

JOURNAL OF ECOLOGICAL SOCIETY

Vol. 3, 1990

Editor
Prakash Gole



**JOURNAL
OF
ECOLOGICAL SOCIETY**

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ECOLOGICAL SOCIETY
PUNE, INDIA

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Published by

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Ecological Society

1 B Abhimanshree Society

off Pashan Road

Pune 411 008, India

Telephone : 336408

Printed at

Aksharchhaya

2035 Sadashiv Peth

Tilak Road, Pune 411 030

Cover :

The famous Mangan Sacred

Grove in the catchment

area of Panshet Dam.

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Editor
Journal of Ecological Society

FOREWORD

Taking stock of the activities of our Society and of similarly motivated bodies and persons, I often am driven to wonder whether we are fighting a rear guard action or doing something worthwhile, howsoever great the disincentives. Development must necessarily involve exploitation, not of man by man (days for this are hopefully over), but of nature by man. In this latter process, there is always a threshold which when once crossed, there is no return to the good old conditions. While it is useful to know where and how a crane or tortoise live, it is more necessary to know who lives with it. This latter need not be a living organism: it is generally a scape or eco-system in which quite a few factors operate. The greatest care has therefore, to be taken in determining to what extent human activities disturb or are likely to disturb environment.

Let us hope that the work of our team and their allies will continue undaunted whatever the challenges of development.

L. G. Rajwade
Chairman, Ecological Society

Dodda Gubbi : The Case of an Overused Lake

Zafar Futehally

Ever since we settled down in Dodda Gubbi in July 1975, I decided to play my part in the rehabilitation of Dodda Gubbi tank. It was obvious that if this reservoir was kept in good health, it would reflect in the well-being of the rural population who were mainly agriculturists. There was also a modest population of sheep and cattle and the foreshore of the Lake was an important grazing area.

The Working Group

As a member of the Karnataka State Council for Science and Technology, I undertook to draw up a project for the improvement of the tank and its immediate surroundings. If I remember right, the KSCST sanctioned Rs. 2000/- to cover incidental expenses involved in the collection of data. In its Report, the Working Group said that Dodda Gubbi lake was an example of ecological damage wrought by improper use of wetlands. The deepest part of the lake which according to village records was 31 feet around 1887 had decreased to 12 feet. The catchment was sparsely wooded, and most of it was under cultivation with extensive tapping of the tank water through a series of wells around its periphery. In addition to the major crop of paddy, ragi, maize, jola, pulses, oilseeds and mulberry were cultivated. Agricultural operations in general, and paddy cultivation in particular, had resulted in a great deal of soil erosion as well as pollution through pesticides and insecticides. There was extensive grazing in the littoral area, so that the natural vegetation which

helps the soil was being altered to annual species of grass which are not effective as soil binders. Very little tree cover was left in the catchment area.

Based on the above findings the Working Group made the following recommendations:

- a) the original areas of the catchment to be restored by strictly prohibiting agricultural operations in the vicinity of the lake;
- b) the crop pattern followed in the vicinity to be changed; no crop which required full irrigation to be allowed. Paddy not to be grown here as it required a great deal of water; (Irrigation of the type provided by Dodda Gubbi tank should be used for other crops so that the total output of feed would be greater);
- c) the littoral area of the tank to be planted with perennial vegetation in order to prevent siltation;
- d) embankments of the tank to be strengthened so that the holding capacity would be increased.
- e) desilting of the tank to be undertaken. (If transportation of the fertile soil was too expensive, this valuable material to be disposed off usefully in neighbouring agricultural lands).
- f) grazing in the catchment to be limited and adequate grazing fees imposed;
- g) irrational use of water from the tank to be restricted so that the water level would not fall abruptly;
- h) awareness in the village folk regarding harmful ecological impact of bad land use practices to be created. (It is essential that they be persuaded to cooperate);
- i) such wetlands to be placed squarely in the charge of a particular officer in the department (Minor Irrigation and Public Health) who should establish a procedure for monitoring the results of the steps taken.

The Official Reaction

My first step, after the publication of this report in March 1979, was to identify an officer within the Secretariat who was even nominally in charge of the tank. After much wandering in the corridors of the Vidhan Saudha, I located an officer in the Minor Irrigation Department who was apparently the official I was seeking. He came over to inspect the tank, obviously his first visit, and it was evident that there was considerable encroachment by agriculturists on the foreshore. Out of the 145 acres of water-spread at full tank level, almost 20 acres were under encroachment. After several meetings with the officials during which the ecologi-

cal problems were identified, I was told that rehabilitating the tank was not merely an ecological but a socio-economic problem. In fact M. J. C. Lynn the then Private Secretary to Chief Minister Devraj Urs, suggested that it was for NGO's like WWF-I to motivate the villagers to do what was necessary as Government was helpless in the matter. It seemed to me to be rather odd, that the Government with all the powers it possessed, should be so unwilling to use the legislative and moral clout it has to ensure sensible land use practices in its domains.

So nothing much happened over the years, except that the lake continued to be silted, which naturally reduced its water holding capacity, and the adjacent water table of the village descended rapidly. In our own case while there was a good 20 feet of water in our well in 1975, by 1979 the well was absolutely dry and we had to subsist on borewells, as was the case with all our neighbours. The Department of Mines and Geology which should be keeping a close watch on the water table was not really playing its part, and several bore-wells went dry within a year or two of their construction.

Degradation Continues

Another factor causing degradation to the Dodda Gubbi tank (as was the case with most other tanks) was the operation by brick-makers on the edge of the tank bed. The removal of the soil for brick-making resulted in large pits being created on the foreshore and this together with the fact that the earth was loosened and the grass cover removed accelerated erosion and siltation.

Apart from this damage, for firing the bricks, many trees in the neighbourhood were hacked down to feed the kilns. Altogether the traditional manner of brick-making seemed very unsuitable for present day conditions. In the old days, presumably because labour was more readily and more cheaply available the soil for the bricks was removed from the middle of the tank, and this served the purpose of desilting as well. Now, alternate and ecologically more satisfactory means of brick making are available and these need to be widely publicised.

But the Forest Department did play its part in re-afforesting a section of the catchment. This was largely due to the efforts of the Chief Conservator of Forests, Mr. S. Shyamsunder and the Conservator, Mr. S. G. Neginhal. A wide belt of acacia was planted on the northern face of the lake. The proposal to have a belt of greenery all around the tank was arrested by brick-makers and encroaching agriculturists and their "socio-economic" strength defeated ecological imperatives. If the Forest

Department could create a fairly wide belt of say 30 metres all around the lake, it would minimise siltation very greatly. There will be no further erosion from this end, i.e. the northern face, and for me it was particularly cheering to find that munias started to build their nests in those trees. Incidentally, Dodda-Gubbi means "Big Bird", and the tank was obviously so named because of the large birds—Storks and Herons—which came here in the right season.

Reservoirs in Karnataka are an essential factor for conserving water because the rainfall is so varied, and the good rainfall of one year must be conserved for a possible drought in the next. Look at these figures:

1978	712.26 mm	28"
1979	1055.7 mm	41.5"
1980	582.0 mm	22.9"
1981	675.6 mm	26.5"
1982	815.4 mm	32"
1983	665.3 mm	26.1"
1984	986.2 mm	38.8"
1985	533.8 mm	21"
1986	1051.0 mm	41"
1987	798.0 mm	31.4"

The maps of the Survey of India of two decades ago indicated Dodda-Gubbi as a perennial tank (marked blue on the map). But the colour changed a decade later when it was shown as a seasonal tank. Whenever the status of a tank changes for the worse it is for Government to take corrective measure, but this is not done in time and then the situation goes out of hand.

Correcting the Over-use

The need for a single individual officer (and one in an appropriately senior position) to monitor and take remedial measures for restoring our water bodies is most urgent. During a seminar organised at the I.I.M, Bangalore, Shri P. R. Nayak, the then Chief Secretary, suggested to Shri Prahlad Rao, the then Additional Secretary, Environment & Ecology, to take charge of the Dodda-Gubbi tank and implement the measures which had been discussed in several meetings for the past several years. But events proved that Shri Prahlad Rao, who was merely an Advisor to the different departments of Government without any executive authority of his own, could achieve nothing at all. The problem of having a Department of Environment with Executive Authority within special

areas cannot be side-tracked if we are serious about environmental protection.

To revert to Dodda-Gubbi: the present position is that the Development Commissioner, has, by personal visits to the area, and by time-bound action plans, attempted to restore Dodda-Gubbi as a working eco-system. Clearing of the channels which feed the lake, soil conservation measures in the catchment, discouraging brick-making activities on the foreshore; stall-feeding animals, use of bio-gas; planting of native species of fuel and fodder trees rather than Eucalyptus, are some of the activities which are in progress. I can only hope that the effort will succeed and lead to similar action in other areas.

Apart from its natural advantages, Dodda-Gubbi tank is a valuable bird sanctuary. In my mind's eye I recall many sights which are a permanent source of pleasure; blackwinged stilts, greenshanks, common and spotted sandpipers, grey herons, harriers in winter, several species of duck, an occasional group of storks; egrets, pond herons, lapwings, wagtails, larks, swallows and many more arrived here at appropriate seasons. These avians, specially their variety, can be an indication of the health of the tank and its aquatic life, and so the presence or absence of birds should be closely observed.

Zafar Futehally
Moi-tska, Bear Shola,
Kodajikanal

The Greening of Our Hills

Prakash Gole

I still remember the day when we arrived on the site with picks and shovels: I with my family and friends. It was 5th June, World Environment Day, in 1986 and we had come with a determination to start work on greening of a small patch of our hills of the Western Ghat. Earlier we had hired some local labour to dig pits on the hill slope. We had now brought some saplings with us from the city. The setting was perfect: the sky was overcast, and a light shower had spread the enchanting fragrance of moist earth in the atmosphere. Mother earth was ready and all smiling, beckoned us to start planting.

With elation and gusto we readied the first pit, lowered the delicate Albizzia sapling into it and covered it with wet, warm soil. The engineer in charge of the dam planted the first sapling. For our site lay not far from a famous dam.

The Barren Hills

I was not unfamiliar with the site. For two earlier years I had trekked the hills of the catchment area of the dam, collecting soil samples from the slopes, making an inventory of the plants and observing birds and animals. I had seen people preparing those rugged hills for planting by burning grass and vegetation that still remained. The annual burn produced ash to fertilize the soil but it also destroyed the delicate plant life. The practice had continued through many past generations and with their vegetation burnt and destroyed, most of the hills presented a

very barren aspect. The rainfall was high in the catchment, one of the chief reasons for placing the dam across the hills. But the heavy precipitation coming down on exposed slopes had opened deep gushes on steep slopes, eroding the precious top soil and bringing down silt in the reservoir.

The intensity of the burn varied. No vegetation could regenerate on the patch which was burnt every year, for the past so many years. This was true in the immediate vicinity of the dam. People could not afford to keep the land fallow as level pieces of land were scarce and holdings were small. But erosion was heavy on slopes which were cultivated. At many places rock was exposed. When the dam was built large quantities of earth were scoured from the hills. These operations had left monstrous scars on the otherwise smooth-faced hills, wide swathes and gullies which helped sweep down more soil in the bowels of the reservoir. Our site lay just below such a gaping wound in the south-facing slope of a hill.

The Sacred Groves

In the interior of the catchment holdings were large and people could afford to keep a patch 'fallow' for 5 to 10 years after it was burnt and used for cultivation. In the fallow years grass and other plants regenerated and now the hills presented a savannah-like landscape: grass and shrubs, interspersed with trees. But there were also some patches of forest that people have not cut down and burnt. These were the "Sacred Groves", forests dedicated to mountain deities and hence not to be touched. For many years the trees stood and prospered, then matured, decayed and died. New ones took their place. It remained more or less a stable eco-system, displaying climax forest communities and holding a sample of forest that would clothe these hills if biotic factors are excluded.

The trees that are found in the "Groves" are typical trees of the moist deciduous forest: *Caryota urens*, *Terminalia bellerica*, *T. chebula*, *Bridelia retusa*, *Randia dumetorum*, *Erythrina variegata*, *Bombax ceiba*, *Syzygium cumini*, and *Mangifera indica*. Thick lianas hung over and wound around these trees and in their shady recesses lived pairs of Brown Wood Owl (*Strix leptogrammica*) and in the crown of a gigantic *T. bellerica* a pair of Crested Serpent Eagle (*Spilornis cheela*) had their nest.

In another grove a spring emerged from a slit in the mountain and its cool water ran down to a depression where a crystal clear pool was the

home of several large-sized Mahseer. A pair of Fishing Owl (*Bubo zeylonensis*) that lived in the *Ficus glomerata* tree above, performed the important biological function of keeping the number of fish in check. No human being was allowed to wash or bathe in the pool or to catch fish living there.

With trees gone in other parts of the hills, no spring oozed out. The dwellers of the mountains had to go down several meters to fetch water from the reservoir. But during the summer when the liquid was in most demand, the reservoir disappeared from many villages as it was emptied fast, its main function being to quench the thirst of the millions who lived in cities.

If the trees regenerate, springs will revive too. There will be perennial water to the villages, fuelwood and timber for their everyday needs, fruit for the household and fodder for their cattle. If our experiment to revive the forest is successful, we felt it would lend confidence to the people to undertake similar work on their own lands. The forest will then revive and the hills of the catchment would be green once again.

The Villagers Around

But it was with some trepidation that we had accepted the task. We knew that without enclosing our land it was not possible for the plants to regenerate. But enclosure meant depriving the villagers around, of fuel for their hearth and fodder for their cattle. The villagers were accustomed to graze their cattle on 'our' slope and though they had not cut down the single mango tree, several stumps of *T. chebula* and *Careya arborea* and *Bridelia retusa* bore the stamp of the woodman's axe, having been coppiced and hacked down as soon as they attained a certain height. They are also not accustomed to stall-feed their cattle but would lead them out to roam and graze in the hills with their children and even able-bodied persons whiling away their time after the cattle. We thought that not only were the resources of the hills wastefully used, but human energy was also wasted—children not going to schools and able-bodied persons not working. The cattle would roam freely, trampling the new growth and removing all the more edible grasses and herbs. What remained on land after the growing season was thorny, poisonous and weedy growth that cattle would not touch and *Heteropogon contortus*, a low-grade grass with long spikes that would cling and hurt any one who dared to walk through it. As cattle roamed freely, villagers were not even able to use their dung as fertilizer.

We wanted to eliminate the cattle from our land but were prepared to

allow the villagers to come and cut the grass in certain patches to feed their cattle.

The Land

We thus began our experiment on land that was degraded to various degrees through burning, trampling, wind and sheet erosion and physical removal of the soil to build the dam (it was an earthen dam). Rock was exposed on steep slopes, while on gentler ones "murrum", the gravel that underlies soil in our hills, surfaced as soil had been carried away. There were deep gullies at many places. Our first task then was to prevent soil erosion in the coming monsoon, by plugging gullies and vents through which soil would have slipped out. Collecting stones and rubble that lay about, we built several plugs,—check dams—across gullies to hold the soil.

Under continuous depredation the land had become acidic giving a pH value of 5 or 6 as nutrients had leached. It was not possible to bring fertile soil from outside, nor was it our intention. We wanted to depend wholly on local resources, just as a poor cultivator could afford.

As we lowered our first sapling in the pit, on that beautiful day in June, we thought of the vicissitudes to which we were exposing the young plant: the marauding cattle, the woodman's axe and the monsoon that would not come in time.

The First Monsoon

1986 was a lean year for the monsoon. True, rains came to water the saplings that we planted on that day. But they disappeared for the rest of the month, only to reappear in mid-July. The season's rainfall (1704 mm) was below the average. The cattle continued to come and the watchman we had employed, could not prevent them coming at night. They ate the grass and then directed attention to saplings of *Albizia* and *Pongamia* that we had planted. They however, did not touch the *Acacia auriculiformis* saplings which prospered and attained an average height of a meter at the end of the year. The woodmen came surreptitiously and removed all the *Gliricidia sepium* poles that we had planted. As we did not use any insecticide, soil insects took their toll of all the saplings of *Erythrina*.

But the check dams held and the depth of soil that collected behind them varied from 20 cms to 60 cms. As the monsoon waned and the flow of water ceased, *Cassia tora* germinated on the accumulated soil, their deep green leaves and tiny yellow flowers providing a colourful background to the drab stone-work.

The protection given to the plants, though partial, did not fail to produce some effect. It was most noticeable in the clumps of bushes that we had not removed. The clumps contained *Lantana camara*, *Woodfordia fruticosa*, *Lasiosiphon eriocephalus*, shrubs or rather weeds that no forester would have tolerated. Earlier they too had succumbed to the wood-cutter's axe. With the axe removed, they revived with a flourish, brightened the slope with their golden-red flowers and the fluffy globules of *lasiosiphon* wafted their pollen as the dry season began.

During the monsoon we had watched a pair or two of Yellow-eyed Babbler (*Chrysomma sinense*) as they searched for a nest-site in *Lantana*. They found it ultimately in August as neighbours to a pair of Red-vented Bulbul (*Pycnonotus cafer*) that nested in thorny *Carissa carandus*. The cattle were not successful in removing all the grass, a few tussocks remaining in some secluded corners. In one of these the tiny Streaked Fantail Warbler (*Cisticola juncidis*) raised its brood and later when the grass dried out, a Crested Lark (*Galerida malabarica*) built its nest.

The Dry Season

The monsoon had come and gone; the grass turned pale and withered, the flowers of the *Lantana* and *Woodfordia* disappeared too and the spikes of the *Heteropogon* bit us as we began to number and measure the saplings. Out of the 670 saplings planted in 1986, 430 survived giving a survival of 68%.

As the second year of the experiment commenced, we redoubled efforts to protect the surviving plants. Stone-walls went up along the boundaries of our land, and in order to prevent goats from jumping over, we heaped acacia thorn over the walls. On slopes where walls would not stay, we dug up trenches and piled up mounds as obstructions in the way of cattle. Through the year we had developed some rapport with the villagers. The result: the surreptitious visits of the wood-cutter declined substantially.

For the monsoon of 1987 we also readied an adjoining 5 ha tract of land that sloped gently for about 100 meters and then ran steeply to the edge of the reservoir. All the soil on the gentle slope was scoured but the steeper side still held some soil. Instead of digging pits in the gravel and in rock, we ran a plough along the contours to prevent sheet erosion and loosen the gravel to let rain water seep in. The plough went deeper on the steep slope so that we obtained a continuous trench along the contour.

We also tried an experiment in conserving rain-water. 3' x 6' x 3' trenches were dug up and plastic sheets were put inside them with edges that poured out on all sides. We put earth all along the edges of the plastic to prevent it slipping and falling inside. Once the trenches got filled up with rainwater, we wanted to cover them with plastic to prevent evaporation.

As summer came and air sizzled, the most critical period in the life of the young plants began. It was impossible to irrigate plants as the reservoir level had retreated several meters from our land. Lack of water proved critical for some young ones and we saw *Melia azadarach* saplings die one after another. No amount of mulching could save them. Out of the 600 saplings planted in 1986, only 49% survived to see the next monsoon. On the other hand, the tough *Butea monosperma* shed all their leaves and survived the drought. The care-free *Acacia auriculiformis* was even bouncing and with the coming of the spring, its fresh green tint, transformed the desolate landscape. New leaves adorned the *Lantana* and the Purple Sunbird (*Nectarinia asiatica*) came to the red flowers of *Woodfordia*.

But what thrilled us as the first black clouds appeared in June, was the revival of certain plants that lay hidden in the clumps of *Lantana* and *Woodfordia*. They became visible as leaves of different shape and colour popped out of the clumps. We then examined all the clumps and to our surprise detected 12 tree species in various stages of revival. *Ficus racemosa*, *Careya arborea* and *Bridelia retusa* were the most common; but *Terminalia chebula*, *Lagerstroemia parviflora* and *Bombax ceiba*, trees that are found in the relatively undisturbed forest areas in the catchment, were also seen to be rejuvenating.

The Second Monsoon

The monsoon however, played truant once again. The rainfall in 1987 was even less (1363 mm) than in 1986. The number of rainy days that the land saw was less than 30. The reservoir failed to fill up for the first time in several years. We had planted *Eucalyptus* saplings as wind breaks on the new patch. But in the meagre monsoon the roots could not grow enough to penetrate the murrum and most of them died. *Agave sisso-lana* planted on the boundaries however, survived. Among the other saplings *Cassia siamea* showed good growth and *Gliricidia sepium* and *Pongamia glabra* were moderately successful.

The most striking growth however, was seen among the number of herbs. Apparently, the stone-walls and trench-cum-mound fencing that

we had put in, were proving effective. There was a marked decline in the number of cattle penetrating the fence, though here and there, shepherds removed the thorns to let their goats in. In monsoon the cattle have pastures everywhere in the hills. The availability of food everywhere also led to less encroachment on our land. The result was a bumper crop of herbs and grasses. In the beginning of July we had counted 24 species of herbs. Among them *Tridax procumbens*, *Indigofera cordifolia*, *Oxalis corniculata*, *Zornia gibbosa*, *habenaria grandiflora*, *Artemisia parviflora* and *Cassia torra* were common. Now their number shot up to 86 in an area of 7 ha. which included the new patch that was ploughed. The newly enclosed area was lit up with charming monsoon flowers of *Smithia*, *Senecio*, *Linum* and *Pulicaria*. In the area where almost a year had passed since the application of partial protection, the variety of grasses also registered an increase. 10 species of grasses were recorded in Sept.-Oct. 1987 as against 4 in July. *Cynodon dactylon*, a grass which is commonly grazed, staged a comeback along with *Chloris barbata*.

The count of trees, shrubs and climbers also showed an increase over previous numbers. In the whole 7 ha. of area, we recorded 22 tree species, 9 shrubs and 9 climbers as against 12 trees, 6 shrubs and 3 climbers.

The almost total absence of any soil cover in the newly enclosed area together with the failure of the monsoon retarded the growth of plants. Even hardy plants like *Azadirachta indica* had difficulty in penetrating the gravelly surface and recorded growth of only a few cms. *Pongamia glabra* fared better but its growth was slow too. *Melia azadarach* saplings failed once again as they could not survive the drought. The best growth and survival was shown by *Cassia siamea*.

Eucalyptus saplings planted on the boundary of the old area also survived, and some even prospered, possibly because more moisture was retained and that too for a longer time in that area due to gulley-plugging. Our efforts to collect water in plastic-lined ponds however, proved futile. The sheeting that we used, proved thin and brittle and the water seeped out as soon as the dry season began.

With the onset of the dry season, the cover of herbaceous flora began to wither and die. The ephemerals disappeared and once again the land looked brown and inhospitable. The newly revived grass species such as *Chloris barbata*, *Digitaria stricta* and *Eragrostis unioides* lay dormant. *Heteropogon contortus* and *Themeda quadrivulvis* dominated the landscape once again, reaching spectacular heights as an effective stop was put to grazing.

Spreading the Resources

For the 1988 season we decided to add another 5 ha. to our land, making the total area a little over 12 ha. This was really an extension of land enclosed earlier and lay adjacent to it. The aspect was similar, a gently undulating slope followed by a steeper one that ran briskly to the water's edge.

We knew that we were spreading our resources rather thinly by covering a larger area. If we had concentrated our efforts in a smaller area, we could have protected it better and achieved better growth of plants. But we were more interested in restoration of biological diversity which includes not only plants but other creatures as well. A larger area we reasoned, would allow diverse species to take advantage of protection even if it was partial. It would also give us an opportunity to observe a greater biological diversity. After all, species may require a minimum continuous area to stay and prosper.

The soil pH in the new area was found to be less than or around 6 showing the acidic nature of the soil. But the soil depth was better in the new area and there were less outcrops of rocks.

The New Area

We enclosed the new area with thorns, some stone and rubble walls and trench-cum-mound fencing. We also erected small enclosures around existing shrubbery, redoubling protection for plants that lay dormant in it. Ploughs ran over the ground along contours to prevent sheet erosion.

The summer proved long, hot and dreary. Irrigating the plants was once again not possible. We thought of providing drip irrigation by using small earthen pots buried near the plant. But these proved costlier than we imagined so also we found out, the use of a moisture-retaining chemical that was then newly-available in the market. In desperation we tried plastic bags filled with water, the pin-holed bag providing a drip. Only a few delicate plants could be watered this way as water had to be fetched from far away. A majority of plants had to endure the dry season without irrigation.

The Third Monsoon

The 1988 season recorded bountiful (2370 mm) rain, the rainy days at the site exceeding 60 in the whole season. Three times the reservoir overflowed. The plants reacted favourably to the bounty of the skies and

of those newly-planted 70% survived to see the dry season. We had planted some mango saplings that we were rearing in our nursery for a year. In the furrows of the plough we had sown the seeds of *Stylo Haemata*, a shrubby plant which provides good fodder. The seed sprouted but could not endure the dry season. *Acacia auriculiformis* and *Cassia siamea* recorded impressive growth and proved tenacious enough to survive the scanty soil and the dry days.

We also experimented with *Leucaena leucocephala*, a fast-growing exotic made popular by the State Forest Department and some private agencies. Lack of irrigation and good soil and depredations of Black-naped Hares (*Lepus nigricollis*) proved inimical to its growth.

As before the most interesting to watch was the progress of natural regeneration. The area we began our experiment in, was now enclosed for over 2 years. But our expectation of this area blooming with many wild flowers, was not realized. Actually the number and variety of herbs that saw the zenith of their growth here in 1987, showed a decline. What we witnessed was a quiet assertion of grasses over herbs. *Pseudanthisteria hispida*, *Aristida adscendeoinis*, *Chloris barbata*, and *variegata*, *Digitaria stricta*, *Eragrostis unioides* competed successfully with *Heteropogon* and *Themeda* and with such herbs as *Aeschynomene indica*, *Dactyloctenium aegyptium* and *Linum mysorens*. As the dry season progressed, however, these grasses lay dormant and once more, *Heteropogon* and *Themeda* displayed their resilience in adverse conditions.

Clumps of *Lantana* and *Woodfordia* also underwent a dramatic change of character. A number of indigenous plants including *Carissa carandus*, *Ficus glomerata*, *Carvea callosa*, *Careya arborea* and *Zizyphus rugosus* popped out of the clumps and for the first time made their presence felt. With woodcutter held at bay for 2 consecutive years the coppiced stumps of *Terminalia chebula*, *Bridelia retusa*, *Albizia procera* and *T. alata* prospered too. The climbers flourished and shrubs were embellished with vivid blooms of *Gloriosa superba* and long plumes of the *Asparagus*. For the first time natural regeneration began to compete with cultivated plants.

The areas enclosed later went through the same phases that we witnessed earlier in the 1986 area. There was a profuse growth of *Heteropogon* and *Themeda* in the area enclosed recently, while the area enclosed in 1987 witnessed a phenomenal resurgence of herbaceous flora. The clumps of shrubbery consisting of *Lantana*, *Vitax* and *Ficus glomerata* showed regeneration of such species as *Colebrookia oppositi-*

folia, *Pogostemon* sp., *Careya arborea*, *Bombax ceiba* and *Indigofera purpurea*. Even the rocky outcrops were invaded by such pioneer species as *Mollugo pentaphylla*, *Polycarpia corymbosa*, *Anilema* and *Cyanotis*. On the gentler slopes developed a community of sub-dominants consisting of *Spermacosis stricta* and *Aeschynomene indica*. A delightful new ground orchid, a species of *Habenaria*, not seen before here, raised its yellow crown in the soft sunlight of September.

Now the area where it all began provided living quarters to some Blacknaped Hares (*Lepus nigricollis*). Sometimes we came across footprints of a Barking Deer and sometimes a litter of Wild Boar (*Sus scrofa*) tried to dig up for succulent roots and tubers. Many times walking through grass one flushed a covey of Rock Bush Quails (*Pardicula argoondah*) and the pairs of Yellow-eyed Babbler, Red-vented Bulbul and Streaked Fantail Warbler are regular breeders. In winter when the grasses began to ripen and drop their heads, a Pale Harrier (*Circus macrourus*) skims low and a Kestrel (*Falco tinnunculus*) and a Black-winged Kite (*Elanus caeruleus*) linger, hovering dexterously in the calm evening air.

As we progressed towards the fourth monsoon season, the project area started reverting to shades of brown. In the sector which was protected just over a year, *Lantana* still dominated the shrubbery and regeneration of other seedlings was not yet evident. In the middle sector, protected just over two years, *Lantana* was on the retreat and *Ficus* was more assertive. These clumps harboured the seedlings of *Careya arborea*, *Terminalia alata* and *Bombax ceiba*. The area where the experiment began showed a predominance of grasses over herbs and in the clumps of shrubs *Lantana* had yielded to *Carissa*, *Careya*, *Colebrookia* and *Clerodendron*. A part of the area looked like a mini forest with *Mangifera*, *Cassia*, *Albizia*, *Lagerstroemia* and *Terminalia* rearing their tall heads.

The 1989 Monsoon

In 1989 the monsoon was again erratic—with the total rainfall (1494 mm) only a shade better than in 1987. But the pattern of growth was now well set. The most recently enclosed sector experienced a resurgence of herbs followed by a spectacular growth of *Themeda*. In the middle sector 24 grass species now competed vigorously with herbs; while in the oldest sector the number of grass species registered a slight decline from 16 to 14 with the area under tree cover slightly increased.

The Economics of Restoration

Four monsoons passed and we felt it was now time to take stock of the situation and prepare a balance sheet of costs and benefits. Our cost worked out to Rs. 5952 per hectare, per year, over 40% of it having been spent on protecting the area. Indeed if the present practice of letting the cattle and goats loose in the hills to graze, was not there, the cost per ha. per year could have been reduced to Rs. 3527.

As will be clear from the foregoing, the plantation that we carried out was neither of very valuable species nor large. It would be proper to say that we added some value to the process of natural regeneration by cultivating certain hardy plants. But even with partial protection, the natural process of regeneration progressed apace, the number of tree species going up from 8 in the beginning to 40 at the end of three years. The cultivated plants added another 41 species of trees. Given the project budget and the social situation (the practice of grazing animals in the wild), even if we had planted additional and valuable species, their survival would have been doubtful. One wonders whether in hilly areas, instead of cultivating plants (tree species), would it not be more advisable to protect a given area well and let nature take its own course? This is particularly applicable to regions where rainfall per year is 2000mm or more. The average rainfall at the site between 1986 and 1989 was 1732 mm.

There is reason to believe that if the protection that we could give was better, or if we were successful in persuading the local people to stall-feed their cattle and goats, natural regeneration would be faster even when the rainfall was below the average in 2 out of 4 seasons that we worked in the Project area. With the process of natural regeneration having full scope, the forest would become qualitatively better, though not necessarily providing greater income to the people.

According to our observations a hectare of hilly area in this part of Western Ghats, if protected well, yields 30 saplings of *Acacia catechu*, 16 of *Bombax ceiba*, 8 of *Albizia procera*, 6 of *Careya arborea*, 4 of *Bridelia retusa*, 2 of *Terminalia chebula* and 1 of *Terminalia bellerica* every season. This has happened in the Project area. All these species that are naturally coming up, as the area is slowly being transformed from xeric to mesic conditions, may not yield economic gains in the short run. But if protected over a period of 20 to 25 years, the economic importance of the forest is likely to increase at an exponential rate. In the longer run, such forest could be more valuable as most of our indigenous flora are

known for their medicinal value. It could also yield other forest produce and provide raw material for cottage industries. Also it would be a far better place for the wild animals and birds than any man-made forest or plantation. Lastly this could be achieved at a far lesser cost than at present.

The greening of our hills therefore, hinges to a greater degree on the reform of our social practices than on any other factor. Indeed the people who live in the hills at present, are thrown further away from the national mainstream, lead a miserable life, spend most of their time in unproductive pursuits, are without proper education and hence unknowingly inflict a far greater harm on the ecology of the hills than would otherwise be the case.

For their economic as well as social uplift, it is necessary that they are weaned from the practice of shifting cultivation, and the practice of letting their cattle loose in the hills. As has been pointed out in this study, these cattle yield very little milk or dung and people waste their income-yielding years in following them during the day. If human interference in these hills is minimised the hills will prove far more productive, and will help the national development effort better, than if they are exploited through wasteful practices as is being done presently.

With the 41 species of trees that we introduced in the project area, we tried to convert a part of the area into a plantation that yields economic gains in the short run. If the minimum cost of protecting the area was Rs. 300 per ha per month, we tried to enhance the economic value of the area by spending another Rs. 200 per ha per month. With this additional expenditure, it is hoped that the area should start yielding an income at the end of 5 years and this income should increase every year if protection and care of the area continue at the present level.

Our experience so far tells us that the process of greening of our hills is an expensive one, given the social practices and the income of the residents. Our study of the catchment area showed that the monthly income of the resident between 1983-85 was less than Rs. 300. It is therefore, impossible for a local resident to invest Rs. 300 per month to improve the conditions on his own land. If the residents cooperate the cost however, is likely to be less.

What then can be done to improve the conditions of the hills and their residents? For regeneration of the forest a planned and cooperative effort appears to be essential. Outside technical guidance and monetary help will be required to the residents for at least the initial period of 5 years. Together with this should come social reform.

It is not necessary to spend a great deal on raising nurseries of plants that need to be introduced in the hills. A limited number of plants of a few selected species are only required. Valuable species require irrigation and great care including protection. Irrigation can be provided only to a very small portion of our hills. For the rest it is not economical to irrigate. It is also uneconomical to provide protection for most of our hill regions given the current social practices. The cost of protection is likely to go up every year if the present social practices are allowed to continue.

If the destructive social practices are changed immediately either by legislation or by social consent, we can begin the process of greening our hills on a cooperative basis at a minimum cost of Rs. 3600 per ha per year. If these practices are not changed, the cost is likely to be at least Rs. 6000 per ha per year but is likely to shoot up every year at an accelerating rate.

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Acknowledgement

We wish to acknowledge with thanks the financial help that we received from Government of India's Ministry of Environment & Forests, for our Project.

A Report on the Cranes of Assam

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Ali and Ripley (1983) reported seven species of cranes in the Indian sub-continent of which Eastern Common crane (*Grus grus*), Hooded crane (*Grus monacha*), Indian Sarus crane (*Grus antigone antigone*), Burmese Sarus (*Grus antigone sharpii*), Demoiselle crane (*Anthropoides virgo*) are recorded in Assam (Baker 1899). Among them the Indian Sarus and Burmese Sarus were resident and Demoiselle, Hooded crane and Common crane were winter visitors. All these reports of the cranes in Assam were of early seventies. In Assam no detailed survey had ever been taken with regard to the distribution, status and habitat preference uptill now.

During the last two decades the habitat condition of Assam has changed rapidly due to urbanization and eutrofication of the habitat associated with wetlands. Due to this habitat shrinkage apart from cranes other wetland birds, mainly waders and waterfowl, are becoming rare.

While surveying waterbirds of Assam during winter, cranes were spotted in some of the localities of Assam. In December 1988, one Common crane was spotted in the Dishangmukh of Sibsagar district. On 15th and 16th January 1989, 4 Common cranes at Jhanjimukh of Jorhat district, were observed. Interestingly, there was no record of the cranes in that area previously. In the month of February 1989 seven cranes were observed in the Orang Wildlife Sanctuary of Darrang district, of which two were Demoiselle and five Common. According to the reports availa-

ble from the local people Common cranes are found in small numbers in Jorhat, Sibsagar, Darrang and Sanitpur districts during winter. Common cranes were recorded from Sonabarighat, Katakhal and Banskhandi of Cachar district in Southern Assam. It is reported from all parts of Assam that the cranes are killed by poachers.

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Assam, showing crane sighting spots (•) = Common, (o) = Demoiselle

Status of Barheaded Goose and Cranes in Assam

Anwaruddin Choudhury

Synopsis

Four species of cranes occur in Assam, all of which are seen occasionally. Recent reports of sighting show small numbers. For one species, the Hooded crane, the only record pertains to the year 1899. The Barheaded goose on the other hand, is a fairly common winter visitor. During winter a large number of migratory waterfowl are captured with the help of nets, which practice is dangerous for the rare birds.

Introduction

The recent data on cranes and Barheaded geese presented in this paper have been collected by me during field trips to the wetlands and other areas in different parts of Assam till the winter of 1988-89. An SLR still camera with a telephoto zoom lens of 75-250 mm, a pair of 20x binocular and a 10x telescope were used during observations.

Barheaded Goose (*Anser indicus*)

A common winter visitor, it affects large man-made tanks, *beels* and rivers, notably the Brahmaputra. Detailed observation on the species has been made by me in Sibsagar district of upper Assam. First sighted by me on 21 March, 1987 on Joysagar, man-made historic tank (water area c. 63 hectares) located on the southern fringe of the Sibsagar Town. A total number of about 300 geese were there in two groups of about 150 each.

Succeeding winter's first birds seen again on the Joysagar Tank (22 December, 1987). The largest congregation observed was of 316+ birds on the Joysagar Tank (25 December, 1987). The Barheaded geese are a common sight in Joysagar almost throughout the winter. They remain in the tank for the day spending the night in the *chapories* (islands-sandspits) of the Brahmaputra and in Pani-Dihing wetlands. In another large tank, the Sibsagar (area c. 52 hect.) in the main town area, they arrive late (first seen on January, 1988). They haunt this tank mostly in small flocks, sometimes in association with the Greylags (*Anser anser*).

More observations on the Barheaded geese in Sibsagar district were made on the *chaporis* (islands) of the Brahmaputra and in Pani-Dihing. Affecting man-made tanks in large groups is quite interesting, as the species is known to haunt chiefly large wheels and rivers (Ali & Ripley, 1983).

The Barheaded goose is also common in the beels and fields of Kaziranga National Park. A flock of 100+ was observed near Borbeel (south-west of Bimoli) on 29 January 1988. On the same day many were seen near Sohola beel, also inside the national park. Sometimes in November-December 1986 I saw one goose in Hajo (Kamrup district) which was captured from a beel of Barpeta district. The Barheaded goose has also been reported from Orang Wildlife Sanctuary and the Bauwua beel area (Hailakandi district). Locally it is called *Boga rajhans* (Assamese in the Brahmaputra Valley) and *Sada rajhans* (Bengali in Cachar area).

Common Crane (*Grus grus*)

A very rare visitor. Sightings are also very few, mostly as occasional stragglers. The only sighting recorded by me was in the Sibsagar district (Choudhury, 1988). The earlier stray records in Assam were from Lakhimpur and Cachar (Ali & Ripley, 1983), which are apparently very old ones.

I located the cranes on 2 February, 1988, in the Doboli *chapori*, off Disangmukh while surveying the area for birds. Doboli *chapori* is a large sandy tract/islet in the Brahmaputra River. I saw nine cranes at 9:45 a.m. They were walking and feeding on the ground amidst jhau (*Tamarix dioica*) shrubs. A few immatures were also there. At 10:35 a.m. they took off from the spot when I could count the whole group exactly, there were 15 cranes altogether. On 7 February, 1988 I again surveyed the locality but did not see any crane.

Hooded Crane (*Grus monacha*)

Recorded as winter vagrant only. The only definite record in the whole of India is a young bird shot by Baker in North Cachar in December, 1899. Other sightings in Assam, also by Baker were recorded on the Subansiri River, Lakhimpur (Ali & Ripley, 1983). During my surveys, which were of course not exhaustive, I did not come across a single Hooded crane. From Lakhimpur area as well as Majuli island (Jorhat district) I received a large number of reports of sightings of cranes during winter (Bikul Goswami, pers. comm.), but authentic specific identifications were not available. Near the Borbeel (south-west of Bimoli) in the Kaziranga National Park I once saw some silhouetted crane-like birds (29 January, 1988).

Sarus Crane (*Grus antigone*)

Recorded as a resident bird (Ali & Ripley, 1983). But till today I could not locate a single bird anywhere in Assam. I also visited Manipur (April, 1988) and surveyed the western edge of the Loktak Lake and also the marshes of the Keibul Lamjao National Park, but no trace of any Sarus crane. In the Handbook (Ali & Ripley, 1983) nothing specific has been mentioned about its status. Surviving population, if there be any, must be very low.

Demoiselle Crane (*Anthropoides virgo*)

Smallest of the cranes found within our limits, the Demoiselle crane is an occasional winter visitor to Assam. During my detailed survey of wetlands of Sibsagar district in the winter of 1987-88 not a single bird sighted. In Kaziranga, Pabitora, Laokhowa, Burha-Chapori and in the wetlands of Kamrup district I did not see any Demoiselle crane.

The only observation made by me was in the Orang Wildlife Sanctuary, Darrang district. It was on 22 January, 1989 while surveying the Satsimolu beel on elephant-back that some grey-coloured birds suddenly sprung from behind the tall elephant-grasses (time, 9:30 a.m.). Recognising them to be cranes I immediately stopped the elephant and started observing the birds keenly. A total number of four birds seen soaring overhead. On closer observation with a 20 X binocular I could make out the following characteristics: size, smaller than lesser adjutants (*Leptoptilos javanicus*) which were also soaring alongside; body colour from below, light grey; and a deep grey or blackish patch extending from neck to breast. The only crane with which the Demoiselle is likely to be

confused in the field is the Common crane. But in this case the birds were much smaller, and the black extending upto breast (restricted to neck in case of *Grus grus*) put me in no doubt about their identity. I also photographed two of them in flight (colour transparency).

Conservation & Discussion

All the four species of cranes recorded in Assam are among the very rare birds of the state. While the migratory species were always scarce, even in the latter part of the last century, the Sarus has perhaps vanished due to loss of (breeding) habitat. The wetlands comprising the *beels* and *haors* are being reclaimed for agricultural purpose. Fishing, boating and grazing in and around the wetlands have also increased considerably over the years because of rapid growth of population. The *chaurs* and *chaporis* of the Brahmaputra are also gradually being settled by temporary fishermen and graziers besides the larger ones which are already under permanent occupation. All the four species of cranes need conservation attention.

Still fairly common during winter, the Barheaded geese face major threat from mass netting by the locals, because netting takes a much higher toll than shooting. There are also cases of poisoning. It is only in the protected areas like the Kaziranga National Park, Manas Tiger Reserve, Orang Wildlife Sanctuary, Dibru-Saikhwa Wildlife Sanctuary, Pabitora Wildlife Sanctuary, Laokhowa Wildlife Sanctuary, Deepor Beel Wildlife Sanctuary and Burha-Chapori Wildlife Sanctuary (proposed) that the wintering birds are safe. What is most important now is to expand the network of protected areas. On a priority basis the Pani-Dihing wetlands of Sibsagar alongwith the adjacent *chapories* and the Phokolai-Dorou *beels* should be declared a wildlife sanctuary (c. 60 km²). The proposed extension of Kaziranga National park which is to cover the whole stretch of the Brahmaputra and its *chapories* should also materialize early.

In the historical tanks of Joysagar and Sibsagar the Barheaded geese as well as the other birds are not disturbed. Both the tanks are regarded as sacred by the locals.

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Glossary

- Beel and Haor*—Ox-bow lakes, depressions, swamps, marshes and lakes.
Char, Chapori—Sandy banks, tracts and islets of rivers.



The Cranes of Madhav National Park

Rajiv Saxena

Introduction

India can boast of having 6 out of 15 species of crane found in the world. They are Sarus (*Grus antigone*), Blacknecked (*G. nigricollis*), Common or Eurasian (*G. grus*), Hooded (*G. monacha*), Siberian (*G. leucogeranus*), and Demoiselle Crane (*Anthropoides virgo*).

In Madhya Pradesh, the Sarus, Common & Demoiselle have been regularly reported from National Chambal Sanctuary (district Morena), Karera Bustard Sanctuary and Madhav National Park (both in district Shivpuri). The cranes have been seen in Dhar and Raipur districts also. The present status of cranes in other parts of Madhya Pradesh remains obscure.

The largest congregation of these three not-yet-endangered species of crane in Madhya Pradesh has been reported from Madhav National Park where they can be seen in large number in winter.

Madhav National Park

The Madhav National Park (25°26' N. and 77°42' E) is situated in Shivpuri district of Madhya Pradesh. The State Government declared it to be a national park from 1st January 1959. The present area of the park is 156 sq. kms. The notification for extension of the park has been issued by the State Government vide No. 14/1/28-10(2) dated 28.5.82, as a result of which the area will become 337 sq. kms. after the completion of

the process of transfer of the area (See map-1).

The two national highways No. 3 (Agra-Bombay) and No. 25 (Shivpuri-Bhognipur) divide this park into three parts. There is also a good network of metal roads in the central zone of the park.

The entire area is covered by a series of undulating hills with intermittent valleys and two lakes. The numerous hill streams and gorges retain the water throughout the year. The altitude of the park varies from 380 metres to 480 metres above mean sea level. The maximum temperature in summer (April-June) and minimum temperature in winter (October-January) are 45° and 3°C respectively. The average rainfall (July-September) is 1010 mm per year.

The forests of the park are northern dry deciduous mixed type, and mainly consist of kardhoi (*Anogeissus pendula*), khair (*Acacia catechu*), salai (*Boswellia serrata*), dhaora (*Anogeissus latifolia*), nirguri (*Vitax negundo*) and siarkanta (*Argemone mexicana*). The jamun (*Eugenia jambolana*) and mahua (*Madhuca indica*) are found along the nullahs.

Panther, chital, nilgai, chinkara, sambar, chausinga, black buck, wild boar, wild dogs, langur etc. are the main animals of the park. Tiger has not been seen for a long time. Recently two tigers have been released in the park for the tiger safari. About 200 species of birds have been recorded, out of which 80 species can be seen in both lakes during winter when a number of migratory birds come here. Crocodiles can be seen basking in the sun near the lakes.

Lakes

Two lakes, namely, Sakhya Sagar and Madhav Lake, are situated in the south-central part of the unextended Madhav National Park, the area being 3 sq. kms. and 0.49 sq. kms. respectively. The water level of the lakes during rains rises by 8 feet.

The one-fourth of the boundary of Sakhya Sagar is concrete wall while the rest is natural boundary with muddy, marshy area gradually sloping down to shallow and then deep water. Cranes are found in the latter area. They are also seen at Madhav Lake.

The Cranes

Demoiselle and Eurasian Cranes arrive in Madhav National Park in winter while the Sarus breeds here.

Table-1 shows the year-wise census of cranes of the park. The census has been done in winters. In case of the year when major variation was found in the number of cranes counted by different persons, the maxi-

mum number has been taken for comparison. The park authorities say that they do not have any record about their numbers.

Data for the years before 1983-84, are not available.

Sarus should also be counted during the breeding period. Their numbers shown in Table-1 have been taken from winter census only.

Table-1

The Census of Cranes in Madhav National Park

Year	Demoiselle	Eurasian	Sarus
1983-84	600	125	21
1984-85	650	80	13
1985-86	400	50	17
1986-87	557	100	50 (?)
1987-88	7000	1000	50 (?)

Discussion

Upto the winters of 1986-87, only a few hundred Demoiselle and Eurasian Cranes arrived annually in Madhav National Park. But in the winters of 1987-88, upto 7,000 Demoiselle and 1,000 Eurasian Cranes were counted. Even if a big error margin is left, it is certain that these cranes came in far greater number than previous years.

Their sudden increase appears due to scarcity of rains in adjoining states of Gujarat and Rajasthan in 1986 and 1987, and an early drying of the lakes in the north. Severe winter in the north in 1986-87 and 1987-88 might be a second cause. The winter of 1987-88 may be called "the winter of great variation".

The Sarus breeds in Madhav National Park. Four juveniles with their parents were seen in January 1988. Here they build their nest in muddy and slightly grassy area near the shallow water of the lake. Cattle grazing is a major problem as they come to this shallow area to drink water, thus disturb the cranes and destroy their breeding ground. Further study is needed.

A large concentration of the Demoiselle Cranes was found near Kota (Rajasthan), and recently, the Sarus has also colonised here. As the straight distance between Madhav National Park and Kota is about 200 kms. there is scope to compare the number of cranes that arrive every year at both places to find out if any relationship exists between them. If it does, whether it is proportionate or inverse. This may be done with the cranes of Karera Bustard Sanctuary also.

From many places in India the cranes are reported to cause a lot of destruction to crops, and hence the farmers are annoyed. There is no such problem with the cranes of Madhav National Park because during their stay the cranes seem to remain within the park. If they cause any damage to the crops of surrounding villages, it should be negligible as no complaint has been filed so far.

It is necessary to know the present status of cranes in central and eastern Madhya Pradesh to ascertain whether all Demoiselle and Eurasian Cranes that arrive in Madhav National Park remain there or some of them further migrate towards other parts of the state.

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The Land Tortoises along the Western Ghats of Karnataka—An Excellent Indicator

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Abstract

The Cane tortoise, *Heosemys silvatica* reported only in the forests of Kerala is now discovered in the higher elevations of the Western Ghats in the district of Dakshin Kannada in Karnataka state. The lesser known Travancore tortoise *Indotestudo forestinii* is found to be sympatric with the former. These inhabit the same terrestrial habitat which is under high pressure of exploitation. The slightest disturbance of the habitat is likely to decimate the population. Hence it is a very good indicator of the health of the terrestrial environment.

Introduction

The Western Ghats of Karnataka harbour one of the rare preserves of the tropical rain forests of the world. Known for its diversity in animal life, the forest on the Western slopes of the Western Ghats is the home of land tortoises. The rarest among them, the Cane tortoise, is now discovered from here.

The other land tortoises *Indotestudo forestinii* commonly called Travancore tortoise, fresh water turtles like *Melanocheilus trijuga*, *Lysamys punctata* and *Tryonix lethi* are also found here.

Habitat

The Western slopes of the Western Ghats in Karnataka precipitate the maximum rainfall. Agumbe receives the highest rainfall in the world only next to Cherapoonji. All this and other factors had facilitated a copious growth of forest. Hiding in the safety of the litter which is under the closed canopy cover of the rain forest and in the burrow of the humus they find the slopes convenient to negotiate.

Ecology

The tribals who live in the foothills and in forests hunt these tortoises. Though hunting is not the main human pressure on these animals, it can be minimised. The major threat to the animals is the habitat destruction. Annual fires triggered by man kills many tortoises. Having a hard shell it has very few natural enemies. Hence any alteration in its population density may be related to human interference.

The Travancore tortoises are large. They grow to about 2250 grams in weight. The colour varies from light brown to black but all have light yellowish blotches on each dorsal scute. Though it requires humid climate it is active during the day and is herbivorous.

A general survey reveals that very few of these animals are found in their usual habitat covered with forest.

A much rarer land tortoise, the Cane tortoise lives in the higher elevations of the Western Ghats. It lives in sympatric association with the Travancore tortoise. Only one female was so far collected and is described below. It is more active towards the evening. Nothing is known of its feeding and breeding habits.

Description of the Cane Tortoise

The carapace is black in colour. The plastron is white but the edge is black (near the bridge). The head is brownish in colour. Traces of red colour are seen on the mandibles. The pupil is black and the cornea is brown, surrounded by a grey limbus. Sclera is reddish-brown in colour.

Description of the specimen

Based on one specimen collected from the Ghats. The specimen is a female. It was located by a tribal.

The striking characters of these tortoises is the presence of three prominent ridges on the carapace. The ridges, unlike those in *Melanochelys*, converge towards the posterior end.

The beak on the upper jaw extends downwards and overlaps the lower jaw. The beak is 3 mms. in length.

The limbs have five webless digits. The hind limbs are more columnar. The claws are strong and well-developed. The absence of webs however, is distinct.

The animal seems to be more active during the later part of the day. Generally they are less active in captivity.

Significance

The Cane tortoise was first reported by J. R. Henderson in the year 1912. Later in 1986 Vijaya C. rediscovered it from the same place and described it (2) more fully. She reports that it is endemic to the hills of Chalakudi in Kerala. Since then it has not been reported from anywhere else. It is also unique to find it north of the Palaghat gap.

Conclusion

The land tortoises : Travancore tortoise and Cane tortoise can be used as indicator species to determine the health of the terrestrial ecosystem along the slopes of the Western Ghats in Karnataka. Hence the data such as the population density of the animal must be known.

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Acknowledgements

The Hebbar family of the Neria estates.
Dr. Jack. G. Frazier, D.Phil., National University, Costa Rica.
Mr. Ullas Karanth M.S., Wildlife Research Centre, Mysore.
Mr. Vinay Bose and Dr. Krishnamohan P. K.M.C. Mangalore.

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Wintering Blacknecked Cranes in India

Prakash Gole

The Apa Tani valley of Arunachal Pradesh shot to fame in mid-fifties when Col. Betts reported a small flock of Blacknecked Cranes (*Grus nigricollis*) wintering there (Betts 1955)—the only flock then known wintering outside China. But for the unfortunate cranes, the scene around them was changing faster than what many of their admirers would have liked. Col. Betts wrote again in 1971, "The cranes were comparatively fearless of the 20,000 Apa Tanis who lived and worked in the fields, but even then anyone not in Apa Tani dress could not get within 0.8 km of them. With the appearance of outsiders and soldiers with firearms, aircraft and motor transport, there is a very grave risk that the birds have either been shot or scared away." (Betts 1971).

What actually happened to the Apa Tani flock is not documented. When Lavkumar Khacher went to the valley in search of the flock in 1978, he could not find a single crane. He was told that the last pair was shot and eaten two years before (Lavkumar 1981). Blacknecked cranes had apparently stopped wintering in India.

Then came the discovery of large numbers wintering in Bhutan (Gole 1989). The occurrence of substantial numbers in Bumdiling at an altitude of 1500 meters and lower than that of Apa Tani valley (1830 meters), rekindled the hopes that valleys in India adjacent to the Bhutan border might still harbour a few pairs of Blacknecked crane. Lavkumar had also expressed the hope that these cranes could be found in valleys where similar habitat conditions prevailed. His probabilities were the

lowland marshes in Lohit division and the marsh south of Seppa in West Kameng division (Lavkumar *ibid*).

I got an opportunity to make a diversion to Arunachal Pradesh while looking for the Sarus in Assam. I went to Apa Tani valley in late February 1990. The valley is a wide shallow basin flanked by low hills clothed with dense pine forests. Rice fields occupy almost the whole valley. In one corner is an airfield where small planes land. In late February the rice crop was harvested long back and preparations were on for the spring crop. The whole valley was a picture of bustling activity. Rice fields were full of people and their animals; there were scooters, cars and trucks on the road and Apa Tanis in traditional dress were hard to find. Elections for the legislative assembly were due. Processions and motorcades were moving on the road and loudspeakers were blaring the merits of the contestants.

The wet rice fields looked very promising and tempting. But no decent crane would have landed there with so much human noise and movement surrounding him.

I showed Blacknecked pictures to many Apa Tanis, now in modern dress and riding scooters. But they said that they had never seen such birds in the valley. Finally I found an Apa Tani in traditional dress complete with bow and arrow and his "dah" (a short sword) slung at his waist. When he looked at the picture, he exclaimed, "Kendah!" the local name for the crane. Many years ago they used to visit the valley, he told me. "We never used to kill them", he added.

It was the entry of the outsiders in the valley that probably sealed the fate of the Blacknecks.

I also visited Tawang which sits high on a mountain. Tawang is a district headquarters with all the hustle and bustle of modern times. But its lower reaches are broad and gently sloping. Naturally villages and terraced cultivation occupied these broad slopes. The ever-smiling Monpas, the local tribe practising Tibetan Buddhism, immediately recognised the picture of Thung Thung Karma, the name given to these cranes in Ladakh, Tibet and Bhutan. "A pair or two sometimes come to our fields" they told me. The broad terraces indeed looked a promising habitat.

But the inhibiting factors operating in the Apa Tani valley were present in Tawang also and probably deterred the Blacknecks. Though the Buddhist culture in the region was a welcome sign. Now I had to find a valley that retained Buddhist culture but was still away from the hurly burly of modern civilization.

It was while returning from Tawang that I happened to look into a quiet valley. A dirt track connected it to the main road. Hardly any vehicles plied over the track. The valley was sparsely populated and the main crop was paddy.

As we started on the dirt track, I showed the picture to a passing Monpa. He recognised the Thung Thung and said that last year two pairs had come to the valley. We approached the village and stopped to enquire at a small hut. A man who was cleaning some fish came out to say that only two days ago he had seen a pair. This was the first positive statement that Blacknecks were indeed present this year.

We went beyond the village and I scanned the sprawling rice fields. Far away I immediately recognised the familiar black and white forms quietly moving in harvested fields. The Blacknecked crane had returned to winter in India!

The place was Sangti valley (Lat. 27°-26° N, Long. 93°-18° E) not far from Dirang, a charming town on the main road to Tawang. We found the cranes on 15th February at 1430 hrs. in bright sunlight with moderate easterly winds at temperature around 15°C. The cranes were searching for food in flooded fields, looking probably for frogs, shrimps and such other animal food. We did not find any fallen grain in those harvested fields. *Najas*, *Cyperus* sp. and *Myriophyllum* were the other plants growing in those fields. I was accompanied by Vice Admiral M P Awati (Retd.) and Prof S D Mahajan from Kolhapur who share with me the (re)discovery of wintering Blacknecks on Indian soil.

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Book-Review

The Status of National Parks and Sanctuaries in India.

Four researchers have now produced a very useful document on our nature reserves. They have brought together a lot of information. We now have a complete statewise list of national parks and sanctuaries together with their location map. One is pleasantly surprised to see the whole country dotted with nature reserves (445 total), though the total effective area covered by them is not known.

The report however succeeds in revealing the stark realities of our nature reserves. It brings out the fact that only 8% of the sanctuaries and 40% of the national parks have completed all the legal formalities and are duly constituted legal entities. Many of the others do not accurately know their boundaries. Their managers do not even have access to relevant maps. Most of the reserves have no system of gathering and regularly monitoring information about their flora and fauna. Uptodate information on forest types existing within their area has not been so far gathered. They do not know all the bird and animal species found within their area, nor do they have a system of regularly gathering these data. They have no facilities to record weather data and water quality is not monitored at all.

Many of the reserves have resident human populations within them and suffer from legal and illegal fellings, grazing, cultivation, poaching, extraction of timber and other product etc. Some have public thorough-

fares running through them, some have commercial and social plantations within, while some suffer from excessive and unchecked tourism.

This then is the environment in which our wildlife managers work. Naturally most of their time must be taken up in resolving conflicts arising out of peoples' rights about settlement, agriculture, grazing, carrying on other occupations etc. not to mention arguments with other government departments and agencies and conflicts arising out of illegal activities. It is no wonder then that most of these reserves have no proper management plans. Moreover, separate budgetary provisions are available for only a few and for the rest even the sanctioned funds are not always released.

Why such a sorry state of affairs? The main culprit seems to be the exploding human population. The report has as its basic premise the concept of the carrying capacity of natural systems. If this capacity is exceeded, the systems collapse. The report identifies pollution and intensive exploitation of resources as the major factors leading to such collapse. But both these are the result of increasing human population and their increasing wants which should be identified as the basic cause of pressure on all natural systems. Indeed the five steps that the report lists as essential "for the development and maintenance of a viable wildlife protected area network in the country", can only become operative once this basic conflict between expanding human population and contracting natural areas is resolved. At some point we (perhaps at the highest political level) will have to pose and answer this question: Do we really want to save all the non-human creatures that are still existing in the country? And how much land, water, forest and other resources are we prepared to set aside for them?

The authors have yet to complete all their field visits to national parks and sanctuaries. We may then expect a more comprehensive report which will probably raise and answer such questions. Nevertheless this status report does make some valuable suggestions such as developing uniform criteria for identification and classification of reserves, uniformity in legal steps and procedures, preparation of a conservation-based land-use plan at national level etc. which may pave the way to resolve the basic question.

In the present state of affairs however, wildlife managers are called upon to prepare managerial plans on subjects for which they are basically not trained. Such natural resource-wild life-cum-socio-economic master plans seem to be imperative in the opinion of the authors. They then go on to categorize various activities that are to be faced by the

managers and then suggest administrative structures and research efforts needed to formulate appropriate plans. The trouble is all these require a substantial increase in funding and according a very high priority to problems of nature and wildlife at the ministerial level. At present for most of the state governments these are pretty low priority items.

The main purpose of management plans is to assess the needs of wildlife and their habitat and with clear objectives, try to manage the reserve for the benefit of the non-human creatures. Unfortunately today's management practices and plans are based on the needs of human beings and the wildlife needs perceived by humans not by the wildlife itself. In many cases managers are not clear even about the objectives of managing a particular reserve. Research in these vital aspects (needs of wildlife and their habitat) should be built into the management of the reserves, e.g. every reserve should have wildlife and ornithological researchers who should routinely undertake gathering of information and monitoring of all biological aspects. Yet few management plans provide for their appointment. Their efforts can be supplemented and complemented by NGOs. The authors however, do not appear to emphasize the importance of such research. The authors have however, done well to recommend increased finances and changes in acts that would for example, enable even a private citizen to bring to book the violators of the Wildlife Act.

The annexures including references and bibliography and detailed tables have enhanced the value of the book for the layman and the serious student alike.

(Book reviewed: *Management of National Parks and Sanctuaries in India: A Status Report* by Ashish Kothari, Pratibha Pande, Shekhar Singh, Dilnavaz Variava. Indian Institute of Public Administration, New Delhi 1989, Price Rs. 250 (hard cover), Rs. 150 (paper back).)

धुंढा गेल्या-जंगले गेली

श्री. द. महाजन

कोल्हापूरपासून फक्त ९० किलोमीटर अंतरावर गेलं तर आपण २० वर्षे मागे जाऊ शकतो—कदाचित् २०० किंवा आठ हजार वर्षांपूर्वीच्या प्राचीन दंडकारण्याची किंचित् प्रचीती आपल्याला येऊ शकेल. कोल्हापूरच्या नैऋत्येला कोल्हापूर-पाटगाव रस्त्यावर कडगावपासून १२ किलोमीटर अंतरावर सावदे गाव आहे. जिल्हा कोल्हापूर, तालुका भुंदरगड. २५ वर्षांपूर्वी कडगावपासून पायवाटेने चालत जावे लागायचे. आता एस.टी. बसही जाते. सावदे गावाजवळ छोटीशी देवराई आहे. डोंगरउतार आणि खाकी सपाट जमिनीवर पसरलेली, दोनतीन किलोमीटर लांबरुंद असेल तसेल. महाराष्ट्रातील अनेक देवरायांपैकी एक. उत्तुंग सदाहरित जंगलाचा एक तुकडा. पूर्वीच्या विस्तृत वनक्षीचा एक नमुनाच म्हटले तरी चालेल.

कोल्हापूर जिल्हा एकदरीतच वनसंपत्तीच्या दृष्टीने समृद्ध आहे—आहे म्हणताना मन काचरते—होता, आणि काही प्रमाणात अजूनही आहे. विशालगडच्या पायथ्याचे गजपूर जंगल, उदगीरीची विस्तीर्ण (सुमारे १५०० हेक्टर) देवराई, गगनबावठ्याच्या अलिकडचे पल्लवांचा जंगल, दाजीपूर अभयारण्यातील काळ डंग'व पाटाचा डंग (डंग म्हणजे धनदाट जंगल), सुरगीचे रान आणि कितीतरी सहभाडीच्या दऱ्याखोऱ्यातील पश्चिम कोल्हापूर जिल्हा म्हणजे सदाहरित, पानझडी व मिश्र जंगलांचा एक सलग पट्टाच होता. आता सर्वच जंगलांचा क्षाटधाने संकोच होत आहे व उधड्या बोडक्या डोंगरांच्या भीषण रांगा विस् लागल्या आहेत. आत्तापर्यंत देवराया तरी निपुंज जंगलतोडीमधून बाळवटातल्या ओघासिसमारक्या वाचल्या होत्या. देवराईतील झाडांची तोड केली तर देवाचा कोप होतो ह्या श्रद्धेमूले, अंधश्रद्धेमूले म्हणा हवं तर. पण आता लोकांच्या लक्षात आले आहे की, देवाचा कोप वगैरे सगळं खोटं आहे. म्हणूनच ज्योतिबाच्या डोंगराजवळील

पोहारे-कुशारेची देवराई तोडण्याचे कंत्राट देण्याचे विश्वस्त समितीनेच ठरवले. कोल्हापूरमधील काही निसर्गप्रेमींच्या प्रयत्नांमुळे आणि मुख्यतः जाणत्या व जागरूक ग्रामस्थांच्या विरोधामुळे हा अनर्थ टळला. जंगलतोडीमुळे होणारे दुष्परिणाम जाणवू लागले आहेत. चारमाही खळल्लणारे झरे आटून जाऊ लागले आहेत. बांधकामासाठी व जळणासाठी लागणारा लाकूडफाटा मिळणे दुरापास्त झाले आहे. परिसरातील शेतजमिनीची धूप होत आहे, तिची जलधारणाक्षमता कमी झाली आहे. हा निसर्गाचा प्रकोप आहे—सर्वसामान्यांना समजावे अशा भाषेत ह्या जंगल देवाचा खेप म्हणत असावेत! उदगिरीच्या विस्तृत देवराईतील सहस्रावधी वृक्षांच्या तोडीचे कंत्राट एका कंत्राटदाराने घेतले. वनखात्याने त्यावर बंदी आणताच त्याने न्यायालयातून बंदीवर स्थगिती आदेश मिळविला आणि रातोरात तोड मुरूही केला. कोल्हापूरमधील जागरूक निसर्गमित्रांनी निसर्गप्रेमी जिल्हाधिकारी यांच्या ध्यानात ही गोष्ट आणून दिल्यावर त्यांनी अत्यंत तडकाफडकीने कार्यवाही केली. तोडलेले लाकूड जप्त केले व भावी तोड थांबवली.

सावई राईमध्ये छोटेसे प्राचीन शंकराचे मंदिर आहे. अर्थातच हेमाडपंती बांधणीचे. (कोल्हापूर जिल्ह्यातील बहुतेक प्राचीन मंदिरे ह्याच प्रकारची आहेत.) मंदिराकडे जाणारी वाट नागमोडी असल्याने अगदी देवळाजवळ गेले तरी देवळाचा बांगपत्ता लागत नाही, आणि मग एकदम थोडीशी मोकळी जागा आणि देऊळ दिसते. पायवाटेने जातानाच तापमानातील फरक एकदम जाणवतो (मायक्रो क्लायमेटिक इफेक्ट), आणि एक नीरव, स्वच्छ, शुद्ध प्रसन्नता अनुभवायला मिळते. पायवाट सोडून जंगलात शिरायचे म्हटले तर सहजामहजी शक्य नसते. बरोबर घेतलेले दोन गावकरी गच्च भरलेला झाडोरा काठघांनी बाजूला करीत तात्पुरती वाट करून देतात. तरीही काही खोडकर बेला तुम्हाला बाचपडायला सावतात, तुमचे कपडेही अल्लडपणे धरून ठेवतातच! अक्षरशः उन्हाचा कवडसाही खाली पडत नाही म्हणतात ना, त्याची सत्यता पटते. अगदी आजही.

वीसपंचवीस वर्षांपूर्वी ही देवराई म्हणजे वनस्पतींचा खजिनाच होता. आईन, वेहडा, फणशी, नागकेशर, पानचोटी, कारे, सातवीण, तमालपत्र, पिसा, पिशी, बोक, उंबर, पिपरी, चारोळी आणि रुद्राक्ष असे उत्तुंग सदाहरित वृक्ष हारीने उभे होते. त्यातले चारोळी आणि आईनासारखे काही पानझडी वृक्षही पाने गाळायचे विसरून येथे सदाहरितरव पावले होते! कित्येक वृक्षांच्या बुंध्यांच्या व्यास सहज तीनचार फूट भरेल. बहुतेक वृक्ष तीसचालीस फूटापर्यंत सरळसोट शाखाविरहित, बरती त्यांच्या फांशा एकमेकात अशा गुरफटलेल्या की माना बर करऊन दांबणीच्या साहाय्याने पाहू गेले तरी कुठल्या वृक्षाची पालवी कोणती हे लवकर समजायचे नाही. खाली पडलेल्या पाने, मोहोर व फळे तसेच खोडाच्या साली ह्यांच्या अभ्यासावरूनच त्यांची ओळख पटवून घ्यायची.

मोठ्या वृक्षोत्तमांच्या खाली विविध मध्यम आकाराच्या वृक्षांचा स्तर (सेकंड कॅनोपी) तीस चालीस फूट उंचीपर्यंत वाढलेला. त्यात मुख्यतः तांबट, कोंकम, सुरगी, हेंकळ, हिरडा, अंजन, गेळा, लोखंडी, लोध, पारजांभूळ, रानजायफल, असाना, भोमा, कुंकू, काजरा, नांदक, मिरजोली, कटकुडा, चिकना, साली, निर्मली ह्यांचा आढळ सर्वत्र. त्यांतले सुरगी, तांबट, हिरडा, पारजांभूळ, असाना, कुंकू इत्यादी वसंत ऋतूत फुललेले असायचे व त्यांचा एक मिश्र सुवास सर्वत्र दरवळलेला. लोध, गेळा, कोंकम ही मंडळी भर

हिरवाळ्यात मोहरतात. कालिदासाने लोधवर्ण सुवती मुखप्रसाधनासाठी केसपावडर म्हणून वापरीत असे वर्णन केले आहे. त्याचा अनुभव घ्यावा. फुलांचा एक गुच्छ (फुलोरा) चेहऱ्यावरून फिरवला की, त्याचे सफेत मुलायम सुवासिक परागवर्ण चेहऱ्यावर चिकटते. कुंकूवाची नर व मादी झाडे वेगवेगळी असतात. मादी वृक्षांना छोट्या सुपारीच्या आकाराची साल फळे येतात. फळ कपाळावर दाबून फिरवले की कुंकूमतलक सावसा जातो. फळावरील साल पूड म्हणजे आयर्वेदीय औषध कापसा.

मध्यवृक्षांच्या खालची तिसरी फळी (थर्ड कॅनोपी) कमीअधिक उंचीच्या कटेरी बिनकाटेरी झुडुपांची. त्यांच्या अनेकविध जाती. त्यात कटेरी रौद्रवंती, रानजास्वंद, माकडलिंबू, करवंद, चिलर, तोरण, चिमट, कटेरी, त्रिचुडी. यांच्यामुळे सहजसंचार करणे अशक्य होते. रौद्रवंती तर नावाप्रमाणे रुद्रावतारी. तिचे काटे अतितीक्ष्ण व हुकासारखे वाकडे. पण फुलल्यावर पहात राहावे असे एकएक टपोरे पिवळसर पांढरे फूल—त्यामध्ये असंख्य ताजुक पुकेसर, तर फळे टेनिसच्या चेंडूसारखी. चालून वमल्यासारखे वाटत असेल तर माकडलिंबाची पाने चुरगाळून हुंगावी. एकदम हुपारी वाटते. रानजास्वंद तर फारच देखणे झाड. सोनेरी पिवळ्या फुलांच्या मध्यभागी तपकिरी रंगाचे वर्तुळ. बहारदार रंगसंगती. हे अजून उद्यानवानस कसे झाले नाही याचेच आश्चर्य वाटते. बिनकाटेरी झुडुपात पांढरी, धामन, हळदी, दिडा, चिन्नाटी, बंगली गांजा, अटवी, पापट, डिकना, दसमुली, कारवी, कारवा, भुईगेंद, रानअबोली, अडळसा, निर्गुंडी, भंदिरा, पांगळी, वामणी यांचा भरणा अधिक. रानअबोलीचे फूल अबोलीसारखेच पण चकक हिरव्या रंगाचे! पापटच्या पानावर हमखास पिवळ्या-नारंगी रंगाच्या ठिपक्यांची रांगोळी असायचीच. हा एक कवकजन्य रोग (फंगल डिमीज) आहे. ह्या कवकाचे वनस्पतीशास्त्रीय (लॅटिनमध्ये) नाव काय असावे? "कुलकर्णीएना"! अगदी आंतरराष्ट्रीय नाव—कुलकर्णी नावाच्या वनस्पतीशास्त्रज्ञाच्या नावावरून ठेवलेले.

ह्या सर्व वृक्षवृक्षांच्या गर्दीवर जणू ताण करणाऱ्या, जंगलाची दाटी वाढवणाऱ्या वेली आणि महावेली इथे ठायी ठायी, आढळतात. विशेष लक्ष वेधून घेणाऱ्या महावेली म्हणजे गारंबी, पहाडबेल, टिपण, पिलुकी, पेंटकूळ, फुसर, गावेल, बोंडबेल, महोल, पळसवेल, घोटबेल, आंबट आणि अंबुळगी. त्यातल्या गारंबीची शान काही औरच. बुंध्याजवळ खोड एकदोन फूट व्यासाचे. तीनचार प्रचंड फांशा निर्गिराळ्या दिशांना थोडे अंतर जमिनीसरपट जाऊन आधार मिळेल तेव्हा वर झेपावलेल्या—अगदी उंचच उंच वृक्षवृक्षांच्या सर्वोच्च शाखांवर पसरलेल्या. एका वृक्षावरून दुसऱ्यावर अशा शे-दोनशे फूट दरवर पसरलेल्या. एक एक शेंग पाचसात फूट लांबीची, चमकदार तांबूस विटकरी रंगाची. हिलाच गरूडबेल असेही साध नाव आहे. अंबुळगी लक्ष वेधून घेते तिच्या रुपेरी चकाकणाऱ्या पर्णराजीनी, तर घोटबेल मोठ्या लंबगोल पानांनी आणि गेंद-फुलोऱ्यांनी, महोल ही कांचनकुळातली एकमेव बेल तर पळसवेल ही पळसाची घोरली बरीचच.

लहान वेळींमध्ये गुंडाळत जाणाऱ्या, झुडुपांवर वाढणाऱ्या, फांशा खाली लोंबणाऱ्या वेळीच जास्त. देवजाई, रानजाई, रानमोगरा, मंजिष्ठ, कृष्णसारिका, हिरणदोडी, कावळी, मिरवेल, ओंबळी, सर्वत्र आढळतात. त्यातल्या ओंबळीसारख्या काही महावेळीही होतात.

जमिनीजगतचे तण किंवा झाडोरा एकंदरीत कमीच, कारण सूर्यप्रकाशाची कमतरता.

पण तेथेही कमी प्रकाशात वाडू शाकणाऱ्या (स्किओफाइडस) नेचे, बेगोनिया, रानगौरी, शोवाळपाचे अनेक प्रकार, जवळ, भूछत्र, लव्हाळे, केन्या, गवताच्या तीनचार जाती अशाची शिरवळ आहेच. अधूनमधून असलेल्या सूर्यप्रकाश पोहोचू शाकणाऱ्या मोकळ्या क्षेत्रामध्ये बुरुन्बी, कवढी, उडीचिराईत, रतौली, खोळली, आणि गवतकुल व कडधान्यकुलातील शाकवनस्पतींची दाटीवाटी. वृक्ष आणि क्षुपांच्या फांशा शोवाळे, कवक, लायकेन्स, वीटकभक्षक युट्रिक्वलेरिया, आर्दीनी लवडलेल्या त्याशिवाय फांशाफांशावर वृक्षरुहा (एपिफाइट्स) अमरी (ऑर्किड्स), नेचे आणि जुने, पूर्णपणे कुडलेल्या पानापाचोळपाचे कृषतमुदेमध्ये (ह्यूमस) रुपांतर झाल्यामुळे मूळची लांबडी माती काळसर झालेली. तिच्यावर अर्धवट कुडलेल्या आणि नवीन पडलेल्या पानापाचोळपाचा थर. त्यामध्ये असंख्य कृमीकीटक, कवक, जीवाणू (बॅक्टेरिया) तसेच गोगलगायीसारखे प्राणी व त्यांच्यावर जगणारे प्राणी यांचा समतोल साधला गेलेला.

पंचवीस वर्षांपूर्वी मी जेव्हा प्रथमच श्री. दिवाण (मधुमाशापालन अधिकारी) यांच्याबरोबर सावर्डे राईत गेलो त्यावेळी मन हरखून गेले होते. तिथला 'रानबा' ('बिल्डरनेस') मनाला चटका लावणारा होता. स्वर्ग स्वर्ग म्हणतात तो हाच की काय, देव स्वर्गात असतो म्हणतात म्हणूनच ही देवराई की काय, असे वाटण्याइतक्या कडगावहुन पायवाटेने रमतगमत, बाटेत वळालेल्या ओढ्याकाठी डबा खाऊन संध्याकाळी सावर्डे गावात पोहोचलो होतो. एका विस्तीर्ण माळवर मनोहारी गवताळ कुरणामध्ये कीटकभक्षक झुसैरा वनस्पतीचे जणू शेतच आडळले! हजारो झुसैरा, सुंदर गुलाबी फुले व केसाळ पानावरील दबबिंदू मोल्यासारखे चमकणारे. म्हणूनच हिला 'दबबिंदू' (सन डप) म्हणतात. कोलेजमध्ये शिकत असताना केळकर भाईंनी (एस्.पी. कोलेज, पुणे) खंडाळपाच्या अभ्यास-सहलीत प्रथम झुसैरा दाखविला होता त्याची आठवण झाली. त्यानंतर नाशिकपासून गोव्यापर्यंतच्या सह्याद्रीमध्ये तो असंख्य ठिकाणी पाहिला होता. पण इथल्याइतका विपुल प्रमाणात, मनसोक्त कुठेच दिसला नव्हता. मध्येच टेकडीच्या उतारावर झुडपांचे रान लागले आणि वातावरणात दरबळलेला एक अनोखा सुगंध कशाचा असेल म्हणून सर्वत्र निरखून पाहिल्यावर एका झुडपाआड दडलेली दोन मोठी, पांढरी, मुलायम, अनियमित आकाराची (झायगोमोर्फिक) फुले दिसली! अप्रतिम सौंदर्याची खाणच ती. मनोहारी आकृतीबंध, मोठा आकार (दोनतीन इंच), मुलायम पिंबूळसर पांढरा रंग, त्यात मध्ये पिंबूळ ठिपका आणि रेटदार रोपूट (स्वर) असलेली ही फुले फार पूर्वी खंडाळपाला पाहिली होती, महाबळेश्वरबरोबर. त्यानंतर महाबळेश्वरला, प्रत्येक वेळी ती तीनचारच दिसली होती. येथे ते रान संपेपर्यंत ठायींठायी आडळली. धनगरांना मराठी नाव विचारले तर त्यांनी सांगितले 'वाघचोर'. ही एक ऑर्किडचीच जात (प्लॅटिगेरा सुसानी), पण जमिनीवर वाढणारी. फुलांच्या पाकळ्या जाड व मांसल असल्याने हवैरियम नमुना मात्र बनवता आला नव्हता.

अशी ही सावर्डे राई, बीसपंचवीस वर्षांपूर्वी तेथे जंगलधरार अनुभवता घायचा. लोकांची थडा तर इतकी दृढ होती की, राईतील वाळलेल्या काटकाकुटका, वटलेली झाडेही तोडली जात नसत. दोन वर्षांपूर्वी पुन्हा तेथे गेलो होतो बऱ्याच वर्षांच्या अंतरानंतर. अजूनही देवराई आहे, पण फक्त मंदिराच्या अवतीभोवती. डोंगरउतारावरील राईचा भाग

पूर्णपणे जंगलतोडीच्या भक्ष्यस्थानी पडला आहे. पूर्वीच्या क्षेत्रफळाच्या सुमारे एकतृतीयांश इतकेच क्षेत्र जाता राहिले आहे. गाव काहीसे राईच्या जवळ सरकत आले आहे. गावाच्या बाजूची अनेक झाडे तर नुकतीच तोडल्याच्या खुणा दिसत होत्या. काही जातीच्या वनस्पती शोधूनही, प्रयत्न करूनही दिसल्या नाहीत. महाराष्ट्रात फक्त ह्याच राईत पाहिलेल्या कित्येक जाती तेथून नामशेष झाल्या आहेत. पानचोटीचे (पॅलेस्विद्यम एलिप्टिकम) उंच उंच वृक्ष, तसेच देवजाईची वेल (क्लेमॅटिस स्मायलॅसिफोलिया) कर्नाटक-केरळमधील सदाहरित जंगलाची आठवण करून देत असत. देवजाई (नाव मीच ठेवले, फक्त देवराईतच ती आडळली) ही जाई कुळतली नव्हेच तर मोरवेल व रानजाई कुळतली (रॅननक्वलेसी) वेल. ऑक्टोबरमध्ये ही फुलली की तिची शोभा अवर्णनीय असायची. वीडदोन इंच व्यासाची मोठी जांभळट फुले आणि मसमली तपकिरी कळपा. आता पानचोटीचा एकही वृक्ष नाही की देवजाईही नाही. परिसरात आडळणारा झुसैरा आणि अप्रतिम लावण्यावान वाघचोर, युनिमस आणि बूमजचे छोटे वृक्ष, जाईवंशी नावाची अमरी (डेन्ड्रोबियम मॅकेयी) सारे सारे काळच्या ओघात गढप झाले आहेत. बोक आणि रुद्राक्ष हे वृक्षोत्तम अंतर्धान पावले आहेत. गावाभोवतालचा टेकड्यांचा परिसर उजाड झाल्यामुळे लोकांची बळदुष्टी देवराईकडे वळली. लोकांसंख्यावादींमुळे सरपणाची आवश्यकता वाढली. देवाच्या जोपाची भीती कमी झाली. लोकांची वर्दळ वाढली, अगदी प्रातःपंधीसाठी सुद्धा. पूर्वी जो नीरव, थंड, आल्हाद जाणवायचा तो आता राहिला नाही.

काही बयोबुद्ध गावकऱ्यांना विचारल्यावर त्यांनीही हताशपणे सांगितले की सरपण पुरत नाही, देवराईचे महत्त्व वाटेनासे झाले आहे. आसपासच्या परिसरात नाचणीचे पीकही आता पूर्वीसारखे येईनासे झाले आहे. बाहेरचे कंचाटदारही लाकूडतोडीसाठी येतात. कायदा न मानण्याकडे लोकांची प्रवृत्ती वाढत आहे. एकंदरीत परिस्थिती बिघडली आहे, जसे ज्हायला नको होते, असे त्यांनी हळहळून सांगितले.

सावर्डे राई हा अनेकविध वनस्पती नमुन्यांचा एक असोल ठेबा आहे. शोकांडो वर्षापूर्वीपासूनच्या जंगलाचा तो एक उर्वरित अवशेष आहे. त्याचे जतन, संवर्धन होणे अत्यावश्यक आहे. त्यासाठी जसे फक्त कायदे करून कार्यभाग साधणार नाही, त्याचप्रमाणे केवळ जनजागृतीचाही फारसा उपयोग होईलसे दिसत नाही. त्यासाठी साकल्याने विचार करून सर्वोच्च प्रयत्न शासकीय, निमशासकीय तसेच खाजगी पातळीवरही आवश्यक आहेत. त्यासाठी काही सूचना खालीलप्रमाणे :

- 1) देवराईच्या मूळच्या क्षेत्राला कुंपण घालावे
- 2) देवराईतील वनस्पती, प्राणी व पर्यावरणाचा सखोल अभ्यास तज्ज्ञांकडून करवून घ्यावा व तो प्रसिद्ध करावा
- 3) देवराईत वृक्षारोपण करू नये. निसर्गाला आपले काम करू द्यावे. तरीही करणे आवश्यक वाटल्यास मूळच्या देवराईतील जातीची रोपे गोळा करून किंवा तयार करून लावावीत. निलगिरी, मुंबामूळ अशी अजिबात लावू नयेत
- 4) परिसरातील गावकऱ्यांना निसर्गाविषयी, पर्यावरणासंबंधी माहिती देऊन निसर्गसंवर्धनाचे महत्त्व पटवून द्यावे
- 5) देवराईबाहेरील परिसरात विविध झाडे वाडविण्याचा प्रयत्न युद्धपातळीवर करावा

त्यात एनर्जी प्लॅंटेशन योजनेचा अंतर्भाव करून लवकरात लवकर वाडणारी वरील झाडे मोठ्या प्रमाणावर, सरपणासाठी लावावीत. त्यात सूरु (खडशोरणी), शिरीष, भोकर, ऑस्ट्रेलियन चामूळ, मुंबाभूळ, पांगारा, शेवगा, हातगा इत्यादी जातींचा समावेश करावा. ६) नाचणीसारखी जिराईत पिके उतारावरील बरकड जमिनीत येणाऱ्या शेतकऱ्यांना वनशेतीचे महत्त्व व किफायतशीरपणा पटवून द्यावा. त्यांना त्यासाठी उद्युक्त करून सामाजिक वनीकरण क्षात्र्यामार्फत व अन्य प्रकारे मदत करावी.

७) देवराई ही एक "जीन बँक" आहे असे समजून तेथील झाडांच्या बिया गोळा करून त्यांची रोपे तयार करण्यासाठी रोपबार्टिका तयार करावी. अशी रोपे योग्य त्या ठिकाणी लावण्यासाठी द्यावीत. काही जातींची रोपे आवश्यकता असल्यास "क्लोनिंग" पद्धतीने तयार करावीत.

८) सरपणाचा वापर करताना बरीचशी उष्णता वाया जाते. सुधारित चुलीचा प्रसार करणे व उर्जेचा योग्य उपयोग करण्याच्या पद्धती जनतेला समजावून देणे फारच महत्त्वाचे आहे. ९) गोबर घेंस, सूर्यउर्जा अशा अपारंपारिक उर्जासाधनांचा वापर शक्य त्या ठिकाणी करून सरपणाची वचत करावी.

१०) एकंदरीत आसपासच्या सर्वच परिसराची पाहणी करून नियोजन करावे. भूदुसंधारण व जनसंधारणासाठी विशेष प्रयत्न घ्याव्याने डोंगरउतारावरील क्षेत्रांमध्ये निकडीचे आहेत.

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"वारीवांचे"
३१४० ए वॉर्ड
कण्हेरकर रस्ता
कोल्हापूर-४१६ ००२

संदर्भ

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सावर्दे राई

१	आईन	<i>Terminalia tomentosa (alata)</i>
२	बेहडा	<i>Terminalia bellerica</i>
३	फणशी	<i>Carallia integerrima</i>
४	नागकेशर	<i>Maesua ferea</i>
५	पानचोटी	<i>Palaquium ellipticum</i>
६	झारे	<i>Diospyros ebenum</i>
७	सातवीण	<i>Alstonia scholaris</i>
८	तमालपत्र	<i>Cinnamomum zeylanicum</i>
९	पिसा	<i>Actinodaphne hookeri</i>
१०	पिशी	<i>Litsia zeylanica</i>
११	बोक	<i>Bischofia javanica</i>
१२	उंबर	<i>Ficus glomerata</i>
१३	पिपरी	<i>Ficus tsiela</i>
१४	चारोळी	<i>Buchanania latifolia</i>
१५	रुदाक्ष	<i>Elaeocarpus ganitrus</i>
१६	तांबट	<i>Flacourtia indica</i>
१७	कोकम	<i>Garcinea indica</i>
१८	सुरंगी	<i>Ochrocarpus longifolius</i>
१९	हेंकळ	<i>Gymnosporia montana</i>
२०	हिरडा	<i>Terminalia chebula</i>
२१	अंजन	<i>Memecylon umbellatum</i>
२२	गेल	<i>Randia brandisii</i>
२३	लोखंडी	<i>Ixora parviflora</i>
२४	सोष्ट	<i>Symplocos beddomei</i>
२५	पारजाभूळ	<i>Olea dioica</i>
२६	रानजायफल	<i>Myristica attenuata</i>
२७	असाना	<i>Bridelia retusa</i>
२८	भोगा	<i>Glochidion hohenackeri</i>
२९	कुंकू	<i>Mallotus philippinensis</i>
३०	काजरा	<i>Strychnos potatorum</i>
३१	नांदुळ	<i>Ficus retusa</i>
३२	मिरजोली	<i>Symplocos spicata</i>
३३	काटकडा	<i>Ixora nigricans</i>
३४	चिकना	<i>Bridelia hamiltoniana</i>
३५	सान्नी	<i>Aporosa lindleyana</i>

३६ निर्मली	<i>Strychnos</i> sp.
३७ रौद्रवती	<i>Capparis moonii</i>
३८ रानजाखंद	<i>Hibiscus furcatus</i>
३९ माकडीलिम्बू	<i>Atlantia racemosa</i>
४० करबंद	<i>Carissa congesta</i>
४१ चिलर	<i>Acacia intsia</i>
४२ तोरण	<i>Zizyphus rugosus</i>
४३ चिमट	<i>Scotia indica</i>
४४ काटेरी	<i>Haplanthus verticillaris</i>
४५ चिचुई	<i>Solanum indicum</i>
४६ पांडरी	<i>Ligustrum neilgirrense</i>
४७ धामण	<i>Grewia asiatica</i>
४८ हलदी	<i>Garcinia spicata</i>
४९ दिहा	<i>Leea sambucina</i>
५० चिम्नाटी	<i>Indigofera pulchella</i>
५१ जंगली गाजा	<i>Desmodium laxiflorum</i>
५२ अटकी	<i>Maesa indica</i>
५३ पापट	<i>Pavetta indica</i>
५४ डिकना	<i>Blepharis asperima</i>
५५ उलमुली	<i>Eranthemum roseum</i>
५६ कारवी	<i>Carvea callosa</i>
५७ कारवा	<i>Strobilanthes exiocephalus</i>
५८ भुइयेंद	<i>Lepidagathis cristata</i>
५९ रानजबोली	<i>Dedilacanthus roseus</i>
६० अडळता	<i>Adhatoda vasika</i>
६१ निर्गुडी	<i>Vitax negundo</i>
६२ भोंदिरा	<i>Clerodendrum infortunatum</i>
६३ पांगली	<i>Pogostemon parviflorus</i>
६४ बामली	<i>Colebroockia oppositifolia</i>
६५ गारवी	<i>Entada scandens</i>
६६ पहाडवेन	<i>Cocculus macrophylla</i>
६७ टिपण	<i>Allophyllus cobbe</i>
६८ पिलुकी	<i>Combretum extensum</i>
६९ पेटकुळ	<i>Dalbergia sympathetica</i>
७० कुमर	<i>Jasminum malabaricum</i>
७१ गावेन	<i>Argyrea hookeri</i>
७२ बोडवेन	<i>Lettsomia elliptica</i>

७३ महोल	<i>Bauhinia vahli</i>
७४ पळसवेन	<i>Butea superba</i>
७५ पोटवेन	<i>Smilax macrophylla</i>
७६ जांबट	<i>Embelia viridiflora</i>
७७ अंबुळगी	<i>Elaeagnus conferta</i>
७८ देवजाई	<i>Clematis smilacifolia</i>
७९ रानजाई	<i>Clematis wightiana</i>
८० रानमोगरा	<i>Jasminum pubescens</i>
८१ गोंजळ	<i>Rubia cordifolia</i>
८२ कृष्णसरिका	<i>Ichnocarpus frutescens</i>
८३ हिरणदोडी	<i>Marsdenia volubilis</i>
८४ काबळी	<i>Cryptolepis buehanani</i>
८५ मिरवेन	<i>Piper nigrum</i>
८६ ओंबळी	<i>Gnetum scandens</i>
८७ रानगौरी	<i>Impatiens balsamina</i>
८८ लव्हाळे	<i>Cyperus</i> spp.
८९ केन्धा	<i>Commelina</i> spp.
९० कवटी	<i>Swertia decussata</i>
९१ उडीचिराईत	<i>Exacum bicolor</i>
९२ दबबिंदू	<i>Drosera indica</i>
९३ वापचोर	<i>Platanthera sussaenae</i>
९४ जाडवंबी	<i>Dendrobium macraei</i>
९५ नाचणी	<i>Eleusine coracana</i>
९६ खोफली	<i>Acalypha indica</i>
९७ ब्रूमज	<i>Celtis cinnamomea</i>
९८ अमरी	<i>Aerides crispum</i> or other orchids
९९ रावना	<i>Vanda roxburghii</i>
१०० जामकी	<i>Hoya retusa</i>
१०१ रतोली	<i>Lippia nodiflora</i>
१०२ चूठम्बी	<i>Leucas stelligera</i>

Faith & Forests Go Together

S. D. Mahajan

Not far from Kolhapur (about 90 km.) was a patch of primeval forest, the famous Sacred Grove of Sawarde. Till recently, though forests in other parts of the district had disappeared, the groves remained due to peoples' faith in deities who were supposed to be the guardians of these forests. The erosion of these sentiments has now threatened these groves also. In one case the trustees of the organization, the legal custodians of the Grove, themselves decided to sell the forest. Only the timely resistance by environmental groups and intervention of the district collector saved the Grove.

The author then describes the luxuriant vegetation of the Sawarde grove, where due to the effect of the micro-climate, even deciduous trees had turned evergreen. The forest divided into different canopies, harboured a variety of rare plants including many used in medicine. The shrubs and the giant lianas, the insectivorous plants and the epiphytes including some beautiful orchids presented an undisturbed eco-system with insects and birds taking their allotted place in the close-knit network.

This was the scene 25 years ago. Now there is transformation to the detriment of biological diversity. This was due to the pressure of population. There is also pressure from outside contractors who want to extract timber. Moreover, people do not believe in, as in former days the religious importance of the grove.

It is now imperative to realize the importance of such groves which are veritable gene pools. Lastly the author suggests some steps such as protection, propagation of indigenous species and creating awareness among people about their importance.

ANNUAL REPORT 1989-90

I. The year under review saw the completion of two projects undertaken by our Society. The first was at Panshet, about 48 km west of Pune near the famous Panshet dam. The Project involved restoration of biological diversity on a hill flanking the Panshet reservoir. In practical terms it involved greening of our barren hills. I avoid the word "afforestation" in talking about "greening". Afforestation now-a-days has come to mean plantation of fuel, fodder and fruit-bearing trees. While we did plant a few of such trees, we were mainly interested in studying natural regeneration, that progresses once biotic interference, grazing, trampling and cutting of plants, was removed. I therefore, prefer the word "restoration" to describe the work we did.

The experience we gained during the 3 years (1986-89) that we worked the Project should prove useful to those who wish to restore biological diversity in our hills. The report we submitted to the Ministry of Environment & Forests, New Delhi, the sponsors of the research project, highlights the following: 1. Given the social practices prevalent in the hills, restoration is a fairly costly job. Our minimum cost was almost Rs. 6000/- per hectare, per year. 2. If the present practice of letting the cattle and goats loose to graze in the hills, is not effectively curbed or banned, this cost is likely to increase exponentially. 3. Afforestation, as it is practised today, will be costlier than restoration, as it involved irrigation, manuring and care and protection of plants. Provision of irrigation water to hill plantations is neither possible nor feasible.

4. Moreover, restoration gives rise to a forest which benefits not only man but other creatures as well; in effect, restoring the ecological balance disturbed due to years of misuse.

Three years of work on the Project site have rejuvenated nutritious grasses, a host of medicinal plants and some fodder and fuel trees. But as the land was previously highly degraded, the plants took a long time to establish themselves and are as yet young and tender. They will need protection for at least another two years. We have applied to the Ministry for funds to enable us to continue the Project for two years more.

II. This year also saw the completion of the first country-wide project that the Society undertook. The Project was to assess the status of a large bird, the Sarus crane, and to find out how this bird, which is a commensal of man, is faring. It therefore, involved the study of man and bird interrelationship. The report that we submitted to the Wildlife Department of the Ministry of Environment and Forests, brings out the fact that Sarus has disappeared from many regions from its former range and its population is declining. Where it is still common, its breeding is not successful due to human pressures on its wetland breeding habitat. Sarus has now retreated to regions which are called "backward" in terms of economic development, signifying that pressures of economic development are adversely affecting its natural habitat.

This probably is the first country-wide study of man and bird relationship.

III. Our Society entered the field of higher education for the first time this year. In collaboration with the Engineering Staff College of Government of Maharashtra, we conducted a Seminar and Orientation Course at Koyananagar on Ecological Considerations in Water Management for Class I officers of the Irrigation Department of Government of Maharashtra.

The Society now wishes to make such courses a regular activity.

IV. In May the Executive Director visited USA, his visit made possible by a grant of Fellowship by International Crane Foundation, Wisconsin, USA. In September he visited USSR to attend an international workshop on cranes through an invitation from the Academy of Sciences of USSR. In December he also attended the India-Pakistan Conference on the Environment organized by the Centre for Science and Environment, New Delhi and WWF-Pakistan.

In December 1989 we participated in the Asian Crane Congress at Rajkot as one of the organizers and in January 1990 as one of the national coordinators for the annual waterfowl count.

V. In January 1990 the Executive Director attended a meeting at Bharatpur. The meeting was called by Govt. of India to discuss the conservation of Siberian cranes wintering in the Keoladeo Ghana National Park, Bharatpur. The heads of wildlife departments of Gujarat, Rajasthan and UP also participated. The meeting discussed the comprehensive project proposal for conservation of Siberian cranes submitted by our Society to the Govt. of India. From this proposal the aerial survey to locate wintering sites of these cranes outside Bharatpur was decided to be taken up on priority. While Govt. of India organized some aerial sorties, our Dr. S. V. Bhawe made a reconnaissance in his own plane and located a pair of Siberian cranes about 60 km southwest of Bharatpur on a wetland called Baretha Bandh. The official effort did not meet with such success. Dr. Bhawe plans to make a detailed survey next season, hopefully with financial backing from the government.

Before we close we wish to record with deep sorrow the sad demise of Sumant Moolgaonkar, our benefactor and supporter and one of the leading conservationists of the country.

The Society is now poised to carry out with greater vigour the work of research, education and restoration in the fields of ecology and environment.

Prakash Gole
Executive Director.

Ecological Society

The Society was founded in 1982 to promote research and education in ecology. Through research, the Society endeavours to study the impact of developmental activities on ecology; through education, the Society tries to make people aware of the implication of the adverse effects on ecology; and through field projects the Society proposes to set up model units where developmental planning and ecological conservation complement each other to better the lot of the people.

Members of the public are cordially invited to participate in the work of the Society by becoming a Wellwisher (life contribution Rs. 100), a Benefactor (life contribution Rs. 1000), or a Patron (life contribution Rs. 10000). Contributions in cash or kind are accepted. All donations are exempt from income tax. All the three categories of participants receive Society's *Journal* and are invited to programmes organised by the Society such as talks, film and slide-shows, seminars and symposia, field trips and excursions etc.

All contributions and correspondence to the Society should be directed to the official address of the Society in the name of the Executive Director or the Editor, *Journal of Ecological Society*, as the case may be.

Views and opinions expressed in the *Journal* or other publications of the Society are not necessarily of the Editor of the *Journal* or the Trustees of Ecological Society.