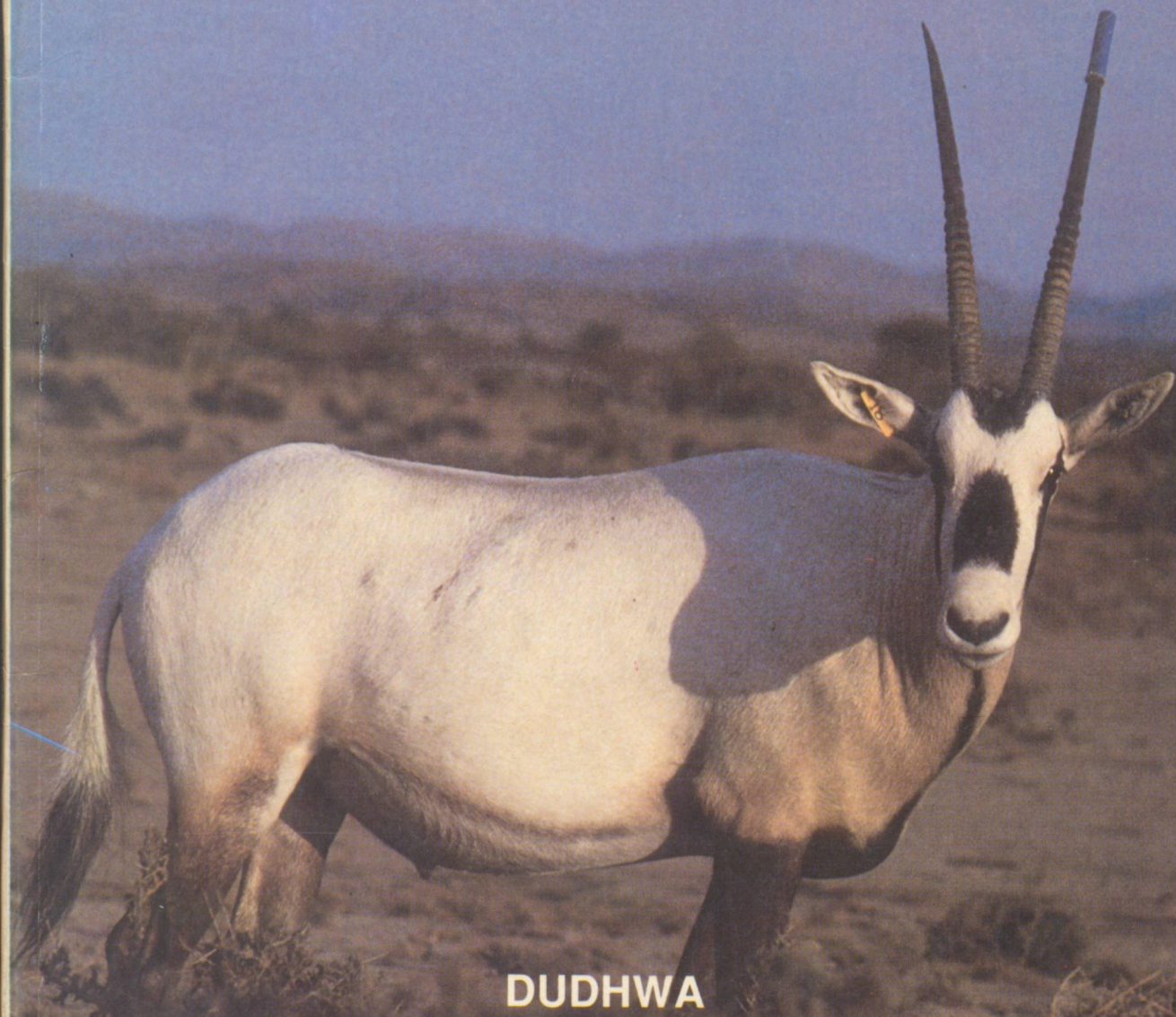


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The rare, white oryx --
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and pride which was
totally exterminated from
Saudi Arabia in 1972,
will soon return
to the wilds, thanks to
almost 25 years of interna-
tional co-operation writes
Asad Rahmani.



42

Legends have been woven
around mantids for
eons, writes **E.Narayan**
whose article on these fasci-
nating insects provides us
with an insight into one of
nature's arch predators.

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Butterflies are specialised
in the art of defensive
camouflage -- sheep in
wolves' clothing, in fact,
says the author,
Torben Larsen. Mimicry
is only one of the many
weapons in their repertoire
in the struggle for survival.



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Commentary

"Why? Why did you not fight back?" a horrified world asked of the Jews when it was discovered how they were cold-bloodedly gassed by a fanatic Hitler half a century ago. But all that is now forgotten. In India, yet another set of fanatics are preparing to sacrifice the lives of yet another minority community -- five million adivasis whose existence is linked to the survival of the several forests which our modern-day fanatics want to drown.

"Why? Why did you not fight back?" future generations are sure to ask the survivors of the new pogroms, half a century from now. How they respond is academic. What is not, however, is our role in this gruesome chapter of contemporary history. Environmental battles have become human rights battles. When the trials for environmental crimes are conducted tomorrow, those who looked the other way will be considered as guilty as the ones who actively participated in the orgy of destruction.

Prithvi Sahgal



Creative protest: To draw focus on their plight, tribals to be ousted by the Sardar Sarovar Dam displayed this 'funeral procession' for the benefit of thousands of pilgrims who had gathered to pray near the banks of the holy Narmada River.

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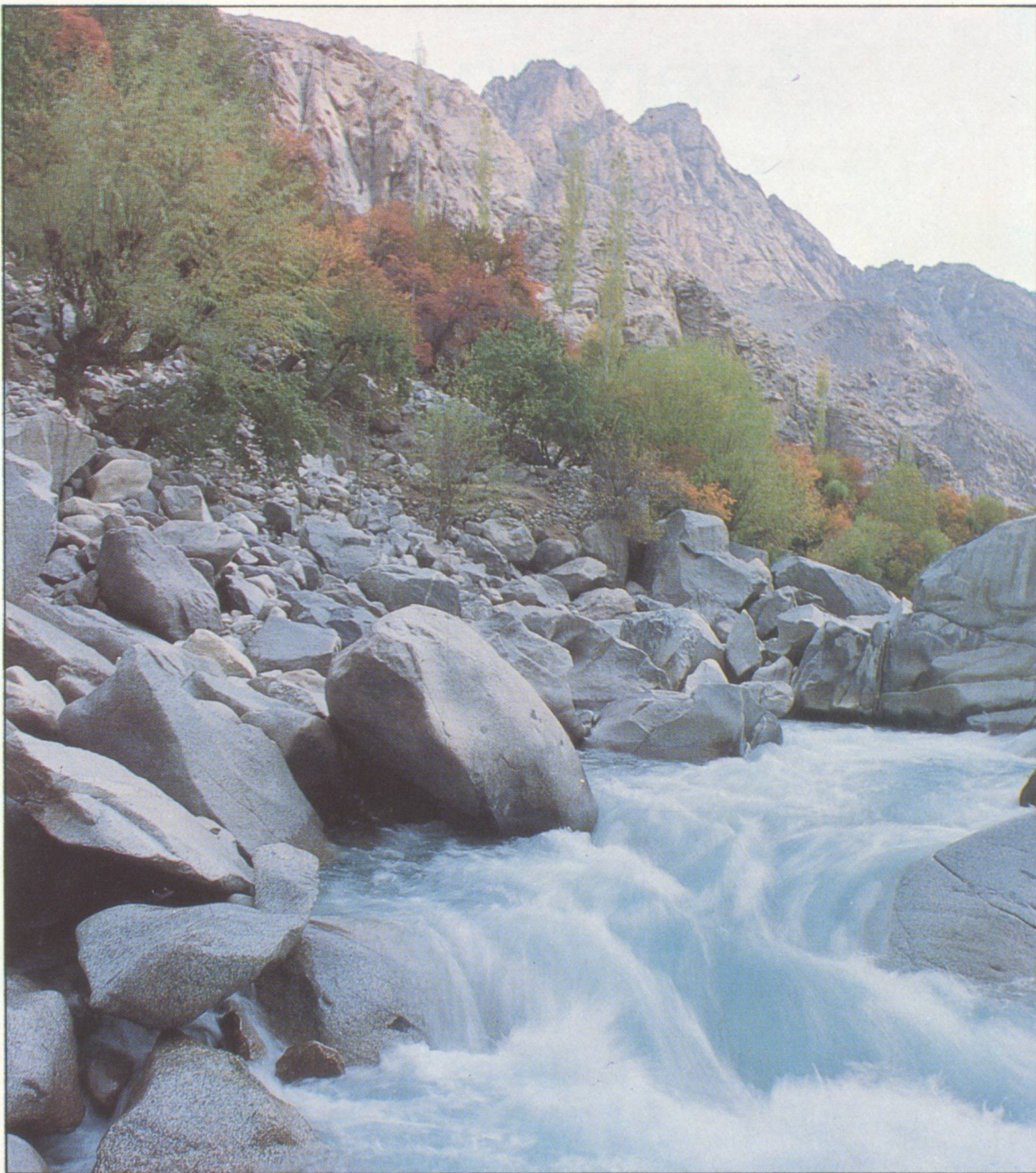
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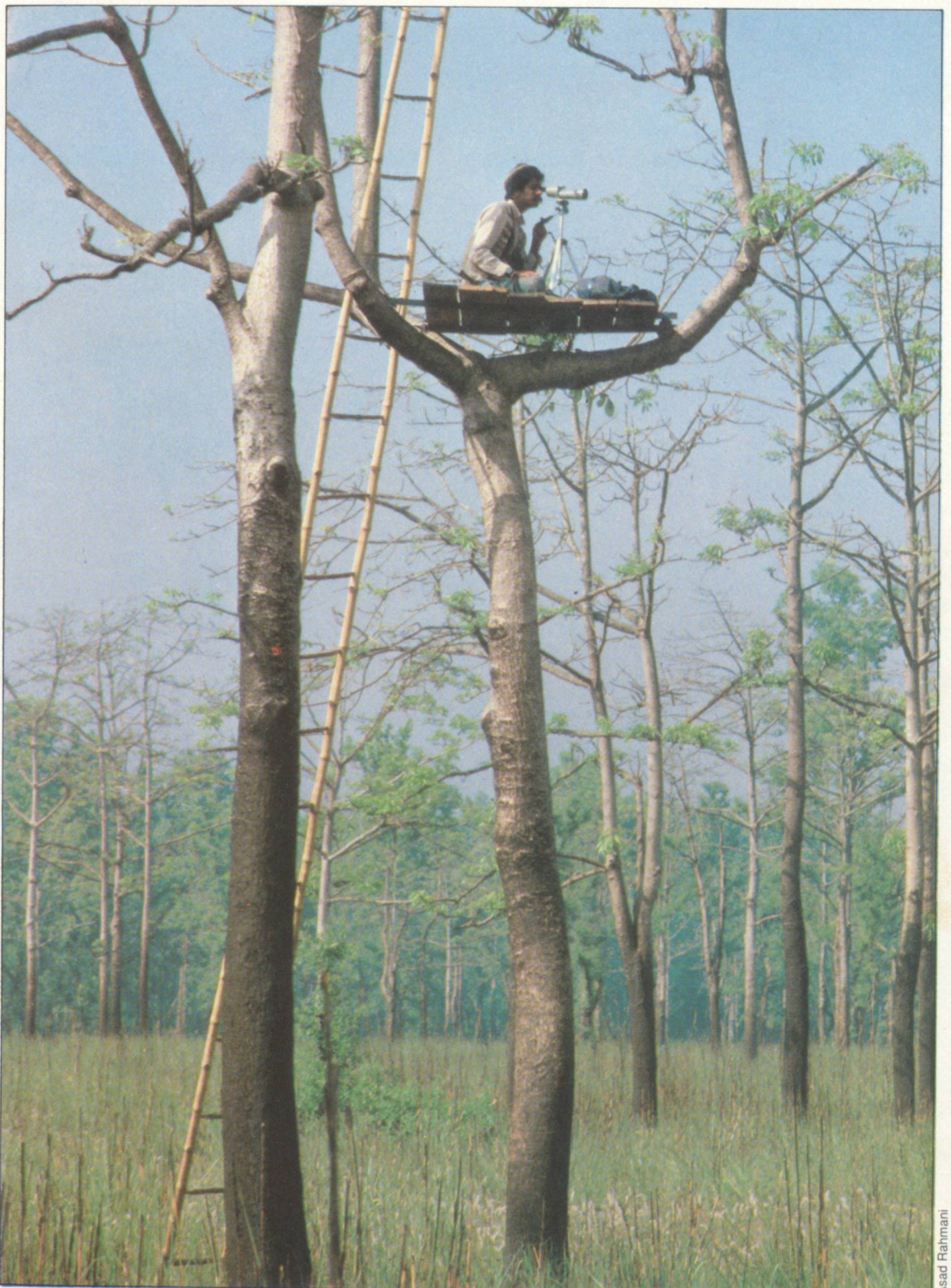
DUDHWA

Last of the Indian *terrai*
Text and photographs by Ravi Sankaran

After several ups and downs, the rhino translocation programme in Dudhwa (Vol. IV, No.3) seems to have succeeded. Seen here is a rhino in its prime in the lush green grasslands of Dudhwa.







Asad Rahmani

The author spent hours observing wildlife from atop machans (above) and hides. It was the swamp deer (facing page), locally called the gond, and not the tiger which laid the foundation for the protection of Dudhwa.





A hand-reared swamp partridge (*Francolinus gularis*) (facing page) adopted the author and his assistant Mehboob, and provided delightful company in the long hours they spent in the wilderness. The Bengal florican (above left), a resident of Dudhwa, is among the rarest bustards in the world. A drongo makes a meal of a martin (above) as a black partridge (below left) calls an end to the day from atop its roost.

Discovering Dudhwa

Winter had been thawed by the advent of spring. But this morning's chill was reminiscent of the weeks gone by. The swallows had just awakened, and clouds of them would leave their roost and soar briefly, before returning to the bare branches of *seemul* trees. The dew of the night rose in an enveloping fog, swiftly hiding the grassland before me. As the rising sun dissolved the fog, I drove down to Muthna Machan. I was not there long when a family of otters, fishing for breakfast, came swimming down the narrow *tal* below me. I watched their marvellous aquatic poetry, as they dived and swam, silent ripples marking their progress. I was particularly amazed at the intelligence of one of them. Often, when the others dove, it would stand up treading the water. Invariably an alarmed fish would burst out of the water and the otter would snap it from the air. And of course, this particular otter seemed the best-fed of all!

I first came to the Dudhwa National Park in April 1985. Our team consisted of four scientists from the Bombay Natural History Society (BNHS), surveying the *terai* of India in an attempt to assess the status of the Bengal florican. To me it was, in a sense, the starting point of what has been an exciting career in ornithology. And I could not ask for a lovelier starting point. So when Dr. Asad Rahmani, who was heading the team, said that we would, in fact, eventually set up camp at Dudhwa, to study the Bengal florican, a dream was born.

It was, however, not until 1987 that the dream came true. I found that Dudhwa was even lovelier than I remembered, and soon the forests and grasslands totally captivated me. That year, I spent a month and a half; the next year, five months. I learnt much about the forest and the animals that live there, a lot more about Dudhwa and the specific problems that afflict this vital Park.

The Dudhwa National Park is today the sixteenth and the latest member of that privileged group of forested areas that come under the purview of Project Tiger. It was, however, the swamp deer, locally called *gond*, and not the tiger which laid the foundations of protection and conservation in this area. Until Independence, great herds of these deer roamed the marshes, grasslands and forests that came to be known as the *terai*. It was a hostile land to man. Old district gazetteers

speak of recurrent attacks of plague, great swarms of malarial mosquitoes and of a couple of severe famines. But by the 1950s, one of the last Indian frontiers had been tamed, and the marshes and the grasslands soon made way for sugar-cane and paddy. The boom of "crop protection guns" then hammered in all but the last few nails in the swamp deer's coffin.

It was about this time that fierce lobbying by an ardent lover of Dudhwa, 'Billy' Arjan Singh, began to pay dividends. Operating from his farm, called 'Tiger Haven', his efforts culminated in the creation of the Dudhwa Sanctuary in 1968, covering an area of 212 sq. km. The swamp deer now gained a new lease on life. In early 1977 the sanctuary was further upgraded to a National Park covering an area of 614 sq. km. Ten years later, at the end of 1987, Dudhwa National Park and the Kishanpur Wildlife Sanctuary (though not contiguous) were brought under the umbrella of Project Tiger. The project area now covers an area of 815 sq. km. and houses the largest number of swamp deer in India.

Dudhwa lies in the *terai* belt of Uttar Pradesh. Towards the north flows the Mohana river, beyond which is Nepal and on a clear day one can easily see the Himalaya about 30 km. distant. The southern boundary is formed by the Suheli river, which, together with the Mohana are tributaries of the Sharada, which in turn joins the Ganges river system. The topography is more or less even, with a mere 32-metre rise between the extreme south-eastern and northern corners. An interesting feature of Dudhwa's soil is the virtual absence of stones or rocks on the surface, a phenomenon yet to be adequately explained.

Typical to the *terai*, the ground water level is high. In fact, according to an old immigrant, when as children they used to take cattle out to graze in summer they could alleviate their thirst by digging only a metre down for water in chosen depressions! In an environment that receives over 1,600 mm. of rain annually and is seasonally prone to flooding, the forests and grasslands of Dudhwa are lush with plant life.

Dudhwa's forests are best described as being moist deciduous and dominated by *sal*. In fact, the *sal* forests, which clothe over 50 per cent of the Park, have been described as one of the finest stands in the country. Along rivers and streams, *jamun* is more prevalent, these trees needing a lot

more moisture to flourish.

Several years ago when existing forestry practices were inclined towards commercial gains, a fair amount of plantation work was carried out. Teak, *sheeshum* and to a lesser extent the infamous eucalyptus were planted, often at the cost of the original mixed forests. Being alien to this environment, both teak and eucalyptus have not done well. Yet, to see eucalyptus amidst fine tracts of forest or grassland is a painful sight. Some consolation exists in the knowledge that eucalyptus logs are used for posts in electric fences. So the day is not too far off when Dudhwa will be rid of this tree!

I sit on a patch of lawn, burned brown by the summer sun. The coolness of the night is a relief after the vicious heat of the day. The Indian jungle nightjar with its monotonous *chaunk... chaunk* and, less frequently, the Franklin's nightjar with its *sweesh*, call incessantly. Occasionally, an Indian cuckoo or a magpie robin bursts into song. I looked forward to this tranquillity at the end of each day.

The sharp crack of exploding gunpowder shatters that tranquillity. Firecracker or firearm? It came from the crop fields barely a kilometre from where I sat, or perhaps from the forest itself. It's difficult to echo-locate sound in a jungle. And the victim? Probably a boar, hog deer or swamp deer. I winced at the thought of yet another animal poached, but in the last few months the sounds of gunfire had become almost commonplace.

Every week, I drive down to Pallia, the nearest town, to stock up on food. In an hour or two I am already tired of this dusty and noisy town. The forest stands like a wall, with sugar-cane fields extending right up to its base. When returning, just crossing the Suheli bridge itself is like coming home. The drive from Dudhwa to Satiana is something I will never tire of -- an avenue lined with *sal*, the sun, a diffused object somewhere above, throwing patches of light and shadow on the road. On the sides the vegetation has been cleared to serve as a fire line. From the ground rise massive termite mounds. My eyes search for a particular species of termite which nest in smaller mounds. These seem to have dispensed with aggressive soldiers, of which the larger mounds are full. At home wait two, hungry, termite-eating partridge chicks.

One day, sitting in the sun, sipping tea, I saw

Doodnath the gardener come quietly up to me with a purposeful glint in his eye. Digging into his pockets, he fished out six partridge eggs and nonchalantly handed them to me. Apparently his children found them and as they were not edible (they floated on water) he asked if I wanted to try and have them hatched? As there was a hen sitting on her eggs at a Forester's house nearby, I decided to give it a try.

Two survived. One was *Langad*, so named for the deformed toes on one foot, and the other we simply called *Teetar*. They were thoroughly imprinted on us, following us everywhere and running up to us when whistled to. The Satiana log hut compound, which was appropriately called *Teetar Kutir*, had virtually been taken over by the little ones. In fact, the moment they lost sight of people they got very alarmed. It was not until they lost their down feathers that I found out they were swamp partridges.

They were an absolute nuisance, but one that I wouldn't have missed for anything. One of their favourite pastimes was to perch on either Mehboob (my assistant) or myself! If we sat on a chair they were quite content to perch on our knees. When I went into my room to lie down they would soon follow, pause at the door, and then with a contented cackle fly and land on the bed. A moment later they would hop on to my person. As far as they were concerned I was just another partridge, albeit larger! They would 'dust bathe' on me, or preen, or rest on their sides, with legs outstretched. I must confess it was a habit that I enjoyed only in the beginning, for, as I learned to my cost, you can't toilet-train a partridge!

At Kowhaghati, the road dips down to cross the Neora *nullah*. It seems innocuous now, but religiously every monsoon this Jekyll and Hyde stream transforms its character, smashes the Kowhaghati bridge and chews up a part of the road, before subsiding back into being a sleepy stream. A massive turtle has made its home in the deep pool below the bridge and I invariably stop to seek it out, only to move on when it disappears amidst bubbles.

Grassy paradise

The forest abruptly opens out into the grasslands, which to my mind are the main attraction in Dudhwa. In these grasslands reside some of





Fighting fire with fire! A controlled fire (facing page) which was started by Park authorities, to save miles of valuable grassland habitat in Dudhwa from being consumed by natural fires. Little appreciated reptiles, like the elegant bronze-backed tree snake (top), have proliferated thanks to the protection given to the jungle in the name of the swamp deer, rhino and tiger. Lakes in Dudhwa play host to a number of water birds such as this shoveller (above) searching for food in Bankey Tal.

Dudhwa's rarest animals and birds. Possibly no part of the *terai* generates more awe than the grasslands. 'Dank and dangerous....inhabited by ferocious creatures' are only some among several colourful phrases used to describe them. But they are so true, for these humid areas are covered by grasses which in most places even tower over elephants.

The grasslands reach their prime just after the monsoons. Through the monsoons and most of winter, therefore, one hardly sees any wildlife for all is hidden. Virtually impenetrable on foot, the grasslands are best seen from the back of an elephant. As you push past, silvery flowers of *munj* erupt in a puff of smoky pollen, a constant rain of the petals of drying *retwa* cover you with red dust. Nearer to water sources, *retwa* and *munj* give way to the golden flowers of *narkul*, or acres of *kans* with more fibrous cotton-like flowers. In the early morning, flowers, heavy with dew, bend their supple stalks and catch the light like a million jewels.

At the end of winter the grasses shrivel and die. The pleasant greens gradually return to brown. Thin, tall stalks poking up into the sky remind one of the promise of flowers yet to bloom. At the end of January it is time for the annual grass burn, a management practice designed to maintain the grasslands. On a warm windy day the fires are lit, which roar across the grasslands leaving ashes and half-burnt grass stalks in their wake. In a matter of days all the grasslands are an extensive charred openness. Animals that have been hidden to the human eye for several months are now visible in the open. Underfoot the shoots of grass push their way out of the ground and swiftly conceal the ashes of the previous year's vegetation. It is a time of anticipation, for it is now that the swamp deer return to the Park.

Dudhwa is a deer haven. It is one of the few places in India where five species of deer co-exist -- chital, sambar, muntjak, hog deer and, of course, the swamp deer for which the Park is so justly famous.

The swamp deer are primarily grassland animals and are widespread in Dudhwa with densest populations in Satiana and Madraiya. The deer are however not present here all through the year. With the onset of the monsoons the deer leave the safety of the Park and spend the next few months in the crop fields and the swamps that adjoin the

Park. It is here in the swampy areas of Ghola and Gajrola that the annual rut begins at the end of October. As wallowing is an intrinsic part of the breeding season, rutting stags are almost always found in a *jheel* or swampy habitat. It is both the need for the marshy habitat and a strong sense of tradition that bring the deer back each year to their rutting grounds. This vital habitat today is under severe pressure from agriculture.

Even with the animals inside the Park all is not well. It is alarming to note that the population is now showing a declining trend. From an estimated population of 1,000 swamp deer in the Satiana region in 1980 the population has dropped to about 500 in 1988. While protection is excellent within the Park it is when the deer move outside that the problem begins. In the agricultural areas of Ghola and Gajrola poaching is rampant. Affluence and gun licences for protecting sugar-cane crops have proved to be a fatal combination for the deer which virtually come to the farmers' doorsteps to be shot. Patrolling at best is poor, for three guards and a forester cannot possibly protect a 13 km. stretch of sugar-cane and swamp, while also trying to prevent wood poaching, encroachment, etc.

Quite obviously there are no easy solutions. To the south, Dudhwa unfortunately does not have a buffer zone. All that divides the core area in the Satiana region and the agricultural areas of Ghola and Gajrola is the narrow Suheli river. Even the erection of an electric fence along the river has proved ineffective. The deer constantly find ways to cross it. Perhaps the only solution is to acquire this recently encroached upon land so that the swamp deer have a place to breed in peace.

At the end of January, at the fag end of the annual grass burn, when the swamp deer return to the Park they are still in their dull winter pelage. They now congregate in big herds on the recently burnt grasslands, attracted no doubt by the outcrop of fresh new shoots. Adult stags still carry their massive branched antlers; several does have fawns at their heels, fawns they dropped in the tall grass just before the onset of the monsoons. Late evenings are enlivened by the bugling of stags towards the end of yet another breeding season. With the onset of summer, the stags begin shedding their antlers. The long dark hair of the deer's winter coat start falling off to reveal their lightly spotted, chestnut coloured coats. As the days lengthen into summer the swamp deer begin to

disperse and the big herds that one saw through February and March are no longer visible.

Though Dudhwa has seen protection since as far back as 1967, for some species the efforts have been in vain. Chausingha which were said to be present in this district in the late 1800s have become extinct in the region. The wild dog or dhole has vanished, the blackbuck was last seen in the Park in 1984 and the leopard is becoming increasingly rare. The nilgai and the sloth bear, both said to be common in the recent past, are now hardly seen.

Dudhwa the bird haven

Flashes of russet or white in the dappled light of the forest are revealed as paradise flycatchers; strips of undulating white ribbons, flitting between trees. Their habits are more than a little puzzling. At one time there would be plenty, then suddenly they would 'vanish' for months on end. Then, suddenly, they would reappear in great numbers. It was the same with the Indian pitta, emerald doves, some cuckoos and bee eaters. Where did they go? What brought them back? The lack of satisfactory answers starkly brought home to me how little I know about birds in spite of being a field ornithologist by profession!

A trip into the field was always exciting, for one never knew what lay in store. With luck, a blue bearded bee eater by a stream, or a flock of large pied hornbills calling raucously. Once, while walking in the grassland I flushed a grass owl and that really made my day! Some of my favourite places for bird watching were the *tals* and *jheels*. A flock of 400 or 500 lesser whistling teal taking to the air is a breathtaking sight. Once while watching ducks through a telescope I saw a falcated teal, which had me enraptured; the last time I had seen one was in 1985 at Bharatpur. Some of the smaller *tals*, hidden in the forest, have a prehistoric aura about them. Here, one fondly hopes, we might actually discover that long-lost resident of the *terai* -- the pink headed duck.

Over 350 species of birds have been recorded from Dudhwa, but none so rare, or as handsome as the Bengal florican. It once was present throughout the *terai* belt, but in recent years has been exterminated over much of its former range. The Bengal florican is possibly the rarest bustard in the world and only about 600 survive today. The Dudhwa National Park has the distinction of

being the only known place in Uttar Pradesh where this beautiful bustard exists. About 40 to 50 of these birds share the grasslands of Dudhwa, with the swamp deer. The Bengal florican has a unique courtship display, like an aerial ballet. With a noisy flapping of wings, it takes to the air, descends a little before gaining height once more, ultimately landing in a dive. This flight is accompanied by a peculiar high-pitched 'chick' call. Its startlingly white wings contrast with its black body and when framed by an emerald forest, the bird presents an unforgettable sight.

Another elusive grassland dweller is the hispid hare. While I have never seen one with certainty, the characteristic tablet-shaped droppings of this hare are to be found in almost all the major grasslands of the Park.

A unique experiment undertaken by the Uttar Pradesh Forest Department, has been the rhino re-introduction programme (*Sanctuary Vol. 4 No. 3*). The rhino was last seen in this region in 1878 and a pioneering attempt was therefore made when five rhinos were translocated from Assam in 1984. Unfortunately, a pregnant female died and then later, another succumbed to complications that arose when she had to be tranquilized to treat a leg injury. In 1985 four more rhinos were brought in from Nepal. At present seven rhinos, two males and five females, live within an electrically fenced area of 27.5 sq. km. At the appropriate time, when the population stabilises, the fences will be removed. In any event, the translocation has already proved to be partly successful. At the end of 1987 one of the females gave birth to a calf, a sure sign of the small group having accepted their new home. It was unfortunate though, that the calf did not survive as it was either stillborn, or taken by a tiger. One waits in eager anticipation for the next calf to be born.

At the end of February, as if on cue, the chital drop their fawns. On drives I often observed them gazing intently at my approaching Jeep only to dash off madly, their fear totally out of proportion with the potential source of danger -- me! It's amazing how fast fawns can run using their typical bounding leaps, the white under-tail standing out like a flag. It's hard on the doe now, for she has to move fast every time her fawns burst into frenzied activity, just trying to keep her precocious youngsters in sight. I also noticed that several had twins, and it must be hard work to keep an eye on two fawns who are intent on dashing off in totally



'Tigers committing suicide', screamed the headlines in response to the senseless slaughter of over 10 Dudhwa tigers (above). The absurd reports went on to suggest that because of 'over population' some tigers were jumping into wells, others were lying down in front of on-coming trains and still others fighting each other to the death! Poachers, taking advantage of the anti-tiger sentiments of locals, made a killing, literally and figuratively, as they went on the rampage in 1987 and 1988, butchering the highly endangered carnivores for the monetary value of their skins and claws.

With the recent declaration of Dudhwa as a Project Tiger Reserve, the authorities expect that man-animal conflicts will be considerably reduced as tigers (inset) will be able to thrive in undisturbed jungles. This

aspect of Project Tiger's mandate, to reduce tensions between man and beast, is little appreciated by most. The basic question before the nation today is whether forests are perceived as national assets, or not. If so, then the managers of wildlife reserves must surely be given all the political and financial support they need to execute their responsibilities. In reality, they find themselves stuck between a rock and a hard place! Locals are encouraged by politicians to break park rules, a cheap way to win popularity. And often, when harsh measures are taken by them against offenders, 'influence' is used to transfer them to less 'sensitive' postings such as social forestry! Such lack of support is the prime reason why people can commit atrocities, such as the one pictured here, and still get away.



Barasingha have the right of way in Dudhwa! The tall grass speaks of excellent protection being afforded to the habitat, but political support still lags far behind what is required.

different directions! Fawn mortality appears to be heavy, for as the days pass, one sees less and less of them. As they grow older the fawns seem to gradually lose their fear of vehicles and can be observed from quite close.

Land of the tiger

The tigers of Dudhwa are possibly second in notoriety only to those of the Sunderbans. It is, in a sense, a deserved reputation. In recent times, more people have probably died here on account of tiger attacks than in any other part of the coun-

try. But the reason for this sad state of affairs lay in old customs and traditions; more specifically the practice of *nikasi*. Under this system the inhabitants of the villages around the Park were permitted to collect thatch grass and firewood for their needs for a few weeks every year. From what I have been given to understand, this meant that several hundreds of bullock carts used to enter the forests and grasslands, people moving into every part of the Park. The consequent violation of the tiger's privacy must have frequently ended in death or injury to the violator. Additionally, outside the Park, a small population

of tigers was known to favour the sugar-cane fields. They came to be known as the *cane tigers* and some certainly had a penchant for human flesh. Others killed or maimed in self-defence. I heard of a case in 1987 in which a woman, while returning after answering a call of nature saw a tiger lying in a cane field. She announced this in the village and a couple of young chaps called her an old fool for mistaking a chital for a tiger and promptly set off to get some venison for dinner. They then lobbed a brick into the cane and the tiger, which was lying up real close, rushed out and swatted them with its paws. They were lucky to escape with minor injuries.

Nikasi has been banned now, and correspondingly there has been a distinct drop in the numbers of man-killing instances. In fact, the last case I heard of from within the Park was in the beginning of 1985. The tigers no longer roam the crop-fields like they used to. Farmers say they see pug marks only very rarely now. In any event locals had virtually declared war on the cane tigers and after poison and bullets did their work, newspaper reports were filled with news of 'tiger suicides'. But it was inevitable. The cane tigers were living on borrowed time anyway, for when man denies the tiger the right to live in its own forests, it's unthinkable that he will share his crop-lands with it!

I had heard hair-raising stories of the blood lust of tigers before I landed up in Dudhwa and I would have been foolish to have been completely unafraid. But I must say that the tigers I came across invariably left the road for me. Only once, the second time I came across a tiger, was I in any way threatened. And that was a tigress with three cubs and on a kill, all the no-nos for tiger sighting! I had unwittingly stopped to measure some grasses near the family. The angry roar when she discovered our presence, the burst of adrenalin that had me diving into the Jeep and the heart-thudding memory of the encounter, however, is something I wouldn't have traded for a hundred less unnerving meetings.

Subsequently, I saw tigers quite frequently (I averaged about one a week). From a cycle, on foot, from the Jeep, from a *machan* and once I spent a slightly uncomfortable five minutes when a tigress balefully glared at me while I was perched barely three metres off the ground on a branch. Those were the only pictures of a tiger that I got after staying five months in tiger country!

The Dudhwa dilemma

If any day can sum up Dudhwa for me it will be February 28, 1988. The previous evening I had watched an immature male florican at Navalkhand till dark, and the next morning I was eager to get back to the spot. Just before reaching Navalkhand, I caught a glimpse of a tiger bounding across the last few metres of the grassland, into the security of deep forest. I stopped for a moment and stared in its direction, screened by some thin saplings. When I caught sight of the striped monarch, I discovered that it too had paused to look back in my direction before disappearing into the forest. What a way to start a day!

I never did see the florican and after a while I proceeded to Dudhwa to spend a relaxed day with the Director. We spoke of the great potential ahead for wildlife in the Park and drove to the rhino enclosure where we saw three of the seven rhinos in great condition. Then we went down to Bankey Tal and did a good bit of birding. We were sitting sipping tea at the Sonaripur rest-house when news came in that a dead tiger had been found just outside the Park. The dark side of Dudhwa had once more reared its head. En route to the spot all I could think of was how desperately we needed to find answers to the contentious man/animal conflicts which threatened to upset the potential of this fine Park.

The smell of putrefication was suffocating. A nearby tree was covered with vultures. The tigress lay where she had crawled in to die, the grass around flattened by the last throes of death. Bloated, lips raised in an ugly snarl, she lay with her fore-paws cut off. Blue flies buzzed around the rotting flesh. Before me lay the remains of one of the *terai's* cane tigers. I had come face to face with Dudhwa's contradictions very often, but never as harshly as this.

It was symbolic, the place she had chosen to die. Around us were tree stumps, mute testimony to the death of forested land. I am informed that around 30,000 hectares of forest has been encroached upon in the *terai* of Lakhimpur district alone. How can any wild animal or habitat take such unholy pressure? Bullets and poison are only the most obvious ways to slaughter animals. Habitat destruction is infinitely more dangerous and inevitable. As I reflect on that terrible sight, my senses reel, and I wonder when it will be that a solution will be found for the Dudhwa dilemma.

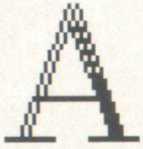
A wide-angle photograph of a desert canyon. The left side of the image is dominated by a massive, reddish-brown rock escarpment that slopes down towards the foreground. The right side shows a more vertical rock wall with some horizontal layering. The ground is sandy and covered with clumps of dry, golden-brown grass. In the distance, a few small green trees are visible against a clear blue sky. The overall scene is a stark, beautiful desert landscape.

SAUDI ARABIA

AN AWAKENING

Text and photographs by Asad Rahmani

The Thumamah escarpment, apparently lifeless, now receives much-needed protection. Each tussock of grass serves as a micro-habitat for smaller life forms, though the region is essentially a draw for those attracted to the severe beauty of the desert.



Among the five species of oryx in the world, the Arabian, or white oryx (*Oryx leucoryx*) is the most rare, and in fact, extinct in the wild in the country after which it is named. However, thanks to nearly 25 years of international conservation cooperation, the Arabian oryx will soon return to the wilds of Saudi Arabia from where it was totally exterminated in 1972.

The Arabian oryx has always fascinated the Arabs. Numerous poems have been written about its beauty, alertness and elegance. 'A blade shining in the darkness of night' wrote an Arab poet of the oryx.

A herd of oryx, trotting in the vast desert, has often been compared with "lovely women, with elegant dress, slowly and proudly walking on the sand." Such is the admiration for this horse-like antelope, that Arab poets describing the hunt, never wished the hunter to win against the oryx. As Dr. Ahmed Mohamed Ghandour of King Abdul Aziz University wrote in his book on the oryx, "The oryx was the symbol of power, dignity and pride never experienced in any other wild animal....The traits given to the oryx such as courage, persistence and pride were those that the Arab poet wished for himself and for those he would hail." However, admiration of the Arab poets and its legendary status could not save the Arabian oryx from the depredation of modern man. Traditional hunting pressure hardly made any difference in the oryx population, and in the vastness of Saudi Arabia there were always some areas where the oryx could live in peace. The oryx was an equal match for the hunter on a horse or a camel. With the arrival of modern weapons and four-wheel-drive vehicles, the balance tilted permanently to the advantage of man. By 1960 the Arabian oryx became extremely rare

and the total population was estimated to be 100 to 200. Nevertheless, the slaughter continued till the last oryx was killed in the wild. Thankfully, a few oryx were present in zoos and private collections. A herd of nine individuals collected from Saudi Arabia, Kuwait and the London Zoo formed the breeding nucleus of the International Oryx Herd. The rest is a golden chapter in the history of conservation here. At present there are more than 600 oryx in the world and thanks to meticulous captive breeding, the population is increasing. The Sultanates of Oman and Jordan have already re-introduced the Arabian oryx in specially

protected areas, and Saudi Arabia is designating areas to be established as national parks where 'wadehi arabi', as the oryx is called in Arabic, will be re-introduced in a few years' time.

Like the Arabian oryx, all the other wildlife in Saudi Arabia is going to have a new lease of life thanks to the formation of the National Commission for Wildlife Conservation and Development. Though the Commission was established only in early 1986 at the initiation of Prince Saud, it has done considerable work in this short period. Many areas, consisting of almost ten per cent of the country, have been identified for total protection. In February 1987, an international symposium on the po-

tential of wildlife conservation in Saudi Arabia was organised which generated considerable interest for wildlife conservation. For the general public, the Commission has produced some popular publications, beautifully designed and profusely illustrated. The first action plan (1987-1990) has been drafted "to guide the work of the Commission" and a comprehensive legislation for wildlife protection is under preparation.

While all the aims and objectives of the Commission cannot be given in this short article, in

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brief, the Commission is mainly concerned "with the preservation, protection and development of wildlife, carrying out biological research and applying the results to ensure an ecological balance."

Saudi Arabia formed the largest part of the Arabian peninsula, occupying nearly 2,500,000 sq. km. It can be divided into at least six main physiographic regions; each characterised by unique geological and climatic features: the Central Najd plateau, the Hijaz and Asir Provinces, the Northern and Eastern Provinces and the Great Desert of the Rub-al-Khali. As a result of which Saudi Arabia contains a variety of habitats -- from the coastal mangrove to the immense sand dunes of Rub-al-Khali. The Arabian peninsula is bordered on the west by the Red Sea and on the east by the Persian Gulf. The Red Sea is very deep (3,000 metres) while the Gulf is shallow, with an average depth of 35 metres. Biologically, both are important. The Gulf, due to its shallowness, supports extensive sea grass-beds, teeming with fish, crustaceans, gastropods, etc. Similarly, the Red Sea is important for conservationists owing to its fringing coral reefs. Where the sea meets the land, extensive mangrove forests are present in the inter-tidal zones. These mangroves are rich in wildlife. As there is not much demand for firewood, thanks to petroleum products, undisturbed mangroves can be seen for hundreds of kilometres. Recently, a breeding colony of the pink-backed pelican (*Pelecanus rufescens*) was found in one of the islets covered with mangrove. Sooty falcon (*Falco concolor*) is another species which breeds in some of the mangrove covered islets. One of the major aims of the Commission is to protect the mangrove and its associated species. Saudi Arabia is rightly famous for its sand dunes

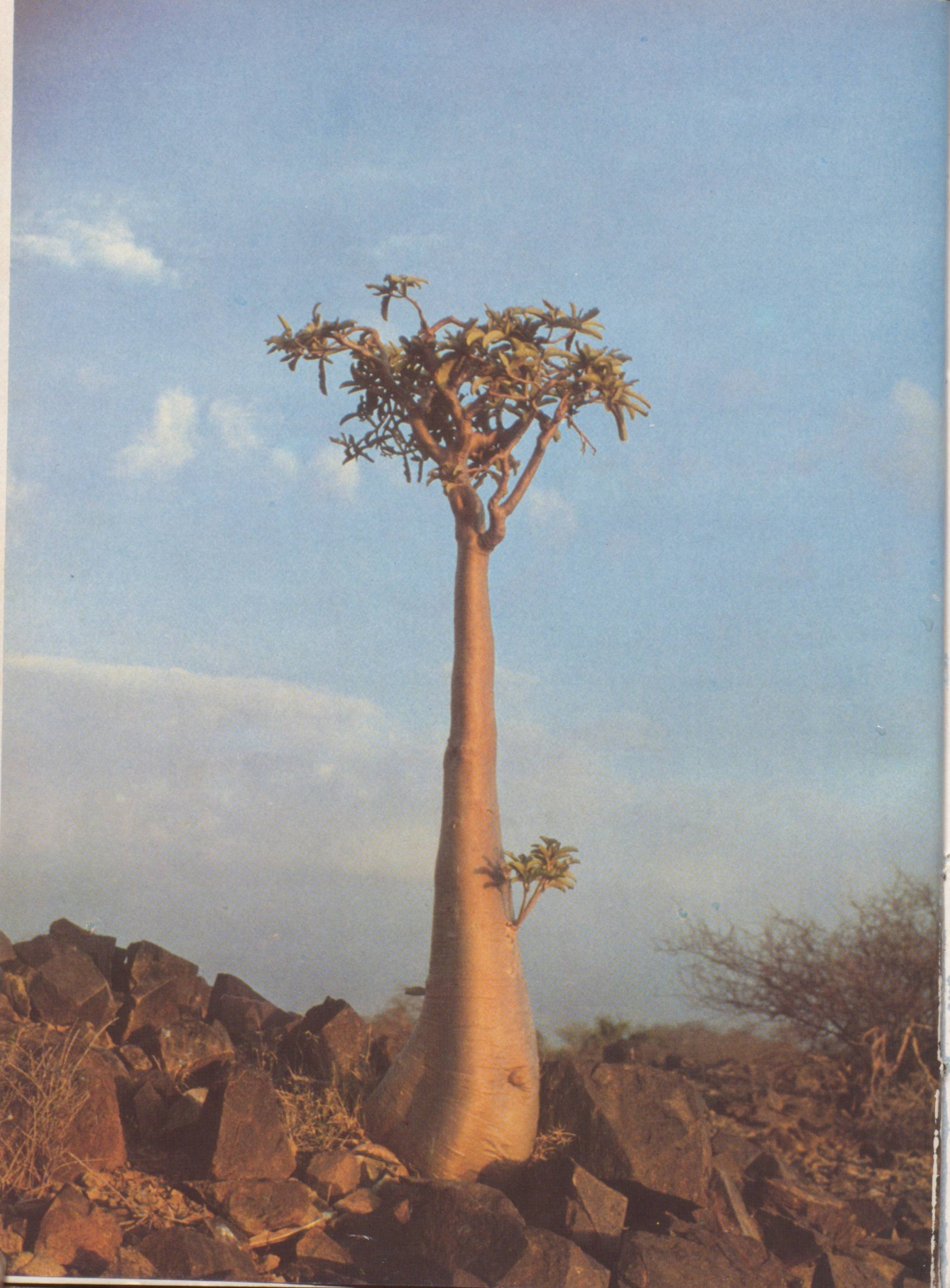
and *wadis*. The Rub-al-Khali, or the Empty Quarter as it is popularly called, along with the Great Nafud desert constitute nearly 775,000 sq. km. of pure sand. It is one of the largest sandy areas in the world. Contrary to its popular name, the Empty Quarter is not so devoid of wildlife. Beautiful goitered gazelle (*Gazella subgutturosa*) still survive in some areas and the Government is very keen to protect them. Plans to re-introduce the Arabian oryx in Rub-al-Khali, from where the last was killed in 1972, are going on. The area is so remote that some of the inter-dunal valleys are not visited by man for years. Sand mountains of up to

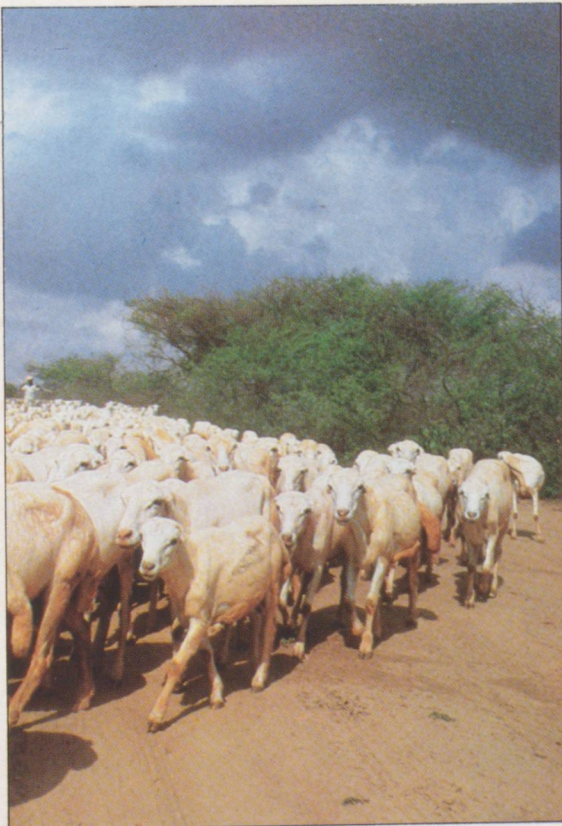
300 metres are not uncommon and a few interdunal valleys run up to 100 kilometres. With seasonal showers, the valleys are transformed into pastures on which thrive hare, gerbils, gazelles and many birds. Desert fox and sand cat are still common in some parts of the desert.

One of the most characteristic features of Saudi Arabia (and other countries of the Middle East) is the *wadi*. A *wadi* is basically a water course where the rain water is channelled to empty either into the sea or to be lost in the sand. *Wadis* are present in the mountains and in the desert. Some of the *wadis* are deep and thickly vegetated, thus providing good habitat to a large number of species.

Even forest and exclusively frugivorous birds like the green pigeon can be seen in the forested *wadis*. In my recent survey in the south-west region of Saudi Arabia, I saw a flock of Bruce's green pigeons (*Treron waalia*) in one of the *wadis*. where we had gone to rest during the hot part of the day. A very important feature of the *wadi*-system is that some of the adjacent *wadis* may contain different species of animals and plants. This is specially true of fishes: some species are restricted to a single *wadi*. Therefore, preservation of the whole *wadi*-system is essen-

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Adenium obesum, (**facing page**) a hardy plant adapted to a hostile environment. The swollen trunk serves to store water and nutrients, an insurance against long periods of searing heat and drought. Flash-floods, (**top left**) though rare, can cause temporary havoc with lives and property. Invariably, however, when the waters recede, they leave behind a bounty which is enjoyed by innumerable life forms. A graphic presentation of a piquant problem -- tyre tracks as far as the eye can see. Off the road driving (**top right**), destroys delicate desert ecosystems. As in any extreme climate, survival for desert plants and animals is critically linked to protection born of solitude. In bygone days, Beduins in Saudi Arabia used to control grazing through an ancient system of checks, incorporated in the hema system. With the advent of modern times, traditional controls have virtually vanished (**above left**) and the resultant over-grazing has virtually destroyed the fragile habitats. Signifying a new awareness (**above right**), several areas in Saudi Arabia now benefit from protection.

tial to protect the diverse life forms. In order to protect them, the Commission is presently engaged in surveys to identify important *wadis* and their respective floral and faunal communities.

Saudi Arabia can also boast of some spectacular mountains and escarpments, where relict populations of ibex and leopard can still be found. Many of these escarpments will be protected under the protected area system being evolved by the Commission. One such escarpment near the Thumamah Research Centre, 70 km., from Riyadh is already protected and is a popular spot for visitors.

In the Arabian peninsula, 64 species of terrestrial mammals were recorded. Among carnivora, only the cheetah (*Acinonyx iabatus*) has become extinct in the recent past, while the Arabian leopard (*Panthera pardus*) is surviving in very small numbers in some inaccessible mountainous regions in Western Arabia. The leopard of Saudi Arabia belongs to the *nimr* subspecies found nowhere else in the world, so preservation of this relict population is quite important from the conservation point of view.

Cheetah in Saudi Arabia became extinct almost at the same time as in India. Four animals were killed

about 1950 near Turayf on the Trans Arabian Pipeline by ARAMCO workers. After that cheetah has not been sighted though some people are still hopeful of finding it in some remote corners of the vast desert. It will not be out of place to add here that in India, the last cheetahs - three young males -- were shot in one night in 1948 by a certain ruler of a small state in Orissa.

Among the lesser carnivora, wolf, striped hyena, caracal, wild cat, sand cat and fox are still widespread though nowhere very common. Most of

these animals are hunted, especially the wolf and hyena, which are loathed by goatherds. In the sandy areas where the animals can be tracked by following their tracks, these animals have been reduced in numbers. The wolf is despised by the Bedouins (local shepherds) and killed on sight or followed up to its den. In spite of this, the wolf is widespread and not in danger of extinction.

Three species of gazelles, all very rare now, are found in Saudi Arabia. The mountain gazelle or Idmi *Gazella gazella* belongs to the same species as our chinkara. The dorcas Gazelle, *Gazella dorcas*, called 'Afri' in Arabic is smaller and paler,

without stripes on the flanks. Mountain gazelle, chinkara and dorcas are so greatly similar in their anatomy that many taxonomists consider them as the same species with some minor sub-specific differences. The Persian or goitered gazelle, however, is quite a distinct species and scientifically called *Gazella subquatorosa marica*. Its Arabic name is 'rheem'. Unlike the mountain and dorcas gazelles, the rheem does not leap and bound, instead it runs away fast with outstretched head and neck. All the three gazelles are endangered in Saudi Arabia and one of the tasks of the Commission is to identify the surviving populations and protect them.

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cent animal.*

Saudi Arabia is quite rich in bird life. About 450 species are recorded, out of which 185 breed in the country. Eleven species like the red-legged partridge, Arabian woodpecker, South Arabian wheatear, Arabian waxbill, etc. are endemic to the Arabian Peninsula, and another 11 are more or less confined to Arabia. In this century, only one avian species i.e. the Arabian ostrich, has become extinct though many have become rare. Among the rarest Arabian birds is the Arabian bustard. On the global scale the Arabian bustard may not

be threatened but in the Arabian Peninsula it is more or less gone. *Ardeotis arabs* as this bird is scientifically called has a wide distribution in North Africa and four sub-species are recognized. The sub-species *Ardeotis arabs arabs* is present in Djibouti, Ethiopia and Somalia. Across the Red Sea it was present in a narrow coastal strip from Medina in Saudi Arabia to Aden in South Yemen. This narrow strip between the sea and the mountains is called 'Tihama'.

Like the Great Indian Bustard, the downfall of the Arabian bustard started with the arrival of four-wheel-drive vehicles. No area remained unapproachable to hunters and the bustard was wiped out within no time, except in a few non-jeepable areas. The remaining birds were threatened by a more insidious enemy -- habitat deterioration by overgrazing. Earlier, stock breeders were confined to areas where water was easily available for domestic animals. Four-wheel-drive vehicles and the Government subsidiary to the Bedouins made water-transport very easy. Vast areas which earlier remained under-utilized by stock breeders were open to domestic animals and soon overgrazed. During my recent survey in search of the Arabian bustard in the Tihama region, tracks of vehicles and domestic animals were found everywhere.

With the twin onslaught of hunters and habitat deterioration, the Arabian bustard population went on decreasing and after 1977 none could be seen. This led to the fear that the Arabian bustard is extinct in Saudi Arabia. Thankfully, the fear was premature and in October 1987, Mohemmad Shobrak of the Commission, and I saw one bustard and found tracks in two more places. However, we do not know whether the birds

were resident or came from Yemen or Djibouti. Dr. Abu-Zinada, the Secretary-General of the Commission was very happy with the 'rediscovery' and a detailed project to rehabilitate the Arabian bustard is soon to be started by the Commission.

Houbara bustard will never fail to fascinate the Arabs as it is a traditional quarry of the falconers. In December 1978, the Indian Government allowed a few members of the Saudi Royal family to indulge in their favourite sport in the Thar Desert where a few thousand houbaras are seen during

winter. However, owing to the adverse publicity in the media and protests by animal lovers, the Indian Government was forced to politely tell the Arab guests to stop this hunting. At that time most of the media people and even some bird lovers had confused the houbara with the Great Indian Bustard which is legally protected in our country and even the Government cannot allow its shooting. Being a migrant and still present in thousands, the houbara did not enjoy the Great Indian Bustard's status (at least not at that time), thus, our Government's complacency in inviting the foreign dignitaries. Even Indian conservationists were surprised to see the popular protests against this killing.

The one who benefited most was the Great Indian Bustard. Suddenly it came into the limelight and received much-needed protection.

Among all the bustard species, the houbara is the most widespread. It is found in the Middle East, north Africa from Egypt to Morocco (including a sub-species on Canary Island) and arid areas in southern Eurasia. In Saudi Arabia, resident as well as winter migrant populations of the houbara are found. Falconry is so popular among the elite that nearly four thousand birds are killed annually

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The peregrine (*Falco peregrinus*), (**facing page**) said to be the most 'royal' of all the birds of prey, is endangered almost throughout its range. In Saudi Arabia the peregrine is relatively safe from the ill-effects of pesticides, which have often presented the species with survival problems elsewhere. The famous houbara (*Chlamydotus undulata*) (**above**) provides the focus of almost all conservation action in Saudi Arabia. Fortunately for other life forms, it has now been realised that the key to species survival is habitat protection and, as such, several species can expect a second lease on life as a result of the desire to save the houbara from extinction. The Nubian ibex (*Capra ibex*) (**left**) was once common in the mountains of the Arabian peninsula. Today the Saudi government has instituted conservation plans to rehabilitate the species which nearly died out as a result of uncontrolled hunting.

in Saudi Arabia itself during the winter months. It is rightly felt that the species cannot tolerate such heavy hunting pressure especially when we do not know the total wintering and resident populations. In order to conserve this majestic bird and to allow sustainable hunting, the Commission has started a project to study the houbara -- both wild and captive.

Attempts to breed houbara in captivity are on in Bahrain, the United Arab Emirates, Jordan, Israel and Saudi Arabia. In April 1986, the Commission established the National Wildlife Research Centre, 30 km. south of Taif, with the main purpose of breeding houbara and the other threatened wildlife of the Kingdom. As the resident population of the houbara in Saudi Arabia is small, it was decided to collect eggs and chicks from Pakistan and Algeria. Therefore two expeditions in 1986 and 1987 were organised which were able to collect a few dozen eggs and chicks. These were transferred to Taif where modern rearing facilities and large pens facilitated the chicks to grow up without suffering much mortality. It will be a few years before these captive birds will start breeding. Among all the houbara captive breeding attempts in the world, the Saudi experiment is the most ambitious and its results will determine the course of action to be taken to conserve this fast disappearing species.

Thumamah Wildlife Farm, 70 km, from Riyadh is another important area which the Commission is developing as a research centre. The 580-hectare

Thumamah enclosure was the private property of King Khaled and was badly neglected after his death. The King was extremely fond of animals and had collected many, especially herbivores, from many parts of the world. I was taken aback to see hog deer and a herd of chital running wild in the big enclosure. The hog deer in India generally lives in humid grasslands of the Himalayan *terai* and in Assam but in Thumamah it was apparently doing well among sand dunes! Similarly, chital which is generally identified with the woodlands

of India, survives in the harsh climate of Thumamah without any adequate tree cover. I saw a small herd of 11 chital and there are said to be 30 in the enclosure. The nilgai, however, may not be out of place in Thumamah because I have seen it in similar habitat in the Thar Desert.

Out of the 700-odd animals in Thumamah, fifty per cent are gazelles. There are 225 goitered and 160 mountain gazelles. Other species are the dorcas, mongalla and Sommering's gazelles, Arabian and beisa oryx, addax, zebra, roan and topi antelopes, llama, ostrich and cassowary. Extensive repairs and construction of modern research facilities at Thumamah are going on and steps are being taken to segregate the various species and to provide a

balanced diet according to the requirements of the species. Within one year, under the control of the Commission, mortality rates of the gazelles at Thumamah dropped by 70 per cent. It is hoped that in a few years' time there will be enough gazelles at Thumamah to be released in the wild.

The future of wildlife in Saudi Arabia never ap-

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peared to be as safe as now, thanks to the establishment of the National Commission for Wildlife Conservation and Development. If the remarkable achievements of the Commission within a short span of two years are any indication, in a few years, the sandy valleys of the Empty Quarter will

again harbour the timid gazelle, the majestic oryx and the enigmatic houbara. Perhaps, the happiest people will be the Arab poets because they will once again admire the beauty of the oryx and wish that the hunters would be unable to exterminate God's children of the sand.

AMBUSH

The mantid story

by E. Narayan



Mantids prey largely on other insects. The ability to endure long periods of starvation is a survival strategy that has served mantids well for millions of years.



hen I recently asked a friend about his garden, he complained of pests and recounted how he had only a few minutes earlier picked out and crushed to death with a stone a large insect 'hiding' in his rose bush. From the description he gave, the insect appeared to be a praying mantid (also known as praying mantis). Mantids often become targets of man's ingrained hatred towards creatures that crawl; their camouflaging colours, often curious appearance and shifty movements make them even more suspect in the eyes of man. They can be easily caught and killed because they are defenceless, slow in movement and fragile. Man has known this insect since ancient times and has even built a legend around it. The ancient Greeks believed it had supernatural powers. The Turks and Arabs thought it prayed constantly facing Mecca, and that its saliva was such a potent poison that it could kill a horse. The Japanese carved its image on the hilts of swords of the Samurai as a sign of courage. The Chinese organised wayside mantid fights between male mantids of the same species, to the accompaniment of much betting and gambling. The very name 'mantid' in Greek means diviner. Whatever the belief, the mantids do not harm plants or man. On the contrary, they benefit both, as they eat insect pests.

The mantids are grouped under the same insect order as cockroaches, but unlike cockroaches which are scavengers, they are predators which catch their prey alive. Their body is modified to perform this specialised function. In a typical insect the body of which is divided into a head, thorax and abdomen, the three rigidly jointed thoracic segments bear three pairs of legs arranged in close succession for effective locomotion. But in mantids, the first thoracic segment is movable and much longer than the rest, as a result of which the first pair of legs is separated and placed well away and in front of the succeeding two pairs. The first pair of legs is also modified for a raptorial function -- for seizing prey. The coxa, very short in most insects, is much elongated in mantids to increase reach. A row of spines lines the lower sides of the femur and a femoral groove snugly accommodates the opposing rows of spines in the tibia which also possesses a prominent tibial spur. An insect caught between the spines of the femur and tibia will be like a man caught in a tight coil of barbed wire -- if he moves, he will only get further hurt. Prey thus caught by the mantid, therefore, allows itself to be devoured

alive rather than attempt a painful struggle to escape. While at rest, the mantid keeps the first pair of legs together in front of the body, as if in prayer. This is what earned it the name, 'praying' mantis.

The mantid catches prey when the latter is in flight or in motion. This requires accurate aiming of its raptorial forelegs, which is made possible by a good three-dimensional vision provided by a pair of compound eyes placed widely separated on its head. Other sensory organs which help in determining the direction of strike also come into play and the head itself can be rotated so well as to make it possible for the mantid to see prey approaching from almost any direction. Normal walking is done by the second and third pair of legs, but the first pair may also aid in locomotion. Many mantids, nevertheless, are clumsy walkers. This is because they do not need to run their prey down, preferring to ambush them by lying in wait in ideal spots. To stay undetected, however, many mantids sport an array of camouflaging colours. Some are foliage green and merge with surrounding vegetation, others, due to the presence of thin, flat expansions on parts of their body, resemble dry leaves and twigs. Even the movements of such mantids imitate dead leaves gently swaying in the breeze! Nymphs of some, resemble ants, while the colours of others merge with the surroundings they frequent. A Brazilian species actually resembles the white ant on which it preys. Nymphs of mantids lack wings and therefore cannot fly at this stage of their lives, therefore many are excellent runners! Adults of some mantids are good flyers and are often attracted to lights at night.

My friend's ill-treatment of the mantid persuaded me to take up camera and pen in its cause. I prepared myself for a long search for my first mantid, but luckily the search turned out to be a brief one. There, right in my own front garden was a female *Gongylus gongylodes* (Linnaeus) (Empusidae) hanging upside down from the leaves of an ornamental plant, waiting to pounce on any insect visiting a nearby flower. Not far away, I soon discovered another of the same species, possibly a sibling. Though of the same species, they showed a remarkable difference in habits. The first always stationed itself near flowers, especially near the *Nerium oleander* flowers which I had in the garden, while the second concealed itself among the leaves and twines of *Clitoria* on the fence, mak-

ing itself almost indistinguishable from the dry leaves and pods surrounding it. For the purpose of photography I directed my attention to the one near the flowers.

With infinite patience this mantid waited endlessly near the flower for a prey to appear. It looked around by moving only its head, keeping the body still. At times it moved its body swinging on its two pairs of hind legs in imitation of a dry leaf swaying in the breeze. If a butterfly or prospective prey insect came within view, its body froze while only the head moved almost imperceptibly, tracking the prey, waiting for it to come within striking distance. I too waited, camera ready, to snap the mantid capturing prey. Insect after insect passed that way without coming within reach of the mantid. During this long wait I realised that to get a photograph of the mantid actually grabbing a prey was well nigh impossible. Once a mantid determined a prey to be within its reach, it struck at it. This sudden extension of the forelegs took only about a twentieth of a second. Even if I reacted promptly and pressed the shutter release button of the camera at the commencement of the strike, the action would have been over by the time the camera captured the image. The mantids in fact rely on such swiftness to capture their prey for the same reason. By the time a fly, for example, realises that it is about to be captured by a mantid it will be too late for it to take evasive action because its reaction time is greater than the mantid's strike time. I therefore decided to gain more control over the mantid's actions.

I impaled a living cockroach nymph on a sewing needle with a small length of thread attached. I then asked my son to slowly lower the suspended nymph within striking distance of the mantid, while I kept myself ready to shoot with the camera. The mantid watched the struggling nymph getting closer, and when it came within reach it struck and I clicked the camera. The first time the picture did not show the grabbing action which I wanted, but the mantid with the nymph safely in its possession. I repeated the sequence with a house cricket and was more successful.

Mantids have a voracious appetite. The one which I photographed while striking, ate a large-sized American cockroach nymph, two German cockroaches, two house crickets and a couple of house flies one after the other, all in the space of an hour. Then, when I stopped feeding it, it went

hunting on its own. Later, after two days, it rewarded me with a bunch of eggs fashioned somewhat after itself.

Mantids lay their eggs in a capsule called the ootheca (bag of eggs), which is fixed to plant stems or other suitable hard surfaces. The egg capsule is a complex construction and varies in shape and size according to the species. The mantid covers the eggs with a frothy secretion which subsequently hardens providing a tough papier-mache-like protective covering for the eggs. This covering, in addition to protecting the eggs from mechanical injury and predators, also helps in maintaining optimum temperature for the development of the eggs. So effective is the insulating property of the cover that mantis eggs still hatch even after the ootheca is boiled in water for five minutes.

After an incubation period, which may last about a month, the nymphs hatch. Mantids are sometimes cannibalistic and, among newly hatched nymphs of some species, being eaten by your own is prevented by the ability to secrete a thread. Suspended by means of this thread and aided by wind, the nymphs disperse and go their individual ways in search of other pastures. This ability to secrete a thread is lost soon after. However, during my own observations on newly hatched nymphs of three species of mantids, I found that cannibalism is not so frequent among them. Immediately after hatching, they tend to show more interest in migrating away from the egg capsule than in feeding. In one instance I found several newly hatched nymphs of *Euantissa pulchra* (Fab) (Hymenopodidae) sheltering huddled together on the under surface of a leaf, waiting for the rain to clear. After waiting thus for more than a day they dispersed when the rain ceased, showing no sign of cannibalism in the meanwhile.

The nymphs of mantids moult several times before they become adults, and the period of development depends on such factors as the temperature and availability of food. Nymphs resemble adults except in size, sometimes in colour, and as we saw earlier, they lack wings. They are also sexually undeveloped. The nymphs move about more actively than adults in some species.

The prey of mantids consist mostly of other insects, sometimes even larger than themselves. Since prey availability is unpredictable they are



Shekar Dattatri



Isaac Kehimkar

Perched atop the blooms, (top) a mantid patiently awaits the arrival of its next meal. Mantids are grouped under the same insect order as cockroaches, but, unlike their scavenging 'cousins', mantids are master predators and eat only live prey. An insect caught between the awesome spines of the femur and tibia (facing page, bottom) will be like a man caught in a tight coil of barbed wire -- if he moves he will be further hurt. Several mantid victims, therefore, allow themselves to be devoured alive! Found in a variety of sizes and colours, mantids (left) are classified under the sub-order Mantodea. We know of some 2,000 species of mantids, belonging to 13 families and 450 genera, which live mainly in the tropics.

capable of withstanding long periods of starvation. They seem to be quite hardy in some respects, and I have seen mantids waiting patiently in the direct sun, day after day without being any the worse for wear. Some species remain on a fixed spot for days together, but might change the spot if prey becomes rare. Others tend to move about frequently.

Female mantids which are usually larger than the males, have been reported to bite off and eat the head of the male while mating, or even eat the whole male after mating. One explanation given for this phenomenon is that mantids are incapable of distinguishing between prey and a member of their own species. My own observations have shown that this is not true. I have seen a dangerous wasp hovering within reach of a *G. gonylodes* without the latter attempting to grab the wasp, obviously recognising the danger.

I wanted to photograph the male-eating phenomenon. Luckily a friend of mine sent me a nymph of *Hierodula membranacea* Burmeister (Mantidae) which moulted into an adult female. The same friend soon sent me a male of the same species too, and I kept them in two separate cages for some time, feeding them well with grasshoppers and other insects. After about a week, one morning I released both of them into a specially made cage with transparent sides for photographing. At first the male rested a few centimetres ahead of the female, facing the same direction, closely watched by her. Suddenly the female shot its forelegs forward to grab the male. The male, as if in anticipation, half flew, half jumped and landed on top of the female, now facing the opposite direction! The male then took a 180° turn and took a firm hold on the leading edge of the female's wings with its forelegs. This was the beginning of a long period of inactivity with the male resting on the female. At the end of the day I tried to separate them in order to resume the observations the next day. But I found that in view of its firm hold it was impossible to dislodge the male without breaking off its legs! It occurred to me that the male was in a similar situation as the man riding a tiger, who stood the risk of getting eaten by the tiger if he dismounted. I left the mantids together in the cage overnight, hoping to see both alive the next morning. The next morning and the whole of the following day they were in the same position without apparently having mated. I left them overnight together again, but could have a look at them only the next afternoon.

By then what I feared had occurred. The male was gone, and there at the bottom of the cage lay its scattered remains: bits and pieces of wings and other appendages. I presumed that mating had taken place after which the female had eaten the male. But I had no way of knowing if the female had bitten off the head of the male before mating. I kept the female fully fed for a few more days and then it laid a jumbo-sized egg capsule from which nymphs started hatching a month later -- proof enough of successful mating.

Most female insects need to mate only once in their lifetime to lay the full quota of fertile eggs over several days. This is made possible by the possession of a spermatheca by the female in which sperm is stored for future use. The mating activity of the male is controlled by the last abdominal ganglion and the brain has inhibitory control over this ganglion. As a result, mating in some species of insects takes place only when one or more conditions are satisfied. Certain *Anopheles* mosquitoes, for instance, mate in nature only after the males go through a swarming flight which is triggered by particular temperature and light conditions. To by-pass this need, medical entomologists wanting to breed such species in the laboratory have often used the simple technique of beheading the males and mating them with anaesthetised females! Beheaded males live long enough for this purpose. The female mantid possibly uses this technique to hasten mating with a reluctant male.

Since mantids must lie in wait for prey to approach them, they are never sure when the next meal will come. A mated female, which is starving cannot produce a full quota of healthy eggs. Eating the male ensures adequate nutrition for the development of eggs. The male-eating phenomenon, therefore, is not self-destructive as it appears to be, but a self-propagating one which ensures survival of species. However, it is possible that all species of mantids do not display this phenomenon. There are, in fact, some mantids which are parthenogenetic.

All through their nymphal and adult stages mantids feed voraciously on a wide variety of insects. Their prey predominantly consists of 'pest' insects and mantids are therefore highly beneficial to man. For this reason some species of mantids have been deliberately introduced into America from Europe and China to check pest insect populations.



A mantid hungrily consumes a cricket. These efficient hunters have been known to take on a variety of prey including spiders, wood lice and even small lizards!

But the mantids themselves are subject to attack by other insects. Some biting midges are known to attack mantids while some wasps attack the mantid's eggs. Since the egg capsule is made of a tough protective cover, the parasitic wasp has to employ dubious methods to gain access to the eggs of the mantid. The female wasps accomplish this by attaching themselves to a female mantid, and as the mantid lays eggs, the wasp inserts its own eggs into those of the mantid well before the mantid covers the eggs with a protective secretion. Later, from the parasitised eggs, wasps emerge instead of mantids!

Under the sub-order Mantodea there are some 2,000 species of mantids belonging to 13 families and 450 genera, distributed mainly in the tropics. They show wide variations in their size, shape and colour. They feed mainly on other insects but the largest of the mantids found in South America have been reported to feed on vertebrates like

small birds and lizards. Though man has been aware of their presence for ages, we know very little of the number of species of mantids inhabiting the earth, their feeding habits and the role they play in balancing insect populations. Very negligible information is available about the Indian species, their prevalence and habitats. In the meanwhile, indiscriminate use of pesticides must be taking a heavy toll on the mantid populations. The larger, more sedentary species are more vulnerable to insecticide sprays. Large-scale habitat destruction, now continuously going on throughout the sub-continent, could also lead to the destruction of some of them. It is thus not unreasonable to assume that some species might already have been driven to extinction.

Looking around me at the state of affairs in terms of such gross habitat destruction, it occurs to me that, today, the praying mantids might well be praying for their own survival.



BUTTERFLIES

Sheep in wolves' clothing!

by Torben Larsen

The blue oak leaf at rest, displaying its flash colouration. The under surface, rather than the upper surface, is cryptically coloured, which confuses predators as the insect is near invisible when its wings are folded together.

You can fool all of the people some of the time and you can fool some of the people all of the time but you cannot fool all of the people all of the time.' This admirable sentiment was, I believe, first expressed by Abraham Lincoln. While he did not so intend it, it is also an excellent comment on defence in the animal kingdom. Enemies are many, they have different tastes, different hunting methods, and different ways of locating their prey. Some have generalised defence mechanisms working against all of the predators some of the time. Others have specialised defence mechanisms that fool some of their most important predators all of the time. Mimicry in butterflies is a case in point.

A number of Indian butterflies, belonging to several different families, are toxic and highly distasteful to birds and other vertebrate predators. Their larvae feed on toxic plants such as the Asclepiadaceae, the Apocynaceae, the Aristolochiaceae and the Euphorbiaceae, all of which are avoided also by grazing animals. The toxic plant alkaloids do not harm the butterfly caterpillars. On the contrary, they are sequestered and stored in the tissues from where they are passed on through the pupal stage to the adult butterfly. So poisonous do the butterflies become that a few ground-up specimens fed to a rat will cause rapid death. I once chewed up a butterfly that was so toxic that it left my mouth blistered; I became quite queasy even if I did not swallow it. And I am many times larger than the normal butterfly predator!

Most of the highly toxic butterflies share a number of characteristics. They have strong, bright colour patterns to make it easy for predators to recognise them. Technically, these are known as warning colours: keep off! Both sexes normally share the same colour patterns, though in many non-toxic butterflies the males and the females may be very different indeed. Toxic butterflies normally adopt a slow and deliberate flight designed to show off the warning colours. They almost seem to taunt potential predators: "come and get me!" which of course no sensible and well-educated predator would dream of doing. Mistakes will occur, however, and here most of the toxic species have another trick up their sleeve. Their bodies are so tough that they may well survive an attack long enough for the bird to discover that it has made a mistake. As if that was not enough, the butterflies have not yet

run out of tricks. If you handle a toxic butterfly, it will immediately feign death (*thanatosis*). This is a very good idea indeed, because most predators will carry through an attack with vigour till it is certain that the prey has been subdued. Only then will it stop to reflect. By playing dead immediately, a toxic butterfly avoids the worst possible attack, the bird will discover its mistake, and the butterfly may well escape unharmed. This process is aided by the fact that most predators will attack an unfamiliar food item with considerable circumspection, not least a brightly coloured, unfamiliar butterfly.

Numerous field and laboratory experiments have shown that toxic butterflies with warning colouration have a distinct survival value in nature. If the warning pattern is modified with paint, survival rates drop immediately. Experiments with birds have also shown that once bitten, twice shy.... many years after a bad experience they will not even begin tentatively to investigate a toxic butterfly with which they have had previous experience.

There is no doubt whatever, that toxic properties combined with warning colouration are a powerful defence against birds and other vertebrate predators. However, a praying mantis or a spider might happily gobble it up. You cannot fool all of the 'people' all of the time.

So powerful are the advantages of toxicity and warning colouration that a number of perfectly palatable butterflies, which any predator would enjoy, have evolved into near-perfect copies of the toxic ones. This is the phenomenon known as 'mimicry'. The toxic species is the model, the copy is the mimic. By any standards, mimicry is one of nature's real wonders as a review of some prominent Indian examples will aptly reveal.

The common rose (*Pachliopta aristolochiae*) is found throughout India, while its close relative, the crimson rose (*Pachliopta hector*) is limited to southern India and West Bengal. It may be very common in the south. Both feed on *Aristolochia* and are highly toxic. Their black, red and white patterns are typical warning colours, and their slow, provocative flight advertises the warning signals. Enter the common mormon (*Papilio polytes*), a pest of both citrus and the curry leaf plant, usually common throughout India, even in

city centres. The male is black with white markings and makes a perfect meal for any bird, though his rapid zig-zag flight makes him difficult to catch. His female is equally palatable, but she comes in three different forms. One is a near-perfect mimic of the common rose. Both of these share the slow, provocative flight of their models which is quite unlike the rapid flight of the male. The third female form is just like the male and her flight also seems to be fast and erratic. At the foot of the hills of southern India both the roses, the models, are very common. The two female mimic forms of the mormon are equally common while the male-like female is rare indeed. In Delhi the crimson rose is absent and the common rose quite scarce. Here, sixty per cent of all females are mimics of the common rose while nearly all the rest are of the male-like form which is so rare in southern India. The form which is a mimic of the crimson rose does occur in Delhi, but only as a great rarity, certainly much less than one per cent of all females.

In a few parts of China the common mormon occurs in localities where no roses occur. Here all females are male-like. Each local population of the common mormon responds to the extent to which each of the three female forms are at a competitive advantage, so if there are no models there is no advantage to being a mimic, and the mimetic forms gradually disappear. Each population is the result of the special circumstances that prevail locally. Technically, this is known as a state of local balance polymorphism.

The common tiger (*Danaus chrysippus*) ranks as one of the most common and widely distributed butterflies, not only in India, but throughout the tropics of Asia and Africa, as well as Arabia and southern Europe. Its larvae feed on the weed *Calotropis procera* which is highly toxic. Throughout its vast distribution area the female of the eggfly (*Hypolimnas misippus*) even copies the slow flight of its model, while the black and white male has one of the most furious and fast flights of all butterflies. In pattern and behaviour the two sexes are so different that it is hard to believe they belong to the same species. In both, the common mormon and the eggfly, only the females are mimetic while the males are very different. The explanation probably lies in the fact that the two sexes have different criteria for reproductive success. The male must be able to compete with other males and quickly find, impress and mate a virgin female. Then his

genes will be safe. His colour pattern will reflect these needs. The female will spend up to a month laying her eggs, singly, in places where the young larvae will be able to survive. Probably the male-like female is more attractive to males and will be mated more quickly. However, this slight advantage is overwhelmed by the advantage of protective mimicry during the long and dangerous process of laying eggs. But the advantage only exists where the local predators are familiar with the models.

The common Jezebel (*Delias eucharis*) is a toxic, slow-flying butterfly with a most spectacular combination of white, black, yellow and red. It is common all over India and I, for one, consider it one of the most beautiful butterflies in the sub-continent. In the Western Ghats and in Sri Lanka it is beautifully copied by both sexes of the painted sawtooth (*Prionerisita*) which is eminently edible to all predators. In nature I have been particularly impressed with this particular example of mimicry, though occasionally the male will affect a fast and furious flight that is at odds with the sedate flight of the model. In north-east India and in the rest of Asia, other sawtooths (or should it be sawteeth?) mimic yet other Jezebels with very different colour patterns.

Finally we come to a swallowtail that lacks a tail, the common mime (*Chilasa clytia*), widely distributed in India and Asia, though usually rather rare. Both sexes occur in two different forms that are excellent mimics of two toxic Danaids, in the glassy tiger (*Parantica aglea*) and the common crow (*Euploea core*) resemblance is even better than in the set specimens shown in the photograph. I have often mistaken them in nature, especially since the flight patterns are so similar. But if a mime gets scared, for example, if you miss it with your net, it transforms immediately and makes off at a speed that is almost unmatched by any Indian butterfly. In north-east India there are several other mime species which mimic yet other Danaids with very different colour patterns.

It would be possible to continue on this topic almost indefinitely. There are several dozen toxic butterflies in India. All have prominent warning colours, the purpose of which, so to speak, is to cry 'wolf'. And, in a way, they are wolves, because any predator that tries to eat them will be in for a rude shock. Nearly all are copied by palatable butterflies deriving protection from their predators. They survive by being 'sheep in wolves' clothing'.

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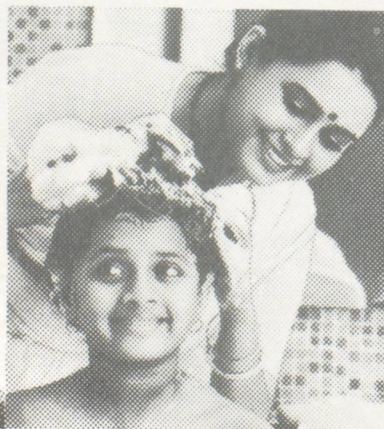
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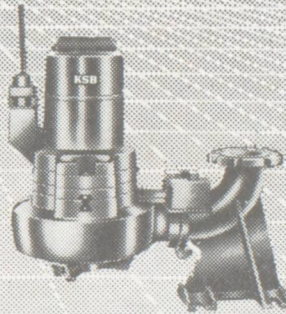
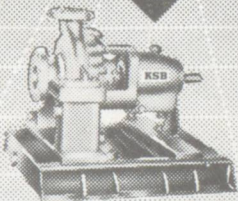
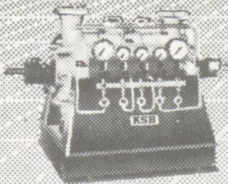
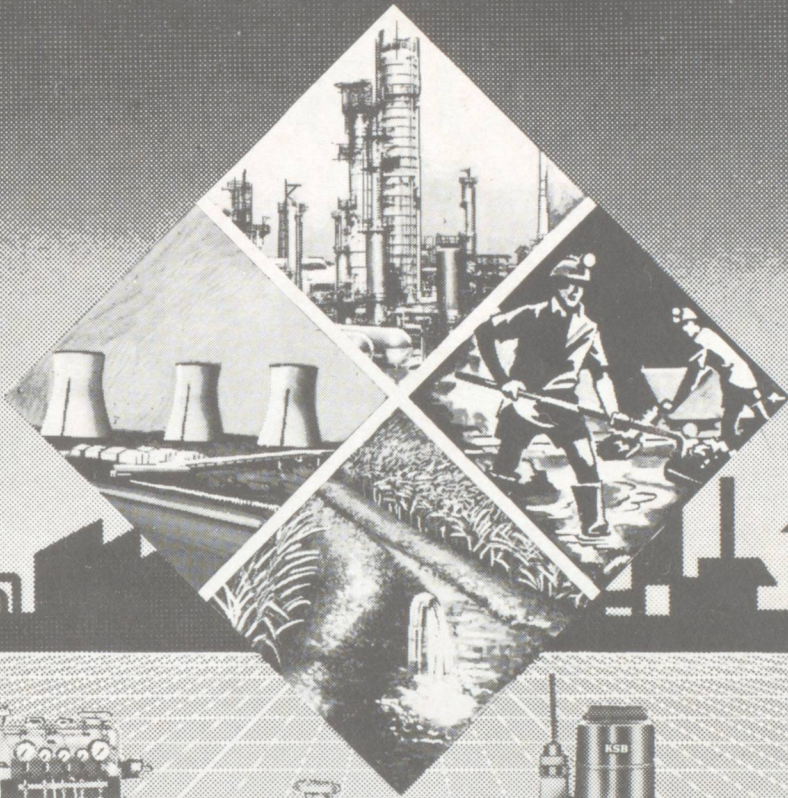
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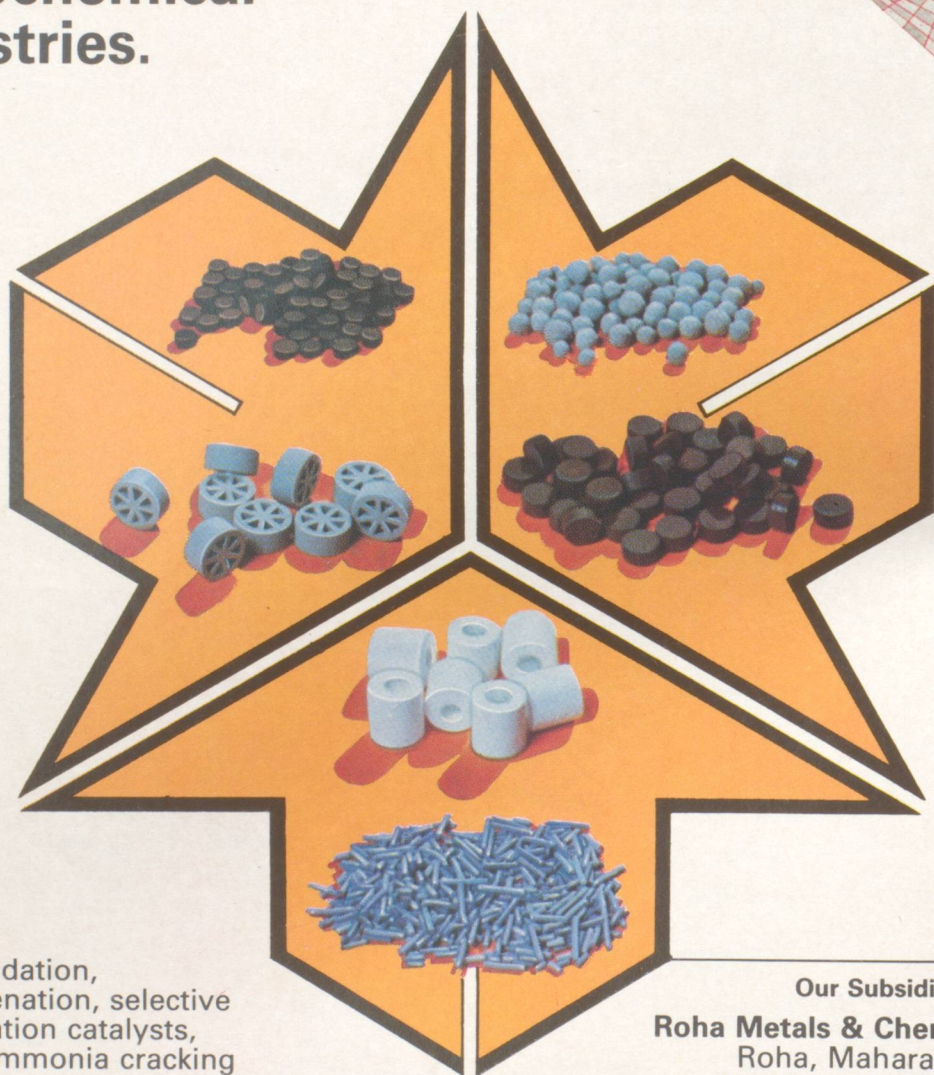
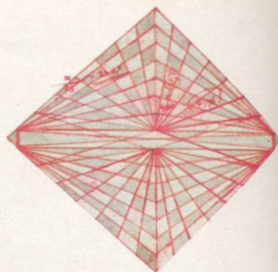
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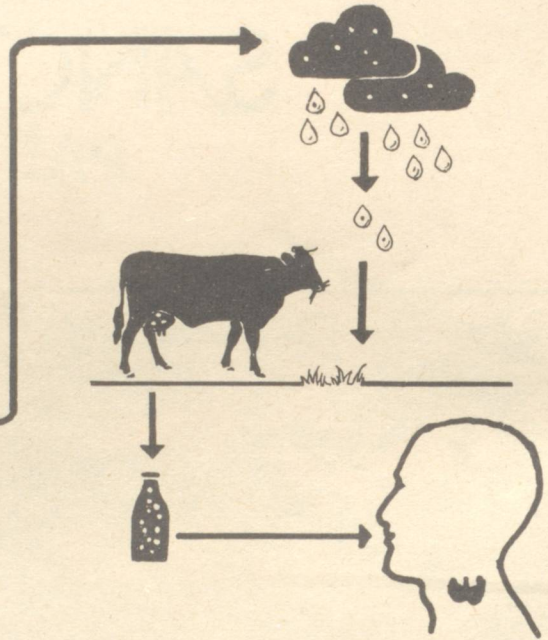
ELEPHANTINE TRAGEDY

SINCE THE BEGINNING OF LIFE ON EARTH, ELEPHANTS HAVE NEVER BEEN KNOWN TO DESTROY THEIR OWN HABITATS. NORMALLY THEY MIGRATE TO NEW AREAS, LEAVING THEIR OLD PASTURES ALONE FOR EXTENSIVE PERIODS, THUS ALLOWING THEM TO REJUVENATE. NOW HOWEVER, SINCE WE HAVE ARTIFICIALLY SPLINTERED THEIR TERRITORIES, THEIR MIGRATION ROUTES HAVE BEEN DESTROYED AND, IN SOME AREAS, THE GREAT BEASTS HAVE ACTUALLY BEGUN TO ACCELERATE THE DESTRUCTION OF THEIR FOREST HOME.

THE SCIENCE OF DESTRUCTION

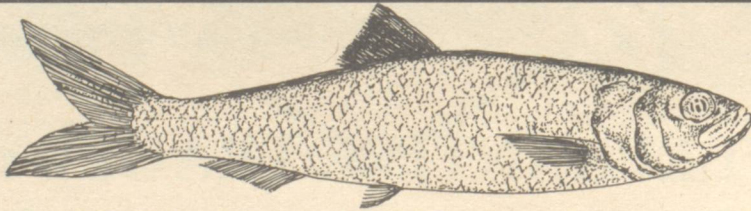


There is almost nothing as graceful as the sight of a bird in full flight. The actual motion of flight escapes most of us because our eye cannot follow the swift movement of the wings, but strobe lights and slow motion cameras can now 'stop' action for us to study and admire.



It would be wonderful if the frontiers of science could be pushed back to discover ways and means to understand our earth and its myriad creatures better. Instead, we find that the work of dedicated scientists is all too often misused by governments for military, or other destructive purposes.

MAJOR THRUST



Fish swim with an ease no scientist could replicate for love or money. The secret lies in the perfect ratios between size, shape and muscular strength. Cartilaginous and bony fishes, of course, originated 390,000,000 years ago in the Devonian period and they have therefore had a fair deal of experience in dealing with the dynamics of movement in water. On our part, studying such natural miracles provides the easiest way to streamline the design of submarines, ships and other such transport.

BUTTERFLY BOUNTY!



*The Lepidoptera, a large order of insects, containing those winged marvels, the butterflies and moths, live two lives in one. Their metamorphosis from tough-jawed caterpillars into the jawless, toothless 'flying jewels' that provide unending joy for students of natural history can be observed by anyone who is interested enough to rear these fascinating insects. To find out more about how you can enjoy the insect world, join the Bombay Natural History Society. Details can be had from **The Curator, BNHS, Hornbill House, Shahid Bhagat Singh Road, Bombay.***

हिंदी मराठी
या गुजराती
डूबने वालों की
एकही जाती



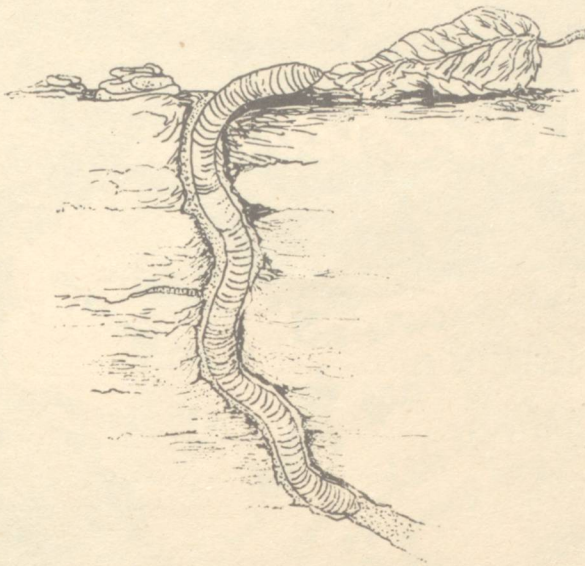
नर्मदा बचाओ आंदोलन

Narmada update

The people's response, to the Machiavellian attempt being made by politicians to rouse parochial passions in Gujarat, against those who oppose the Narmada Project, has been both, effective and heart-warming. Villagers from Gujarat, Maharashtra and Madhya Pradesh, whose homes are fated to drown, have taken this rousing cry to their brothers and sisters:

HINDI, MARATHI, YA GUJARATI
DOOBNE VAALON KI EK HI JATI!

THE WONDERFUL FERTILISER FACTORY



India is being bled to death by the high cost of pesticides and fertilisers. Such inputs push food prices up so high that poor people starve even in times of plenty. Nature, of course, has its own fertiliser factories, the output of which is available free to those

who know and understand its ways. Here we see one of nature's most diligent workers, an earthworm, busily pulling its raw material (a leaf) into its den.

The Nuclear Battlefield

Even as the world is poised to reject nuclear energy as too costly and too dangerous, our government is poised to set up 10 new reactors within the next decade! When will our over-eager planners discover that prevention is better than cure?



We do not need to condemn our children to the dirty job of living with our nuclear wastes. What we need is for scientists to work towards energy efficiency so that existing thermal and hydroelectric plants perform what they had promised, but not fulfilled, to the nation. This would be many times more efficient than setting up deadly albatrosses, in the shape of nuclear reactors, for our children to wear around their necks forever.

DAM IMPLICATIONS

In the mad rush to build new mega dams, we seem to have forgotten some of the consequences which haunt us at sites where dams were built earlier. These technical realities are never projected by dam builders for fear that 'activists' may use them as a stick to beat their projects with! Such suppression of the facts, however, will not make the problems go away, but only aggravate them because the activities of irresponsible people will not be monitored. Here is a small list of the lesser known aspects of large-scale irrigation which serve to degrade our soils and damage human health:

1. The excess supply of water for short periods leads to the displacement of plant nutrients, clay minerals and organic colloids to lower ground levels. This causes the impoverishment of topsoil, even as it destroys subsoil quality because of over-concentration.
2. Flooding and irrigating vast parcels of land lead to heat loss from the ground, thanks to which natural germination and plant growth are delayed, particularly at the start of the vegetation process.

3. When large sheets of water are spread across the land, even for relatively short durations, the root growth of natural plants is seriously affected since the roots cannot obtain enough oxygen from the air.
4. When chemicals and fertilisers from fields are flooded with irrigation water, the noxious, poisonous residues enter the drinking water reservoirs all around, thus leading to serious health problems for humans and livestock.
5. Poor drainage, the bane of Indian agriculture, causes water to collect just under the surface leading to water-logging. This water has only one way to escape -- evaporation. The problem is that though the water escapes, its dissolved mineral salts stay trapped on top of the land, thus leading to soil salinity. When the concentration of such salts becomes too high, then almost nothing useful can grow on such land. This is one of the most 'efficient' ways in which our country is turning fertile fields into wastelands! *In Sangli district, for instance, vast parcels of land have been rendered so saline, thanks to over-watering, that not even the infamous eucalyptus can be grown there now!*

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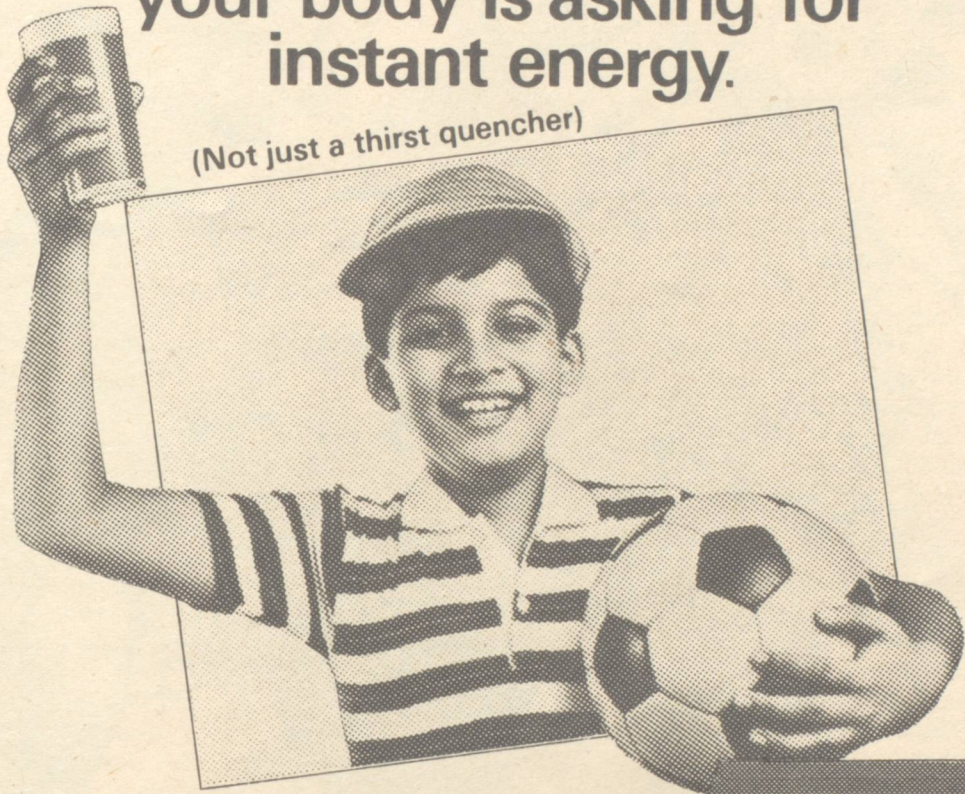
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IN THE EXCURSIONS AT MANALI OR CORBETT PARK

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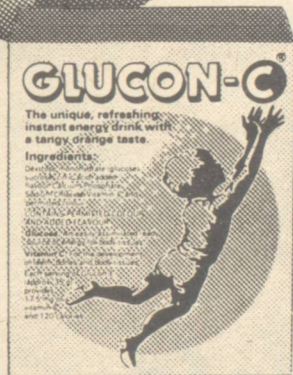
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AIR-INDIA

CONSERVATION AND THE ENVIRONMENTAL VOTE BANK

by Bittu Sahgal

Can you see a change of mood around you? No longer, thank heavens, are 'elitist' conservationists at the forefront of the battle to save our land. At *Dahanu*, it is the villagers who refuse to allow the government to put up a polluting thermal plant. In *Baliapal*, Orissa, it is the combined wrath of 1,10,000 people protesting against their ouster from traditional homes that will stop the creation of a missile base. In *Tehri*, housewives and children fight against all odds against the combined might of big business and an unsympathetic government. In *Patalganga*, Maharashtra, the power of big industry seems fragile in the face of protests from thousands of villagers who finally realised that keeping quiet is tantamount to poisoning their children with the effluents of callously set up chemical plants. In *Poyamkutty*, Kerala, 3,00,000 reed workers have given notice to the teetering State government and the builders of a devastating hydro-electric project that their votes will be used against *anyone* who threatens to destroy their only supply of reed.

Political pundits would be well advised to take a closer look at the sheer number of people who are to be adversely affected by dubious development projects. Conservatively estimated at around 35 million people, this vote bank could well turn the tide against seekers of the quick buck. It now remains for social and environmental activists to awaken people to the power of their vote. The issue at stake is now human rights -- this is the new thrust of the conser-

vation battle today.

As a sort of overview, here is a glimpse at 10 'typical' environmental threats facing different habitats and people in India. If you look closely you will see that most of the problems lead to the destruction, or damage of water sources upon which the poor are to-

tally dependent. This is by no means an exhaustive choice, just an eye-opening one. What one hopes is that in the coming elections, people in these and other environmentally ravaged sites will vote against those who are prepared to devastate their lands.

1. In the **Salim Ali National Park**, in Srinagar, the Chief Minister Mr. Farooq Abdullah wants to build a golf course for tourists and he has already ordered more than 4,000 trees to be cut for the purpose. These trees had been planted by hundreds of Kashmiri schoolchildren to help stop their precious Dal Lake from becoming oversilted.

Today most of the people of

J&K do not realise that forest loss will affect their livelihoods, but they are quickly learning and when they do, the political future of those responsible is sure to be dim.

2. In the **Nagarjunasagar Tiger Reserve**, the Chief Minister of Andhra Pradesh, Mr. N.T. Rama Rao, now wants to build a nuclear reactor which will threaten his state's finest remaining jungle with permanent destruction. After much protest, it looks like this plan has been thwarted. Nevertheless, there are over 1.5 lakh cattle grazing in this reserve which serves to collect water for the Nagarjunasagar Dam.

Political pundits would be well advised to take a closer look at the sheer number of people who are to be adversely affected by dubious development projects. Conservatively estimated at around 35 million people this vote bank could well turn the tide against seekers of the quick buck.

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NATIONAL IMMUNISATION SCHEDULE

(Revised on October 21, 1987)

Notified by the Directorate General of Health Services, Government of India

Age	Vaccine	Doses	Diseases Prevented
Infants & Children			
Birth-9 months	B.C.G.	1	Tuberculosis
6 weeks-9 months	DPT & Polio	3	Diphtheria, Whooping Cough, Tetanus, Poliomyelitis
9-12 months	Measles	1	Measles
18-24 months	Booster, DPT & Polio	1	Diphtheria, Whooping Cough, Tetanus, Poliomyelitis
5-6 years	DT*	1	Diphtheria, Tetanus
	Typhoid	2	Typhoid
10 years	Typhoid*	1	Typhoid
	Tetanus Toxoid*	1	Tetanus
16 years	Typhoid*	1	Typhoid
	Tetanus Toxoid*	1	Tetanus
Pregnant Mother			
16-36 weeks of pregnancy	Tetanus Toxoid* (protects both mother & child)	1	Tetanus

* 2 doses if not vaccinated properly

Interval between two doses should not be less than one month

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Persons using the Public Health audio-visuals produced by Glindia Limited, prior to October 21, 1987, should make a note of this revised immunisation schedule and follow it.

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Glindia - a concern for health

The reservoir here is quickly becoming a muddy lake because of over-siltation, caused by deforestation and over-grazing. But the administration is blind to the consequences of such environmental *harakiri*. Several local protest movements have sprung up and in the coming election year activists promise to make the pollution of rivers, destruction of forests by industry and the usurpation of common lands by the rich and powerful the main planks of public protest.

3. In the **Borivli National Park** which supplies almost 20% of Bombay city's drinking water, the defence department wants to build a radar on top of the highest point in the jungle. In doing so they will have to build a major road and therefore cut trees and disturb the wild animals which need peace and quiet if they are to do a good job of 'gardening' for us. The point is, if the forest dies, so will the supply of drinking water for Bombay city!

As if this were not bad enough, news reports on December 23, 1988 reveal that the authorities want to now build a dam in Borivli! This will drown the very forests that harness the monsoon waters -- much like killing the goose that lays the golden eggs. But then, most planners have proved to be butchers anyway, so what's a slaughtered goose or two to them!

4. In the **Andaman Islands** some people want to cut the rain forests and thus destroy the protective coral formations, so that they can build a second 'Hong Kong'. Others want to cut natural forests and plant palm oil trees for factories to use. No one seems to realise that these islands and their wildlife are desperately in need of protection and that they will be destroying a vital 'gene bank' if their plans go through. All this time the Central government has vehemently denied such plans, but in December 1988 an innocuous report indicated that the necessary sanctions have been given. Someone should inform Delhi that *Kala Pani* is no longer cut off from the world and that mere public denial of plans does

not mean that they won't ultimately be exposed.

5. In a place called **Poyamkootty** in Kerala, the Chief Minister wants to build a series of hydro-electric projects which will drown rich forests in which elephants and other wild animals live. They will also drown some very valuable reed forests which supply the raw material to over 3,00,000 basket and mat weavers who will have no other source of income. The reed workers have sworn to remove the local MLA if he is seen to support this body blow to their only means of sustenance. More power to them.

6. In the **Silent Valley, Eravikulam and Perambikulam National Parks** in Kerala, the State Government wants to build some fancy tourist resorts and tarred roads, thus threatening to destroy virgin forests in the name of tourism. What will happen is that picnickers will throng to these places with their garbage, noise and pollution. Also, naturally, poachers will have a field day since there will be so much coming and going in the jungle.

In any case, this action goes against the ruling of the *Indian Board for Wildlife* which stated in its last meeting that tourism in protected reserves must not be designed for the rich tourist, but rather for young students and poor villagers -- so that they can learn more about nature from

their experience. Such proposals may be well intentioned, but planners must see the writing on the wall. Besides, why destroy the very thing that you want people to come and visit?

7. Pressure is being put on the Gujarat government to build a tarred road through the **Gir National Park**, the last home for the Asiatic lion, because transporters want to save driving distance for their trucks. The road will put years of conservation work at risk and endanger the future existence of the lions. The Managing Director of Ambuja Cements, a major beneficiary of such a road, has come out publicly

In the Andaman Islands some people want to cut the rain forests and thus destroy the protective coral formations, so that they can build a second 'Hong Kong'. Others want to cut natural forests and plant palm oil trees for factories to use.

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against the plan saying, "It would seriously damage Gir, and we will not be party to such proposals." Now if such persons can place their country before their own narrow interests, then pray why can't some bureaucrats in our government do the same? Or are we to understand that the road will *not* be built? The whole world is concerned with the fate of these lions and we wait for an answer.

8. Cement companies are fighting tooth and nail to be allowed to mine corals for limestone from the vicinity of the **Marine National Park** in the Gulf of Kutchh. This will damage the delicate eco-system and ruin the coastline. Other chemical plants discharge millions of tons of hot water into the sea, claiming they 'cannot' possibly cool it before discharge. The trouble is, increased temperatures cause fragile marine organisms to die.

On top of this, short-sighted leaders have encouraged their 'vote banks' to graze their camels and livestock in the mangroves of Kutchh and also to cut the hardy trees for fuel. What they do not realise is that mangroves actually help to desalinate water by absorbing the salt from the brackish water in which they thrive. Thus, the critical drinking water problems of the area have been aggravated.

9. Near the **Ranthambhor Tiger Reserve**, vested interests wanted to build a gas-based fertiliser plant which would have polluted the water of the Banas River which runs through this exquisite forest. The plan was stopped after a big fight, but the 'spoilers' have not yet given up and they are still doing the rounds of various ministries to get permission to build their factory. That their pollutants will also poison the drinking water of Sawai Madhopur town seems not to worry these people at all.

Additionally, our failure to provide fodder and fuel wood to the simple residents of the villages around Ranthambhor has led them to push their cattle inside the Park. This is eating at the innards of the forest.

Can someone in government, or private industry not see that investing Rs.50 crores in the social uplift of the people would be a far wiser investment than thousands of crores in a fertiliser plant designed to destroy the forest? Here too, activists are busy telling the local people who it is that is exploiting them and an interesting battle is shaping up for the coming polls.

10. In Karnataka in the Dharwad district, the government wants to plant eucalyptus trees on government lands instead of planting trees which will benefit common people. The eucalyptus will be consumed by *Karnataka Pulpwood Limited*. The people of the villages in and around Kusnur, the worst affected area, have protested peacefully, by uprooting eucalyptus saplings and replanting them with fruit and fodder-bearing trees. An organisation called the *Samaj Parivartana Samudaya* (SPS) has been formed and will link up with hundreds of other small pro-people groups fighting to save their environment from exploiters. But the government is threatening to arrest those planting the fruit trees because they are destroying 'government property' i.e. the eucalyptus trees!

If the advisers to the Janata government in power cannot foresee the backlash of such anti-people activities on account of the peoples' disillusionment and anger then they should get themselves checked for myopia!

*Write a post card,
or letter to the Prime
Minister, and to the
Chief Minister of your
state and tell them that
you are against destruc-
tive development and
that you will cast your
vote in favour of a candi-
date who reflects
your concern for the
environment.*

Notwithstanding all that has been stated above, if YOU feel concerned about the environment then you must make your concern known NOW. Write a post card, or letter to the Prime Minister, and to the Chief Minister of your state and tell them that you are against destructive development and that you will cast your vote in favour of a candidate who reflects your concern for the environment. Don't delay this small act. You could be setting into motion one of the most powerful new ideas to shake the political serenity of those who have taken you for granted for years. □



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TOO FAR?**

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KAMALA CHOWDHRY, ENCAPSULATES THE PROBLEMS THAT CONFRONT US ALL. OUR PLANNERS WOULD DO WELL TO READ WHAT SHE WRITES AND TO REMEMBER THAT NEHRU'S PRIME QUALITY WAS HIS ABILITY TO ANTICIPATE EVENTS. IF DEVELOPMENT IS DESCRIBED AS THE UTILISATION AND ENHANCEMENT OF A RESOURCE, THEN WE MIGHT RIGHTLY ASK OUR PLANNING COMMISSION "IN WHAT WAY HAVE YOU ENHANCED THE QUALITY OF INDIA'S PRIME RESOURCES -- AIR, WATER AND LAND?"

POVERTY, ENVIRONMENT AND DEVELOPMENT

by Kamla Chowdhry

Is India sliding downhill? Has Pandit Nehru's dream turned into a nightmare as Gandhiji had foreseen? Our government would have us believe not. But then, why are half our people in the grip of such total despair? The evidence of an ecological cataclysm is staring us in the face and the author suggests that the problem, and its solution, lie at our feet, in the plundered earth. Read what she has to say. As one who has seen the nature of the beast from inside the government (with the Wastelands Development Board) and outside, her views on **poverty and land use patterns** cannot be taken lightly.

Realities

India's poverty is closely linked with its increasing land degradation. Out of a total land mass of 329 m. ha., as much as 175 m. ha. are now considered degraded in one form or the other. What is even more alarming is the *rate* at which land degradation is taking place -- 1.5 m. ha. a year of forest loss according to satellite imagery. Further, due to faulty agriculture and irrigation practices, poor road building in fragile hills, bad mining practices, wind and water erosion leading to soil erosion, landslides and ravines, water-logging and salinisation, urbanisation and industrialisation, etc., possibly another 1.0 m. ha. per annum is going out of productive use. To add to this, marginal lands and slopes not suited for the purpose are being used for agriculture by the poor, leading to further land degradation. *Cultivable land per capita has thus declined from 0.48 ha. in 1951 to 0.26 ha. in 1981. By the year 2000, it will be around 0.14 ha. per capita.* The pressure on land is enormous, so is the hunger and crime for land. Illegal occupation of revenue and community lands as well as land-grab in urban areas have become a commonplace phenomenon.

Livestock

Alarming, livestock has increased from 292 million in 1951 to over 416 million in 1982. *Grazing lands on the other hand have decreased substantially.* For instance, in Rajasthan, grazing lands decreased by nearly 2 m. ha. between 1957 and

1977, and the cattle population increased by six million (40%). Predictably, grazing lands everywhere are over-used and therefore degraded. Acute shortages of fodder have led to a decline in the health of the livestock and a fall in milk production. *Yet the country has no grazing policy, no fodder development policy, and no policy relating to livestock numbers in relation to the bearing capacity of available grazing lands.* Even if one were to assume a minimum 1.0 ha. of land per animal for healthy development, the livestock population would need over 400 m. ha. -- clearly an impossible situation.

Deforestation

It has been stated in the forest policy that to maintain the ecological balance, one-third of the land area should be under tree cover, that is, about 100 m. ha. There are 75 m. ha. of land with the Forest Department out of which almost 40 m. ha. are now without adequate tree cover. If appropriate forest and land use policies, involving the people are not formulated, it is clear that the remaining 35 m. ha. of forest cover will be denuded and devastated. And with deforestation, especially in the water-shed areas, soil erosion has increased very considerably. According to the Department of Agriculture, the country loses 30 to 50 m. tonnes of food-grains on account of loss of topsoil. Dams get silted much sooner, resulting in the life of dams being reduced to approximately half of what was planned. Floods and drought too have increased in frequency, severity and extent, leading to enormous losses, human suffering and increased poverty and hunger.

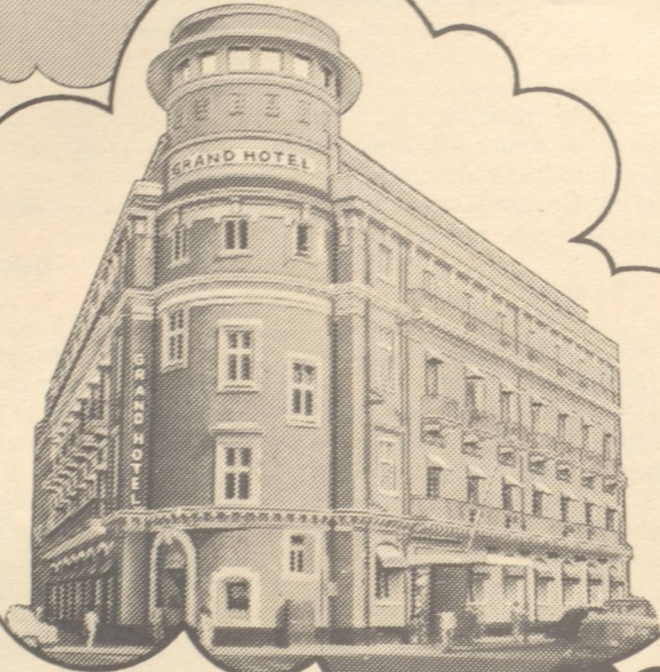
With deforestation also come acute shortages of fuelwood and fodder. Women walk miles to collect their daily burden for survival. There are also extreme shortages of bamboo, reed and other raw materials, once abundant and freely available from forests. This has led to the destruction of livelihood and the very basis of survival, culture and life for thousands of tribals and rural poor.

Social Forestry

The Social Forestry Programme was largely initi-

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ated in the Sixth Plan to increase fuelwood, fodder and other small timber needs for the rural poor. The programme was meant to be a people's movement, to empower the rural poor to avail of their minor, yet vital needs. Again, lack of appropriate policies regarding access of land to the poor for afforestation purposes and defunct Acts and laws which hinder rather than motivate people, resulted in vested interests controlling the Social Forestry Programme. Instead of fuelwood and fodder, the Social Forestry Programme has largely provided raw materials to the paper, pulp and building industry, by-passing the rural poor.

Drought

In India, about a third of the country's land area is classified as drought-prone. And in a bad drought year, as in 1987, over two-thirds of the country was badly affected. Desertification is largely man-made, primarily related to over-cultivation, over-grazing, deforestation, and bad irrigation. It spreads from a small nucleus until it eventually lays waste large areas. It feeds upon itself creating arid areas where previously rainfall was plentiful. If timely action is not taken, recovery and regeneration becomes difficult. Soil erosion also leads to desertification. For example, deforestation and the consequent soil erosion, in the Himalaya, Western Ghats, Shivaliks, etc., has resulted in these hills and mountains becoming desertified.

Of land records and track records

Land records in most states are in a dismal state -- the ground truth often being different from state data. In several states, considerable tribal community lands have become part of forest lands through a system of administrative notification which the tribals just cannot comprehend. Activists are now trying to resolve these issues on behalf of tribal and other village communities at the Supreme Court. Considerable upheaval and unrest have been generated on such land issues, leading to political movements. Appropriate institutional, administrative and legal changes are necessary to promote a holistic approach to land use policies and their implementation.

If poverty in the country is to be seriously tackled, then land use planning and policies, and issues such as deforestation and afforestation, degraded and wasted lands, soil erosion and desertification, saline and alkaline lands, promotion of productive use of common lands should receive the highest political attention. *In the 40 years of Independence, every*

Five Year Plan has focused on the elimination of poverty, and yet 40 years later, we find that about half of our population still lives below the poverty line -- a dismal track record indeed. The poor are caught in a vicious downward spiral -- poverty leading to impoverishment of resources and impoverished resources leading to increased poverty. The interests of the poor can only be safeguarded if development thinking takes into account the inter-relationship of poverty, land use policies and environmental concerns.

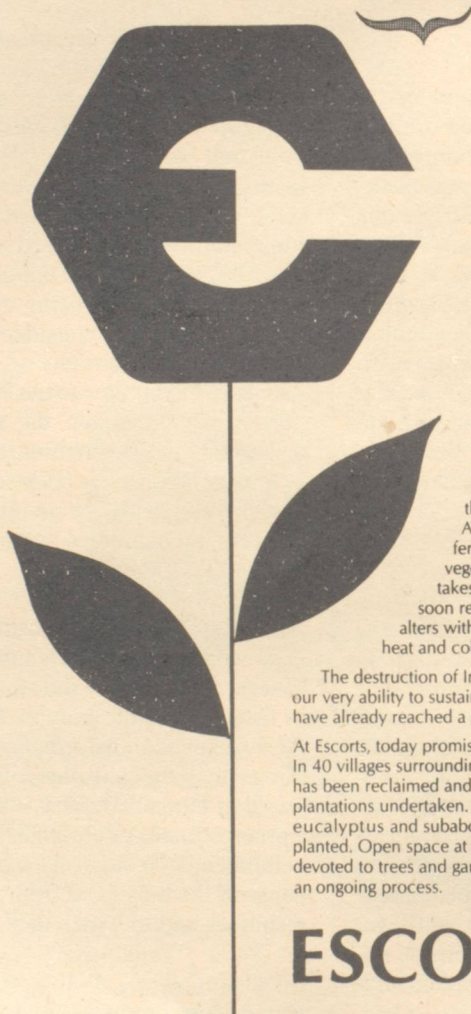
Development and Environment

Jawaharlal Nehru dreamt of a modern, industrial India bristling with steel and fertiliser plants, dams and hydel power, modern agriculture, and a large scientific set-up to deal with nuclear energy, space, industrial and agricultural research. Prestigious institutes of technology were set up to produce the scientists and technologists to build this modern India and this broad-based scientific and industrial infrastructure is looked upon with pride. But its contribution to the well-being of the people, especially the rural poor, is in considerable doubt today. Prof. C.N.R. Rao, Chairman of the powerful Science Advisory Committee to the Prime Minister, in his report, has pointed out the failure of science and technology in the economic and social development of the country. It has been suggested that the scientific institutions in the country have generally aped Western technologies, ignoring the needs of the people and Indian realities.

According to Edward Goldsmith, Editor of the *Ecologist*, economic growth is but another word for biospheric destruction -- the other side of the same coin, in fact. Economic growth, he points out, involves the systematic transformation of the world of living things and the biosphere into a totally different world of human artefacts -- the technosphere. Such a process is anti-evolutionary and technological developments, he suggests, can only grow at the expense of the biosphere from which they derive their resources and to which they consign their wastes.

Look around us. Pollution from industry has affected agricultural lands as also lakes, rivers and seas, affecting drinking water, killing fish, and destroying the livelihoods of millions. Open cast mining too, has degraded large areas of land since rehabilitation or restoration is rarely taken care of. Building of large dams for irrigation and hydel power has meant the submergence of prime forests and the displacement of millions of people from

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their habitat, largely resulting in their destitution.

Dams, displacement and destruction

The recent Narmada and Tehri dams have been justified in terms of development needs, of electricity generation and development of industries, of irrigation potential and agriculture, even though it is realised that thousands of ha. of forests would be submerged and thousands of tribals and others would be displaced with little hope of their rehabilitation. The rehabilitation policies of 'land for land' are difficult to implement because of large-scale illegal occupation and general non-availability of land. Further, most host communities are not only reluctant, but positively hostile to the idea of still more people sharing their scarce land and water resources. Further, compensation to landless tribals with community lands, and women-headed households are not taken care of because of existing legal and administrative constraints. The disruption of social and community life, the loss of cultural identity, the trauma of uprootedness and unwantedness is also ignored for the ephemeral benefits of 'development' and the 'larger good' of the people.

The evil of economic and political control by one country over another in the exploitation of its raw materials, cheap labour and markets has been labelled 'colonialism' and it finds very few apologists these days. However, as Gandhiji pointed out, "the colonial system is still practised in its essence by countries aspiring to effect a quick entry into the modern era... and nobody thinks anything of it. On the contrary, it is justified and even glorified in the name of 'progress', national prosperity and so on."

In terms of development and environmental issues, the march of regress as far as the poor are concerned seems unstoppable. In the case of the dam-building industry, as in other large-scale projects, Goldsmith suggests that the dam-building industry has acquired a vested interest. He suggests that "*dams in USA were being built largely because the State paid for them. Now the law has changed and requires local communities to contribute. So dam-building too has come to an end in the USA and the industry keeps going largely by persuading Third World countries to buy these highly destructive and totally uneconomic devices.*" Even otherwise, there seems to be enough global documentation available to indicate the damage that can be wrought by large dams. For instance, Prof. Ramalingaswamy who was earlier chief of the Indian Council of Medical Research noted that a crippling bone disease (knock knees) began to appear in the Nagarjunasagar Dam area.

Similar bone diseases have been reported in Ganganagar and other dam locations. Prof. Ramalingaswamy also warned that the incidence of malaria and other water-borne diseases would increase in the dam areas. In the Aswan dam in Egypt, it was found that there were a great many disease germs that had piled up there, apart from other ill effects. But we do not wish to learn from history.

Ivan Illich emphatically denies that development has eliminated poverty; on the contrary, all it has done is to modernise it. And the breakdown of social and natural systems, has increased crime, drug addiction, accidents and mental disease. In any case the basic question raised is, what *is* progress? Is the adivasi from Nagaland or Mizoram less 'progressive', less well-off than the slum-dweller of Calcutta? Is the woman, who used to spend only half an hour to collect fuelwood and fodder, and now spends six to eight hours, better off? The GNP as a measure of economic progress is a funny thing. "You can double a country's GNP," suggests Goldsmith, "by the simple expedient of getting every woman to cease looking after her own children for nothing and look after her neighbour's children instead -- for which she would needlessly to say, require a salary." Perhaps economics needs to be re-written to take into account social, environmental, cultural concerns and the differing assumptions of a different world view. The basic assumptions of 'Western' economics are not shared by older cultures such as the Buddhist, Hindu, Muslim and Tribal cultures. Schumacher too, towards the end of his life, became interested in Buddhist economics, stressing 'small is beautiful' and offering a different vision of a good life.

Modernisation, industrialisation, big dams, nuclear energy and other such large-scale projects can create the illusion of progress. The 'limits of growth' would depend on the limits of sustainable natural resources that can renew themselves. This would vary in different countries depending on population, land, water, oil and other natural resources. What is feasible in USA may not be feasible in India. Decades earlier, Gandhiji had asked, "Why must India become industrial in the Western sense? The Western civilisation is urban. Small countries like England and Italy may afford to urbanise their systems. A big country like America with a very sparse population cannot do otherwise. But one would think that a big country with a teeming population with an ancient rural tradition which has hitherto answered its purposes need not, must not, copy the Western model." On another occasion he observed, "My resistance to Western civilisation is really a resistance

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to its indiscriminate and thoughtless imitation, based on the assumption that Asiatics are fit only to copy everything that comes from the West."

The Gandhian Way

Gandhi was not dazzled by the technological achievements of industrialised societies. His world view was very different. "I am convinced," he said, "that if India is to attain true freedom, and through India, the world also, then sooner or later the fact must be realised that people will have to live in villages not towns, in huts not palaces." Observing the direction in which industrialised countries were moving he said, "I must not fear if the world is going in the wrong direction, and like the proverbial moth burn itself eventually in the flame around which it dances more and more fiercely. It is my bounden duty, to my last breath, to try and protect India, and through India the entire world from such a doom."

The India of Gandhi's dreams was a federation of small village republics providing the essential needs of the community without large-scale industrialisation. Such an ideology ensured sustainable development without over-exploitation of natural resources. Said Gandhiji, "The earth has enough for everyone's needs but not for everyone's greed."

Ecologists everywhere seem to be sharing Gandhiji's view that the world is moving in the wrong direction, that like a moth around the flame, it is destroying itself. They question the industrial way of life and say that if the biosphere is to survive, then industrialism in its present form must sooner or later end. They point to the fact that the life support systems of the planet are being rapidly exhausted to cater to the insatiable demands of a consumerist society. They point to the fact that the industrialised and, increasingly, the Third World countries are causing massive air and water pollution, threatening the livelihood of the poor and the survival of many plants, bird, fish and other species. Already acid rain has destroyed large areas of forests in industrialised countries and there is concern about the hole in the ozone layer protecting the earth, and concern about the 'green-house effect'.

Deforestation in India and in other Third World countries is going on at a horrifying rate. We know that deforestation gives rise to soil erosion, desertification, floods and droughts and impoverishes the people. There is sufficient awareness of the implications of industrial growth and the consequent ecological degradation. But the will to action seems frozen for it would mean a 'sacrifice', a giving up of

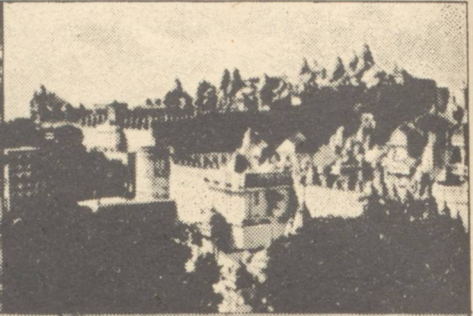
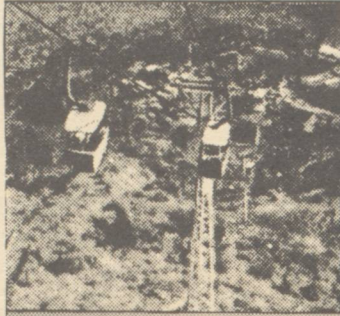
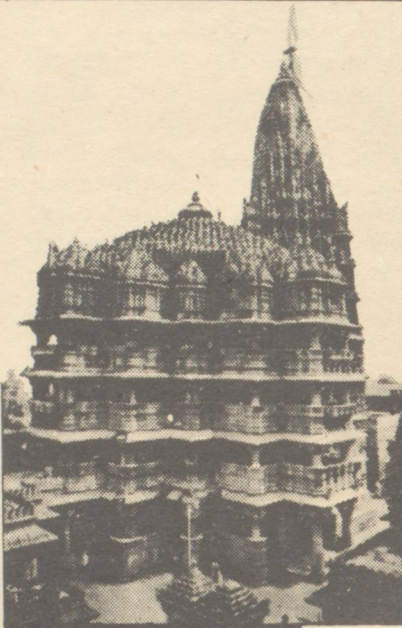
the existing way of life. Krishna Chaitanya, a philosopher, discussing modernity and survival with Goldsmith asks the question: "Yes, it is wrong, we have to go back, but can we do it? Many of the people in the well-paid death industry (plutonium, uranium) are sending their children to Ivy League Colleges, living in fine apartments and maintaining a high standard of living. Going back to peace (and sustainable environment) means not only surrendering those standards but may mean even privation, one meal every alternate day. Are we prepared for it?"

Gandhiji had believed that if India became heavily industrialised, beyond the sustaining capacity of its natural resources, it would inevitably be driven to exploitation and become a "curse for other nations, a menace to the world." The tendency to over-production is inherent in the industrial mass production system itself. "God forbid," exclaimed Gandhiji "that India should ever take to industrialism in the manner of the West. The economic imperialism of a single tiny island kingdom is today keeping the world in chains. If an entire nation of 300 million (now 800 million) took to similar economic exploitation it would strip the world bare like locusts."

Conclusion

There is a growing world-wide realisation that poverty, environment and development are inter-related; that economic and environmental concerns cannot be separated from ethical concerns; that poverty is a major cause, as well as effect of global environmental problems; that the international balance of payments situation actually *causes* environmental degradation. In one of the public hearings organised by the World Commission on Environment and Development, a speaker from the floor said: "We know that the world lives through an international financial crisis, which increases the misery and poverty in the Third World, and we sacrifice even more our environment though we know that this situation can be reversed if we can use new technology and knowledge. But for this we have to find a new ethic that will include the relationship between man and nature above all."

This need for a new ethic, or an age-old ethic, is what Gandhiji emphasised. If the world is to be saved from doom, then *development must be in harmony with nature not at odds with it*. It is futile to deal with economic or environmental issues without a broader perspective that encompasses the factors underlying world poverty and international inequality.



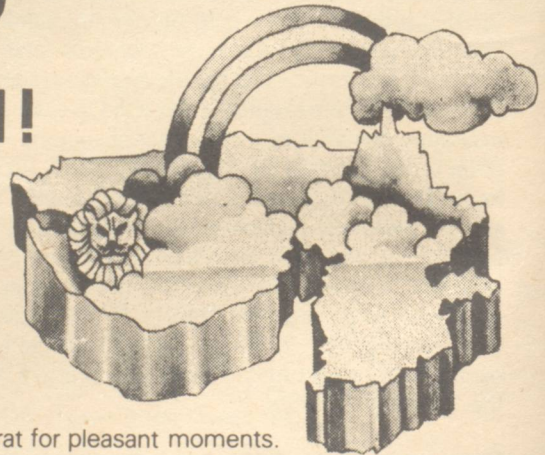
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WHOSE FORESTS ARE THEY ANYWAY?

A very significant incident in Himachal Pradesh seems to have gone unnoticed on account of the very hectic political activity and speculation that the country has witnessed in the last couple of months. This incident is the arrest, on September 12, 1988 of three *Chipko* activists (Kulbhushan Upmanyu, Dhalku Ram and Bhuru Ram), on charges of causing damage to public property. The public property in question? 7,000 eucalyptus saplings from Sehunta forest nursery in the Chamba district! What Upmanyu and 250 other villagers did was to uproot the eucalyptus saplings and then plant broad-leaved trees in their place.

These arrests marked a new stage in the struggle that the people of Bhatiyat tehsil have been engaged in since 1983, against widespread eucalyptus plantation being carried out by the State's Forest Department. The three *Chipko* activists continue to remain in judicial custody till the writing of this appeal.

Despite the Chief Conservator of Forests having come to an agreement with agitated villagers on an earlier occasion and the written assurance, in 1986, given by the Chief Minister to the *Chipko* leader Sunder Lal Bahuguna that 'the planting of commercial species is not being encouraged' in social forestry, the 'Van Mahotsava' at Sehunta (Chamba) in July 1987 was celebrated by the plantation of just such species. It would be pertinent to point out that even the Union Ministry of Agriculture, in its 'Guidelines for Preparation of Working plans and Felling in Forests (1983)', has called for a review of monoculture practices and recommended the plantation of indigenous species instead.

Opposition to the plantation of eucalyptus is not a phenomenon confined to the people of Bhatiyat. It has aroused similar, and even stronger, resentment among small and marginal farmers in the states of Karnataka, Rajasthan and Kerala. Quite significantly, this resentment has not been prompted by interested people with ulterior motives, but has come about as a result of the practical experience of the common farmer. It emerged out of the small farmer's realisation that such species of trees have added to his already difficult struggle for survival.

It is an accepted fact that the replacement of indigenous species by those of a commercial variety (chir, pine, eucalyptus, poplar, etc.) can (depending upon the area) cause a scarcity of fodder and drinking water on the one hand and encourage soil erosion and floods on the other.

It would, of course, be naive to believe that eucalyptus has been an undiluted evil for all. There is, obviously, a section of relatively bigger and richer agriculturists that has benefited from it. This section, is perhaps, better placed to create a powerful lobby in favour of such plantations, even though the larger and poorer section of society obtains little benefit from them.

If Kulbhushan Upmanyu and his associates had been the only persons in the country to uproot eucalyptus saplings, it might, indeed, have been possible to view it as an ordinary matter of 'damage to public property'. This, however, is not the case. The detention and prosecution of the three persons concerned is not the real issue at stake. What is of greater significance is the *reason* for which they must suffer detention.

The issue which must first be decided is: whose needs are more closely related to the proper management of forest wealth and whose lives are fundamentally affected by it? Those of the villagers whose entire livelihood depends upon a harmonious and symbiotic relationship with the forests? Or those of the politicians and bureaucrats residing in palatial bungalows at the state capital?

The three persons in custody are not projecting their own petty interests. They do, very obviously, represent a much larger cause. Is, for instance, the large-scale plantation of eucalyptus in the environmentally fragile area of Bhatiyat tehsil in any way beneficial to the large majority of small and marginal farmers of that tehsil? Local opinion is almost unitedly against such plantations. Does the government need popular participation in the formulation and implementation of its forest policy so as to make it effective? The state government repeatedly announces the fundamental relevance of people's participation in such spheres but promptly proceeds to take action *against* those who have the

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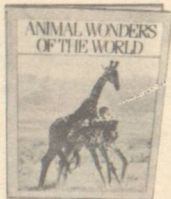
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Illustration:
Centre for Science and Environment

courage to oppose certain wrong-doing.

This is an appeal to all right thinking people to come out in support of Kulbhushan Upmanyu and the two others who are still in judicial custody in Chamba. Your appeal to the Himachal Pradesh Government at Shimla to settle this matter in an enlightened manner would contribute immensely towards supporting the hitherto lone struggle of the people of Bhatiyat. It would help them to preserve, protect and enrich their natural environment and livelihood alike.

At the time of going to press we received news that Kulbhushan Upmanyu and his two associates have been released, after being in judicial detention for over 50 days. The total 'damage' they were charged with having caused was Rs.50! The amount was so low because the agitators' objective was to make a symbolic protest only. The degree of opposition amongst locals can best be judged from the fact that one of the detainees, Dalku Ram, is 70 years old but willingly stayed in the Chamba Jail for the full 50 days. Bhuru Ram is an ex-serviceman who has a

small land holding in the area. He hardly expected to be so shabbily treated after a lifetime of service to his country. Despite the widespread anguish caused by this ham-handed treatment of a people's protest, the State Government appears unmoved. The case against the three still stands. The issue of eucalyptus plantations still remains unresolved. No one has broached a dialogue with the villagers of Bhatiyat tehsil. What they now wonder is whether they must spend another 50 days in jail before the government they elected deems it fit to talk to them. □

Letters of support may be sent to:
**The Chipko Information Centre,
Kamala, P.O. Sehunta,
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Letters of protest to:
**The Chief Minister,
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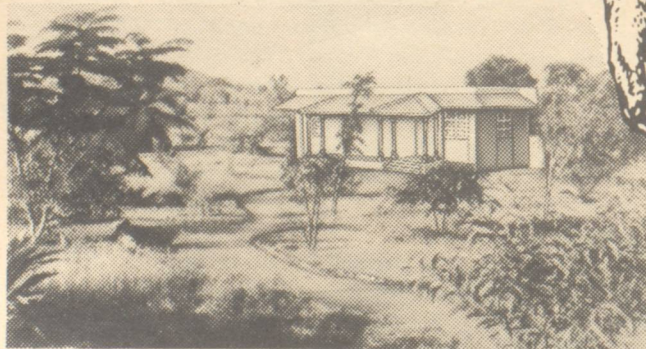
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AXES AT THE ROOT OF CONSERVATION: KERALA UNDER THREAT

Three important wildlife sanctuaries in Kerala are facing a serious threat of being ravaged by the very organisation which is supposed to protect them -- the Kerala State Forest Department. It is with great dismay that we are bringing these facts to the attention of wildlife lovers so that they can intervene to save our priceless wildernesses.

The Silent Valley National Park, Parambikulam Wildlife Sanctuary and the Eravikulam National Park are facing an imminent threat of being devastated by tourism. The unique eco-systems and environment are being so disturbed that there is a serious risk to the wildlife populations.

It is reliably understood that top officials of the Forest Department are planning to promote tourism on an alarming scale in these protected places, thus sacrificing all that has been done for their protection and conservation. The one to suffer most will probably be the Silent Valley National Park which was saved from the clutches of a hydro-electric project some years ago.

During Prime Minister Rajiv Gandhi's visit to Silent Valley in August 1986, he had given strict instructions not to tar the road from Mukkali to the park, or to 'beautify' any part of the park at the cost of the present environment. He had also issued strict instructions that no tree should be uprooted for beautification, etc. for his visit.

When the Prime Minister actually visited the national park, he found, at the portals, a marble plaque six feet high, signifying its inauguration as a national park. Needless to add, the plaque stuck out like a sore thumb and had to be demolished after a few days on instructions from the P. M.

Now, contrary to all the genuine concern of the P.M., the construction of a tar road is being proposed from Mukkali to the portals. This may lead to the uprooting of many trees. A posh rest-house is also under consideration, violating all the norms and guidelines for the control of wildlife tourism by the IBWL. May we request readers to write to the Kerala Forest Department opposing the destructive 'development' they are considering. Silent Valley needs peace and tranquillity, not man-made facelifts

designed to convert it into a picnic spot. The core area of the Parambikulam Wildlife Sanctuary is also under a similar threat. Though, wildlife management guidelines and norms demand absolutely no human interference in the core area, they are being blatantly violated.

A proposal to construct a road from Chalakudi to Parambikulam through Orukkombankutty and Kuriarkutty, is being implemented. We cannot let this road cut through the core area of the sanctuary.

The Eravikulam National Park in Munnar is the abode of the Nilgiri tahr which is highly endangered. This National Park boasts a very unique eco-system consisting of rolling grasslands and mountain slopes of immense scenic beauty -- a truly virgin sanctuary.

But, this National Park too, is to be ruined. Currently there is only a trekking path to enter the National Park from the Vaguvari Tea Estate.

It is learned that this path is to be widened for vehicular traffic and a rest-house is also under consideration in place of the existing small hut. There is another proposal to widen the path from the hut to Valparai. It takes little knowledge to see that these moves will seriously damage the core area of the National Park. Already there is a tourism zone existing, comprising Rajamalai and Anamudi. In spite of this, forest officials are making plans to extend tourism to the core area. It's inexplicable.

No one has any quarrel with *individuals* in the Forest Department, but even they must be held accountable, for the forest itself takes precedence over all else. In our opinion, if forest officials are made to see how upset the people of India would be if the forests in their charge were to be ill-treated thus, then they might alter their plans. This is the least we can do to ensure the long term survival of our wildernesses.

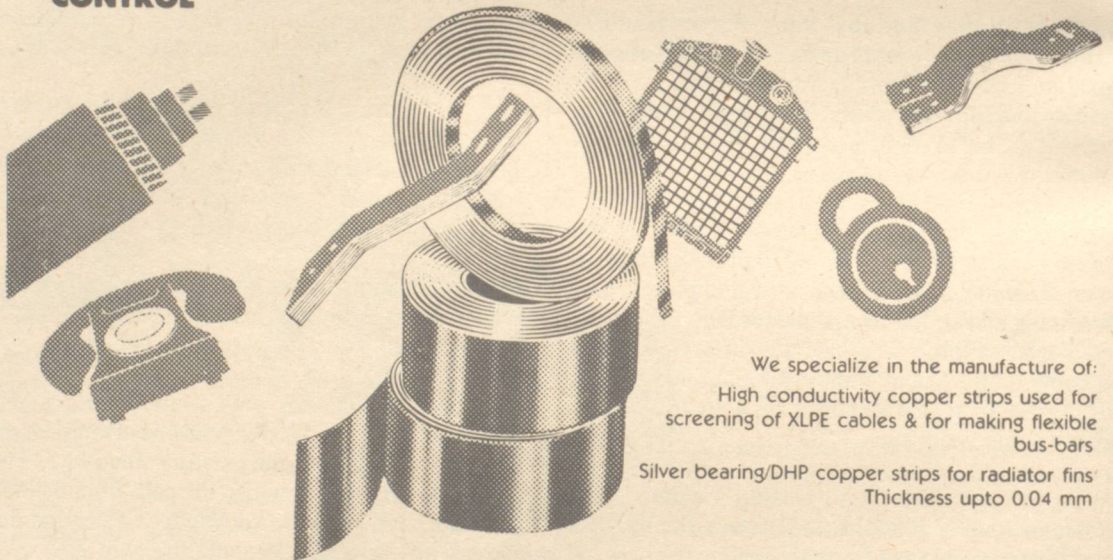
**GREEN EARTH MOVEMENT: THODUPUZHA
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Environmentalists and social activists are invited to send in reports, opinions and news which they would like to disseminate through Sanctuary. Such material may be edited for space considerations.

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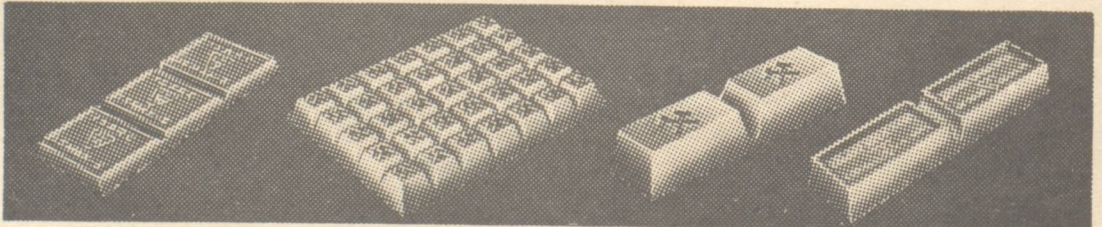
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NATURE WATCH

Comments on the Asiatic Lion Population of the Gir Forest

by Don Hunsaker

The current population of Asiatic Lions in the Gir National Park and Sanctuary is estimated by the park administration to be slightly less than 250 individuals. Although there has not been an extensive analysis of the ecology of the population in the past few years, one could assume that the population is at the carrying capacity of the habitat. During the past 20 years, the range of estimates has been from a high of 290 in 1955 to a low of 177 in 1968. The good rains of the 1988 monsoons produced excellent forage with good reproduction in both the prey species and lions. It is evident from the new growth that the acacia trees are recovering from the 1987 drought when only 199 mm of rain was recorded.

The carrying capacity is certainly enhanced by the presence of an estimated 17,000 head of livestock in the Sanctuary area. The cattle and Maldharis have been excluded from the 248 sq. km. National Park which has provided the lions with an effective refuge area. Since at least 30% of the lions have livestock (both buffalo and cattle) as their primary food source, the presence of the livestock has both positive and negative values. Most environmentalists would like to have a self-sustaining, naturally reproducing wildlife population with no human intervention. However, in this case, a sizeable percentage of an exceptionally rare species is supported by the presence of livestock. Any removal programme should be carefully considered and conducted over a period of time since a rapid removal of this much of the prey base could result in increased mortality. Although there might be sufficient prey available, if the lions were habitually feeding on cattle, it might be difficult for some to shift to wild species which are more difficult to find and kill. Any claims about the Gir population being "domesticated" are exaggerated. The observations of myself and my field assistants, Joe Saccoman and Zay Ebesen convinced us that some of them are as aggressive as the African lions we have seen.

With good habitat management practices, the Chital

and Sambar deer populations could well be increased to support the existing population levels. Research on the carrying capacity and population size will provide much needed data with which to make policy decisions.

Genetic studies have shown that there is serious inbreeding and little or no genetic variability in the population. Recently, geneticists (Steve O'Brien) sampled 46 allozyme loci and found them to be monomorphic at all of the 46 loci. Data such as this suggests a serious genetic bottle-neck that is certainly substantiated by historic evidence. The sample is only a very small per cent of the loci present, and may not be representative of the total variability. There is no doubt that lions are inbred, and have gone through a breeding bottle-neck, but they do not appear to me to be identical individuals. Since we observed individual phenotypic differences in the appearance and behaviour of the Gir Lions, it is my personal opinion that we should assume that there is some genetic variability in the population. The practice of the Gir Forest personnel to maintain separated populations appears to be sound management.

There is also a sperm abnormality problem estimated to be up to 47%. However, current observations indicate that reproduction is good. The cubs that survive are healthy, so increased mortality from inbreeding, depression or sperm abnormality does not appear to be a serious factor at the present time. The low birth rate to number of matings referred to in the literature might be a result of the sperm abnormalities but there are sufficient young born who survive to sustain and increase the population.

My main concern is that there are too few back-up populations that would afford protection of the species in the event of a disease or other natural disaster decimating the current Gir population. If possible, another wild population should be established. I fully realise the complications involved in establishing a new population. The prey base has to be re-



The key to saving the Asiatic lion lies in our attitude to habitat protection and on our ability to ensure that social and economic justice is dispensed when relocating the Maldharis.

habilitated or established, there are questions of liability and displacement of humans. However, from the standpoint of the endangered lions only, a second wild population would help ensure the survival.

The zoo at Junagadh and the Sanjay Gandhi National Park in Bombay should be supported and encouraged to breed more pure Asiatic Lions. At the present time, the Sanjay Gandhi park lions are said to be crossbred with individuals of the African subspecies but the Junagadh group has a good breeding record of pure Asiatics.

There should be more populations established in other zoos for other captive breeding programmes outside of India. This is a very sensitive subject with many zoos that thought they had pure Asiatic stock

and only recently found out that they were in fact bred with African lions sometime in the past and are not pure stock. The AAZPA species propagation group for the Asiatic lion, chaired by Randy Wolfe at the Knoxville, Kentucky (USA) zoo, is presently formulating a plan to manage the captive populations.

Based on my recent observations, and a review of the literature and the discussions with Shri. B. J. Pathak, the deputy forest conservation officer in charge of the forest, the present management programme is probably the best that could be implemented considering the complexity of the problem. With the programme in place, the Asiatic lion population appears to be stable and healthy.

Reader's Forum

I have read the articles on different sanctuaries and National Parks published in *Sanctuary* with interest and these have certainly added to my knowledge and understanding of the places I have visited, and those I might visit in future. Perhaps you are aware of a beautiful gaur sanctuary at Radhanagari, quite close to Miraj. I am very familiar with the area and plan to visit the forest again before the next monsoon. As *Sanctuary* has not covered Radhanagari thus far, I wonder if you would be interested in an article, supported by colour and B&W photographs?

Vijay Tuljapurkar
Miraj

We would indeed be interested in an article on Radhanagari, provided the work is original, thoroughly researched, well-written and supported by good visuals. It may interest readers to know that many of our articles are submitted by informed naturalists, not by professionals. We pay for all material accepted, but it would be best to submit a synopsis beforehand. We could send readers the necessary guidelines for submissions on request. Ed.

I am an engineer and a lecturer in a Diploma College in Bangalore. I only recently came across *Sanctuary* and would like very much to receive copies regularly and to join any team fighting to save our natural wealth. Our fellow citizens seem lethargic when it comes to understanding environmental issues and we should do whatever we can to propagate nature education in the country.

Suresh M.S.
Bangalore.

I was fascinated by *Project Tiger*, the serial, after which I came across *Sanctuary*, your wonderful magazine. *Sanctuary* helps young and old to become acquainted with the natural world in which we live. Mine is a medical background. I am studying dental surgery after having graduated in 1988. I would like to be involved in the battle to save nature. I am particularly interested in wildlife and would like to know if there is a particular society or organisation I can join which will help me to get *practically* involved.

Prashant
Jaipur

There is nothing as powerful, they say, as an idea whose time has come. India's emerging awareness for the need to conserve nature is exemplified by the keen interest that people from different walks of life have begun to show in the subject. If readers send us a stamped, self-addressed envelope, we would send them the names of organisations they could join. This, in fact, is the heart of Sanctuary's appeal -- "Don't get angry -- get involved!" Ed.

In October 1988, together with three members of the Indian Society for Wildlife Research, Calcutta, I visited the Achanakmar Sanctuary in the Bilaspur District of M.P. Its natural beauty is indescribable. One factor that we noticed here, however, was that water was in extremely short supply, even soon after the monsoon. We understand that five gaur died of thirst here in 1987. As of now, the Sanctuary is extremely disturbed, with a metalled road cutting through it connecting Bilaspur with Allahabad and Jabalpur. Animals are constantly being run over and we saw the mangled carcass of a langur ourselves. The 551 sq. km. area harbours around 36 tigers and we appeal to the Centre, through the good offices of Dr. M.K. Ranjitsinh, Jt. Sec. (WL), Ministry of Env., to declare this and the adjoining forests a Tiger Reserve of around 1,000 sq. km. area. This would give wildlife the much needed protection and also allow the government to build a new road around the Reserve so as to return peace to the animals.

Arijit Sengupta,
Calcutta.

I was recently in Goa, walking along the beautiful Vaddi Beach near Benaulim, when a motorcycle roared by along the sands -- one of many intruders. The beauty of such beaches is far better observed by the quieter, less destructive, pastime of walking or pedal-cycling, both of which provide great pleasure and do no harm. I understand there are plans afoot for developing this quiet, restful beach by cutting down many of the fringing coconut palms to build five-star hotels. Such disastrous alterations to the environment will doubtless benefit developers, but the countless sand-dwelling organisms, which keep the beaches clean and pure, will die in the cross-fire between motorcycle wheels and hotels. Birds which depend on the crustaceans for survival will desert

the beaches, as will the local fisherfolk after they are deprived of their homes and living. Which have the greater claim?

Elizabeth Forester
Norfolk, U.K.

The Kaziranga National Park was ravaged by floods this year. Twenty-three rhinos, two elephants, three buffaloes, over 700 deer and many other animals were swept away. These numbers are based on carcasses discovered. The actual death count would be much higher. Manas was better off, because its catchment forests are better protected.

We would like to kick off a major campaign against tree felling in Assam, which is the sole cause of such severe floods and we would welcome the involvement of *Sanctuary* readers. For the moment, such involvement could take the form of letters of protest against forest destruction, written to *The Sentinel*, G.S.Road, Dispur P.O., Guwahati 781005; and to the Chief Minister of Assam.

Siddhartha Sharma,
Guwahati.

Four persons of Daldali village in the Durg district have been arrested by the Forest Department for killing four leopards whose skeletons were recovered from a *nullah*. The cats were said to have caused major havoc by killing livestock in the area and they were therefore poisoned.

Irrespective of the outcome of this prosecution, we must recognise the wisdom of managing wild habitats with a view to reduce man/animal conflict, or else our nature protection efforts will come to nought.

Rajive Saxena,
Gwalior.

Just outside the limits of the Wandoor Marine National Park in the Andamans, we have discovered an astounding number of *Acanthaster planci*, commonly called the crown-of-thorns starfish. In the 1960s there was considerable damage to the Great Barrier Reef by these marine organisms, which are capable of killing off 95% of the hard corals of an area. Some suggest that such infestations are the

result of human-caused changes to the environment, while others suggest that they are purely natural phenomena. Whatever the cause, we do know that reefs can take from 20 to 40 years to recover from such attacks and that the Andamans are under a very real threat today.

The Andamans chapter of *Intach* is doing its best to monitor the situation, a difficult proposition at best as the starfish are nocturnal, necessitating improvised night lights on boat trips in the dark. What is tragic is that instead of helping fragile eco-systems to cope, by not adding pressures, we seem bent on 'developing' the Andamans -- the equivalent of placing the last straw on the camel's back.

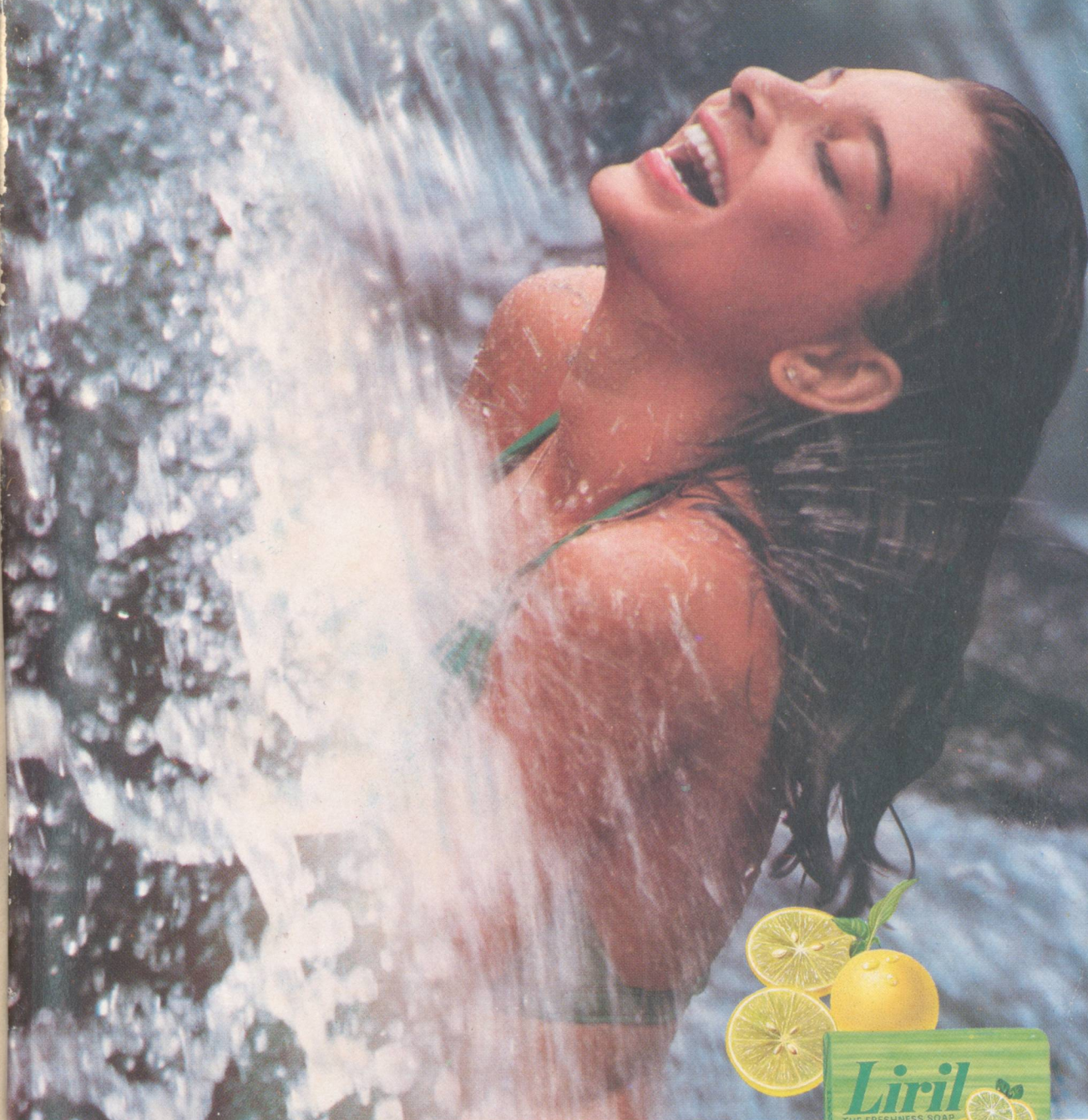
Samir Acharya,
Intach, Port Blair.

A tiger was killed in Lucknow when it inadvertently stepped into human habitat from adjoining forests. The death was doubly tragic, because it could easily have been avoided. When I made enquiries I was told that there was a delay in sending the cage, which could have saved its life, because no one knew who would pay the Rs.1,000/- needed to hire the small truck to transport it! It would appear that our Wildlife Wardens are not environmentalists, but bureaucrats. Anywhere else in the world a major mission would have been launched to save the animal in whose name so much fanfare is raised.

Lt. Col. R.K. Mazumdar,
Lucknow.

Let me make it very clear that I have never taken opposition to the Narmada Project as "anti-Gujarat." Contrary to it, I take every care that such feelings are not aggravated. Accidentally, most of the people opposing the project are non-Gujaratis. Gujarat has always welcomed non-Gujaratis in the most patriotic manner. Their feelings are injured when something untoward happens in regard to the most dear and most important development for Gujarat, because of the attitude of non-Gujaratis. I can assure you, such a thing can never happen on my behalf.

Sanat Mehta,
Chairman,
Sardar Sarovar Nigam Ltd.,
Gandhinagar.



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DUDHWA

a forest held to ransom

by Ravi Sankaran

The issue of people and forests has been ignored for long enough by planners. Almost all the original thinking on the issue is currently being done by activists and environmentalists (not necessarily together), both of whom are 'outside' the corridors of power. The few persons in government who are contributing their strength to this effort are a threatened lot at best. They are consistently being victimised, transferred and otherwise humiliated by politicians and their lackeys. Yet people harbour the mistaken notion that 'the public knows more about the value of forests today than ever before'. Nothing could be further from the truth. The cost of forests, or even the cost of forest loss may well be known, but the awareness of the value of forests seems as distant a dream as it was a decade ago.

How many people accept, for instance, that water is going to be the key to the development destiny of India in the coming decade? Or that forests and wild ecosystems are our only effective long term means to harvest rain, or snow melt. It would be safe to say that the stalwarts manning our Agriculture Ministry are equally unaware of the fact that forests, grasslands and wetlands are critical to the fertility of the soils of India. As for the office of the Prime Minister, one wonders if his advisers have bothered to explain to their leader, whose mind runs unerringly towards financial solutions for social problems, that the key to the dignity and health of the Indian people lies in the protection of forests and common lands from the tentacles of big business and their political patrons. Our forests and commons, which are routinely being squandered to satisfy flippant short-term objectives, supply the fuel and fodder requirements of over 60% of the population of India. Yet we have no fuel wood policy in India. No national fodder policy. Worse, our energy focus continues to be rooted in oil, coal and nuclear ambitions.

This is the canvass in which field biologists like Ravi Sankaran, an expert on grasslands, must agonisingly urge their countrymen to 'Save Dudhwa'. For a while it seemed that Maneka Gandhi might actually be able to perform a miracle and that the forests and forest dwellers of India might still win their unequal battle. But the Ministry of Environment has now effectively been turned into a rubber stamp for the Industry and Tourism Ministries, by our Prime Minister. Under the circumstances our only hope is in the newly emerging partnership between true conservationists, their counterparts in government, and the social activists in whom the people, who stand to benefit most from the survival of forests, repose their trust.

The Dudhwa National Park was declared on February 1, 1977. It encompasses (614 sq km core and 124 sq km buffer) the only well protected representative of the once-extensive *terai* habitat in the country. At the end of 1988, Dudhwa, along with the Kishanpur Wildlife Sanctuary (158 sq km core and 43 sq km buffer), was brought under the aegis of Project Tiger. The project area now covers 815 sq km.

The Dudhwa Tiger Reserve has some of the rarest species of animals and birds found in India. The only known population of the Bengal florican in Uttar Pradesh is found here and, in fact, comprises about 10% of the world population of this highly endangered bird. This Park also has the largest number of

the threatened swamp deer found in India. It is also the site of the prestigious Rhino Rehabilitation Project wherein seven rhinos obtained from Assam and Nepal were released here. Dudhwa also boasts of a healthy tiger population and several other diverse life forms.

Considerably more important than its wildlife is the fact that it is certainly the last well protected *terai* habitat in India, which is playing a crucial role in maintaining the ecological balance and fertility of the grassland belt. Ironically, its value is greatly enhanced because of the denudation of *terai* forests elsewhere in India and Nepal, such deforestation greatly aggravating the frequency, severity and duration of floods and water logging during the monsoon. The neglect of this critical ecological zone will

almost certainly lead to a decline in the fertility of farm lands at the base of the great Himalaya and beyond.

Due to the high quality timber that this region offers these forests were extensively logged in the past. The forest and its surroundings were very thinly populated (primarily by Tharu tribals) and the forest department had a system called *nikasi* by which the forest and peripheral villages were given certain concessions, in return for free labour for departmental activities like fire fighting, construction of roads etc.. This system continued until 1986 when it was stopped. The system of *Nikasi* was restricted to 37 forest villages (mostly Tharus) and 21 concessionist

villages which fell within a radius of 5 km of the park. Concessions included windfall timber for fuel, thatch grass, grazing and fishing rights. Apart from this, each family in the concessionist villages was permitted to cut one sal and one Khair tree of unspecified girth annually. This apparently was an ecologically sustainable practice when the forests were very much more extensive and the human population substantially lower. However, after the partition of India and the opening and reclamation of the *terai*, the population has burgeoned. Patian, for instance, just had a population of about 500 people over 40 years ago but now has over 15,000. The number of villages and the smaller hamlets affiliated to the villages

has also seen similar dramatic increases. Today in the belt once occupied by the 58 concessionist villages the number has increased to over 85, plus the smaller hamlets associated to each village.

Under the Wildlife Protection Act 1972 no extraction of forest produce is permissible in a National Park. However, due to certain political imperatives, when declaring the Park the existing concession system was continued. In the early 1980's an attempt was made to modify this system by permitting for a brief period annually the removal of windfall timber and thatch grass for all comers, irrespective of their village of origin, for a fee of Rs. 25 per bullock cart. As this was in direct contravention of the Wildlife Protection Act (1972) the government could not

endorse this. However due to certain vested interests in the Forest Department, people began paying a fee of Rs. 100 as against Rs. 25 (the official rate) to the *gram panchayat*, in exchange for which they had their names enrolled in the concessionist list. The difference apparently was shared between the *gram panchayat* and certain corrupt elements of the forest staff. This meant the entry and plunder of the forests by several hundred carts every day for a period of about three to four weeks annually. Man-tiger encounters consequently increased dramatically and Dudhwa became known as a haven for man-eaters, many of which had to be shot.

In 1986 when Mr. G.C. Mishra took over as director of Dudhwa National Park his attempts at stopping *Nikasi* were strenuously resisted by the local politicians and strong complaints were made against him. In a visit to Pallia the then Chief Minister is alleged to have given verbal orders to continue concessions. In a writ petition (No. 286 of 1986) Mr Arjan Singh (a renowned conservationist who was instrumental in the creation of Dudhwa National Park) obtained a stay from the High court at Lucknow. *Nikasi* was then legally put to a stop. Tharus however continue to enjoy certain limited concessions but only in the buffer zone. As was to be expected, political bigwigs ensured that Mr. G C Mishra was transferred in 1987. Simultaneously, Billy Arjan Singh, a man respected around

the world for his commitment to conservation and to tigers in particular, began to be shamelessly harassed and victimised by the government.

With a substantial increase in timber prices, massive profits were waiting to be reaped by wood poachers and smugglers whose nefarious activities still continue. Nepal permitted timber felling and Indians imported and stole Nepali timber. To this was added timber that had been illicitly felled from both Dudhwa National Park and North Kheri forest division. These traffickers have strong political connections and include Avadh Bihari (Block Pramukh), Sita Ram Agarwal from Bellraein village and T.N. Bhalla plus other political figures. The area of their operation is primarily West, Bahraich forest division, North Kheri

"The key to the dignity and health of the Indian people lies in the protection of forests and common lands, from the tentacles of big business and their political patrons."

forest Division and the Dudhwa Tiger Reserve. Timber smuggling is also carried out in connivance with the railways. On November 24, 1989, election day, for instance, when most government officials were on duty, felled teak and khair were seized at Dudhwa Railway station, the consignment was headed for Delhi.

Until our people see the connection between the loss of forests and their own falling standards of living, we will continue to face the predicament of dwindling forests, fuelled by the apathy of those in authority. At the moment, however, the worst trial for the Park authorities is the renewed demand to expose the Tiger Reserve to the practice of Nikasi. The drive is being spear-headed by an MLA called Nirvendra Kumar Munna, an independent candidate from the Nighasan constituency who was apparently voted into power on the explicit promise of re-opening the Park for Nikasi. He publicly announced that Nikasi would be restarted and that the grasslands which fell within the National Park would be distributed among agriculturists. This was publicized with the aid of posters and Mr Munna went so far as to claim that he had Maneka Gandhi's approval and that the distribution of forest land would be done by the Minister for Forests U.P. The Minister, of course, had nothing to do with this and predictably refused to co-operate in any respect.

The next phase was when Mr. Munna having so far been unable to succeed in his populist demands went on hunger strike from January 26, 1990. A relay fast involving about 500 villagers was also on. Ironically a majority of the labourers had come from as far as Eastern U.P. and Punjab, for the jobs provided in the sugar cane harvest, and would never have stood to get an ounce of benefit from the defunct Nikasi system.

Realizing that legally Nikasi could not be revoked, Mr Munna has now asked for 'verbal' assurance to permit Nikasi, thus circumventing the law. This will be in direct contravention to the existing court or-

ders. The forest Department has already provided free supply of thatching grass from the Reserve forest of North Kheri. The Department is also offering supply of firewood at various depots at no profit no loss with the collection being undertaken from reserve forests by the Department.

However the MLA does not agree with this arrangement and insists that the people be allowed into the National Park. Mr Munna is not altruistic in his endeavors. At the end of January 1990, his brother (joint family) was apprehended with 8 bullock carts of timber illicitly felled. A crowd of nearly 200 people tried to prevent the confiscation but failed. Subsequently the MLA had given in writing to the concerned forest official to defer taking action until he clarified the matter. The laws of the land are thus being flouted in letter and spirit.

The issue has become more serious now as arms have been collected to intimidate the forest department, while tensions runs higher and higher. On the MLA's instigation people are gathering at Bellraein and illicit entries into the forest are being made. The current incumbent director Mr. R.P. Singh has his work cut out for him in trying to control the situation, which threatens to get out of hand. There is as yet no real support from

the Government to the Forest Department in their endeavors to protect the National Park. As Mr Arjan Singh so aptly put it, "if Nikasi were to continue the entire forests of Dudhwa Tiger Reserve will by cut and sold on the local market in a few years."

Many will debate the issue of people and forests, splitting hair after hair to make their point, even as the forests they discuss vanish into thin air. I wonder whether social activists even realise how MLAs are using them by making the issue out to be a people vs forest affair, when in fact the issue at stake is hard cash on the timber market. Clearly something needs to be done urgently to solve the stalemate, but I would urge those in power to consider one last point. Since the practice of Nikasi has been stopped tiger attacks on humans have virtually ceased!



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