for meat and feathers. Parrots may still be ubiquitous, but the future for a number of species is uncertain. Of the world's 356 species, at least 105 (plus 63 subspecies) are threatened. At least 16 species are now critically threatened — there is a 50 per cent chance that they will become extinct within the next two generations.

Parrots are a large group, with diverse ecological requirements. Many species are adaptable, and some birds that have been released, or have escaped from the vast populations held in captivity, have become naturalised — there are stable feral populations of 27 species in the U.S.A. alone. Other species have proliferated in their natural range as a consequence of man's activities, such as the galah (*Eolophus*



Ian Rowley/ Surrey Beatty & Sons

**Having a galah time — populations of the galah have increased sharply as a result of man-made changes to parrot habitats. The bird with fully erect crest was tagged for behavioural studies.**

*roseicapillus*) in Australia, and the monk parakeet (*Myopsitta monachus*) of South America, which has a population estimated to be in the millions. In contrast, there are a number of specialised parrots that are intolerant of (man-made) change, and have consequently declined drastically.

The main problem is the loss or modification of natural habitat. Another is the bird trade; a number of the most seriously endangered parrots, such as the hyacinth macaw (*Anadorynchus hyacinthinus*) are threatened by the demand from the illegal and apparently insatiable feather trade. Other threats include hunting, introduced diseases and predation by, and competition from, introduced mammals such as rats and cats.

The ICBP is in the process of finalising an ambitious action plan for parrot conservation, prepared on the basis of a workshop held last year to assess the worldwide status of parrots. The action plan seeks to safeguard viable populations of *all* the world's threatened parrots. This involves a series of integrated programmes covering direct habitat protection and management measures, education and public awareness campaigns, and the adoption and implementation of national and international legislation. In some cases, where the number of wild birds is very low and captive populations are already available, captive breeding has been suggested.

The problem is money — up to US \$10 million per year. But looking at it another way, this sum

represents just *one per cent* of the total spent worldwide on caged parrots and their maintenance. Surely the plight of parrots in the wild should move not merely wildlife organisations but also pet fanciers to shell out.

### Shhh..

Conservationists have been yelling their heads off about noise pollution, and nobody's listening. The focus of protests has usually been cities — but the effects of noise pollution extend into wilderness areas as well, particularly in the west, where noisy equipment such as chain saws are used in relatively remote areas. Animal sounds are a vital means of communication, for example to announce ownership of territory or to advertise for a mate. Each species has a limited vocal range, and if a man-made noise of the same acoustic frequency drowns out its call, the animal suffers. Low-frequency sounds emitted by ships, for instance, interfere with whale communications. Some species may be able to adapt to noise — waterfowl colonies have thrived near major metropolitan airports — but the majority are likely to be detrimentally affected. Noise can wake up hibernating animals too, thus raising their metabolic rates at a time when food supplies are scarce.

The results of laboratory tests on the endangered desert kangaroo rat in the U.S.A. are particularly scary. The rat's sensitive hearing can detect its mortal enemy, the sidewinder rattlesnake, from 40 cm

away. It then instinctively kicks sand into the snake's eyes, temporarily blinding it. But after a brief exposure to moderate decibel level sounds (such as those often made by human visitors to its natural habitat), the rats were unable to detect sidewinders until the snakes were within two centimetres — and the effects of the noise lasted for weeks. The result? Almost certain death.

A group of American conservationists has been campaigning for stricter laws. Apart from restrictions on aircraft flights over a few wilderness areas, there are almost no regulations governing noise pollution. They have proposed measures such as changing aircraft flight patterns, regrading or realigning roads so that vehicle sounds don't carry, or limiting the use of intrusive equipment such as chain saws or off-road vehicles in sensitive areas.

Another suggestion, somewhat tongue-in-cheek, is to declare a single square inch of wilderness a totally noise-free area. That, of course, would entail banning many human activities for miles around (and above) that square inch. Their first priority, however, is simply to bring the subject of noise pollution to the attention of the general public. It's one message that should be heard above the din.

### News from Pakistan

There is both good news and bad from the Palas valley in Pakistan (see this column in *Hornbill* 1991(2)). The Palas forests harbour the largest known concentrations of the threatened western tragopan (*Tragopan melanocephalus*). Population estimates for the tragopan have been revised upwards to over 500 — at least five times that of any other known site. Recent surveys by the ICBP/WWF Himalayan Jungle Project showed that Palas contains good populations of six of the other seven west Himalayan endemic bird species, plus at least two other threatened species — the Himalayan musk deer (*Moschus chrysogaster*) and the west Himalayan elm (*Ulmus wallichiana*).

The project started well, focusing in its first year on sociology rather than ecology, to build up popular support for wildlife conservation schemes that would follow, and eventually for a comprehensive plan for sustainable use of these remote mountain forests. But in September 1992 the western Himalayas were hit by the heaviest rainfall this century. In Palas, rivers broke their banks, drowning

two women and destroying over 50 foot-bridges, sections of the main Palas pathway and most water-mills. 9000 villagers in the upper Palas region were stranded, unable to either mill their grain for food or take it to market.

The project team responded magnificently. With the help of the Pakistan government and SUNGI, a local NGO, they sent in 50 tonnes of food, paid for by Save the Children Fund (U.K.), Oxfam and the World Pheasant Association. The airlift operation took six days of gruelling and highly dangerous helicopter flights. Project officials worked with tribal councils to distribute the food equitably, and later to rebuild bridges, pathways and water-mills. When Palas does return to normal, the goodwill generated by the project team will start to pay off. The chances are now better than ever that the valley, one of Pakistan's most valuable wilderness areas, will be preserved.

There is some consolation in knowing that matters would have been much worse but for Palas's virgin watershed forests. In neighbouring Kaghan valley, where forests have been damaged, catastrophic landslides took a heavy death toll, and crores of rupees worth of cut timber swept away by the floods demolished every major road bridge. The logs finally stopped at Mangla dam, 160 km downstream, splintered and worthless.

### The world's costliest egg

Normal eggs cost about a rupee apiece. Dinosaur eggs are somewhat more expensive — earlier this year a 70 million year old dinosaur egg fetched £5500 at a London auction of scientific instruments and 'other apparatus'.

The 18.2 cm long egg was probably laid by the herbivorous *Hypselosaurus* during the Maastrichtian age of the Cretaceous period near Aix-en-Provence in present day France. The site at Montagne St. Victoire became famous in the 1950s for its dinosaur eggs. Some limestone deposits are almost entirely made up of eggshells, and whole nests of eggs of a dozen types have been found. Most eggs are crushed or distorted, but this one was "unusually fine", according to the British Museum scientist who authenticated the specimen. The site near Aix is now protected, which might explain the high price fetched by this specimen. In 1972, a similar egg was auctioned for £260. ■

# FOLKLORE

## The Sarus Crane

NARESH CHATURVEDI

**T**HE SARUS CRANE has long been known as a symbol of everlasting conjugal love, because it pairs for life. Even so, there are very few references to this devotion in ancient Indian literature, probably because its distribution is largely restricted to the northern part of the subcontinent. In contrast, the more widely distributed brahminy duck, also known for conjugal devotion, has been mentioned extensively (see previous issue of *Hornbill*). The apparently life-long devotion that sarus cranes show to their mates has earned them a degree of popular sentiment amounting to sanctity; if one of a pair is killed the other is believed to haunt the scene of the outrage till its death.

Perhaps the most famous reference to the sarus crane is in Valmiki's *Kavya Ramayana*. The rishi-poet, during a pilgrimage, halted at the banks of the Tamasa river, where he saw a pair of sarus cranes engaged in their nuptial dance. Suddenly a fowler struck down the male with an arrow. On hearing the cry of the female sarus, Valmiki's heart was filled with sorrow, and he cursed the fowler. Never would he find the comfort of a home; and his reputation too would be lost forever.

The Mughal emperor Jehangir, in his memoirs, *Tuzuk-e-Jehangiri*, describes how a sarus sat for days on end, without food, on the bones of its dead mate — so much so that when the mourning bird was lifted up its breast was found to have been eaten by worms and maggots.

**T**HE SARUS CRANE is referred to in Indian literature by several other names: *Laxamana* — possessing a distinctive mark. The sarus has a red head which provides a striking contrast against the grey body. *Pushkarakhya* — one who is found near water (*pushkar* = pond or lake). *Kurankuraha* — a sarus pair is known to indulge in a complicated 'love dance' as a preliminary to consummation. Hence the name *Kurankuraha* or *Kalankuraha*, meaning one who is an expert at foreplay.

One previously unsuspected quality of the sarus

was revealed by Kalidasa in *Meghdoot*. Sweet words of encouragement can invigorate one's beloved. But even more effective are the clouds that waft in from the Shipra river during the rainy season, bringing with them the fragrance of lotus flowers and (what is more important) the melodious calls of the sarus crane. The lassitude that follows a bout of passion vanishes, and the lady is ... well, receptive.

**S**ARUS CRANES MAKE excellent pets, and can also be trained as watchdogs, provided you catch them young. They were traditionally a part of royal households, including those of Lord Ram and queen Kaikeyi. The court of king Vasantsena is described in Kalidasa's *Mricchakatika*. There is a row of palaces, and the seventh court, which is particularly resplendent, contains an aviary.

*The doves bill and coo in comfort:*

*The swans like balls of moonlight roll about in pairs,*

*While long-legged cranes stalk about*

*The court like eunuchs on guard.*

The *Sutras* deal with dietary restrictions, including details of which birds may or may not be eaten. All cranes make good eating, but the sarus is taboo. In the *Valmiki Ramayana*, Lord Ram, during his wanderings in exile, is advised by a *gandharva* named Kabandh to kill and eat the various birds that frequented the Pampa lakes: geese and ducks, coots, common and demoiselle cranes — but not the sarus.

Sarus cranes are also said to be harbingers of good fortune. According to the *Vasatraja Shakun*, seeing a pair guarantees success in practically any field. If you hear a sarus calling from behind you, you need not even leave home — success will arrive at your doorstep. A bird calling from your left is a good omen if you have sons- or daughters-in-law. And if you see (and hear) a pair calling ahead of you, it means that you will shortly receive a substantial gift from the king himself. ■

*Narsh Chaturvedi is Dy. Director (Collections) at the BNHS. An entomologist by specialisation, he also collects references to natural history in Indian literature and mythology.*

## SEASHORE LORE

### 12 — The Birds and the B's



*Thousands of barnacles, small and great  
Stick to the jolly old ship of State  
So we mustn't be cross if she seems to crawl—  
It's rather a marvel she goes at all.*

A.P. Herbert

**B**ARNACLES — THEY ARE the *bete noire* of biologists, a nuisance to sailors, and a source of curse-words for any beach-comber unlucky enough to have slipped on a rocky shore and be cut by their knife-sharp 'shells'.

There are some 720 kinds of barnacles in the seas (but none in fresh water), and they come in two categories — the rock or acorn barnacles and the stalked ship's or goose barnacles. Acorn barnacles (which are themselves different from rock barnacles) grow on rocks, and also on the skin of whales and the carapace of turtles. They look like miniature volcanoes, or a cone or pyramid with a hole at the top. The flat base is firmly cemented to a rock, and the sides of the cone are formed by six, or sometimes four, and very rarely eight, limy plates. The top is closed by two doors, each made up of two plates.

Rock barnacles are the most numerous and conspicuous animals to be seen at low tide. A kilometre long stretch of rocky shore may have a thousand million of them, varying in diameter from less than a centimetre to over 6 cm. Because of the limy 'shell', even two hundred years ago barnacles were thought to be molluscs. It was only in 1829 that a doctor, J. Vaughan Thompson, found that a barnacle's babies were similar to those of crabs, and deduced that they were related to lobsters, prawns and crabs.

**B**ARNACLES ARE FOUND from the highest high-tide zone downwards to the surf zone, but do not thrive in calm waters.

Depending on the species, they may live from one to seven years. But their life span and rate of growth depend on the height that they live on the shore. Thus, in the first year, barnacles that live lower down grow faster and spawn at one year, and die in the third year. Those higher on the shore spawn only in their second year but live for five years or more.

At ebb tide there is no movement, no sign or suggestion of life. But, when submerged, the top flaps open, and from the slit-like opening six pairs of branched, slender feathery appendages emerge. They come out and, like a hand with bent fingers, curl over with a grasping action, and then, like a clenched fist, close and withdraw into the shell. These legs, beset with bristles, act like a sweep-net, collecting minute food particles. As the tide ebbs, the plates at the top shut tight, enclosing a little water which serves for the animal's breathing until the next high tide. It is this feeding action which led T.H. Huxley to remark that a barnacle is a "Crustacean fixed by its head and kicking its food into its mouth with its legs."

Charles Darwin also studied barnacles, and psychologists have been able to gauge his varying moods from his statements. In 1848 Darwin called them "my beloved barnacles." But in 1849 they had become "my confounded Cirripedia." His despondent mood continued in 1852 when he stated, "I hate a Barnacle as no man ever did before." But in 1853, he wished he could study them: "All nature is perverse and will not do as I wish; and just at present I wish I had my old barnacles to work at..."



**T**HE REASON WHY barnacles are so unpopular with sailors is because they settle and grow on ships' bottoms. A layer 50 to 75 mm thick on a ship's hull can weigh over 100 tons and, because of increased friction, reduce its speed by 10 per cent, while increasing fuel consumption by 40 per cent. Methods to discourage their settling on boats were known as far back as 412 B.C., when a mixture of arsenic and sulphur was used. Later, wooden ships were protected by tallow and sulphur coatings or by thin sheets of lead or copper fixed below the water line. Nowadays, anti-fouling paints containing compounds of copper or tin are used.

Barnacles are considered to be an unmitigated nuisance, but on one occasion they were appreciated. When the whale ship *Essex* was sunk by a sperm whale in 1820, after 25 days adrift, the survivors found barnacles on the bottom of their boat which were large enough to eat.

A classic example of transplantation of barnacles from one country to another is of *Elminius modestus*, a native of Australia and New Zealand. It was noticed near the Isle of Wight (in the English Channel) in 1943, brought there inadvertently by a warship. By 1950, it had colonised the whole of coastal England. In 1955 it reached Scotland and in 1957 it crossed over to Ireland.

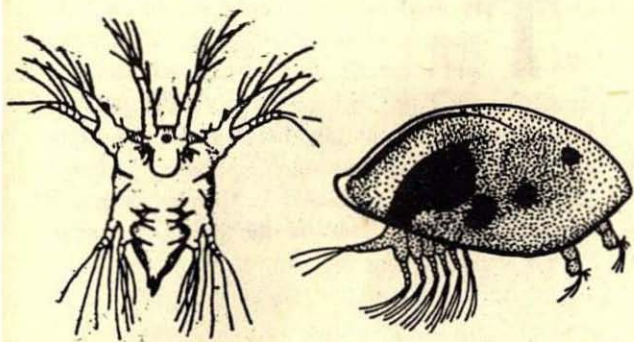
**T**HE BARNACLE IS a hermaphrodite, which means that an individual is both a male and a female. But an isolated barnacle cannot breed. This is where the profuse growth of barnacles in close proximity helps. The sperm from one animal is transferred to its neighbour by a long, tubular mating organ. Unlike in Charles Dicken's novel 'Little Dorrit', where the Barnacles are a human family of nine bungling incompetents, barnacles are very productive. On an average, a single barnacle will bring forth over 9,000 young every year. The fertilised eggs remain within the parent's shell for several weeks before being discharged into the sea.

Unlike human babies which resemble adults except in size, the newly hatched young, called nauplius larvae, look very dissimilar. The nauplii have a roughly triangular shape and are about 0.25 mm long, with three pairs of appendages and a single eye. They seek the light and drift about in the surface waters, feeding on algae. They moult (i.e. shed their skin) six times as they grow.

At the sixth moult, the animal changes shape and acquires an oval, hinged bivalve shell like a clam. There are now six pairs of appendages. Biologists call this stage a cypris larva. The cypris now seeks the sea bottom, walking about with its first pair of



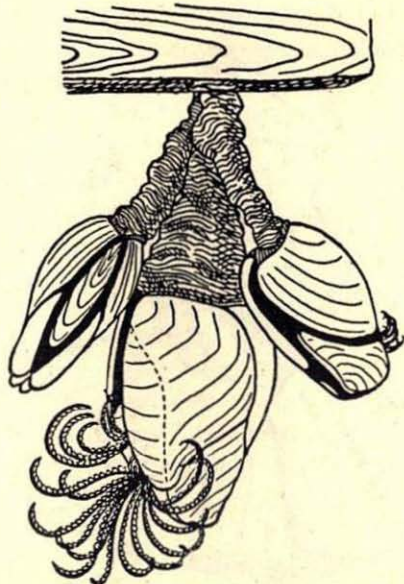
Acorn barnacles (*Balanus*).



Left — nauplius larva, right — cypris larva of barnacle.

antennules. it is very choosy about where to settle, and may walk about for an hour before it finds a place to its liking — preferably a groove or a pit rather than a flat surface. It will align itself with the long axis of the groove. On a flat surface, it will align itself either along the direction of light or the direction of the water current, preferring the former if the two conflict.

Once it has decided its spot, the cypris larva sticks to it by means of a glue secreted by the antennules. The tissues reorganise, it moults, the shell of the adult develops in 12 hours, the appendages at the rear end elongate to form the feathery feeding cirri, and the body turns over. The result is an upside-down adult in its limestone house.



Goose barnacles (*Lepas*) on a floating plank of wood.

**S**TALKED BARNACLES settle only on floating pieces of wood or pumice. They are called ship's barnacles, but this is rather a misnomer today. In the days of wooden sailing ships on slow, long ocean voyages, they were able to stick onto the ship's hulls. Today, they have little chance of attaching themselves to fast steamers except in harbours; sessile acorn barnacles are the ones found nowadays on ships.

At the end of a purple-brown, fleshy, wrinkled stalk, which is sometimes 20 cm long, are five white shell-plates enclosing the body. From a slit on one side emerge six pairs of feathery feeding cirri, looking just like those of acorn barnacles.

People are often intrigued by its name, which goes back to the middle ages. Seeing stalked barnacles on drifting tree trunks, they mistook them for the fruits of the tree. To them, the feathery cirri seemed to be the tail feathers of a bird. A myth grew that barnacle geese originated in the fruit (the goose barnacle) of a tree that grew on certain shores. We may laugh at it today, but even in a scientific paper in 1677 in the *Philosophical Transactions of the Royal Society*, Robert Moray wrote:

"I saw lying upon the shore a cut of a large *Fir-tree*... Only on the parts that lay next to the ground, there still hung multitudes of little Shells, having within them little Birds .... supposed to be *Barnacles* .. This Bird in every Shell that I opened, as well the least as the biggest, I found so curiously and completely formed, that there appeared to be nothing wanting, as to the external parts, for making up a perfect Sea-Fowl: every part appearing so distinctly, that the whole looked like a large Bird seen through a concave or diminishing Glass."

A cousin of these barnacles, named *Sacculina*, is a parasite on crabs. The adult looks like a fleshy bag on the lower surface of the crab's abdomen, but it has nauplius and cypris larvae similar to those of barnacles. A male crab affected by *Sacculina* apparently changes its sex; it looks like a female, but cannot function as one. The testes atrophy; the triangular abdomen takes the broad female shape, the mating organs become stunted, and four pairs of feathery, female-type abdominal appendages appear.

**I**HAVE HAD SEVERAL 'encounters' with barnacles, but the one I shall never forget was a comedy of errors. Midway between Raj

Bhavan and Prongs Lighthouse of Bombay is an islet, which is submerged most of the time, except during spring tides on three or four days every fortnight. Since hardly anyone ventures there, it has a lush growth of seaweeds and sea-life. One summer, I had taken along a group of friends on our 15 m research boat, which anchored some 50 m off the islet. We got off by batches in a small dugout canoe.

While returning, the dugout continually got swamped and filled with water as people tried to sit in it. While manouvering the canoe, the swell knocked off my friend, who slipped and got his whole back cut by hundreds of barnacles. I was trying to steady the canoe by levering myself on my extended leg, when a wave pushed the canoe onto me. Had I not withdrawn my leg, it would have come under the canoe and got broken. As I slipped, the inside of my right thigh was completely lacerated by barnacles. When I reached home, to avoid worrying my mother, I quietly applied mercurochrome on the myriad cuts and went to bed.

The next morning I was to accompany a batch of oceanographers on our research boat to test some equipment. This involved an eight-hour stint. I had forgotten to apprise my office people about this programme. Next morning, one of the picnickers of the earlier day telephoned my office to enquire about my leg. Finding that I was not in, he told the Curator that he had seen the dugout canoe capsizing over me and was sure (!) that I had fractured my leg.

Meanwhile, after a tiring voyage on the boat, I

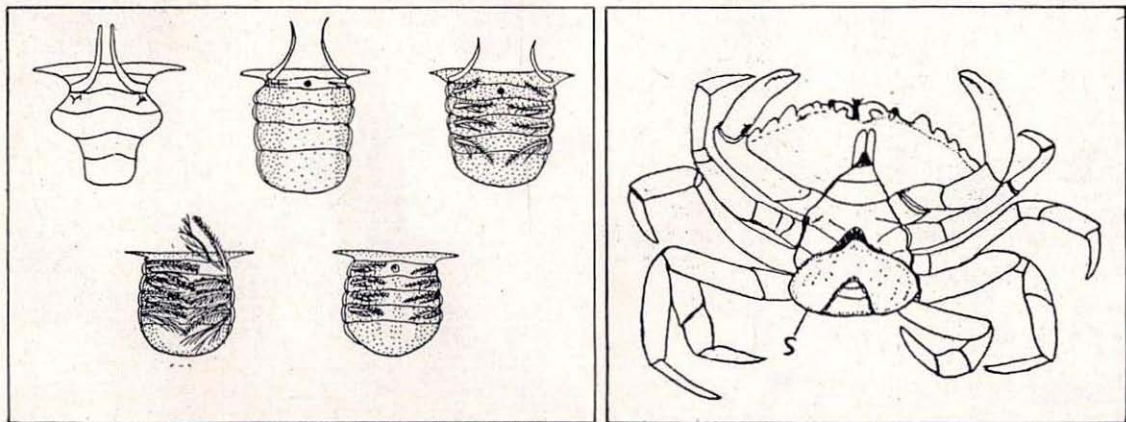
### SUPERGLUE FROM BARNACLES

Since barnacles have to withstand the violence of pounding surf, the cement that they produce to stick to rocks has to be really tough. If a barnacle is removed from its shell, a yellow, jelly-like mass is left behind, containing a series of paired glands. It contains a thick pale brown fluid of the consistency of motor oil. This is the barnacle glue or cement.

A layer of this glue just 0.0025 mm thick has a shear strength of 495 kg per square centimetre. Barnacle glue heated to 350°C softens slightly, but does not melt (lead melts at 325°C). Even when dipped in liquid nitrogen (230°C below zero), it does not crack or peel. Moreover, it does not dissolve in strong acids, alkalis, organic solvents or, of course, water. And it is long lasting. Fossil barnacles stuck 15 to 20 million years ago have not come loose even today.

Once the glue is chemically analysed and synthetically produced in the laboratory, scientists envisage that it will have a wide variety of uses in bonding anything to anything — metals, plastic, glass, in construction, industry, and even to stick broken bones.

arrived home in the afternoon and decided to take a short nap before attending office. Alas! This was not to be. The Curator, in his anxiety, came to my house, rang the doorbell, and as soon as my mother opened it, rushed into my bedroom and pulled up my pyjamas to ascertain the extent of my injury. The red mercurochrome all over my thigh heightened the gory effect of my wounds. My mother refused to believe that my leg was not broken, and to convince her, I had to get up, get dressed and leave the house to attend office! ■



**Sex changes in a male crab parasitized by *Sacculina*. Normal male abdomen (top left), changing to female's shape (top middle), and appearance of feathery, female-type appendages (top right). Compare with normal female abdomen (bottom left) and parasitized female's abdomen (bottom right). Inset — Lower surface of crab, showing the parasite *Sacculina* (marked 'S').**



**T**HE STEEP, FRAGILE HILLS with patches of broad-leaved trees and conifers reminded me of the Shivaliks of north India. I was in Nikko National Park in Japan with three of my Japanese friends, looking for the Japanese serow. This mountain goat has relatives widely distributed in south-east Asia — from Kashmir to Sumatra through Burma, China, Taiwan, Japan and the Malay peninsula. As a result of this wide distribution and specialization to local conditions over thousands of years the serow has evolved into numerous subspecies and three species: *Nemorhaedus crispus* in Japan, *N. swinghoai* in Taiwan and *N. sumatraensis* on the Asian mainland.

I have several times visited serow habitats in India over the past 10 years, but not till my Nikko visit did I see a wild serow — a young male, browsing at the edge of a precipitous ridge that fell away into a valley 100 m below.

cultural property. Anything that represents nature in Japan and/or has academic or scientific value can qualify — plants, animals, even geological formations. The serow is now protected by law, though its habitat is not. (There is another category of monument, under which both the animal and its habitat are protected.)

**A**LARGE SCALE AFFORESTATION scheme was in progress when the serow was designated as a special natural monument. From 1955 to 1973, 3000 sq. km of natural forest were cut down every year and converted to coniferous forest. Early in the '70s the area of this artificial forest exceeded 90,000 sq. km — 35 per cent of Japan's total forest area. Plantations in the early and pre-thicket stages, which last till the trees are 7-10 years old, are preferable, as they provide abundant cover and high quality food for the serow.

## THE JAPANESE SEROW

### *Lessons for Himalayan Serow Conservation*

A. J. T. JOHNSINGH

The Japanese serow is endemic to three of the four large islands in Japan — Honshu, Shikoku and Kyushu. 18th century literature informs us that it was once common on these islands. Its distribution range largely overlapped the cool, high altitude temperate forest zone of Japan, where the vegetation cover often exceeded 90 per cent.

Japanese serow were hunted traditionally for their meat and pelt. As a result of this long term unrestricted hunting their population declined. Coupled with this was loss of habitat as well. As a result, by the early 1900s serow were found only in high altitude zones. In order to arrest this worrying trend the conservation-minded Japanese government, even as early as 1934, designated the serow as a 'natural monument' and in 1955 as a 'special natural monument'

Natural monuments' are designated by the government under the law for the protection of

In the absence of poaching, the serow immediately responded to this habitat improvement. Its range expanded considerably and populations shot up — from 75,000 in 1980 to 100,000 in 1985. The expansion of the range and number, however, had a disastrous effect on the plantations, especially those of the Hinoki cypress, which is the mainstay of the Japanese timber industry.

As a result a new conservation strategy was formulated to manage serow. Thirteen serow protection areas, ranging in size from 1400 to 2150 sq. km, were designated as natural monuments. Outside these areas, serow control through hunting was permitted. In two prefectures (districts) where damage to plantations was serious, 4000 serow were shot.

But it was by no means a mindless massacre. The carcasses were examined to collect information on food habits (by analysing the stomach contents), nutritional condition, age structure and fecundity of

*Capricornis sumatraensis jamrachi*



1.



*Capricornis sumatraensis rodoni*



*Capricornis sumatraensis rubidus*

Printed from century-old lithographs by J. Green, in the BNHS collection.

## MOUNTAIN MONARCHS

The serow is an ungainly creature — large head, donkey-like ears, thick neck and thick limbs. And its usual stance, with forelegs astraddle, the hoofs widely splayed and its head thrust downward, adds to its awkward appearance. It is larger than its nearest relative, the goral — some old 90 kilo males stand over a metre high at the shoulder. Males and females look pretty much alike. Both sexes have black, conical horns (thicker in males than females) which show growth rings for three quarters of their length.

Serow live in the recesses of thickly wooded gorges whose boulder-strewn slopes and shallow caves give shelter from inclement weather. If the serow is to survive in India, then such gorges must be protected from poachers and from medicinal plant, mushroom and bamboo collectors.

Females (three years or older) give birth to single kids usually in May or June, and 80% of the adult females give birth each year. The gestation period is between 210 and 230 days. Perhaps to compensate for this long period, females can, and often do, conceive as early as three months after giving birth. The weight of the new born kid ranges from 3.5 to 4.5 kg.

In captivity, to avoid possible antagonism towards the kid, the mother always chases the father away after the birth of the kid. The kid starts on solid food when it is a month old. Thereafter it stays alone, coming to the mother only to suckle. Kids are weaned when they are about 6 months old.

the population. And the culling programme was coupled with extensive research on both captive and wild animals, using radio telemetry. As a result the Japanese serow is today one of the most extensively studied species in Asia. This research has obviously benefited conservation programmes for the Japanese serow, but the knowledge can be applied to other serow species as well.

**T**HE JAPANESE SEROW usually lives alone, sometimes in male-female pair units. Very occasionally there are family groups of up to four. Each serow has its own home range — an area with which it is familiar, and uses intensively for feeding, resting and breeding. These home ranges are more like territories in that intruders are kept away. The mean size of annual home range is around 13 hectares for adult males and 9 hectares for females. Range overlap between members of the same sex, or even of different sexes, is rare, but a few males do have ranges which overlap those of two or three females.

Serow are most active in the evenings (about 4 to



Few Asian species have been as intensively studied as the Japanese serow. This radio collared animal will provide information on ranging and activity pattern, among other things.

7 p.m.) and then again at about 6 a.m. Between 70 and 100 per cent of the intervening period is spent lying down. In one large enclosure a captive serow spent 91% of the day within a well defined one hectare area. Its favourite rest sites were at the highest spots in the home range, from where it had a clear view of approaching danger.

Kids are usually born in May or June, and weaned when they are about six months old. Generally the yearling is forced to leave its mother by the latter's aggressive behaviour (butting with the head and repeated chasing) soon after the next birth. But gradually, after the newborn is a few months old, the aggression wanes, and the mother appears to become more tolerant towards her previous offspring. Thereafter, a mother, her kid and yearling occasionally form a group.

Almost all yearlings remain within their mother's ranges well after they are independent. The yearling benefits in many ways by sharing the range with the mother. It gets sufficient time to learn about the habitat and the dangers around, while still under the watchful eyes of its mother. This period also gives the yearling the necessary time to locate a vacant range.

When serow are sexually mature, at the age of two or three, they leave their mother's ranges. By the age of five, they have all left their natal area, or have carved out their own territories from the natal area. A female offspring either shares her mother's range or takes over half of it. In one study area only two female newcomers established territories between 1979 and 1985, as compared with 18 male newcomers. When daughters took over half of their mothers' ranges, territorial males became polygynous with the mother and her daughter. But such father-daughter breeding, if any, is unlikely to continue for long, because territorial males are frequently replaced by male newcomers.

**T**HOUGH PRACTICALLY no work has been done on serow in India, the knowledge gathered on Japanese serow can help us to understand our subspecies (*Nemorhaedus sumatraensis tahr*). Two factors which keep the serow population at a low level are worth recording. One is the territorial nature of the serow, which will never allow the species to reach high densities as seen in non-territorial species such as chital. The other is low fecundity as a result of its territorial

nature.

A female can live for 15 years and can at the most produce 10 young in her lifetime — if she is able to hold on to her territory. This, however, would be difficult once she is past her prime, say after seven or eight years. Reproduction by non-territorial individuals is not usually successful. Mortality of young is also high — out of the 12 dead seen in one study, seven were kids. As a result of these parameters turnover in serow population, even when it is free from poaching and predation (as it is presently in Japan) could be low.

**T**HE SEROW IN INDIA occurs in the north-east, central and western Himalaya, ranging in altitude from 1000 m in states such

as Manipur and Meghalaya to 4000 m in Himachal Pradesh and Uttar Pradesh. There are over 50 protected areas in the serow's range, from four to 1800 sq. km in size, with a total of about 17,700 sq. km; this includes non-serow areas at both high and low altitudes. Of the roughly 19,000 sq. km of serow habitat (sub-alpine zone) in India, 6000-8000 sq. km are in protected areas.

Not bad at first glance. But several problems remain, and even continue to grow — habitat fragmentation, habitat disturbance by mushroom and medicinal plant collectors and poaching. Serow habitats lie in inaccessible areas where protection is hard to enforce; and most of the locals relish serow meat and have been hunting serow for ages. Therefore we have a situation in India which is somewhat similar to the one in Japan at the beginning of this century.

One difference, which could be critical, is predation. In Japan the serow has no natural predators, but most serow areas in India have leopards, and some at higher altitudes have even snow leopards. A few

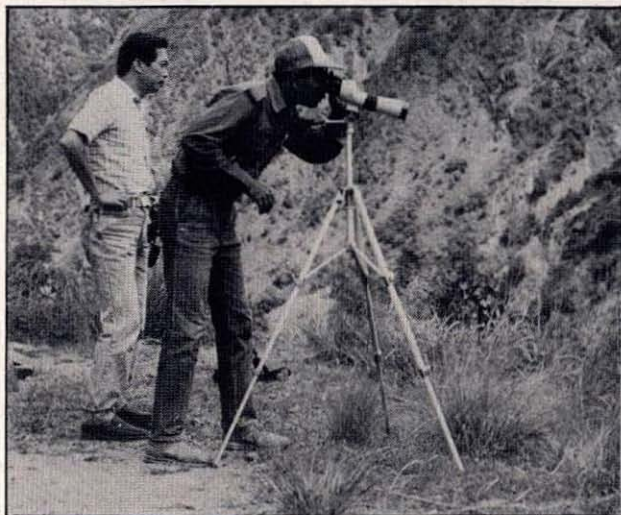
areas have tigers and clouded leopards. Areas like Namdapha in Arunachal Pradesh may have all four cats. The consequences of a combination of poaching and predation could be disastrous for the territorial serow, which occurs at low densities.

**A**NOTHER PROBLEM IS the distribution of protected areas that contain serow populations. It would appear that the present range of the serow is discontinuous, with large gaps between protected areas — Balphakram in Meghalaya is 200 km away from the nearest protected area in Manipur. A possible reason for these discontinuities is that the intervening areas may have so many problems, some of them insurmountable, that it may not be worth-while to create a protected area in that region.

If such a situation exists, and given the ever-increasing biotic pressures in the country, it will be extremely difficult to create more protected areas in the intervening areas. Protected areas in the Himalayas are designated largely to protect watersheds and/or assemblages of plant and animal communities. The serow is one of the large mammals found

in many of the Himalayan protected areas. It will be difficult to create protected areas exclusively for serow, but fortunately all serow habitats enjoy some form of legal protection — either as protected areas or as reserve forests.

What is urgently needed now is a survey for serow in protected areas and the intervening regions, followed by an in-depth ecological study in two or three good serow habitats. ■



**Patience pays — wild serow are not easy to spot, either in India or in Japan. But the results of studies at Nikko and elsewhere can be applied in the Himalaya.**

*Dr A.J.T. Johnsingh, Joint Director of the Wildlife Institute of India, is an authority on Indian mammals. He has to his credit a number of landmark studies, including those on elephants, wild dogs and several deer species.*



# COVER

Sclater's or the Mishmi monal pheasant (*Lophophorus sclateri*) is a somewhat mysterious bird; the range in India is restricted to parts of the north-east Himalaya, and little is known of its biology in the wild. It is found, usually singly or in parties of three or four, between 3000 and 4000 metres altitude, and generally affects silver fir forest with dense rhododendron undergrowth.

Two closely related monals are found in the Himalaya — Sclater's monal and the Impeyan or Himalayan monal (*Lophophorus impejanus*). Both are similar in size (slightly larger than a domestic hen) and appearance. Sclater's is a little duller. And where the Himalayan monal has a prominent crest of wire-like, spatula-tipped metallic green feathers, in Sclater's the crown is covered with short curly or frizzled feathers. Females of both species are brown overall and far less colourful than males.

Monal range occupies a long, narrow strip that runs almost the entire length of the Himalaya. Himalayan monals are found from eastern Afghanistan eastwards to east Bhutan. From there on is Sclater's range, stretching eastwards to north-east Burma and Yunnan. The dividing line, somewhere between 92° and 93° East longitude, roughly passes through the eastern and western boundaries of Meghalaya and Arunachal respectively, and through the middle of Assam.

The breeding season lasts from April to June. In courtship the cock droops his chestnut wings, spreads out and erects his tail, jerking it up over the back from time to time as he struts around the seemingly unconcerned hen. There is also a spectacular courtship flight, where he leaps straight up into the air from a steep hillside, moving slowly with wings held high, tail partly spread and the white rump conspicuously displayed.

The species was reported to be common in the Upper Dibang valley in Arunachal 50 years ago, but its present status is a matter of conjecture. Hunting could be a factor; according to a 1915 report published in the *BNHS Journal*, "These birds when chased by a dog refused to fly until nearly caught, when they would fly into a tree and remain there while the dog barked below."

## ACKNOWLEDGEMENTS

*We are grateful to*

**SETH PURSHOTAMDAS THAKURDAS & DIVALIBA CHARITABLE TRUST**

*for financial support for the publication of Hornbill.*

Support conservation

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The Bombay Natural History Society was formed 109 years ago, as a forum for exchanging information on natural history. Over the years, it has helped to shape the course of wildlife conservation in India. Its members and scientists have helped document India's diversity of wildlife; BNHS studies on little-known and highly endangered species have provided the basis for many conservation projects, and indeed for the establishment of some of India's best known sanctuaries and national parks.



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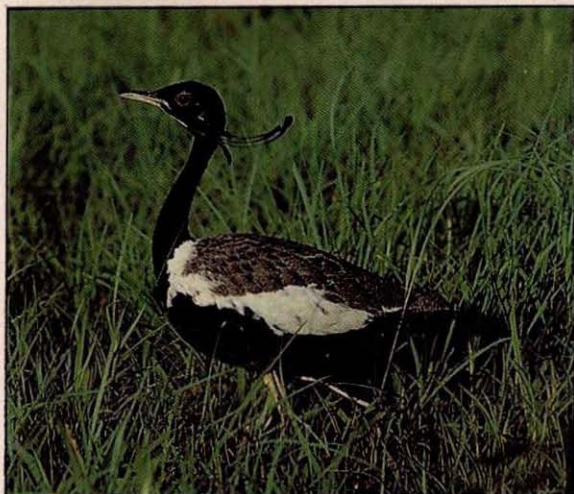
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Today, the BNHS is Asia's premier conservation organisation, with members in over thirty countries and an international reputation as an authority on Indian wildlife.

The Society's work is not restricted to wildlife research. Its publications wing has produced a series of books on natural history, many of which are standard works of reference. It runs a nature education programme of over fifty years' standing, propagating conservation through film shows, lectures and nature camps for students, biology teachers and the Society's members.

BNHS members enjoy a range of activities — film shows and lectures on natural history, regular weekend bird-watching trips, and the opportunity to participate in environmental conservation campaigns, and even field studies in wildlife sanctuaries and national parks.



*The lesser florican is one of the world's most endangered birds. BNHS studies have focused on the critical factors involved in the conservation of such species.*

**India's natural heritage is in danger of being lost forever.  
Help to protect it — join the BNHS today.**