

# JOURNAL OF ECOLOGICAL SOCIETY

Vol. 1, 1988

*Editor*  
*Prakash Gole*



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ECOLOGICAL SOCIETY**

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## Foreward

The articles appearing in this journal have been written by various experts who have obviously taken a great deal of trouble over studying their particular fields in order to explain to the lay man the various dangers facing him, not only in the growing urban agglomerations but in the entire State generally. Natural resources like land, trees, water and air were regarded as unlimited upto recently, or at least in such plentiful supply as not to need any particular care or attention with regard to the extent of their use and exploitation. Latterly, and especially since the eighties, the scenario has changed rapidly and threatens to become totally confused and distressing, unless steps are taken urgently to rescue the ecological situation and restore some balance between land & its "users". 'Uses' can be easily defined and put into the form of a law or rule, but it is the "user" who succeeds in overcoming these laws or rules by using politically popular slogans such as the crying need of people for shelter and livelihood. The battle between environmentalists or ecologists and land developers is likely to be long drawn, but it must be waged without losing heart, if there is still to survive some charm in an ordinary citizen's life. It should be the endeavour of all thinking people to prove that orderliness and purposeful living can coexist.

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L. G. Rajwade  
*Chairman, Ecological Society*

## **History of Environment and Man in the Thar Desert**

*V. N. Misra and S. N. Rajaguru*

The Thar Desert of western Rajasthan occupies an area of nearly 200,000 sq. km., and has a human population of over 10 million. Most of the land surface is covered by high and long sand dunes and sand sheets. The rainfall is very scanty, ranging from about 500 mm per annum in the east, near the Aravalli hills to 100 mm in the west, and it is highly uncertain. There are neither river channels nor flowing water. In fact, on the drainage map of India the vast region between Ganganagar and Jodhpur and between Ajmer and Indo-Pakistan border appears totally blank. Because of scanty rainfall and absence of surface water, irrigation facilities are virtually non-existent, and for this reason no agriculture is possible during winter and summer months. Whatever cultivation is done is confined to the monsoon season when crops like *bajra*, *moth*, *til* and *gour* are raised. Because of inadequate agriculture, the population depends mainly on sheep, goat, cattle and camel pastoralism for its sustenance. Increasing livestock is also denuding the vegetation cover, and so is the increasing demand for fuel and timber. The result is that bereft of vegetation cover the sand dunes get destabilised, and the sand starts moving by high velocity summer winds and encroaches upon arable land. This phenomenon creates a scare among people that the desert is expanding toward the east. The delicate balance between man and environment established several thousand years ago is being steadily upset.

However, if we are to harness the limited resources of the desert to

satisfactorily support the growing population, and at the same time also prevent the further deterioration of the environment, we must have an accurate body of information to answer such questions as: when and how did the desert come into existence? Have the environmental conditions in the desert remained uniform throughout its history or have they changed? How long has man lived in the desert, and how has he adapted himself to the desert environment? What has been the role of man in the creation and expansion of the desert?

An understanding of the environmental history of the desert is also important from another point of view. It is now well known that our planet has experienced drastic climatic changes during the last one million years or so. In high *latitudes* these changes consisted of alternating cold and warm periods. In low *latitudes* the cold periods probably coincided with aridity and warm periods with humid conditions. It is now widely feared that the earth is heading for another Ice Age. If that turns out to be true, the arid zone of India will experience accentuated dryness which in turn will adversely affect agricultural production. To meet that eventuality we must have a reliable picture of the climatic changes in the past so that we can forecast the future changes with some degree of accuracy and plan measures to meet the challenges created by these changes.

Our knowledge to answer these questions so far has been very meagre. In the absence of reliable scientific data many theories have been advanced with regard to the origin and antiquity of the desert. To answer some of these questions the Department of Archaeology, Deccan College, Pune launched a modest project funded by the U.G.C. (University Grants Commission) five years ago. It is a multi-disciplinary project in which the main participants are Prof. V. N. Misra (Prehistorian) and Dr. S. N. Rajaguru (Geomorphologist and Environmental Archaeologist) and several research fellows and students from the Deccan College. Besides, scholars from several leading national and international institutions are participating to help solve special problems.

The main aspects of our work during last five years are as follows:

1. We have carried out several extensive reconnaissances of the desert to collect archaeological and geomorphic data. We have located nearly fifty new stone age and other sites on sand dunes and in fluvial sediments. We have studied dunes in many areas to understand their morphology, distribution pattern, and weathering profiles, and examined several hundred wells, tanks (*nadis*) and quarries to study the nature and stratigraphy of fluvial sediments and locate archaeological

sites in them. Every village has one or more *nadis* the digging of which has thrown up buried sediments and along with them stone implements in large numbers.

2. We have carried out excavation of several stone age sites at Jayal and Didwana in Nagaur district. These have revealed, for the first time, evidence of occupation of this part of our country by Lower Palaeolithic (Early Acheulian) Man, dating to about half-a-million years ago. These are the first excavations of Palaeolithic sites carried out in the desert. Until this work was done, it was believed that the desert came to be inhabited by man only during the Middle Palaeolithic times, some one hundred thousand years ago. What is even more significant is that we have been lucky to locate primary archaeological occupation sites where the stone tools lie buried in fine sediments exactly where they were manufactured, used and discarded by stone age man, and where they got buried in fine sediments deposited in sluggishly flowing water or in lakes and pools. This discovery of undisturbed living sites of Palaeolithic Age is considered very important in prehistoric research.

3. We have dug a 16 m. deep trench through a fossil sand dune at Didwana to recover the stratigraphy of various dune phases. This trench has revealed three major lithounits and at least four palaeosols. These lithounits differ from one another in the texture of the sand, colour, degree of compactness, mode and extent of calcium carbonate leaching and segregation, and humus content. In this 16 m. vertical profile the climatic history of the last 60 to 70 thousand years can be read like an open book, and even a layman cannot fail to see that environmental conditions during the period of dune formation were not uniform throughout, but were marked by considerable changes. It is for the first time that a fossil dune has been intentionally sliced open to recover climatic history. Earlier attempts at building the chronology of the dunes and of climatic fluctuations were based only on surface observations of dunes and were, it now turns out, highly erroneous. What has made our excavation in the fossil dune even more significant is the recovery of stone implements on two horizons. We now know on the basis of solid and unequivocal evidence that man had lived in the desert during the arid period which lasted from roughly 70 to 10 thousand years and when extensive and high dunes were formed. During this long and generally dry period there were short intervals of increased rainfall when dune surfaces acted as open land surfaces which were subjected to weathering and stabilization on which stone age hunter-gatherers camped. It is for the first time in India that stone artefacts older than the

Mesolithic period have been recovered from the body of the dune.

4. Prof. D. P. Agrawal and Dr. A. K. Singhvi have dated numerous carbonate, sand and lacustrine sediment samples by using Radiocarbon and Thermoluminescence dating techniques. They have applied for the first time anywhere in the world Thermoluminescence dating technique to the dating of dune sands. The results of this experiment are quite encouraging, and with increasing refinement of technique are expected to give us a larger number of dates to build a detailed chronology of the complex phases of dune formation and the weathering and stabilization of dunes during episodes of increased rainfall.

5. We have carried out detailed laboratory studies of ancient sediments and soils by using sophisticated techniques like X-ray diffraction and Scanning Electron Microscopy as well as mechanical and petrological analysis to understand the processes involved in the formation of these sediments and soils.

6. In 1980 we dug a 7.50 m. deep well in the deepest part of the Didwana salt lake bed to recover the stratigraphy and samples for sedimentological, palynological and radiometric analyses for the period before 10,000 years, as the climatic history of this lake for the last ten thousand years had already been worked out earlier by Dr. Singh. We already have a radiocarbon date of about 13,000 years from an upper horizon of these deeper lake beds. Dr. Singh is now working on the pollen analysis of these sediments, and Dr. R. J. Wasson and Dr. S. N. Rajaguru have completed detailed chemical and mineralogical studies of these sediments. Once the results of these analyses are available, we hope to have a fairly detailed picture of climatic fluctuations and their durations for the last 20 to 25 thousand years. Meanwhile, Dr. Kajale has started work on the palynological analysis of sediment samples from Tal Chhappar and Bap Rann Salt lakes.

7. We are collecting information from Survey of India toposheets, aerial photographs and Landsat imageries to supplement information collected from surveys on ground for reconstructing ancient landforms including palaeochannels.

As a result of this multi-disciplinary, collaborative research effort it has become possible to trace the evolutionary history of the desert over the last one million years or so, to understand the complex processes of climatic and hydrological changes involved in the formation of the desert, and the history of human adaptations to the changing environmental settings of the desert. The fascinating story that emerges from this sustained research effort can be summarised as follows:

Some 100 million years ago the Indian landmass was very close to the Equator, and the area now comprising the Thar enjoyed a warm tropical climate comparable to that of Kerala today. The major portion of the Thar was occupied by sea, and the Aravalli mountain acted as a great water divide for the Indian sub-continent. Owing to movements of earth's plates India shifted towards north, and the Western Ghats and the Himalayas came into existence some 30 to 40 million years ago. The great Sindhu sea receded from the Thar and the climate of the region became dry and continental. The Himalayas attained their present height due to continued epirogenic movements, and the monsoon system got firmly established in the area around two to three million years ago.

The Thar was watered by mighty streams comparable in size to the Indus and the Ganga about one million years ago. Geomorphologic evidence for the existence of such powerful streams is preserved in the form of relict bouldery beds from near Ladnun in Nagaur district in the east, to Phalodi in Jodhpur district in the west. These beds are best developed near Jayal in Nagaur district where they attain a width of some 10 km. and a height of nearly 75 m. above the surrounding ground level. When these beds were being formed, the Thar was certainly enjoying a much higher rainfall than today. Due to tectonic movements in the area the powerful drainage system got disorganised and was replaced by less powerful and meandering streams around half-a-million years ago. It is during this period that man first appeared in this area. Stone age hunter-gatherer groups camped on the shores of lakes and pools in the floodplains of these shallow rivers. We have unearthed campsites of Lower Palaeolithic man at a number of places around Didwana in Nagaur district. The archaeological evidence for the existence of man in the area is found in the form of stone implements like handaxes, cleavers, choppers, chopping tools, polyhedrons, etc. which are found embedded in the soft foamy sediments of lakes and pools and scattered on the surfaces of the bouldery beds of an earlier age. Early man selected suitable rocks and boulders of quartz and quartzite for making his tools from nearby hills and from the river beds which are now buried under sand dunes. The large number of sites located by us and the density of artefacts on them shows that the region was densely populated in Lower Palaeolithic times and must have had good vegetation cover and ample animal life. These pioneering colonisers of the Thar lived by hunting and collecting wild vegetable foods. Although no bones have been preserved in the sediments, from the faunal remains associated with stone tools of

comparable technological stage in the Narmada and Godavari alluvium, we can say that the Acheulian inhabitants of the Thar hunted large herbivores, and had adequately developed social organisation to permit coordinated group hunting. The discovery of a few quartz crystals in association with stone tools in our excavations at Didwana may suggest one of the earliest uses of semi-precious stones by stone age man in India.

The Acheulian people occupied the area for several hundred thousand years. During this long period they continued to refine the techniques of their tool making. Their later tools are more symmetrical in outline, thinner and have more even surfaces. These tools which we call Late Acheulian have been found in large numbers in the dug out loam of a tank at Jankipura, a few kilometres west of Didwana. With the passage of time some of the old tool forms were given up and new ones like scrapers and points were introduced. These tools were smaller and were made on small flakes carefully detached from large pieces of rock known as cores. The working edges of these small flake tools were strengthened by removing small shallow flakes from the margins, a process archaeologists describe as retouch. These later stone age people also used, alongside quartz and quartzite, fine-grained rocks like chert and chalcedony for making their tools. By around 100,000 years ago both the forms of tools and the techniques of making them had undergone sufficient transformation for us to designate them as belonging to a new stage of culture known as Middle Palaeolithic.

Around this time the Thar also began to experience changes in environment, the consequences of which were dramatic. Rainfall began to decline and the rivers started shifting their courses to the west, perhaps in response to tectonic movements in their headwater region. By around 70 to 60 thousand years ago the complex and well-integrated drainage of the earlier times had become totally defunct. The reduced rainfall and considerably lowered water table must have very adversely affected the vegetation growth. Strong winds started lifting up sand and silt particles from thickly alluviated surfaces which were parched for water and denuded of much of their vegetation cover, and began depositing them elsewhere. In this way much of the land surface of western Rajasthan was eventually covered by thick and large sand dunes and sand sheets. This arid climate, however, did not remain uniform throughout the long period of dune formation. Instead the aridity was interrupted on several occasions by short periods of increased rainfall. During these wet intervals the dune surfaces formed open land surfaces

on which vegetation grew and animal life flourished. The dune surfaces were stabilised and hard calcareous soils developed on them. Man reappeared in the area during these periods of congenial climate. The deep trench cut by us in a fossil dune near the Didwana salt lake has exposed a sand profile in which the several climatic fluctuations during last 70,000 years are beautifully preserved. There are three distinct lithounits representing three major phases of dune formation and at least four palaeosol horizons representing four wet episodes.

The onset of aridity in the region resulted in the decline of vegetal and animal food resources and forced Middle Palaeolithic populations to migrate to the southern part of the Thar where the Luni continued to flow due to good rainfall in the Aravalli hills. However, whenever conditions ameliorated in the northern part of the Thar due to increase in rainfall, hunter-gatherer bands reappeared in the area. In our excavations in the fossil dune at Didwana we have found stone implements at two horizons, at depths of about 10 and 6 m. from the surface. These implements include, besides scrapers and carefully struck thin flakes, symmetrical blades, suggesting considerable advancement in stone working technology. On the upper of these two horizons we discovered to our surprise a very small, thin and symmetrically shaped oval handaxe which is a masterpiece of stone age man's craftsmanship. This horizon has been dated by radio-carbon method to around 24,000 years ago. This handaxe therefore will be the youngest tool of its kind in the world, and probably the only one to be found in a sand dune. We have collected sediment and soil samples from the lower levels of the dune cutting for dating by radiocarbon and thermoluminescence techniques. But pending the availability of these dates, we can extrapolate the age of the older dune deposits from the already available dates from the upper levels of the dune. On that basis of these dates we can say that dune building activity began about 70 to 60 thousand years ago.

The history of arid climate preserved in the dunes is corroborated by the sediments deposited in the salt lake at Didwana. In the past many theories have been advanced regarding the origin of the salt lakes of Rajasthan. On the basis of the stratigraphic and sedimentological data collected by us from Didwana and several other lakes we can say with certainty that these lakes came into existence due to the disorganisation of the drainage system in the Thar. Lake sediments dated to before 10,000 years consist of alternating bands of sands, clays and evaporites, representing periodical filling and drying up of the lake. During periods of increased rainfall the lake was carrying fresh water, and it is during

these periods that the hunter-gatherer groups settled on the nearby dunes. During periods of reduced rainfall the lake turned saline, and sands were deposited in it, and halite and gypsum bands developed in these sandy layers.

The harsh dry environment of the Thar probably came to an end around 7,000 years ago. Due to considerably increased rainfall the lake started carrying abundant fresh water. In these deep waters of the lake clayey sediments were deposited which are preserved in the form of thin laminated bands. These clays are of dark black colour and because of their apparent likeness to kajal (collyrium) are known as kajalia. In these clays pollen grains have been preserved in rich quantities which help us in reconstructing the vegetation and climate of the period. On the dunes this wet climate is reflected in the form of a deeply weathered brown layer in the youngest dune phase. As a consequence of the luxuriant growth of vegetation which must have naturally followed increased rainfall and which is attested by the pollen record of the lakes, the dunes got stabilised all over the desert. This period seems to have been very congenial to human populations. Hunter-gatherer populations flourished in large numbers all over the desert. Their archaeological remains are found in the form of microlithic tools on numerous dunes. These microliths were made from tiny, slender, parallel-sided bladelets by steeply blunting one or more margins. Their shapes are often geometric like crescents, triangles and trapezes. A series of these tiny tools were hafted in slotted wood and bone handles and shafts to make spears, arrows, knives and sickles. There is definite evidence from Central Indian rock paintings that microliths were used to tip and barb arrowheads. Bow and arrow came to be regularly used for hunting in this period. Also for the first time shallow grinding stones began to be used for the preparation of food. These innovations in technology coupled with increased food resources which must have been generated by higher rainfall were probably responsible for the dramatic rise in human population in this period. The widespread and often dense distribution of microlithic tools on dune surfaces all over the desert shows that the Thar region must have throbbled with human and animal life during this period. Rich faunal remains recovered from the excavation of the sand dune site of Bagor in Bhilwara district on the eastern side of the Aravallis show that the Mesolithic hunter-gatherers had taken to sheep/goat and cattle pastoralism around six-and-a-half thousand years ago. This pattern of subsistence based on a combination of pastoralism and hunting and gathering must have diffused to the Thar region as well around this

time. It proved to be an ideal adaptation to the semi-arid and arid environment of the desert, and has persisted to this day. Farming-based life did not appear in the area until about two thousand years ago. With the introduction of farming clearing of vegetation began which in turn led to a decline in wild animal life. Consequently the role of hunting in the subsistence economy steadily declined and pastoralism became more and more important. Nomadism was characteristic of this pastoral-hunter-gatherer way of life. When around 4000 years ago rainfall began to decline again, the trend toward nomadic way of life must have been accentuated. This is the beginning of historical period in India.

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- The trees—the existing trees could be integrated in the design to perform various functions like—adding beauty and colour, as heat insulation by providing shade, as dust filter, as a play-activity, as a structural support and so on.
- The rocks—could be used as landscaping elements, as building materials, as furniture etc.
- The earth could also become a space defining element affording privacy by creation of mounds. The earth as a landscaping element also can provide good insulation to walls and terraces.
- The surrounding views are sometimes an asset, which could be emphasized & framed by the designer. Ugly views could be covered up.
- The relationship of the design to the neighbour, the road, the other infrastructure could be sensitively worked out.

#### B) The climatological environment response

The prevailing climatological elements could be explored in the following manner:

- The wind—proper planning can increase or decrease wind velocity, & ensure comfortable working conditions. Those sides bringing in foul smells, dust etc. would need a different treatment. The Badgirs or the wind towers used in Pakistan & middle east are good examples of harnessing wind for comfort.
- The rain—adequate protection and use of non-eroding and non-decomposing finishes in heavy rainfall areas is a must. The roof gradients should also respond to this factor. The disposal and channelization of rain water could become a design element (water spouts, channels etc.) Collection of excess rain water in tanks could lend a helping hand in reducing water shortage. The sound of the falling rain on different materials is also very interesting. Water could be effectively used to cool the microclimate in hot dry areas.
- The sun—in most places in India, the designer should try and get in light without direct sun-rays and glare. Efforts should be to have minimum solar radiation collecting surfaces on south and west. Indirect light through verandahs and courtyards is more pleasant. North-side glazing gives good, uniform glare-free light. Sun-protection devices could form an intrinsic aspect of the building aesthetic. The light entering the building could be shaped in different ways by the designer.

#### C) The Economic environment response

The economic criteria work in multiple levels.

- The basic economy should result from efficient planning with minimum waste circulation areas and multiple uses of spaces (thereby increasing the utilization factor). Efficient planning also brings about a saving in man-hours—by positioning of different functions with a good understanding of their interrelationships.
- There also has to be a proportionate relationship between the initial expenditure and recurring expenditure. Some materials which are initially expensive have less maintenance expenditure. Use of vernacular, locally available materials with local skills could be more economical.
- Economy of building materials would relieve the strain on the depleting natural resources—bricks consume large quantities of good top soil. Because of dams & siltations, good and abundant sand in riverbeds has become difficult to get. Good quality wood in desired sizes has become a rarity. Thus optimum utilization of building materials is a must. The research for regenerative, light weight & high strength materials is on. Good planning and structural design can also save considerably on the quantum of material used.
- Economy can be achieved by efficient, compact planning of service lines (water, sewage, electricity, rain water drains etc.) roads etc.

#### D) The energy environment response

- The building needs energy for heating, cooling, lighting, cooking, communications etc. Some of it can be generated by wind (wind mill), the Sun (various solar appliances), sewage (gas plant), trees & plants (gas plant, fuel & compost heap manure). Every building should try and incorporate those energy-saving devices that are well suited to its particular context.
- The designer should strive and give very good natural day lighting and ventilation to bring about some energy saving. He can also create insulative & reflective surfaces in the right places.
- The water distribution system could be planned to reuse water at varying levels of purity. e.g. the flushing cistern could definitely use the waste water from the wash basin or bath. Use of atomiz-

ers instead of conventional taps would save a lot of water and would be as efficient. The waste water (sullage) and the effluent after the septic tank could be used for gardening and in creation of biomass. The initial construction water tanks could be retained as storage sumps or landscape elements.

- A southern sunlit corner inside the kitchen could facilitate the housewife to use the solar cooker from inside.

#### E) The socio-psychological environment response

The designer has to bear in mind the social background of the user so that his design elements work the way they were intended to, e.g. a standing cooking platform may not work for poor people who are habituated to cooking on the floor with fire-wood. Large glass windows & openings may not be worth while in a conservative household.

The designer can learn a lot from the time-tested vernacular design, e.g. the wide verandahs as functional extensions and shading devices, the courtyards as introverted activity areas and light ventilation walls; the jallis, the common walls to reduce radiation; the built-in storage spaces etc.

A new life is added to the building, if the designer achieves a sense of unity between the interior & exterior spaces by providing special spaces or areas for landscape in the building design itself.

The interior spaces & furniture also should be as flexible as possible to enable the interior to respond and adapt to the environmental & functional changes.

The sensitive designer would also take keen interest in preserving the art & cultural heritage of a place. Thus his designs would not hamper or clash or destroy the historic environment.

Each of the above could be dealt in great detail, but the purpose of this paper is to just open up some of the vistas towards an environment-conscious design.

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## Environmental Dimensions for Pune Metropolitan Area Some Systemic Considerations

Prof. G. K. Kanhere

Pune, a city situated about 192 kms. from Bombay at latitude 18° 25' N and longitude 74° E, is a major metropolitan growth centre in western Maharashtra. The city was the capital of Peshwas who ruled a major portion of India in the 18th century before the British established their supremacy by 1840 A.D. It was later a cultural capital of Maharashtra and is now rapidly heading to be the second most important industrial centre after Bombay in Maharashtra State. This considerable industrial growth has put extra pressure on the otherwise well-known environment of Pune.

Traditionally there existed numerous urban sub-systems which operated in the old cities of India and contributed to the satisfactory environment and to a suitable balance of open spaces in the urban environment. Today due to the rapid expansion of the city and the application of the new development rules as well as the changing pattern of living, the traditional sub-systems are getting totally destroyed. Consequently urban congestion, growth of traffic, pollution by industries, and the ever-increasing strain on the urban services, all add to the urban degradation.

### The Chowk System

Ecological balance in the traditional cities was maintained by the *chowk* system or the *wada* type of planning. The Indian house at Pune or elsewhere used to be basically introvert. The house (*wada*) focussed on

the *chowk* or the courtyard which provided the light, the sunshine and air circulation and even plant life: trees and a flowering garden. This was the place where birds and domesticated and pet animals used to bring a piece of nature in contact with the residents.

There was usually 30 to 50 p.c. of land kept open within the courtyard and a well provided the source of water. In Pune there was even a duct of water from Katraj village to the south of the city to supply water and there were orchards which provided the green areas around the city. In the mediaeval and pre-British period this introvert planning was suited to the urban sub-systems which included the disposal of garbage from the rear lanes and which was used as manure for the orchards.

The bullock-cart, horse-drawn carriages and even elephants and camels constituted the transportation system for the outer area. Pedestrian traffic was dominant in what today is referred to as the congested zone. This prevented any air pollution as no vehicles existed at that time. Animals and cattle provided manure to the fields.

#### The Compact House

The British introduced the compact house in the cantonments with no courtyards but external open spaces in the compound. This form of housing which can be described as extrovert, was more suited to the cold climate of England than the climate and the living pattern of the Indian citizen.

#### The Byelaw Culture

The introduction and change in the building bye-laws and their gradual application to Pune city created the present dilemma. The bye-laws which were oriented to the western way of life and made by taking into account: 1 the western space requirements, i.e., only one-third of the total area to be built-up; 2 the western way of managing the open areas, i.e. keeping open spaces around the houses, and 3 the western climate, with limited sunshine, making it impossible for plants to grow in an enclosed *chowk*; (there it is necessary to have external open spaces for the lawns and gardens to thrive), were not suitable for Indian conditions and Indian way of life.

The *chowk* of a *wada* is an integral part of the house and hence is always kept clean and neat. The same does not apply to the extrovert open spaces, i.e. the two-thirds open space introduced in the bye-laws by

the British. This planning was perhaps more suitable to cantonments; but to-day it seems to have failed there too, and we do have many congested areas in the cantonment of Pune.

Today the cantonment yet retains the open spaces and green lungs such as the race-course, the golf ground and flying clubs etc. Koregaon Park with spacious compounds around bungalows provides open housing for the rich but the old city keeps on getting congested and the cooperative housing, the builders and the developers use the bye-law culture to their advantage pulling down the old *wada* system which provided all the amenities and facilities within walking distance of every citizen. The added higher densities put pressure on the existing old amenities and today open spaces are almost non-existent in the old section of Pune city.

This is a result of the clash of two systems. For the old areas a different set of rules should have been used with a much lower floor space index.

The transition has affected the open areas surrounding the city also. Early in the life of the metropolis there were green orchards and gardens of the *grandees* or *sardars* and other rich families of Pune. Beyond the city area there were plenty of open spaces all around the city. The overall covered or developed areas were limited to a smaller extent which was well-defined. Temples and their courtyards and gardens also provided a welcome relief to the citizen.

Today right upto surrounding hills and even on hills like the Parvati, there are slum-dwellers and their encroachment. The canal carrying drinking water for the city has become the life-line for the migrating slum-dwellers seeking jobs in urban zones. The green areas reserved in the congested part of the city are systematically taken over by politicians and others for the settlement of the migrating hordes which then serve as vote banks for the former. The callous indifference of a typical Maharashtrian towards the deteriorating urban environment has also resulted in the growth of slum population from a mere 10 p.c. to 40-45 p.c. of the total population in Pune, 50 p.c. in Bombay.

#### Control Parks

We certainly cannot hope to have a Versailles or Karlsruhe in Pune but extensive open areas as lungs and the preservation of flora and fauna would ensure that future generations can expect to hear and see the koel, crow-pheasants, parakeets and bulbuls along with crows and

sparrows, Mongooses, snakes and other smaller animals are still seen in some parts of Pune city. We do have a big chunk of open land right in the heart of Pune city near Sangam bridge at Sangam wadi. If we can at least conserve this green area we can still retain the charm of the city to a certain extent.

### An Eco-systemic Approach

An eco-systemic approach seems to provide the urban planner an option both theoretically and practically. From the smallest unit of planning to the established social organization of the past, all of these units such as *alli* or *peth* (a lane or a ward) need critical evaluation to identify urban sub-systems which can have relevance today. The trades like *Burad* or bamboo-workers, *Kumbhar* or potters, *Danauole* or vegetable merchants and many other traditional urban professions had developed locations, norms of spaces and groupings and relationships with one another which have proved the test of time. The caste system is no longer of great significance, but the spatial organization based on *allis* and *peths* with its physical forms can be of great value for urban planning. Support of the natural forces will increase the credibility and confidence of the masses in the success of open spaces. Private ownership rather than public ownership as a tool in some cases can achieve the objective of greener cities.

Effective administration of the planning laws, implementation of the sanctioned development plan and reduction in the role of politicians in deletion of open spaces can reduce the pressure on the proposed and existing open spaces in Pune city. Today 40 p.c. of the total population of Pune stays in slums and even a greater percentage of population will be in slums by the year 2000. The percentage may be as high as seventy by the year 2010. If we are to have a better environment some bold initiatives are necessary for the future of the city. Conceptually a metropolitan development with low density core and a high density ring surrounded by a uniform density-structure suburban development can be a model which can ensure protection of hills and central open spaces. There is a need for adequate sub-centres or nuclei to disperse and maintain the amenities and commercial facilities for the outer zone.

Disorganized and low standard slum development will be a disruptive force as some had feared in the past. The current slogan of slum improvement not slum removal may have to be revised. New 'urban form options' for the area have to be studied by the planners and an authority

like Pune metropolitan region development authority may be the answer to the problems of integrated planning. In future it may not be proper to think of open spaces in isolation.

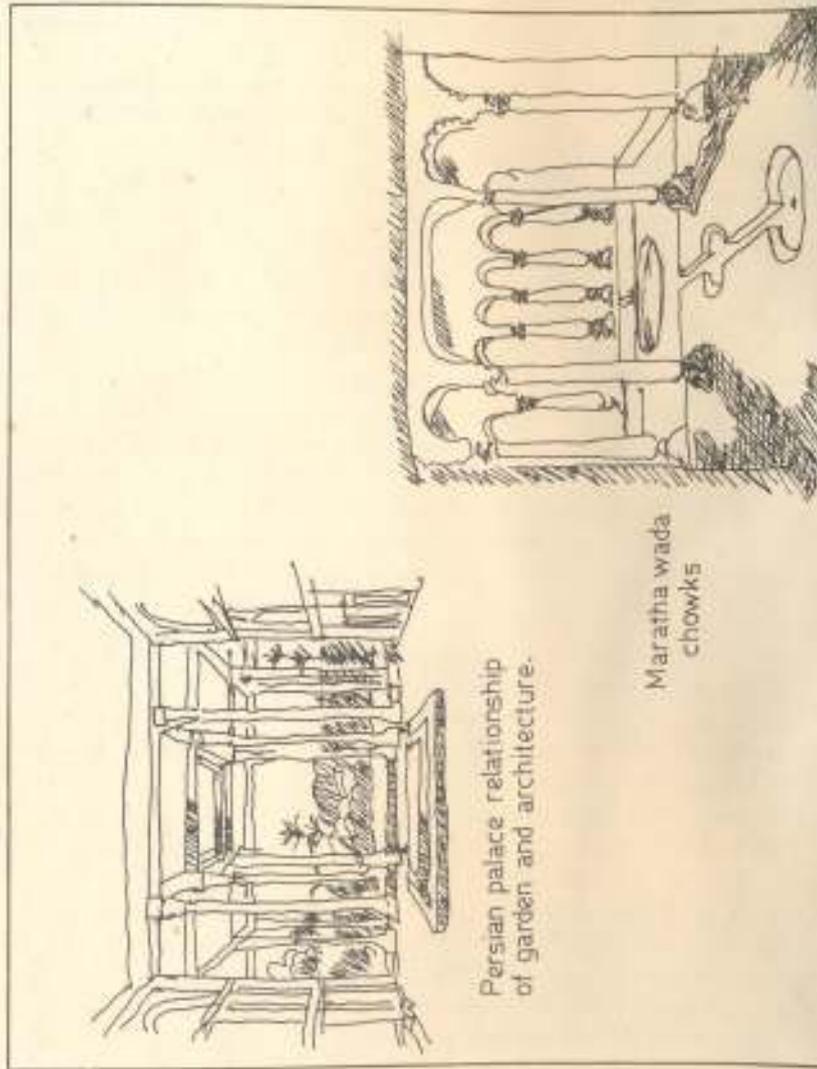
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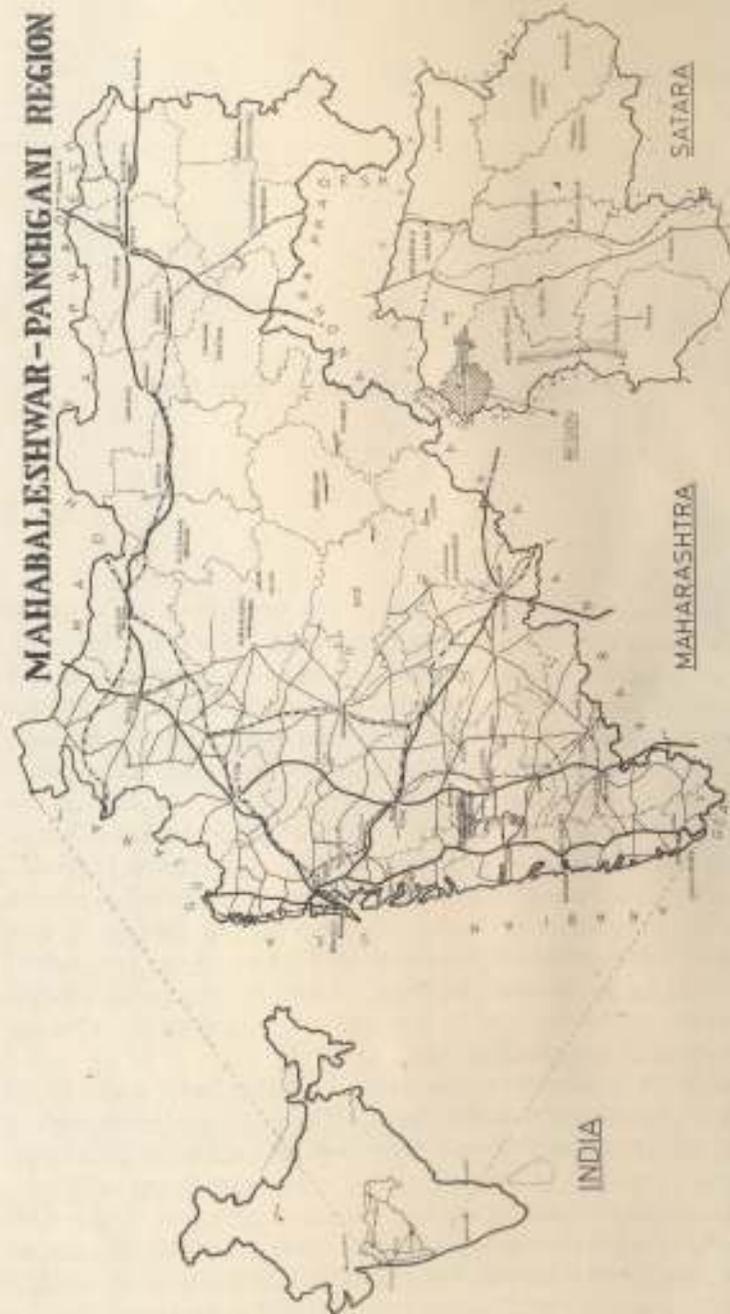
## Politics of Environmental Planning

*Prakash Gole*

Mahabaleshwar and Panchgani are the two famous hill resorts of Maharashtra State. Situated atop a flat plateau (Lat. 17° N and Long 73° E) at an average height of 1200 meters, they are surrounded by well-preserved forests. These forests are a store-house of botanical wealth and harbour 70 p.c. of the total number of plant species found in Maharashtra. The average rainfall of the plateau is 6900 mm. and the temperature ranges from a minimum of 13°C in winter to 29°C in summer. The salubrious climate, the beautiful forests and the striking mountain scenery of precipitous escarpments attract a large number of tourists from the surrounding plains, especially the two metropolitan centres, Bombay and Pune. The number of tourists per year has gone up from about 150,000 in 1978 to 300,000 in 1983. This has put a considerable strain on the resources of the plateau resulting in increased exploitation of forests, disturbance to local fauna, diminishing water-supply and worsening of sanitary conditions.

With the increase in tourist traffic a building boom started in the eighties. Developers from Bombay and Pune began purchasing agricultural lands and over 1500 applications were received by the government for the conversion of agricultural land to non-agricultural purposes, a pre-requisite for building non-farm houses on such lands. The builders desired to divide these lands into smaller plots and sell them to prospective buyers from the cities. This activity was carried on mainly on lands outside the municipal limits of the two resorts as development within





their jurisdiction was strictly controlled and plots smaller than 2 acres are not permitted. The 20 kilometer tract between Mahabaleshwar and Panchgani was sought to be built up along modern lines with a minimum individual plot of 278 sq. meters only.

Such intense development of the plateau would have resulted in congestion and in greater strain on forests, water supply and other civic amenities. Alarmed by the threat to the very character of these resorts, some leading citizens formed the Save Mahabaleshwar-Panchgani Association. They were supported by environmental groups from Bombay and Pune. Strong representations were made to the government including one to Prime Minister Indira Gandhi demanding that builders be prevented from destroying the ecology of the plateau. The Chief Secretary of Govt. of Maharashtra and Secretary, Dept. of Environment, Govt. of India, visited the hill resorts to assess the situation and submitted reports. A letter from the Prime Minister went to Govt. of Maharashtra urging them to take preventive action. This led Govt. of Maharashtra to appoint a regional planning board for the systematic development of the whole plateau.

The Mahabaleshwar-Panchgani Regional Planning Board was constituted under the Maharashtra Regional & Town Planning Act, 1966. The Commissioner, Pune Division, was appointed the Chairman of the Board and besides the heads of the concerned govt. depts, the members of the Board consisted of 3 members of the legislative assembly (lower house of the state), 5 members from the local bodies of the two resorts, 2 persons representing environmental organisations from the hill resorts and 3 members representing environmental bodies from Pune. The author was a member of the Board. The planning region covered the plateau area and some adjoining villages encompassing 237.28 sq. kms. with a population of 38064 persons according to 1981 census.

The terms of reference of the Board included preparing a regional plan on the basis of a study of existing land-use and with a view to preserving the ecology of the two hill resorts. Regulation of transport and communications, water supply and other civic amenities and tourist facilities was also to be considered while preparing the plan.

Before the constitution of the Board, the municipal councils of both towns had prepared development plans. The development plan of Panchgani was sanctioned by the state government on 1st November 1974. The development plan for Mahabaleshwar was sanctioned earlier, i.e. on 15th Nov. 1969 but was later revised and resubmitted to the State Govt. This revised plan was awaiting govt. sanction when the Board was

constituted.

The Board came into being on 5th July 1983. A number of representations had been submitted to the Board by concerned citizens, environmental groups, political leaders and govt. departments.

### The Working of the Board

In its first meeting the Board established 3 sub-committees to investigate and examine various issues. The sub-committees were: Ecology, Landuse and development, and Tourism. These sub-committees prepared their reports which were discussed by the entire Board. The Board then prepared its interim report. This report was made public and objections and comments on various recommendations in it were invited from the public. Hearings were held by a sub-committee of the Board specially set up for this. The Board then appointed a planning committee to prepare a report taking into account objections and comments from the public. This report was discussed by the entire Board. The final Regional Plan was prepared after these deliberations.

### The Regional Plan

Regional Plan for Mahabaleshwar and Panchgani Region 1984-2001 is in some respects a unique document. The especial nature of the Board's work is spelled out in the aims and objectives of the plan. The aim was to 'conserve, and to restore the ecological order for the betterment of the environment of the region'. (Page 4). To achieve this the Board was to 'study the existing land-use and ecology of the Region and to suggest measures to preserve and enhance the ecological order' (Page 4). The Regional Plan therefore recommended, 'it is necessary to protect the watershed by preserving the ecological and environmental balance. The main objective of any land-use pattern for the region will therefore, be the preservation and enhancement of the environmental qualities while outlining the picture of prospective development of Mahabaleshwar-Panchgani region' (P. 50).

The report contains a detailed statement of the ecology of the region and its importance. This probably is the first official recognition in India of the importance of ecological factors in regional planning. For the first time ecological factors, rather than technical, economic or financial, have been given a prominent place in a regional plan. In doing so, criteria of economic development might have to be set aside, to a certain extent. It would be interesting therefore, to examine how far the Regional Plan succeeds in achieving its avowed objective of preserving

and enhancing the ecological character of the Region.

This change in the official attitude towards regional planning was due to certain developments (narrated earlier) that led to the constitution of the Board. The incorporation of recommendations based on ecological considerations in the plan however, did not come about without a struggle. Members of the Board were themselves divided into 3 groups: the champions of ecology and economic development in 2 opposing camps and a third group that held a middle position often proposing a compromise to reconcile the opposing view-points.

### Politics of Regional Environmental Planning

To recapitulate, the region derives its unique character from its situation at a height of over 1000 meters and the concentrated high rain fall that it gets during the period June to September from south-west monsoons. These have endowed the hills with luxuriant forests harbouring unique endemic and rare species of plants and a varied insect, bird and animal fauna. The natural beauty of the plateau attracts a large number of tourists who desire modern amenities including facilities for modern entertainment. This has unleashed a building boom and expansion of commercial activities that threatened the natural environment.

The building boom which started in the eighties would have resulted in high-density housing, conversion of open spaces and woodlands into commercial and recreational complexes and expansion of allied businesses and industries. The environmentalists rightly feared that a replica of Pune or Bombay would be created on the plateau. On the other hand champions of economic development including some of the elected representatives and members of the Board welcomed rapid development of tourism in the belief that it would provide ample employment to local people and enhance their incomes mainly through sale of agricultural, open and at present barren land.

The environmentalists' solution was a ban on commercial developmental activities and a severe curb on the expansion of residential area by imposing a minimum plot-holding of 2 ha. on open lands between the two resorts and non-conversion of large forested estates to smaller residential plots. The opposing camp resisted the move to enlarge individual plot-holdings and stoppage of agricultural land conversion to non-agricultural purposes. This view-point was best reflected in the draft development plans prepared by municipal councils of both the towns. These plans recommended a tripling of residential area from 227 ha. to 680 ha.

The Board debated this issue at great length. It actually involved consideration of three sub-issues; whether any of the existing forest area is to be sacrificed for residential and allied purposes; how and to what extent the expansion of existing villages, farming and allied agrobased activities is to be allowed and how far the developers are to be allowed to convert agricultural lands to non-agricultural activities. Development of the existing municipal areas was another important issue.

The development plans prepared by the municipal councils had proposed a reduction in the existing forest area. The Board could not accept this as it was found to be repugnant to the objectives of the Board. The Regional Plan therefore, accepted the environmental groups' demand that the area should not be reduced and should not be converted to non-forest uses. Thus 52.23 p.c. of the total area of the region is to be kept forested.

Once the forest zone is decided to be kept inviolate the Board divided the rest of the area into two zones: Green Zone and Residential Zone. The municipal areas of the two towns constituted another separate zone. The Board decided to reserve 35.70 p.c. of the total area of the region as Green Zone. There was great debate in the Board as to what was to be permitted in this zone. There are 58 hamlets in this zone; there are also extensive campuses of educational institutions in this zone. With the growth of population room has to be kept for the extension of village areas. Development of farming and allied occupations being carried on in this zone has to be considered. Apart from suggestions on permitting or restricting particular activities, environmental groups as well as the other groups presented no comprehensive plans for the proper development of the green areas.

The environmentalists wanted the extensions of village areas confined to within a boundary of 100 meters from their location, they wanted to restrict the size of farm houses to a ground floor structure of 80 sq.m. and they did not want any large-size commercial agro-based activities to be carried on in this zone. In all these respects they had to be content with modifying their demands, in some respects to a substantial extent. The Green Zone that was finally accepted by the Board and included in the Regional Plan allowed normal village extension (as prescribed by the Revenue Department of the Govt.) with ground and one storey structures, farm-houses not exceeding 160 sq.m. of built-up area, agro-based activities and industries irrespective of their size, structures connected with public utilities and a limited expansion of the existing structures of educational institutions. Another concession

made to the economic development point of view is: 'Construction proposals deemed by the Competent Authority to be of a major character may be permitted by the Commissioner, Pune Division, in consultation with the Director of Town Planning' (P. 53).

The 170 ha residential zone sanctioned in the Regional Plan was obviously a concession to developers who had already invested in land on the plateau. The zone however, was of the extent of only 0.79 p.c. of the total area. The minimum plot-holding in this zone is to be from 1000 m<sup>2</sup> to 1500 m<sup>2</sup> much smaller than 2 ha. demanded by environmentalists but larger than 278 sq.m. presently allowed in revenue regulations. The developers are far from happy at this as this means merging of smaller plots sold already to different individual buyers. The environmentalists however, succeeded in restricting the size and design of dwellings in these plots. In residential zone only one dwelling unit with a floor-space index of 0.125 and built-up area of 1/4 of the total per plot are allowed. The only concessions for somewhat larger structures are that open verandah, basement and an out-house are allowed and excluded from the FSI. Further the developer has to ensure continuous water-availability and adequate sanitary and waste disposal facilities and plant local species of trees at the rate of 8 per 100 sq.m. The design and lay-out of the houses have to be in consonance with the surroundings. It is perhaps a measure of success of these regulations that some of the developers have now quit the scene having unable to cope up with the severe restrictions so placed on their profit-making.

Thus the future landscape of the region visualised by the Regional Plan can by no means be considered unreasonable; development of commercial nature is curbed, adequate room is left for the promotion of economic ventures by residents and existing forest cover is preserved.

The development plans prepared by municipal councils contained provisions to increase the residential area by three-fold. This meant the conversion of forested lease-hold properties to residential areas. This would have meant a loss of another 46 ha. of forest to residential development. The Regional Plan recognised that 'these mostly large wooded expanses are important for the preservation of the hill-station character and environment of the area.' (P. 59). It prohibited subdivision of these properties and recommended transfer of surplus land not required by the lessees for their own residences to Forest Department to be maintained as forests. It however, allowed additions and alterations to existing structures within the framework of municipal rules. One loop-hole left is that the recommendation of the Board about

the inclusion of the surplus area is rather vague. They are to be included in Green or No Development Zone which is not clearly defined. (P. 59).

The Regional Plan does not allow further extension of residential area other than that normally happening with the growth of residential population, within municipal limits of both towns. A definite plot is now assigned to the cooperative housing societies of local residents with row-housing, ground plus one storey construction and an FSI of 0.5 allowed for such development. In Panchgani a minimum plot of 0.1 ha is allowed with building restrictions same as in Mahabaleshwar.

By restricting the expansion of residential areas the Regional Plan not only tried to curb the building boom but also sought to place restrictions on the expansion of tourism on the plateau. Much as the environmentalists wanted it, the Board did not favour restrictions on the number of tourists entering the region as such restrictions would have been successfully challenged in the court. As the main income-generating activity of the Region is tourism, the preservation of the ecology of the region depends much on how and what kind of tourism is promoted. The Board rightly concluded that the proliferation of urban recreation need not be encouraged. Thus proposals brought in by economic development proponents to set up skating rinks, tennis courts, swimming pools, mini-trains, electrical ropeways etc. were thrown overboard and not included in the final plan. The tourists that flock to these resorts come in private cars, taxis and buses. During the peak season the noise and bustle of these vehicles pose a major threat to the tranquillity and sylvan atmosphere of the plateau. The environmentalists wanted vehicle-free roads, restriction on numbers of vehicles entering per day, speed limits and ban on through vehicular traffic that merely passes through the region. The Board accepted these with some modifications and ensured that if properly implemented, these restrictions would help promote the right type of tourism. Moreover the plan seeks to promote nature-based tourism through hiking, riding, nature-watching etc.

The exponential growth in the number of tourists has led to great pressure on forest resources as well as the civic amenities like water. It was known that local people cut down trees to supply fuel-wood to hotels and guest-houses, an activity greatly accelerated during the peak tourist season. Environmentalists also reported of clandestine tree-cutting in forest areas by timber contractors and their henchmen. There was no disagreement on the point that wood-cutters should be weaned away from their occupation by provision of alternative gainful employment. The plan suggests bee-keeping and sericulture as alternative

sources of employment. These however, may not be sufficient. Thus the vexed problem remains. The Plan however, guardedly suggests that compensatory payments be considered while abolishing the communal rights of collection of wood and forest produce enjoyed by local communities. Forest Dept., in a note placed before the Board had requested increase in staff to ensure proper implementation of laws & protection of forests. These the Board accepted. Moreover inspite of the Departments' opposition, the plan recommends that through traffic which allegedly facilitates clandestine activity be restricted. The pressure on civic amenities such as water supply is sought to be alleviated by construction of a dam on the Venna stream downstream of the existing lake and expansion in minor water storage capacity.

The restorative aspect of preservation of nature is looked after by accepting the environmental demand for creation of a biosphere reserve and stress on the plantation of local and endemic trees in afforestation schemes. The Plan rightly recognises that restoration of forests is beyond the capacity of official agencies acting on their own. It suggests involvement of private agencies. Likewise when the Plan suggests development of alternative tourist spots to divert tourist traffic away from these two resorts, it recognises that official funds would hardly be available for such development. It therefore, suggests involvement of private capital on what is termed as development of site and services. It has also suggested a number of socio-economic, biological and hydrological surveys and setting up of a centre for environmental studies to monitor the ecology and changes in it on the plateau. In these respects most of the demands of environmental groups have been accepted by the Board and incorporated in the Regional Plan.

One aspect neglected by environmentalists as well as proponents of economic development is the provision of basic amenities to villagers. The Board has taken them into account and the plan provides for schools, dispensaries, drinking water etc. for the rural areas.

Moreover, to bring about these development measures the plan suggests augmentation of funds to the local authorities through state level grants as well as funds from schemes supported by the federal govt. On the whole it can very well be said that the Board, through the regional plan, has made a sincere effort to preserve the unique character of the plateau. That the restorative aspect is not dealt with in the Plan with the same vigour, is due to the inadequacy of the present administrative structure of the government. It just does not accept the responsibility for restoration in a way in which exploitation of nature is handled by the

official agencies. Therein lies the real problem of environmental planning.

The Regional plan was submitted to Govt. of Maharashtra in early 1985. While the Board was in session, the Govt. created the post of Additional Collector to handle the administrative machinery of the region. As the Competent Authority designated by the Regional Plan, the Additional Collector has the responsibility of enforcing the recommendations of the Plan which has the force of law under the provisions of Maharashtra Regional and Town-Planning Act 1966, till the government makes a final decision about the Plan. Till to-day Govt. of Maharashtra has not made up its mind about accepting or rejecting the Plan. The provisions contained in the Plan thus continue to have the force of law.

The character of the plateau today remains what in essence it was before the building boom started. Most of the big estates carved out of agricultural and other open land on the plateau have their lay-outs and building plans in suspension, though a few, taking advantage of the discretionary powers handed over to the Chairman of the Board, are reported to have wriggled out some concessions. The powerful building lobby is reported to be busy among the highest political levels trying to abolish the post of the Competent Authority and to see that while accepting the Plan vital modifications are brought in to benefit builders and developers. The local environmental groups appear to be in a limbo. They will have to rise to the occasion once again if the government succumbs to the pressures of the building lobby and the ecology of the plateau is once again in jeopardy.

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## Food Habits of Geese in Northern India

Beth Middleton

### Abstract

Regional, yearly and seasonal differences are apparent in the food habits of geese in northern India. For barheaded geese (*Anser indicus*), a wild wetland grass, *Paspalum distichum*, is the most important food in the Keoladeo National Park. Elsewhere in the region, *Cynodon dactylon*, another grass species of drier areas, can be more important, at least in certain seasons.

For greylag geese, *Anser anser*, in the Keoladeo National Park *Paspalum distichum* was the most important food in December 1985, while in the drier December 1986, *Eleocharis palustris* was the most important food in the diet. Seasonal food habit shifts are apparent for both greylag and barheaded geese in the Keoladeo National Park.

### Introduction

This study compares the food habits of barheaded geese in the Keoladeo National Park to those of other wetlands in the region. Yearly and seasonal differences in goose food habits are examined in the Keoladeo National Park for both greylag and barheaded geese.

Because geese digest only about 25% of the cellulose in their food (Buchsbbaum et al. 1986), faecal analysis is an adequate method for estimating food habits. The fact that geese do not have to be killed to examine stomach contents insures that the population can be resampled

over time.

## Methods

### Study Sites

This study was largely conducted in the Keoladeo National Park near Bharatpur, Rajasthan, 50 km west of Agra (27° 13' N 77° 32' E). This park lies in the floodplain of the Gambhir and Banganga Rivers in a natural depression. Water level is regulated by a floodgate near the Ajan Bund.

While greylag and barheaded geese overwinter in this park, greylags are typically more numerous. In the winter of 1985-86, there were more than 6,000 greylag but only about 500-1000 barheaded geese in the Keoladeo National Park. Goose populations were much lower in the winter of 1986-87 there, most likely due to drought conditions in the park.

Three other study areas included Siliserh Lake, and Siliserh Dam near Sariska in Rajasthan and Tundla, near Agra, in Uttar Pradesh. Less than 100 barheaded geese were observed at each of these three study sites on the single visit in March 1986.

### Goose Dropping Collection and Analysis

Food habits information was collected every month during the winter goose grazing season, November 1985-April 1986, in the Keoladeo National Park, Bharatpur, Rajasthan and then again in December 1986-January 1987. To serve as a regional comparison, droppings were collected in March 1986 at Siliserh Lake, Siliserh Dam and Tundla.

A good estimate of food habits in a location was ensured by gathering 100 goose droppings over a wide area for both greylag and barheaded geese. Note that greylag droppings were collected only at the Keoladeo National Park. Each sample of 100 droppings was cleaned of debris, mixed and then blended in a mixer. The faecal material was washed through a 0.1 mm mesh screen for about 5 minutes (Scott and Dahl 1980). Pressurized water was helpful for the cleaning procedure. The cleaned material was then either dried in an oven at 72°C or immediately made into slides (Middleton and van der Valk 1987).

To prepare the slides, a small amount of faecal material was placed on the slide and heated on an alcohol burner in Hertwig's solution to clear stains not removed in the washing process. The material was spread evenly over the slide, boiled in Hertwig's mounting medium and covered with a 22 x 50 mm slide cover during the final heating (Baumgartner

and Martin 1939).

A set of reference slides was prepared from known plant material. After chopping the plant, the plant material was processed in the same manner as the faecal material. Reference slides enabled identification of the plant fragments through microscopic structures such as trichomes, stomates, and silica cells.

To read the slide, starting at the upper left hand corner, 3 or more fragments were identified in a microscope field until 50 fields had been read. Fields with less than 3 identifiable fragments were skipped (Scott and Dahl 1980). For each sample from an area, 5 slides were read and averaged. More than one area was averaged for each month in the Keoladeo National Park. The other sites, Siliserh Lake, Siliserh Dam and Tundla are from only one goose flock in one area in March 1986.

## Results and Discussion

### Seasonal Variation

In the Keoladeo National Park, *Paspalum distichum* constitutes nearly half (45%) of the diets of barheaded geese in December 1985-April 1986 (Table 1). Crops such as wheat, peas and grams are important in certain months. In January 1986, wheat constituted 65% of the diet, but, as it is not eaten in later months, made up only 16% of the total seasonal diet. Peas grew in importance in the diet through the season until April, just before barheaded goose migration, when peas made up 72% of the diet. Overall, peas made up 42% of the diets of barheaded geese in the Keoladeo National Park (Table 1).

### Yearly variation

Barheaded goose diet was much different in winter 1986-87 than in the previous winter. *Paspalum distichum* made up 72% of the January 1987 diet but only 11% of the January 1986 diet. Wheat was less important in January 1987 (17%) than January 1986 (65%). *Ipomoea aquatica* was 7% of the diet in January 1987, whereas in January 1986, only 1% was of *Ipomoea aquatica* (Table 1).

### Regional Variation

As an example of how much regional variation appears in this brief study, while barheaded goose diet in March 1986 in the Keoladeo National Park included 50% of *Paspalum distichum* (Table 1), in other areas such as Tundla, Siliserh Lake, and Siliserh Dam, barheaded goose diet was dominated by *Cynodon dactylon* (75%), a dryland grass. In

addition, the percentage of crop plants eaten by barheaded geese varied greatly in different regions (0-48%; Table 1). In areas outside of the Keoladeo National Park, wheat was found in small amounts in the Siliserh Lake sample (3%), but wheat was not found in the Siliserh Dam or Tundla samples. While crop plants may be present at other times, this study did not find significant crop plant usage in the diets of barheaded geese at these sites in March 1986.

### Greylag Geese

#### Seasonal Variation

Greylag geese had large differences in seasonal food habits during the winter of 1985-86. *Paspalum distichum* was the most important food overall (68%) just as it was for barheaded geese (Table 2). The usage of *Paspalum distichum* by greylag geese increased during the season, but earlier in winter 1985-86, seeds of *Nymphaea nouchall* and *Oryza rufipogon* were important. These constituted only 13% and 10% respectively of the total diet, because their usage dropped off sharply as the winter season progressed. No crop species were found in greylag goose droppings in any month (Table 2).

#### Yearly Variation

A comparison of December 1986 and the wetter December 1985 shows large differences in food habits for greylag geese. *Eleocharis palustris* made up 42% of the diet in December 1986, but was not a part of the diet in December 1985. Likewise, *Ipomoea aquatica* was 29% of the diet in December 1986, but only 1% of the December 1985 diet. *Paspalum distichum* was 14% of the December 1986 diet, but was 31% of December 1985 diet. Food habits apparently vary not only regionally, but also between years at a single site.

### Conclusions

1. Goose feeding is very variable depending on the nature of the wetland and the surrounding area, weather, season of the year and the array of potential food plants.
2. We cannot predict where geese will feed based on food availability because goose flocks feed on a wide variety of plants in the same region during the same time period.
3. Caution should be used in making general statements about what geese eat based on too little information. Overall food habits of greylags and barheads could be described only with long-term, multi-

regional studies with special attention given to seasonal variation of diet within a study site.

4. What geese need to eat cannot be inferred from what they do eat. Food requirements of geese would have to be determined by studies of migration, overwintering and reproductive nutrition.
5. Barheaded geese eat mostly non-agricultural plants in this study, while greylag geese eat only wild, wetland plants.

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Table 1.  
Food habits of barheaded geese in various locations in Rajasthan and Uttar Pradesh. Averages for all species given by percent.

Species	Location and Date									
	Keoladeo National Park						Siliserh Dam 1986	Siliserh Lake 1986	Tundla 1986	
	Jan	Feb	Winter 1985-86		Ave	Winter 1986-87	Mar	Mar	Mar	
<i>Paspalum distichum</i>	10.8	95.0	49.5	26.4	45.4	97.8	72.1	—	—	23.1
<i>Pisum sativum</i>	4.6	—	44.5	72.3	30.2	—	—	—	—	—
<i>Cicer arietinum</i>	3.1	—	2.7	0.6	1.6	—	—	—	—	—
<i>Triticum aestivum</i>	65.1	—	—	—	16.3	—	17.0	—	2.9	—
<i>Cynodon dactylon</i>	5.5	0.7	1.5	0.3	2.0	—	—	97.4	82.6	75.6
<i>Ipomoea aquatica</i>	0.8	0.2	0.1	—	0.3	1.3	7.3	0.4	—	—
Insects & Snails	—	2.2	0.3	0.1	0.7	0.1	—	1.0	13.6	0.8
other <sup>1</sup>	10.1	1.9	1.4	0.3	3.5	0.8	3.6	1.2	0.9	—

<sup>1</sup> Other food components present in barheaded goose diet included

*Ceratophyllum demersum*

*Eleocharis palustris*

*Eichhornia crassipes*

*Hemidelfphus polyspermus*

*Marsilea* sp.

*Nymphaea nouchali*

*Nymphoides cristatum*

*Nymphoides indicum*

*Panicum paludosum*

*Paspalidium flavidum*

*Polygonum plebium*

*Sagittaria guayanensis*

*Scirpus littoralis*

*Scirpus roylei*

*Scirpus tuberosus*

*Scirpus* sp.

*Sporobolus* sp.

*Utricularia* sp.

*Valisneria spiralis* (Maheshwari 1963).

Table 2.  
Food habits of greylag geese in the Keoladeo National Park.

Species	Time						
	Nov	Dec	Winter 1985-86			Ave	Winter 1986-87 Dec
			Jan	Feb	Mar		
<i>Paspalum distichum</i>	29.4	31.2	90.0	92.2	96.1	67.8	13.5
<i>Nymphaea nouchali</i>	55.1	9.4	0.1	—	—	12.9	—
<i>Oryza rufipogon</i>	1.2	46.7	2.3	0.9	0.8	10.4	—
<i>Ipomoea aquatica</i>	1.2	0.9	0.9	2.8	0.5	1.3	28.8
<i>Nymphoides cristatum</i>	7.8	1.7	0.1	0.1	0.1	1.9	—
<i>Eleocharis palustris</i>	—	—	0.3	0.1	0.1	0.1	42.3
Insects & Snails	3.0	5.3	0.6	0.7	0.9	2.1	13.6
other <sup>2</sup>	2.3	4.8	5.7	3.2	1.5	3.5	1.9

<sup>2</sup> Other food components present in greylag goose diet included

- Ceratophyllum demersum*
- Cynodon dactylon*
- Cyperus alopecuroides*
- Hemidelfus polyspermus*
- Nymphoides cristatum*
- Panicum paludosum*
- Paspalidium flavidum*
- Sagittaria guayanensis*
- Scirpus littoralis*
- Scirpus tuberosus*
- Sporobolus* sp.
- Utricularia* sp.

## **Nature Management : Balancing Wildlife & Human Use**

*J A van der Ven*

### **Introduction**

In former times one could say there was a certain balance between nature and Man's living pattern. He used to hunt a bit, and when this became difficult he went a few miles further. If that area was already occupied, there was a little war and everything started again. More people, however, require much more careful management, a much more careful adjustment to supply and demand.

Nature is a rather slow, complex process which needs to take its own time. Nature cannot be hurried; it is three weeks for a chicken and nine months for a human being. There are no (economic) processes imaginable which can shorten these times.

Nature is no longer the natural environment of our society; nowadays it is no more than a claim in the process of country planning, a claim to be fought for. Large-scale air and water pollution where the limits to dump waste are being exceeded and are not in balance with the natural ways of acquiring certain amounts of waste, is the natural environment of human society.

Instead of working hard against these processes, we started to create nature reserves. These are places where nature is more important than human development, places where rare animals and plants could survive, places where people could enjoy nature that once was. I think it is the right answer but it is not enough. Through our nature reserves we

must fight for more responsible use of our entire environment. It is unacceptable that trees can no longer grow in large parts of Europe. We have already lost the lichens and nobody worried; the sandstone buildings are affected and everyone was surprised; the copper hooks of a slate roof are immediately affected; the lakes in northern Europe are suffering from the rain instead of enjoying it; now the trees can no longer stand the rain. And what about us and our carefully protected nature reserves?

As a nature reserve we protect a particular area from certain developments, from human activities etc. It always seems to be defensive though it should be a much more positive approach. It should be a contribution towards a better environment with real living green areas supporting a variety of wildlife and a balanced system which contributes towards the functions of nature. However, its surrounding area is sometimes completely different. A wetland might be surrounded by desert-like areas, a forest by cornfields, a reedbed by cities and villages. The area itself might be protected, but its survival is never guaranteed. We have to control the positive and negative influences of the unnatural surroundings of our reserve; it has to be a part of the management.

There are many different ways of protecting an area. In general, it will depend on the political system of the country concerned whether an area has to be bought or can 'simply' be declared a reserve. Sometimes, with a well-enforced country-planning purchase is the only solution—purchase by an organization which will take care of the long-term protection and its management. It will ensure a clear starting point and a certain basis for future development of the area. There should be no discussion about the ownership of the protected area: where this is in doubt it is better to delay a long-term management programme.

#### **Influences: External & Internal**

There are many reasons why it is necessary to manage an area. A forester manages his forest because he wants to find the best balance between his efforts to plant trees & to harvest them and in the meantime maintain an optimum forest eco-system. Some organizations start their management on a completely wrong footing. After an area has been declared a reserve, they start building hides, information centres, plant trees, build roads etc. The best thing is to do nothing and just try to get to know your area. Some guards to observe the behaviour and preferences of the animals are more than enough. Later, we can make a real plan on the basis of such information.

There are two types of influences that are to be taken into account.

They are:

External:

- a. Influence by the environment on the area
- b. From the protected area to its surroundings.

Internal:

- a. Ecological processes within the area;
- b. Bias towards some animals or plants;
- c. Recreation;
- d. Other functions of the area;
- e. Financial balance.

#### **External Influences**

As mentioned before, there is a possibility of profound environmental influences from the outside. To plan a nature reserve close to an air-polluting factory is not wise. Preventing the building of such a plant near your reserve is commendable. It is also wise to plant trees etc. around such a plant, but that is not a nature reserve, and it will never become one. It is a green 'aura' around such an area, extremely important but not a reserve. It has completely different functions. The bird reserve in the centre of the harbour of Tokyo is not an easy area to manage. Completely surrounded by pollution, it is restricted in its possibilities, but also an excellent educational project, a victory for conservation and a living warning system, a sensitive nose with living real birds as warning signals.

The more indirect external environmental influences are even more difficult to consider. Pesticides found at south pole, acid rain in Scandinavia from factories over 1000 kms. away; such processes cannot be controlled in a single nature reserve. We can only use the reserves to show the disastrous influence of these processes and fight against the irresponsible use of pesticides, the easy-going industrial processes etc.

In general, small nature reserves will suffer greatly on account of their surroundings, but again there are conceivably several reasons why it is justifiable to establish such reserves. Only their possibilities are restricted.

The nature reserve will sometimes have a certain influence on its surroundings. Sometimes it has more to do with education and general acceptance of the idea of reserves than with anything else. But again it is the scale of your reserve that is really important. A small area does not disturb and cannot contribute, but large areas will have an impact. Certain animals and plants will not stay in the reserve and will penetrate

the surrounding area. If it is a reserve for elephants it is not acceptable for large groups to destroy the agriculture outside the reserve each night. The reserve is probably too small.

It is much more difficult to measure beneficial effects. Owls will eat mice in the surrounding fields, and there may be some beneficial influence on the (micro) climate. Although hedges are seldom nature reserves, one sees the difference between agricultural areas with hedges and those without. Partridges, pheasants, birds of prey, songbirds—these define the richness of an agricultural area intersected by hedges, and they are all absent from the areas with mono-cultures. Quality is never easy to measure; loss of quality is easy to see and difficult to repair.

### Internal Influences

One of the most important general questions will be the type of vegetation and the degree of succession. If the vegetation has reached its climax (e.g. forest, sea-shore, dunes, lakes) the management process will be completely different from a situation in which the vegetation will pass through several different stages (marsh, shallow water, moors grazed by sheep, meadows etc.).

I do not suggest that the first types are stable and only the second dynamic. They are all dynamic botanical processes and one has only to judge what to do. A forest will be a climax situation botanically speaking, but fire, storm, age will always change the area and all different ages of forest, including open areas will be present in a natural situation. However, in situations where the vegetation itself is still undergoing change, sometimes caused by human activities, management is different. A lot of nature management is related to slowing down the natural ecological processes in favour of a certain type of system which would be rarer under natural circumstances. Wetlands in particular suffer from changes in their surroundings and a lot of the management efforts are necessary to remove these influences.

In forests we are generally concerned about human occupation and forest reserves are not that easy to manage. It is difficult to predict whether a man-made forest will ever grow into a natural forest again, with the same variety of trees as there was before human interference. If such processes were to take hundreds of years, it would be preferable to set aside areas where such processes could evolve. Nature management is not something for ourselves but for generations to come.

In small areas one must decide upon the preference in the choice of the ecological processes. After making such a choice one should not

change it. You will ruin your reserve by choosing another system with each new manager. Once the choice has been made to allow one ecological process to develop undisturbed, this must be the policy, at least for the next 100 years unless significant influences from the outside prove the decision unjustified after all.

Large areas are perhaps easier to manage after a decision is made, but the decision is extremely important for the future of the area. People, especially political people, who have no knowledge of ecological processes should never be involved in the management practice. They should be involved in the establishment of the reserve but not in the management.

### Special Preference towards some Animals

As the possibilities for nature are limited in general, it will be difficult to develop complete, natural eco-systems in all reserves. There will be special reserves for breedings cranes, for tigers, may be for dragonflies. In a huge marsh a crane will always find a square metre needed for its nest. But this chance will be reduced to practically zero if the marsh is very small and if the natural succession is to continue. If the marsh is especially established as a reserve for cranes, one has to manage the water, the vegetation etc. Cranes will show their appreciation by breeding in the well-managed site. But in a small area one should not bring too many conflicting interests together.

The greatest satisfaction derived from a well-executed management plan will always be the spontaneous establishment of new species or the enlargement of an existing colony. However, this is a human approach and not always the best ecological one. 'More' is the human assessment of success; ecologically just a balanced minimum is much more attractive. Management is not only a lot of one species, but a balanced system which can survive in itself.

However, bias towards certain species is sometimes very necessary. Some animals evolved into such crazy specialists that they can never survive in our society. One of the challenges for nature conservation is to find solutions for these specialists. The challenge for the politician is to create opportunities for all these different ecological requirements; for the manager to bring them to fruition.

### Botanical Preferences

An area with a special rare plant or a special type of vegetation may be especially managed for this purpose. Many of the north European heaths

evolved several hundreds of years ago after they were deforested. Keeping these areas open, with their own botanical and zoological community is one of the aims of nature conservation in those countries. Although we know the technical process very well of how to manage those areas, acid rain and general air pollution destroy these processes and it is doubtful whether we can maintain the heather community as such in these countries.

Preference for certain plants is sometimes easily combined with the wish to harvest and to slow down the natural succession. Reed (*Phragmites communis*) is a good example. Reed is an early pioneer in the water land process. It already grows in water 2-3 metres deep and can grow for many years under rather dry conditions. If it is possible to control the growth of reeds, harvest it, burn it, etc. the marsh can keep its original character for centuries. If this harvesting can be combined with a financial approach, it will be a successful management tool. However, if commercialization of the reed-harvest becomes an aim as such, the activity cannot be accepted in a nature reserve.

#### Recreation, Interpretation, Education

Never start a discussion with people as follows: the nature reserve is paid for with our taxes; the nature reserve is for us and we want to do what we want. After this people think that the nature reserve is a sort of cheap television, where one can watch tigers eating deer; see mating animals everywhere; make thrilling observations etc. Forget it. In general, nature reserves are rather dull areas, sometimes with a certain beauty, scenery. Nature has its own rights and we should not let nature be over-run by people who do not know what to look for.

If one accepts the idea that people have no right to disturb nature inside or outside reserves and parks with their recreational activities, one can ask what possibilities there are of showing people something of the life inside the reserves. The possibilities are absolutely endless, even within the limits of responsible use of the area. To open an area for different kinds of recreational opportunities is extremely important for the acceptance of the area as a reserve and for nature conservation in general.

As a general rule, one could say that recreational use should be along existing paths with enough undisturbed areas for wildlife. Knowledge of the area and of the different processes are necessary before one can start to show visitors some of the birdlife. It is dangerous to start special attractions for the public too soon. It is much better for the reserve to

establish itself over a period of many years and then one learns where the attractions are and how to manage them more to the public benefit. New roads etc. should be avoided, and sometimes the existing ones must be reconsidered.

There are very few examples of well-organised national parks in which large numbers of people can really enjoy themselves. In general, it is where one can find geological formations, caves, water falls etc. Natural beauty seems to be more easily managed than living nature. It is easier to show people a sunset than the flight of a nightjar which happens at the same time.

In general, cars should not be admitted to reserves and parks. Although it is known that several animals are less afraid of cars than of people on foot, the speed of cars is not compatible with the aims and possibilities of the area. Transport by silent boats through certain areas is ideal. Some very large parks can only be visited by cars, but this comment is given only as a general rule. In my opinion, all special provisions such as restaurants, over-night facilities etc. should be arranged near but not inside the park.

Guided tours, interpretative routes, information centre, school programmes: all these are essential for the area, essential for long-term nature conservation and the best use of the amenities of the area. I am not negative towards recreational aspects. But if wrongly managed they ruin your area or conjure up forces that cannot be controlled.

As mentioned before, a nature reserve is not a buffer between a polluting factory and a city. A nature reserve needs a buffer for its own purposes. Country planning should be mindful of the reserves as long-term well-managed processes are very difficult to replace or relocate.

#### Financial Aspects

A fee creates expectations. A fee just to sweat will not be tolerated. But people will happily pay a fee to see something in the wild. A well-equipped information centre, guided tours, information staff: people are willing to pay for quality.

I would like to give one example of a wrong financial approach in a national park. This park (60,000 ha) has a small staff of 10 people and is subsidised by the national government. Each year over a million visitors come to the park and enjoy nature and the particular atmosphere. The ministry responsible for national parks has to pay money each year to the staff and all kinds of supplies for an information centre. The money from the visitors do not go to the national park or the appropriate ministry,

but to the ministry of tourism which organises, in the name of national park, visits by tourists. In my opinion a completely wrong approach is this. There can only be one 'hand' that manages a park or a reserve. This hand does not only deal with plants and animals and some enthusiastic bird-lovers, but this 'hand' manages all the above-mentioned processes and tries to find the financial balance.

Many small reserves with limited aims and recreational possibilities, will cost money. There is no alternative. This is inherent in the decision to establish such areas. One should not fear financial problems. With nature, one has something unique if it is well-managed. After some time you can offer the public something they like to see. With more and more spare time people are ravenous for new ways to spend it.

#### **Basic Information (mainly abiotic)**

A map of the area has to be developed; preferably a map on which it is possible to note several activities in management and recreation. The boundaries of the area, operative or future, have to be defined on the map as well as in the field. In relation with the management process it might be necessary to spend a lot of time on boundaries, as many conflicts may arise in the future from border problems. Future plants which might have an influence on the reserve should be taken into account. It is also important that the area itself and a buffer around it are accepted as such as soon as possible. It helps to involve local authorities in the process so they learn what it is all about.

A description of the area, historical as well, has to be provided. If there are any buildings it is wise to make a decision as soon as possible. Sometimes the area has important historical buildings. They have to be maintained, but they can also prove attractive for future recreation. Vulnerable ecological processes should not be developed close to such points. Other buildings should better be demolished as soon as possible before other interests arise. It is better to have buildings outside than inside. Even a warden does not have to live inside the area, as after a few years he needs electricity, a school bus, tap-water etc. A geological and geomorphological map and description are useful. A water-table should be very useful in wet areas surrounded by agricultural areas.

#### **The Ecological Inventory (Biotic Information)**

For the management of an area it is extremely useful to have a good inventory of biological processes and of data related to plants and animals; preferably for several years. At least some key information is

necessary; e.g.

mammals : are there any rare species; large herds; where do they stay; are they diurnal or nocturnal etc.;

birds : are there any colonies; areas with large birds of prey; concentration of birds during winter or on migration; any rare species with special needs etc.

other animals : additional information about reptiles, amphibians, fish is most welcome;

Plants, vegetation, succession : a vegetation map is essential for good management; a sub-division into different types of forest, different ages, different management in the past, already gives much information; more detailed vegetation maps of certain parts of the area are needed.

During the process of gathering this information one gets ideas about management. Therefore, those who are responsible for management should be involved in this part of the process too. It is not necessary to know all birds, all plants etc. but a certain knowledge of the processes, including some groups of plants and animals is essential.

If the area is just a new lake in bare surroundings, the inventory will be very short, and much more attention has to be devoted to planning new activities. But if the area is a thousands-of-years old complex of marshes, meadows & forest, the inventory is important and one should not start doing all kinds of things too soon.

It is also important to describe the existing use of certain areas. What about agriculture, hunting, cattle etc.? First describe and try to find out if an influence can be notified on vegetation or other animals. If it is clear that over-grazing by cattle takes place, this has to be resolved before the establishment of the reserve. There are situations in which cattle contribute greatly towards the biological diversity of the reserve. But one should also ask oneself why there is not a possibility, in the long-term, of this role being assumed by original or locally extinct grazers.

Another aspect that has to be mentioned here deals with research : in general, biological research, but one can also think about agricultural, sociological and economic research. Small reserves are not very attractive for fundamental research but it is very interesting to find out how they contribute towards the evaluation of the surroundings in which one lives.

It is attractive to know a lot of all the processes in your area. But each new piece of knowledge need not lead to new revolutionary management processes.

### Management Plan

First a long-term plan has to be developed. In this plan an over-view is drafted for the first 10-50 years. All aspects such as borders, environmental aspects, zoological and botanical information, recreation, people in the surrounding area etc. are described. Sometimes it is wise to present such a plan to the local community or to have a discussion with the local authorities: partly for their information, partly also to involve them in the process and to take care that the country-planning authority in the region is informed about activities in the area.

The short-term management plan however, is an internal document. For the area as a whole and for each clearly identifiable part of the area, it is essential to mention all the necessary activities, which time of the year, etc.

A management plan is an enumeration of activities. But in this context 'doing nothing' is also an activity. The well-planned non-activity is just as important as a certain activity. If one works from the general over-view towards the details, one will not make many mistakes. To write down all kinds of work in your area is far easier than the long-term plan in which processes are described and combined. A short-term management plan without the support of a long-term plan will nearly always become a failure.

### Finances & Personnel

There are hardly any situations in which a plan can be developed and staff and money are immediately available exactly as one would wish. A good management plan should be 'sold' to those who took the decision for the reserve.

Management activities will cost money. Sometimes it is cheaper to have one's own personnel to carry them out; sometimes it is cheaper and better to involve local contractors. Each area and each country has its own approach. This is also the place where one has to decide whether local people are to carry out certain management activities; e.g. cutting reed, grazing, guided tours, wood-cutting, hunting, fishing etc. If it is possible to reach favourable agreements with the local people, it will help the aims of the reserve, the acceptance of the enclosed areas and the financial situation of the reserve.

### Evaluation Reports

It is extremely important that all kinds of activities and observations

are written down in regular reports or special forms. Using the same maps and the same compartment numbers as shown in the management plan makes life easier. The information can immediately be used for a new plan.

Reports relating to the management of the area should not only contain biological observations but should also give an overview of the management activities themselves. For large areas an annual report will be very helpful, but for small areas simple data-gathering will be enough.

In general, it will be impossible to collect data on all biological phenomena which are of interest in the area. It is possible to make a selection of 10-20 species: animals and plants. Do not take only the rare ones, but also one or two common species, as it is very interesting to see how such a population changes in relation to management activities. Cranes, certain birds of prey, colony breeders, woodpeckers; they are in general key species for management reports. Results should contribute towards the management plan itself, but basic principles should not be changed too quickly.

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## **Birds of Prey Around Pune**

*S. Ingalhallikar*

A number of species of birds can be seen in and around Pune (Lat. 18° N & Long. 74° E). A count carried out in March 1979 in Pune city recorded species and gave an overall density of 2.6 birds per ha. (Gole 1980). More recently a check list of birds for the city gives a total number of 290 birds recorded in the past 15 years in the city and its environs (S. Ingalhallikar & T. Gole 1987). This list gives a total of 34 species of birds of prey and 6 species of owls.

This varied bird life is sustained by diverse habitats. The accompanying map shows the variety and distribution of various habitats found in Pune's vicinity. This note is based on field notes on raptors kept during the last 10 years. For the purposes of this note the Pune area is defined as follows: the region enclosed by Katraj and Sinhgad hills to the south; National Defence Academy campus and Pashan Lake to the west; TELCO lake and Bhosari village to the north and Kavadi village and Bopdeo hills to the east and south-east respectively. This is roughly the area within a 15 kilometer radius from the centre of the city. (See map). Table one combines the various habitats into 3 main categories such as forest, more open habitats and wetland habitats. Locations where these different habitats occur and birds to be seen at these places are given in Table 1.

Though the information collected so far is not exhaustive, some points that have emerged from field observations may be made out:

1. Some nesting sites which have been repeatedly used by raptors have

been located.

2. However, a high mortality of eggs and chicks has also been noted particularly among forest eagles.
3. Another fact that causes concern is the declining number of sightings of raptor species occurring in open habitats. These points are further elaborated below.

#### A. Nesting of Forest Eagles near Pune

Crested Serpent Eagle (*Spilornis cheela*) and Crested Hawk Eagle (*Spizaetus cirrhatus*) have been observed nesting for the last ten years in the forested slopes of Sinhgad hill. Their nests were located in a small semi-evergreen forest patch on the hill's slope that faces north.

The serpent eagle was found nesting on a tall *Dalbergia* tree in the middle of the forest. After a couple of futile breeding seasons (1980-82) the pair shifted their nest to a *Terminalia* tree that stood deeper in the forest. Here the nest was constructed at an unusually low level (5 to 6 meters from the ground level). During incubation it was observed that the nest was molested by langurs (*Presbytis entellus*). Apparently they destroyed the solitary egg in their antics. The nest was found to be full of the fruit of *Terminalia balaerica* which the tree was bearing in abundance. The nest was presumably used as a roosting platform by the foraging langurs.

Due to repeated failure to raise a brood on the *Dalbergia* tree the pair shifted to the *Terminalia* tree. But their choice of a fruit-bearing tree was also probably unsuitable. When last observed the pair had again shifted to the *Dalbergia* tree but had built their nest on a fork at a higher level than previously.

The story is not much different for the crested hawk eagle pair. The pair had selected a tree on a steep slope near the upper edge of the forest. The pair did not use this site every year. But when they did nest here they were not successful.

In 1985 the pair shifted their nesting site to the deciduous forest in the Katraj hills. (see map). The pair had selected the tallest yet the thinnest tree on the steep slope that adjoins the highway passing through the hills. The nest was very conspicuous from the highway. The eagles kept to the nest however, without any concern for the heavy traffic on the road. The incubation went on for an unusually long period of 10 weeks. The pair abandoned the egg later as the egg did not hatch.

In case of both of these species the pairs abandoned the nest at the end of incubation periods. Except for the langurs the nests remained undis-

turbed yet the eggs failed to hatch. This seems quite intriguing and gives cause for concern. Both the species commonly inhabit these forests and no apparent destruction of habitat or reduction of prey species are observed.

Bonelli's Eagle (*Hieraetus fasciatus*) on the other hand, has shown a surprising breeding success. This eagle pair have a nesting site in the Vetal hill area on a scrub-covered slope facing the Pashan Lake. The nesting tree is again a *Dalbergia* sp., tallest on the slope. Initially the pair suffered as the fork in the tree could not support the weight of the nesting material. In a heavy storm the nest was almost blown away. Then a young bird-enthusiast Taej Mundkur came to the rescue of the eagles. He climbed the tree in spite of the presence of the pair around and tied steel wires at the bottom of the nest all around the fork. Also barbed wires were tied on the trunk of the tree to prevent anyone from climbing it and disturbing the nest. The reinforcement of the nest was successful and over the years the nest has now assumed a gigantic shape. The pair has since then raised broods successfully for the last two years.

#### B. Red-headed Merlins in Pune city

The Red-headed Merlin (*Falco chicquera*) has been breeding successfully since 1974 amidst the thickly populated areas of Pune. One nest was located on the adorning fixture of the city market tower. Merlins and house crows alternately occupied the nest. The breeding success of the merlin pair in this unusual location was probably due to a change in feeding habits that they brought about. The number of this species appears to be growing in the city and it is estimated that there are at least 5 breeding pairs in and around Pune city. This falcon also inhabits tall spires of a number of churches in the city. The reason for its association with such structures is the presence of *pipistrelle* bats in such locations. This falcon has adapted to feeding exclusively on these bats in the city.

They hunt these bats from dusk till late in the evening and the tall spires serve as strategic points for perching. Male and female hunt independently but in the same general area and exhibit superb manoeuvring during hunting sallies. The birds leave the perch gently and fly in a particular direction and intercept the bats by sudden dips, rises and turns. After going for a certain distance the falcon turns round and flies back to the perch in the same manner often along with the prey in its talons. A pair usually defends their territory from other adults but is seen to allow last year's immature birds to participate in the hunt. In one instance 7 falcons were seen on the perch within the foraging area. The

Table 1

## STATUS AND HABITAT OF BIRDS OF PREY IN AND AROUND PUNE

S.No.	Species	Habitat	Location	Status	Strength	Breeding	Pairs	Remarks
1	Honey Buzzard	Forest		Resident	C	?		
		Semi-evergreen	Sinhgad					
2	Crested Hawk Eagle	Moist Deciduous	N.D.A.	Resident	C	1 Yes	1	Breeding in Katraj
3	Black Eagle	Dry deciduous	Katraj	Resident	O	—	—	Local Migrant
4	Crested Serpent Eagle			Resident	C	1 Yes	1	Breeding in Sinhgad
5	Shahin Falcon			Resident	O	?	?	
6	Indian Kestrel			Resident	C	? Yes	3	Breeding in Sinhgad
7	Long-billed Vulture			Resident	C	Yes	2	
8	Goshawk			Migrant	O	—	—	
9	Crested Goshawk		Sinhgad	Migrant	O	—	—	
10	Sparrowhawk			Migrant	O	—	—	
11	Indian Hobby	Open Habitats		Migrant	O	—	—	
12	Blackwinged Kite	Gardens	University	Resident	C	Yes	10	
13	Pariah Kite	Plantations	Agricultural	Resi.	C	Yes	Many	
14	Shikra	Cultivation	College	Resi.	C	Yes	5	
15	White-eyed Buzzard	Scrubland	Botanical	Resi.	C	Yes	1	
16	Bonnelli's Eagle	Grassland	Garden	Resi.	O	Yes	1	
17	White-backed Vulture		Empress	Resi.	C	Yes	2	
18	Egyptian Vulture		Garden	Resi.	C	Yes	2	
19	Short-toed Eagle		Koregaon	Resi.	O	Yes	2	
20	Laggar Falcon		Park	Resi.	O	Yes	2	
21	Red-headed Merlin		Pachgaon	Resi.	C	Yes	5	

22	Long-legged Buzzard		Parvati	Migrant	O	—	—	
23	Booted Hawk Eagle		Baner Hill	Migrant	C	—	—	
24	Tawny Eagle		Vetal Hill	Resi.	C	—	—	
25	Lesser Spotted Eagle		Hanuman Hill	Migrant	O	—	—	
26	Griffon Vulture		Bopdeo Ghat	Migrant	O	—	—	
27	Pale Harrier	Open Habitat		Migrant	C	—	—	
28	Montague's Harrier	(contd.)		Migrant	C	—	—	
29	Lesser Kestrel		Baner Hill	Migrant	O	—	—	
30	Kestrel			Migrant	C	—	—	
31	Brahminy Kite	Wetland	Mula River	Resident	O	?	?	Local migrant
32	Blackeared Kite	Habitat	Mula Mutha rivers	Migrant	C	—	—	
33	Imperial Eagle	Rivers						
34	Greater Spotted Eagle	Lakes		Migrant	O	—	—	Sighted once
		village tanks	Pashan Lake	Migrant	O	—	—	
35	Marsh Harrier			Migrant	C	—	—	
36	Osprey		Khadakwasa Lake	Migrant	O	—	—	
37	Hobby			Migrant	O	—	—	



## **Owls Around Pune**

*Tejas Gole*

Spotted little owl (*athene brama*) : This little owl appears to be abundant around Pune. Spotted owl is found wherever there is a group of trees or a small patch of woodland. Within the city I have been able to see this bird in the Prabhat road and Cantonment areas; both fairly populated, but having bungalows and buildings with spacious compounds & large trees. Also on the city outskirts, such as Pashan and Aundh areas it lives in close proximity to man. A walk at late dusk in this area is always rewarded with a number of sightings of this bird. A pair or more owls are generally together on roadside poles, close to a lamp & are scrutinizing the ground below. I can roughly estimate a pair per 200 sq mts of this area.

Outside the city this owl generally keeps to a large tree like Mango or an Acacia, during the day. Such roosts have been seen near Baner, along the river near Aundh; near Pashan lake on a bayan tree. Three banyan tree roosts are to be found in the University campus. Near the National Defence Academy (NDA) again a mango tree is used as a roost. Near the Baner hill a number of pairs (4) roost communally, which is unusual for this species. They breed in a number of holes on the steep mud walls of gullies formed by erosion. To my knowledge, such a nesting site has not been reported so far.

In spite of the abundance of this owl not much is known about its nesting in Pune area. Probably because its nesting site is very well concealed. One site we discovered was by an unfortunate accident. It

was on a tall steel structure built to support four water tanks. The nest was in a horizontal hollow girder at the top, a site contested by Common Mynahs. Unfortunately a very young owl fell out of its nest from a height of 40 ft and died. Another nest was in a hollow of a tree trunk of a tall tree about 30 ft above the ground in the University campus.

Some juvenile spotted owlets are often found by people & are brought home in an injured state. The injuries are usually inflicted by boys throwing stones and not by mobbing by other birds.

*Barn owl (Tyto alba)*: This owl appears to be not as abundant as the Spotted owlet, but nevertheless quite common. The density must also be less too and I would estimate a pair per sq km or more of Pune area. A ride around the city at night may show only one or two of these owls. They do not have favourite perches like the Spotted owlet, but are generally seen in flight in pursuit of their prey. On some occasions I have seen this owl in the most densely populated areas. For example, in densely populated areas such as the Laxmi road I have seen this bird once at around nine p.m. Another sighting was near the Shaniwar wada also in the same area. On more than one occasion I have seen a barn owl looking for prey on the tennis courts of the Deccan gymkhana. Besides these the regular sightings have been in the University, Aundh and Pashan areas. The owl generally emerges after dusk and flies straight to a perch, pauses there briefly and continues its flight, flying at a height of about 10 to 20 ft. I have never seen a barn owl roosting presumably because it hides in the deepest crannies in tall buildings or in their tiled roofs.

The only nest I have been able to observe was in a tall building in Spicer college (Aundh). This was in a hollow space under the tiled roof. We watched this nest for at least twenty days before seven young flew out at around 8 pm. During the period of observation the parents brought in food (usually rats or mice) at frequent intervals of one per hour.

Juveniles of this species are many times captured, because mobbed by crows they are injured or are driven into houses. They are always in a state of shock and attempts to feed them do not succeed. The injury is usually in the wing, sometimes if the wing is broken we have never been able to save the bird. The birds without any external injury usually fly away after recovering from the shock.

*Great horned owl (Bubo bubo)*: This owl is perhaps the least abundant of the three owls. It is seen on all the hills surrounding the Pune city. Usually it is found on hills with only scrub cover or no cover at all. The roosts are usually in places such as quarries or some such rock faces, with bushes growing on ledges. Here they can spend the day in the

shade. In these surroundings they are very well camouflaged. They are always to be seen in pairs, not far away from their roosting places. They do not appear to range over a wide area enabling a fairly accurate estimate of their numbers.

There is at least one pair of these owls on the baner hill, which can be easily disturbed in daytime during a walk on this hill. There is another pair on the hill behind ARDE (Pashan). One pair is found on the Vetal hill near the temple. One pair resides near NDA Pashan gate, one at Peacock Bay (NDA). Besides these there is one pair at Pachgaon Parvati and another in the Katraj valley. Perhaps a few owls stay close to the city as some immatures are also caught there. In spite of their confinement to particular areas, their nests are difficult to locate. One nest located this year (March '87) belonged to the pair at NDA (Pashan gate). This was in the stone quarry at the base of the hill, on a ledge on the rock face about 12 ft. above the water level in the quarry. The ledge was hidden behind an outcrop of vegetation & could be located only after much effort. This nest produced two young which came out of the nest when they had grown all feathers except the horns yet were not able to fly. The pellets found near by were large and full of hair possibly of bandicoot and field mice, their skulls and bones were also present in some. The juveniles are quite often driven into houses and gardens by mobbing flocks of crows, usually between December and June. Sometimes they are caught in barbed wires while trying to evade the crows. Though the chances of survival of the injured owls are low, the uninjured owls are capable of flying away after a day or two of rest.

## नागपूर परिसरात तुरेवाला मोठा दाबचिक

रमेश साहवडेकर

५ जानेवारी १९८५ ची सकाळ होती ती. गारठा चांगलाच जाणवत होता. आकाश काहीसे अन्धकारित होते. पहाटे भरपूर दव पडलेले होते. तशात उत्तरेकडून रेंणारे बड बरे गारठा वाहवीतच होते. नागपूर जवळच्या अंबाझरी तलावाभावीच्या उजाड माळरानावर मी, माझे मित्र गोपाळ डोसर व पांडुरंग केवटे असे तिथे भल्या सकाळी पर्यावरणीयशास्त्राची पोचलो होतो. खरं तर आजवर अनेकदा इथे आम्ही पक्षी-निरीक्षण केले होते. पण आज एखाद्या मोहीमेवर नियंत्रणाचा उत्साह संचारला होता. कारणही तसेच होते. केवट्यांनी परबाच आम्हाला एक सुखद धक्का देणारी वार्ता दिली होती. त्यांनी सांगितले होते, "अंबाझरीवर मी जो पक्षी पाहिला, तो बहुधा ग्रेट ब्रेस्टेड ग्रीब (तुरेवाला मोठा दाबचिक) असावा."

नागपूरच्या परिसरात या पक्ष्याची ही पहिलीच नोंद असावी. थोडीशी शंका आणि प्रचंड उत्सुकता घेऊन हा दाबचिक पाहण्यासाठी आम्ही अंबाझरीवर आलो होतो. नागपूरच्या नैऋत्येस असलेला अंबाझरी हा तलाव तसा जुना आहे. मुळत नाग नदीच्या उगमापाशी होत उचबट्यामध्ये मातीचा बंधारा घालून ग्रेट ग्रीबनी हा तलाव निर्माण केला. नागपूरला भोसल्याचे राज्य असताना त्याचा बंधारा अधिक पक्का केला गेला. त्याला आजचे स्वरूप प्राप्त करून दिले इंग्रजांनी विसाव्या शतकाच्या आरंभीच्या काळात. तलावाचा परिसर लहान टेकड्या आणि मुरमाड माळरानाने व्यापला आहे. पाणलोट क्षेत्रात सुमारे ४०-५० टक्के क्षेत्र म्हणजे निम्म जमीन कुरण आहे. तलावाला इलवनीची किनार फारच थोडी आहे. पाणी संपताच मुरमाड जमीन सुरू होते. पाण्याला लागून थिड्याचे पट्टे फारसे तसल्यामुळे तलावाकाठाचे "वेडम" फार कमी संख्येने दिसतात.

पश्चिमेकडून येऊन मिळणाऱ्या मुख्य प्रवाहाच्या तोंडाशी तलाव उभळ आहे. या ठिकाणी उभ्या दांड्याचे पाणगवत वाढलेले (रीड्स) आहे. मात्र 'रीड्स' चा पट्टा मोठा नाही. तलावाच्या पश्चिमेस एक औद्योगिक वसाहत आहे. बंधाऱ्याच्या उत्तर टोकाशी नागपूर महापालिकेने एक बाग तयार केली आहे. पश्चिम व दक्षिण कडावर दोन पंपहाऊसेस आहेत. त्यांच्या अवतीभवती काही झाडे प्रयत्नपूर्वक लावण्यात आली आहेत. तलावाच्या खोलगट भागात पाण्याची सोली १० ते २० फूट (३ ते ६ मीटर) असावी.

दुर्बिणीतून तलावाचा कप्पानु कप्पा न्याहाळित आम्ही पश्चिम टोकाजवळ येऊन पोहोचलो. इथे पक्ष्यांची गर्दी वाटली होती. काही हजार कूट आणि टफटेड, कॉमन टील, कॉमन पोचार्ड, विजन, शॉव्हेलर, गार्गनी, आणि डॉटन टील या चढकांच्या प्रचंड गर्दीत आम्ही दाबाचकचा आतुरतेने शोध घेऊ लागलो. पण दाबाचक काही दिसेना. आम्ही निराश होऊ लागलो. चढते उन मानेला चढका देऊ लागले. एवढ्यात दूर पोलिकडच्या किनाऱ्याजवळ एक पांढरा मोठा पक्षी चढकांच्या गर्दीत उडून दिसला. आमची उत्सुकता शिगेला पोचली. क्षणात त्या शुभ्र पक्ष्याने पाण्यातून सरळ आकाशात झेप घेतली. त्याच्या पखांच्या टोकाशी असलेल्या काळ्या 'टिप्स' दिसू लागल्या. एखाद्या शिकारी पक्ष्याच्या शिनाफीने या पक्ष्याने हबेत उंची गाठली. हा काही दाबाचक नाही अशी आमची खात्री पटली. तोच तो मोराड पक्षी पाण्यावर झेपावला आणि स्थिरावला. माझ्या डोक्यात प्रकाश पडला. "अरे, हा नक्कीच गल आहे! पण कोणता?" भराभर "पिकटोरिअल गाइडची" पान वाळली गेली आणि "हॅरिंग गल" निश्चित झाला. "आंधळा मागतो एक..." असे आम्ही आनंदलो. कारण या पक्ष्यालाही आम्ही नागपुरात पहिल्यांदाच बघत होतो. त्याचीही ही पहिलीच नोंद असावी. १९२३ साली नागपुरच्या म्युझियमचे क्युरेटर डी एब्बु यानी नागपुरच्या पक्ष्यांची यादी प्रसिद्ध केली आहे. या यादीत हॅरिंग गल नाही. नंतरच्या कालात या पक्ष्याची नागपुरात नोंद कुणी केल्याचे आमच्या पाहण्यात आलेले नाही.

पण दाबाचक काही दिसेना. नंतर दोन तास शोधूनही तो मिळला नाही. केवट अस्वस्थ झाले, ओशाळले. "जाऊ द्या हो! पक्ष्यांचे हे असंच असत; म्हणून तर पक्षी-निरीक्षणात कायम धिल असत," अशी त्यांची समजूत घालीत आम्ही "पॅकड लच" संपाविली. केवटघाना काम होत म्हणून ते निघून गेले. दुपारच्या सुमन उन्हात मी आणि ठोसराती झाडाखाली बसक ताचून दिली.

दुपारी दोनच्या सुमारास परत निघण्यापूर्वी, आम्ही समोरच्या पाणपसाऱ्यावर पुन्हा एकदा दुर्बिणी रोखल्या. आमच्या समोरच्या कडावरून दोन पांढरे पक्षी पाण्यावर मगसप पाय बाजूचीत "टेकऑफ"साठी पळत गेले. अगदी "गुज" शैलीत पंख झुनवीत खोल पाण्याकडे उडाले. नाब जाऊन पाण्यावर स्थिरावले. "शकाच नको, हे घेट क्रेस्टेड पीबच!" (*Podiceps cristatus*) (तुरेवाला दाबाचक) आमची दोघांचीही खात्री पटली.

नंतरचे दोन-अडीच तास तलाबापलिकडच्या रस्त्यावरली राहवारी, आमच्या आमपास माळरानावर चरणारी सुरे, चढके देणारे उन या कशाचेही बान आम्हाला नव्हते. तिकडे दाबाचकही उदरभरणात मग्न होते. खोल पाण्यात अन्न शोधण्यासाठी हुबकी मारून ते

अदृश्य होत, ते १००-२०० फूटांवर भलतीकडे निघत. बाहेर निघाली की मान हलवून दोनघाबरचे पाणी झटकीत. त्यावेळी त्यांच्या मानेचा "इंगर" सारखा आकार अनुभवताले घेई. मानेची ती बिंबाष्ट पेट, मोठा आकार, पांढरट, राखट रंग यामुळे बंदकांमध्ये ती सहज उठून दिसत. पाण्यावर बंदकांपेक्षा ती अधिक चपळ वाटली. अन्न शोधण्यासाठी ते सतत हुबक्या घ्यायचे, बंदकांच्या एका पोटलयाजवळून दुसऱ्या पोटलयाजवळ निघायचे. त्याची गती सहज डोळ्यात भरावी अशीच होती.

त्या दिवशी अंबाझरी तलाबावर आम्ही चार दाबाचक नोंदविली. बहुधा दोन युगले असावीत असा आमचा पहिला अंदाज होता. त्यांच्यापैकी एक अधिक काळ-पांढरा, आकाराने मोठा, वेहऱ्याच्याभोवती पिमाची सुरेख झालर असलेला असा "डोमिनंट मेन" असावा असे वाटले. इतर कदाचित् पूर्ण वाढ न झालेले पक्षी असावेत. ते सर्व मिळून एक कुटूंब असावे असेही काही वेळ वाटे. वेगवेगळ्या ठिकाणी एकूण बोडी अधुनमधुन दिसते, त्यामुळे दोन स्वतंत्र युगले असावीत असे वाटे. असे बदलते तर्क मांडीत आमचे दोन-अडीच तास त्यांच्या निरीक्षणात कसे गेले कळलेच नाही.

आता उन्हा बरीच कलली होती. डोर परतीला लागली होती. आता परत जायला हवं असा विचार करून मनात टिपण करायला सुरुवात केली. माझ्यातला पक्षी-अभ्यासक जागा झाला. दाबाचकच्या हुबकीचा वेळ मोजायला लागलो. एकदा-दोनदा शंभर सेकंदावर गेलो. दोनदा तर दोनशेच्याही वर गेलो. मग मोजणे सोडून दिले. आता उतरत्या उन्हात "दिवर" जमविण्यासाठी एक नाश हॅरिंगने चाचपणी सुरू केली. बंदकांमध्ये "हलचल" सुरू झाली. काहीनी उडवण केल. पाण्याखालून अचानक वर आलेल्या एका दाबाचकने आजूबाजूला कसला गोंधळ चाललाय या आविर्भावात इकडे तिकडे मान बळवून बघितले. हॅरिंग दोनदा त्याच्या जवळून गेला. दाबाचकने त्याची दखल घेतली नाही. जवळच्या कूटच्या घण्यावर हॅरिंग झेपावला, तेव्हा कूटसुमधे चांगलीच पळपळ झाली. त्यानं चिडून म्हणा, गोंधळून म्हणा, दाबाचकने एकदम धमजाव करून हॅरिंगकडे आक्रमक पवित्रा घेतला. कलत्या उन्हात त्याच्या डोळ्यांतली चमक, पिसारलेली वेहऱ्याभोवतीची झालर, आणि मानेची पेट क्षणभर दिसली. तीनदा हॅरिंगकडे बळून त्यानं हा पवित्रा घेतला. चौथ्या वेळाने हॅरिंगही कूटसुचा नाव सोडून निघून गेला.

अतिशय आनंदात आम्ही राहाराकडे परतलो. आज आमच्या डायरीत एक ऐतिहासिक नोंद झाली होती. महाराष्ट्राच्या पक्षीसूचीत आजवर नोंदविला न गेलेला दाबाचक आम्ही नोंदविला होता.

डिसेंबर १९८६ मध्ये पक्षीगणनेच्या वेळी आमच्या चमूला तुरेवाला दाबाचक पुन्हा दिसला. गावेळी तो नागपुरच्या उत्तरेला १० कि.मी. वर असलेल्या कोराडी जलाशयात दिसला. हा जलाशय कोराडी धर्मन पांवर स्टेशनच्या बायबलसंच गरम पाणी सोडण्यामुळे तयार झाला आहे. तो १५-२० वर्षांपामुन इथं आहे. या तलाबाच्या एका अंगाला विद्युत्गृह व कर्मचाऱ्यांची वसाहत आहे. बाकीच्या बाजू होतीले व्यापल्या आहेत. मात्र तलाबाच्या काठाने भरपूर पाणगवत आहे. अंबाझरीपेक्षा कितीतरी जास्त. या 'रीड्स'च्या पट्ट्यात कमलपक्षी (फ्लॉट टेल्ड जॅसाना), पाणकोबड्या (मूरहेन्स)-यामध्ये जांबळधा पाणकोबड्या (पर्याप्त मूरहेन्स) जास्त-कूट हे पक्षी घर्टी बांधतात. तलाबापलिकडे

कोलार नदी आणि तिच्या खोऱ्यातल्या कोळशाच्या खाणी आहेत. तलावाच्या आरुमतात "अंशाफॉन"चे प्रदूषण जाणवते.

या तलावात एकच तुरेवाला दारुचिक दिसला आणि तोही खोल पाण्यातच वावरत होता.

अंबाझरी आणि कोराडी हे दोन्ही तलाव वाहने, माणसे, (काही शिकारी), औद्योगिक गवज, प्रदूषण, आवाज या सान्यामुळे ग्रस्त आहेत. पण बरबर पाहता पक्षांवर याचा परिणाम झाल्यासारखे दिसत नाही.

जानेवारी १९८७ मध्ये काही पक्षी-निरीक्षकांनी चंद्रपूर जिल्ह्यातल्या चारगाव तलावात चार-पाच तुरेवाल्या दारुचिकची नोंद केली. हा तलाव बरोड्याच्या (अक्षांश २०.५ उ. व रेखांश ७९.५) आग्नेयेस सुमारे ३० कि.मी. अंतरावर असून तो एक छोट्या नदीवर धरण बांधल्याने तयार झाला आहे. याला सर्व बाजूंनी शेतीने वेढले आहे. पाण्याजवळ पाणगवताचा पट्टा इथेही आहेच. तलावात भरपूर गाळ साचल्याने पाणी उधळ आहे. इथे पाणपक्षांची विविधता पहायला मिळते. गेल्या दोन वर्षांत इथे झेंच (दमांसिल जेन), राजहंस (बारहेडेड गूज), करकोचे (पेन्टेड स्टॉक) यांची नोंद झाली आहे. याही तलावात तुरेवाने दारुचिक बांधाजवळच्या खोल पाण्यात, रहदारीची फारशी दखल न घेता वावरताना आढळले.

फेब्रुवारी १९८७ मध्ये मला एक तुरेवाला दारुचिक दिसला. तो पुन्हा अंबाझरी तलावात.

गेल्या काही वर्षांत तुरेवाला दारुचिक विदर्भाच्या बऱ्याच मोठ्या भौगोलिक क्षेत्रावर स्थलांतरीत होऊ लागला आहे असे वाटते. उत्तरेकडून येणारे पक्षी विंध्य व सातपुडा पर्वत ओलांडून, मध्य प्रदेशातून पूर्वे विदर्भात वैनगंगेच्या खोऱ्यात नागपूर, बंदारा, चंद्रपूर, गडचिरोली आदी जिल्ह्यांत उतरत असावे. (नकाशा पहा)

गुजरातमध्ये गेली ३ वर्षे सतत अवर्षण असल्याने तळी कोरडी पडली आहेत. तेथून हे पक्षी कदाचित् तापी नदीच्या खोऱ्यातून पश्चिम विदर्भात येत असावे. संपूर्ण प्रदेशातील तलावांवर लक्ष ठेवणे जरूर आहे. पक्षी-निरीक्षकांना ते एक आव्हानच आहे.

तुरेवाला दारुचिक विदर्भात स्थिरावतो का, हे पाहण्यासाठी त्याची अनेक वर्षे नोंद ठेवली पाहिजे. काही विशिष्ट नैसर्गिक परिस्थितीत स्थलांतरीत झालेला हा पक्षी, या भागातला एक नेहमीचा स्थलांतरीत पक्षी म्हणून गणला जाण्यासाठी कोणते घटक कारणीभूत ठरू शकतात? दरम्यान या पक्षाच्या सवयीमध्ये काही परिवर्तन घडून येते का? बदललेल्या सवयी पटल्या पिढ्यांमध्ये संक्रमित होतात का? रहिवासी पक्षी, कायम स्थलांतरीत पक्षी यांच्याशी या नव्या स्थलांतरीताचे संबंध कसे असतात? असे संशोधन मग या अनुषंगाने करणे शक्य आहे.

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संदर्भ:

अली सानिम, रिप्ले डिलन, १९८३: ए पिक्टोरिअल गाइड टू दी बर्ड्स ऑफ दी इंडियन सब-कॉन्टिनेंट,  
बॉम्बे नॅचरल हिस्टरी सोसायटी ऑक्सफर्ड युनिव्हर्सिटी प्रेस, नवी दिल्ली.  
द एज्यु. इ. ए. १९२३: ए इंग्लिश-लिस्ट ऑफ दी बर्ड्स ऑफ दी सेंट्रल प्रोविन्सेस,  
रेकॉर्ड्स ऑफ दी नागपूर म्युझियम, नं. ३ गव्हर्नमेंट प्रेस, नागपूर.

### Occurrence of Great Crested Grebe (*Podiceps cristatus*) near Nagpur

Great crested grebes were first sighted on the Ambazari tank near Nagpur on 5th January 1986. Four grebes were seen searching for food in the deeper portions of the tank. On the same day a Herring Gull (*Larus argentatus*) was also noticed on this lake. This to my knowledge, is the first record near Nagpur.

In December 1986 a single *P. cristatus* was seen on the Koradi reservoir 10 km.s to the north of Nagpur. Again in January 1987 some bird-watchers recorded 5 grebes on the Chargaon tank 30 km.s south-east of Varoda (Lat. 20° 5' N and Long. 79° E). On this tank Painted Storks (*Mycteria leucocephala*) Barheaded Goose (*Anser indicus*) and Demoiselle Crane (*Anthropoides virgo*) were also recorded. In February 1987 I again saw a single grebe on the Ambazari tank. It appears that these grebes are regularly visiting the Vidarbha region of Maharashtra by crossing the Vindhya and Satpuda ranges and coming through the Vainganga river basin. There was drought in Gujerath in the last three consecutive years. Grebes from Gujerath may be entering western Vidarbha through the Tapi river basin.

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Ramdas Peth  
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(Another observer recorded *P. cristatus* on the Tadoba Lake, Tadoba National Park, Dist. Chandrapur, Maharashtra, on 4th December 1984: Meena Haribal in Journal of Bombay Natural History Society, P. 661, Vol 83, No 3, December 1986. Ed.)



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