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FOREWORD

We must apologize for the delay in the publication of this Volume of our Journal. The main reason is financial. This year we are not successful in securing the publication grant which enabled us to distribute the Journal free of charge. The usual format of the Journal has to change also to suit the size of our purse. We hope the readers will bear with us and even support us in our efforts to continue to publish the Journal.

The present continues to be full of turmoil for the environment. Whatever is natural continues to shrink and is being replaced by the man-made; the all too familiar pressures on the biota continue to increase. We are still far away from a national consensus on the environment. We do not think that remedy lies in harking back to the old conservation practices as both the context and peoples' aspirations have changed radically. New circumstances demand a new set of values. We urge our readers and contributors to think ahead and formulate ideas that are novel and useful in the present context. We will be glad to publish them.

This Volume is being published at a time when the usual monsoon season is getting over. By and large the rain-god is again kind to the country. A good harvest is being forecast & those who planted saplings are happy about their survival. If they survive they will undoubtedly add to the green cover of the land. But this man-made cover will continue to be strange to the non-human beings as most of the saplings that are planted do not belong to our natural forests. Why not raise and propagate saplings that are native to our forests? Well, Ecological Society has started doing just this.

Editor.

A LANDSCAPE APPROACH TO CONSERVATION OF BIRDS

R. J. Ranjit Daniels

Introduction

Birds have contributed most significantly to the diversity of terrestrial vertebrates. Birds also have a special role in conservation as they not only help identify areas most worth saving but also have the capacity to make conservation an "affair of the heart". Birds have even fostered international cooperation. Bird migration first convinced conservationists of the need to disregard human frontiers, to protect birds all along their migratory routes. Besides, birds have to be protected for their own sake (Urquhart,1987).

As with any other group of organisms,the problem in conserving birds is the limited availability of habitats. This is particularly true in developing countries such as India where all available habitats have been under constant human pressure. As a result some have totally vanished while others remain as fragments. Such a condition has challenged conservationists, particularly those who insist on having only large contiguous habitats as reserves.

However,since we are often left with only patches of remnant habitats, we have to adopt strategies that help us get the best out of the seemingly useless bits. It is here that landscape ecology finds the most application.

Landscape has been defined as 'kilometers-wide area where a cluster of interacting stands or ecosystems is repeated in similar form. A landscape is therefore, an ecological unit with a distinguishable structure and landscape ecology can hence be considered as 'patch-work ecology.' It deals with patches; patches of different sizes, shapes and origin (Forman & Godron,1986 ;Noss,1983).

Landscape Approach

A landscape approach to conservation of species is an integration of ecological concepts. It starts with the realization that patches of habitats are interacting. All habitats are "open" and exchange energy,mineral nutrients and species. It thus makes the landscape mosaic a more important unit for study and management than individual,isolated habitat patches (Noss, 1983).

The landscape approach further teaches us to respect every -"useless" fragment in any landscape. For instance, corridors of trees along highways, hedgerows along cultivated areas, a channel, etc. can all aid the movement of species and thus make patches far apart interactive. Besides the movements of species, entire communities can be dynamic too. Hence the landscape approach recommends dealing with an ecological mosaic of patches with continuously varying degrees of connectedness and recognises the importance of matrix and corridors to terrestrial habitat island dynamics (Noss, 1983).

Managing a landscape also calls for assigning priorities to the elements (species or communities) involved. While some elements can exist only in large patches of habitats, many can thrive in the fragments. It is therefore, essential to treat these separately instead of complicating the management plans by an equal emphasis on preserving all elements in a landscape.

The landscape approach aims at preserving a) maximum species diversity, b) representativeness and c) species of high conservation value.

Species diversity has often been the prime attribute in conservation strategies. Sites have been evaluated merely by the number of species they contain. Species diversity is conventionally defined at three scales : alpha, beta, gamma. Alpha diversity is the number of species within a single homogeneous habitat or community. Beta diversity reflects the change in species composition along an environmental gradient or series of habitats. In simpler terms, it might be easier to consider alpha and beta diversities as within-and between habitat diversities. The total diversity in a larger area including more than one habitats such as in a landscape is called gamma diversity (Noss, 1983). It is the gamma diversity that we ultimately aim at "maximizing" in any landscape conservation plan.

Maximizing gamma diversity has however, been criticized as dangerous when applied simplistically. Particularly in manipulated areas a greater diversity may be the result of several introduced and nonnative species (Noss, 1983). Thus it has often led arguments such as whether it is relevant to only conserve a number of species or try to see what the species are (Diamond ,1986).

Representativeness of species or communities has been emphasized as an alternative to maximizing diversity. For instance, in the Biogeography project of Government of India, 1984,it was proposed to draw up a list of localities which are desirable to bring under protected area status in order to rectify the present deficiencies in representativeness (Rodgers & Panwar,1988).

Preserving species based on some assigned values has also been in much focus currently. Though it has not been fully decided whether species are to be valued for "their own sakes" or for our sakes, it is apparent that conservation evaluation and strategies are more effective if there are systems of attaching values to species. As a result, different ways of valuating species and\or communities have been proposed (The Nature Conservancy,1983; Usher, 1986; Daniels,et al,1991).

Since the three attributes discussed above are not always intercorrelated and that they cannot be applied as mutually exclusive of each other, a balanced strategy is needed. I have therefore, tried to synthesize these within the norms of the landscape approach and outline a conservation strategy for the birds of the Western Ghats.The results presented are based on a 5 year case study in Uttar Kannada district (Daniels,1989).

The Western Ghats

The Western Ghats have one of the most complex and patchy landscapes in India. As a result of the topography and climatic gradient, the natural habitats vary from wet montane grasslands through a range of forests to dry rocky scrub. All these are interspersed with streams and marshes forming a natural mosaic of patches and corridors. Further interference by humans has fragmented the entire landscape creating several newer habitats including a variety of exotic species and considerably reducing the original extent of the natural habitats. Thus it is almost impossible to find homogeneous patches of habitats,

especially evergreen forests, larger than a few square kilometers anywhere on the Westren Ghats today.

The Western Ghats have a rather diverse avifauna. There are 508 species known from these hills and the adjacent narrow coastline. Of these 300 are residents; 15 being endemic. The number of resident species of birds on the Westren Ghats is however, lower when compared with other parts of the tropics, particularly the neotropics. A comparable richness of birds has been reported from many areas (15 Km2) in Panama and Amazonia (Terborgh,et al,1990). An analysis of the avifaunal composition of the Western Ghats suggested that it has much fewer representatives in all families of tropical forest birds than northeast India and the contiguous southeast Asian mainland. The depauperate avifauna on the Western Ghats has been attributed to its prehistory and origin and being isolated from the rest of the tropical hills (Daniels,et,al, 1992). Further,the species of birds have evolved under conditions of limited habitat availability; that only 25% of the present avifauna are birds with some specialized habitat requirement; a few being specialists of evergreen forests (Daniels,1989).

Whether the avifaunal richness of the Western Ghats compares well with other tropical areas or not should not deter us from attempting to conserve their birds. The Western Ghats and the eastern Himalayan foot hills support the last remnants of tropical forest birds in India. Therefore, merely for the sake of "representativeness" they ought to be conserved.

A case study of Uttara Kannada's avifauna:

The Uttara Kannada district is located centrally on the Western Ghats (13^{0} C 55'-150 32'N ; 74 05'-75 05'E).It politically belongs to the state of Karnataka in South India. This large landscape of 10,290 Km2 is one of the most forested areas in peninsular India with a forest cover of 70%. The forests include evergreen, semievergreen, moist and dry deciduous stands and a variety of secondary stages and monocultures of exotic trees such as Eucalyptus, Cashew, Wattles and Casuarina. It receives an average rainfall of 2500 mm; mostly during the 5 rainy months (June-October). It is rather low in elevation with only a few hills exceeding 600 m. Including the coastal and freshwater marshes, 21 major habitats have been identified within the district (Daniels,1989).

The avifauna of Uttara Kannada is fairly rich. Four hundred species are known from the district since it was first surveyed by J. Davidson in the 1890s (Davidson,1898 a & b). Of these, 220 are residents (Daniels,1989). Thanks to the large landscape and its great diversity of habitats and birds, Uttara Kannada turned out to be an ideal site for the study. Further, this district has a well-documented past history of land use which helped analyse the response of the avifauna to the human-caused habitat transformations during the past century. Interestingly,the results of these analyses showed that except for a few secies of birds-those in the fringes of their geographical ranges within the district - the avifauna has largely remained the same for nearly 100 years(Daniels,et al,1990). This surprising result and a complete inventory of gridwise (5 X 5 Km) bird -habitat distribution for district are the basis for the conservation strategy outlined below:

a. Maximizing avifaunal diversity

If all species of birds in a landscape as that of Uttara Kannada district are to be conserved, maximizing the gamma diversity should be the goal. Hague et,al (1986) and Noss & Harris (1986) recommend the creation of a network of centres of diversity.These centres of diversity are called nodes. Each node is chosen in such a way that it is not only rich in species but also has the largest set of unique species. With proper links or corridors between the nodes, connectivity is increased. This renders the entire network interacting ensuring the continued existence of the entire avifauna in a landscape.

When such a procedure was followed, it turned out that by protecting 6 (out of 21) major habitats in the district, 80% of the avifauna can be maintained (Daniels,1989). However, as expected, an effort to maximize diversity had led to an overemphasis on protecting secondary and distributed habitats such as urban centres, man-made reservoirs and beaches. The forest birds which are more characteristic to the Western Ghats were poorly represented (Daniels,et al,1991).

b. Preserving representativeness :

The Uttara Kannada district does not have any species of birds unique to its landscape. However,there are small populations of some of the little known and characteristic species of the Western Ghats. Examples are Ceylon Frogmouth, Wynaad Laughing Thrush, Great Indian Hornbill, Rufousbellied Hawk-eagle and Niligiri Wood Pigeon. All these species are nowhere common. They are local and often exist as isolated populations; especially the frogmouth with its northernmost population in Uttara Kannada, totally isolated from the only other population which is widespread in Kerala. Similarly, the laughing thrush and hawk-eagle do not extend north much beyond Uttara Kannada. These birds are also not known from many parts of the Western Ghats between Uttara Kannada and Kerala. All the spp. mentioned above also happen to be birds of the evergreen forests. Thus a careful selection of patches of evergreen forests within the district can only ensure the survival of these species.

c. Preserving the valuable bird species:

There are various ways of assigning conservation values to species. While some have been criticized as anthropocentric, others are widely accepted by conservationists. Valuing species by endemism, habitat specialization, taxonomic uniqueness and degree of endangerment has been more popular among those attributes generally accepted. Assigning numerical conservation values under these 4 attributes to each species of birds in the Western Ghats has helped assess localities in Uttara Kannada district by their values of birds. Thus when the 4 attributes were considered equally important and sites of conservation interest selected accordingly, the result suggested that by preserving 18 localities (out of the 107 surveyed) representing 5 major habitats, 75% of the district's avifauna can be protected. These include all the valuable birds of the district; the most important habitats of conservation interest being evergreen forests and marshes (Daniels, et al, 1991).

A synthesis:

The case study of Uttara Kannada district discussed above has proved to be a pointer to conservation planning. It however, does not try to deal with issues such as whether to preserve a single large area or several small patches (Simberloff & Abele,1984 Willis,1984).

On the contrary if we agree with the statement that "all parks and prserves are too small to protect their biodiversity", then we are forced to make compromises (Schonewald-Cox & Bayless, 1986). Noss (1983) feels that larger preserves are easier to maintain. But how large should a preserve be for it to be considered large ? (Rafe,et al,1985). The issues are probably never resolved. Therefore instead of complicating matters further let us consider the following situation.

In Uttara Kannada district evergreen-semievergreen forests are spread over approximately 65% of land. The next important and very different habitat viz., the marsh is more scattered and however,it is estimated that in about 30% of the district, there can be at least one marsh not less than 50 X 50 m within every 25 Km (Daniels,1989). If the largest available patches of these two habitats are preserved around the nodes identified, a major fraction of the district's avifauna and valuable species are preserved. Other nodes including beaches and scrub together cover almost all the species of birds in the district (Fig 1). A selection of many smaller patches (less than a hectare or two) can add to the network. For instance, the sacred groves in the district are well-protected centres of diversity though often small. There are nevertheless species of thrushes, babblers and flycatchers breeding within these patches. Since these have been maintained by the local people for ages, no investment is needed to protect them further (Gadgil,1991). Most of the secondary and man-made habitats including monocultures of teak and eucalyptus serve as corridors in Uttara Kannada. A careful utilization of these as links would make the network more complete and ensure the survival of the district's diverse avifauna.

The Uttara Kannada district is just one of the several districts in the Western Ghats. A similar approach to conservation of birds in more parts of Western Ghats, would help prevent loss of bird species in the long run. It is also hoped that this case study will be a model all over the country.

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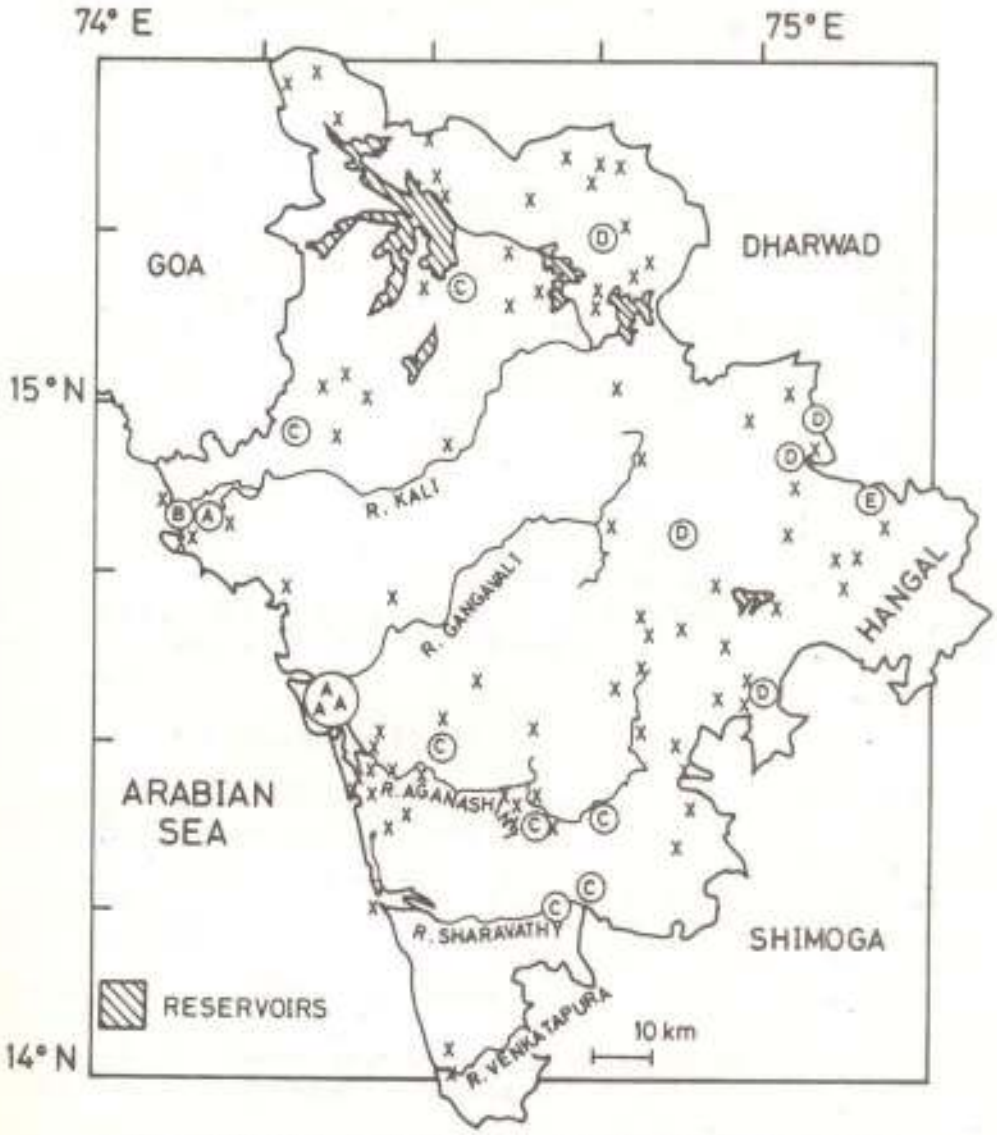

Map of Uttara Kannada District with the adjacent Hangal talik of Dharwad, showing the localities of conservation interest (circles). 'X' indicates all the sites surveyed (after Daniels et al 1991).

BARODA'S PLIGHT : ENVIRONMENTAL DEGRADATION DUE TO INDUSTRIALIZATION AND URBANIZATION.

S. F. BARODAWALA, P. K. PATEL & C. D. PATEL.

Introduction

Baroda as it is known now, was in the ancient past called as "Vadapadarka" may be due to the proliferation of banyan trees in the locality. Even in the 1960,s , one remembers Baroda as a city having avenus lined with banyan and other types of trees, not to mention vast tracts of greenlands both in the city as well as the outskirts.

The post-industrialisation phase i.e. from 1961 onwards,has witnessed first a gradual, followed by a rapid decrease in the vegetional cover in an around Baroda city. The distruction of vegetal cover can be attributed to encroachment upon once existing forest and agricultural land, by urbanisation and industrialisation.

Discussion of Meteorological Data

Metorological data from 1898-1987 was collected from the Meteorlogical Observatory in Baroda. From this several salient features can be seen.In the time span before the onset of industrialisation i.e. before 1960, Baroda's climatic regime was, in comparison to the present, bearable.

Pre-industrial Baroda (before 1960)

Temperature: Taking 44.5° c as the normal summer temperature, 44.82% of the total years recorded above normal temperarure.

Rainfall: Taking 900 mm as the normal rainfall, 51% of the total years recorded below normal rainfall.

Post-industrial Baroda (1960 onwards)

A comparision of the same two above mentioned parameters for the time span 1960-1987, show a dramatic change.

Temperature: Keeping 44.5° c as the normal, 48.27& of the total years show above normal temperature. This indicates a nearly 4% rise in the number of years having above normal summer temperature within a relatively short span of 28 years as compared to the years 1898-1959.

Rainfall: Keeping 900 mm as the normal rainfall, 62% of the total years show below normal rainfall. This indicates an 11% increase in number of years having below normal rainfall in the span of 28 years as compared to the period between 1898-1959.

This climatic change can be attributed to the rapid urbanization and industrialization of Baroda, the effects of which are discussed in detail below.

Cities,because they are cities, have climates different from the surrounding countryside. In fact, the city reaches out and influences the region beyond the inner city-the suburbs and often the hinterlands.

many miles from the city (Bryson and Ross, 1972). We now know that man has unwittingly changed such fundamental things as temperature, air circulation and the heat budget. In short, the cities that man builds profoundly affect climate in the short run and almost certainly will produce significant long-term climatic effects as well.

The evidence is mounting that these climatic changes can make life unpleasent. Table 1 shows the average changes in various climatic elements caused by urbanization. Urbanization alters the city climate in various ways. First, urbanization changes the physical surface of the land, notably by constructing many buildings and paving much of the ground, in the process water-proofing the land, increasing its thermal admittance, and increasing its roughness and hence its effects on wind. Second, urban man and his activities produce climatically important amounts of heat in several ways. Third, by their functions cities introduce great quantities of fine particles into the air.

Changes in the Physical Surface

Waterproofing: On an average, man has waterproofed about 50% of the surface in cities. Roofs, streets, and parking lots increase the runoff of even gentle rain, and drain systems are required to transport the runoff away from settled areas quickly and efficiently ; otherwise every minor storm would bring a barrage of phone calls because of filled basements and flooded underpasses. Thus we put gutters on roofs and along streets, and we build strom sewers as the waterproofed areas increase the runoff. Contrast this with the situation in the rural areas, where much more water soaks into the soil, eventually to return to the atmosphere by evapotranspiration or to seep slowly away in the groundwater.

This waterproofing brings about hydrological change with climatic consequences. Since in the city rapid runoff leaves paved surfaces dry most of the time between rainfalls, less moisture is available for evaporation than in the countryside.

This is significant because the evaporation process removes heat from the air (approximately 600 calories for every gram of water evaporated) and hence has a cooling effect at the earth's surface. Paved and roofed city surfaces simply do not have this mode of heat loss (Bryson & Ross, 1972).

Thermal admittance: The city has higher thermal admittance than the surrounding countryside.To understand this, let us look first at a rural field covered with grass. The ground receives heat during the day and cools off at neight, but vegetation acts as an insulating blanket (in large part trapping still air, through which heat moves slowly). The flow of heat both into and out of the soil is therefore reduced. During the day, the grass blanket keeps heat from flowing into the ground as rapidly as it otherwise would, so there is less heat stored in the soil. This would leave more at the surface to heat the air, except that evapotranspiration from the vegetation helps to lower temperatures. At night, the temperature at the top of the grass drops owing to reradiation back to the atmosphere, but the insulating blanket prevents considerable heat flow from the soil below. In short, the vegetation (when growing) tends to reduce surface temperatures during both day and night.

In contrast, the city, with its acres of concrete, has high thermal conductivity and heat capacity. Heat flows easily into the concrete during the day and is stored. At night, as the surface cools, there is a flow of heat upward to balance the surface loss. The effect of this is to maintain relatively higher temperatures at the surface. Thus the city, with high thermal admittance, stores more heat during the day and lets out more at night. For these reasons, night temperature in the city a few inches over concrete may be 5-6 c. warmer than temperature over rural fields.

Roughness: In cities man has also altered the roughness of the earth's surface. This (aerodynamic) roughness modifies the movement of the air at the surface. What happens depends primarily upon the smaller features, such as trees, bushes, less upon the space between them. The city in most situations, is rough compared to the open countryside.

Increased surface roughness affects the wind structure and causes a major adjustment in the vertical wind profile so that wind speeds near the surface are reduced. The structural features of cities, because they interfere with laminar flow, also increase the number of local eddies and thus increase the turbulence. The decrease of wind speed over cities is poorly documented (Bryson & Ross, 1972). Reasonable interpretations of available records suggest that wind speed in cities is about 25% less than in rural areas. This is not unreasonable in the light of measurable increase in aerodynamic roughness.

Experiments show that the aerodynamic roughness is proportional to the height of the buildings (h) squared times their width (w) and inversely proportional to the size of the lot the building occupies, that is, to the square of the average distance between buildings (D):

$$Z_o = \frac{I\ h^2\ w}{2\ D^2}$$

This roughness length Z may be 5 cm in the countryside and 1000 cm in the city. Given these figures, the reduction of wind in the city at 30 m above the ground may be 80% or more. This reduction proportionatly lengthens the time required for the wind to flush air pollutants from the city. At greater heights the reduction of the wind speed is much less.

Heat Production:

Not only has man, through his urban constructions, dramatically affected the exchange of energy and moisture within the system by altering the physical qualities and materials of the earth's surface, he also has become a primary source of heat production within the system. The heat man produces has led to even more radial changes in the heat balance than result from construction. These changes are manifested in many ways, ranging from the heat release of fossil fuel combustion to that of the human metabolism.

A typical automobile, operating in a city, burns about 13.65 lit. of fuel per day. The combustion in most automobile engines produces about

the same amount of heat as the typical home furnace in winter; indeed one can easily heat a house with an automobile running in the garage given the appropriate exhaust system and heat exchange. All this heat is added to the city's heat system.

Human beings themselves are another contributors to the city's heat budget. A man produces heat at a rate of between 100 and 300 watts depending on his activities - a person produces about 100 watts at rest and about 200-300 watts while working. Some heavy work produces even more. That is not insignificant with 1-10 millon people in the city. In crowds, the heat generated is equal to summer sunshine. The net contribution of combustion, heating, and metabolism can produce an impressive adjustment of the earth's heat budget in urban places and urban areas.

Turbidity : Particles in the air: In addition to alteration of the physical surface and variation in heat production, a third factor distinguishing the city from the country-side is a difference in combustion and properties of the atmosphere. The measure of dust, smoke and other particulate matter in the air is referred to as turbidity. All air is turbid to some degree. Nature contributes dust from sparsely vegetated land, for example, but man has greatly increased emission, and other activities.

Atmospheric dust has a number of effects. Among these is interference with solar radiation by the suspended particles. Although this interference affects the whole spectrum, it is most pronounced in the short wavelengths, resulting in a reduction of about 15% of total direct radiation over most major cities. This reduction is generally greater in winter and less in summer.

The result of all this is that citles become "heat islands "characterised by temperatures 5 to 10 c higher than surrounding countryside (Valdiya, 1987).

Fall-out of aurbanization and Industrialization of Baroda.

Table 4 gives the comparative and use characteristics before and after the urbanization and industrialization of Baroda city and its surroundings. From this it is very clear that there is a drastic decrease in agricultural land due to the spread of industrial and urban areas. This is also accompanied by the increase in waste/barren and degraded land. This is aptly depicted in fig. 3 & 4.

Unless some drastic controls over haphazard and urban growth are not taken, there are possibilities of some natural disaster occuring in this area. Disasters provide colourful examples, but they do not do much to call attention to the chronic problems. These are obviously significant in human and material costs, but unfortunately reliable statistics that treat "normal " death rates as a function of the urban atmosphere have not yet been compiled. Thus, the city changes its own chemistry as well as its climate- both at considerable expense to the city dweller's quality of life.

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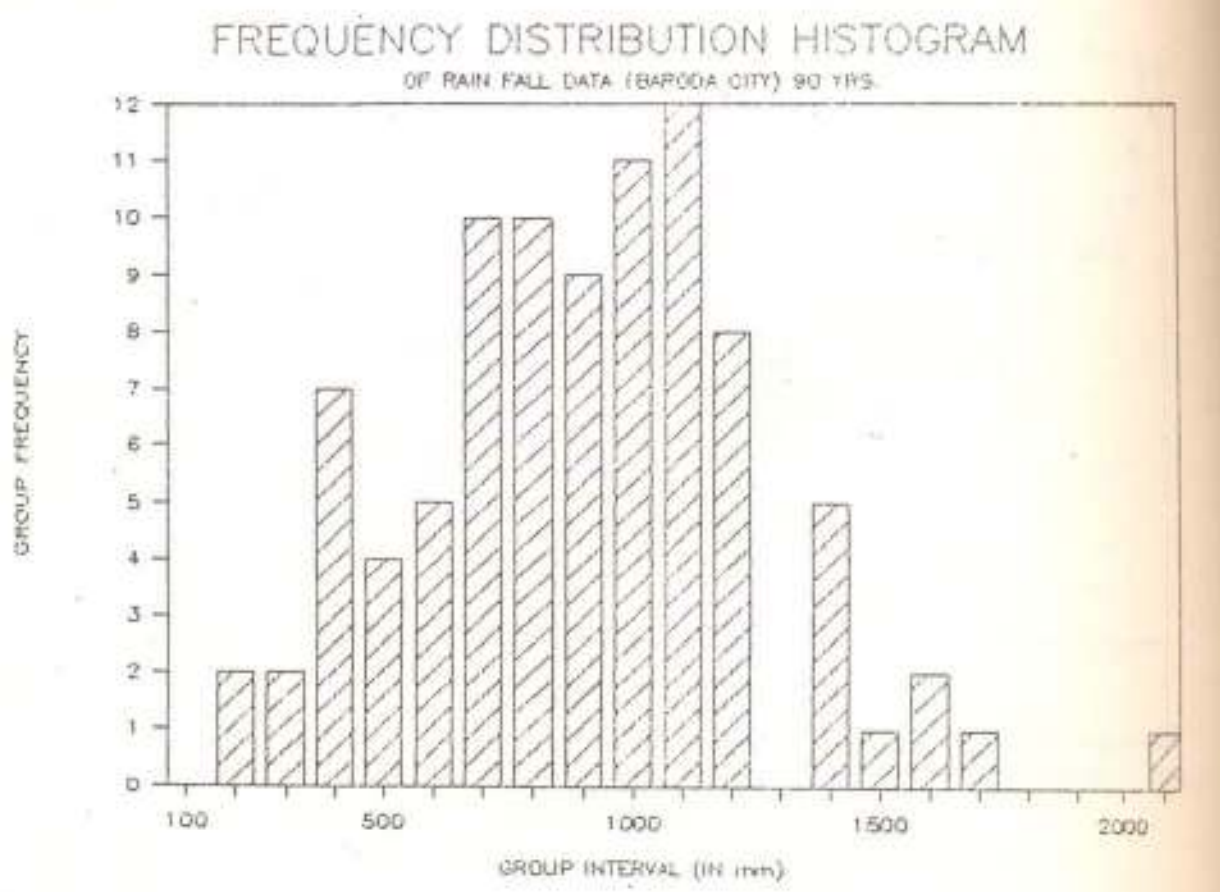
FIG. I


FREQUENCY DISTRIBUTION HISTOGRAM
OF RAIN FALL DATA (BARODA CITY) 90 YRS.
GROUP FREQUENCY
0
1
2
3
4
5
6
7
8
9
10
11
12
100
500
1000
1500
2000
GROUP INTERVAL (IN mm)

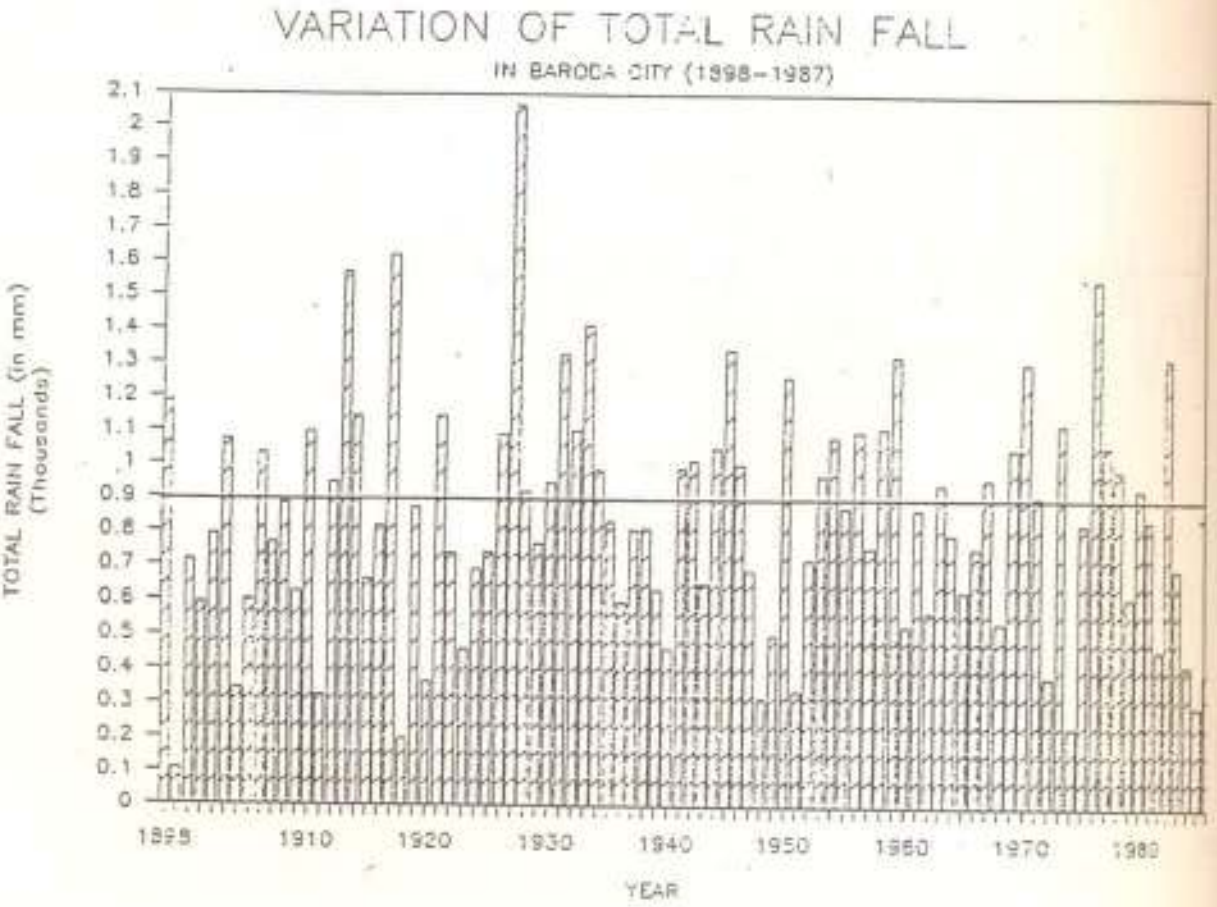
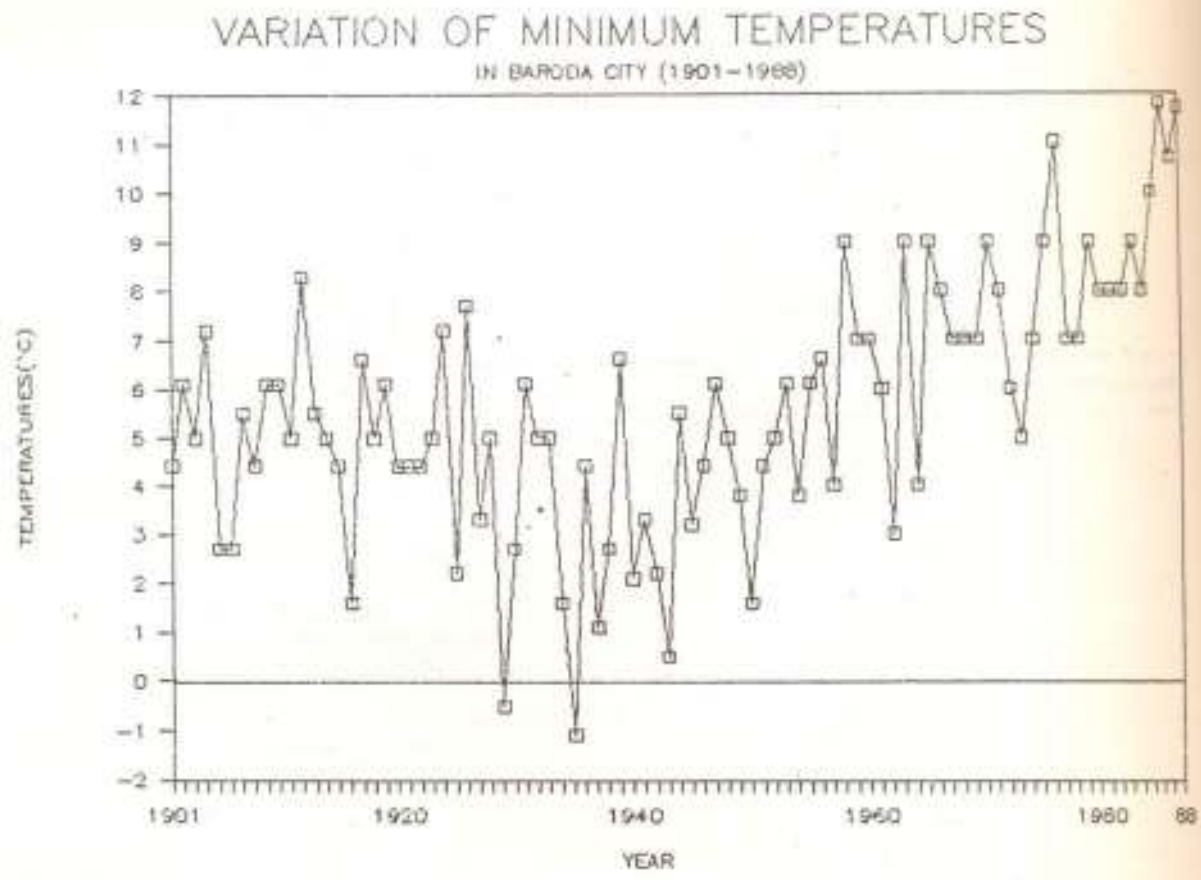

VARIATION OF TOTAL RAIN FALL
IN BARODA CITY (1898-1987)
TOTAL RAIN FALL (in mm)
(Thousands)
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
1.1
1.2
1.3
1.4
1.5
1.6
1.7
1.8
1.9
2
2.1
1898
1910
1920
1930
1940
1950
1960
1970
1980
YEAR

FIG. 2


VARIATION OF MINIMUM TEMPERATURES
IN BARODA CITY (1901-1988)
TEMPERATURES('C)
12
11
10
9
8
7
6
5
4
3
2
1
0
-1
-2
1901
1920
1940
1960
1980
88
YEAR

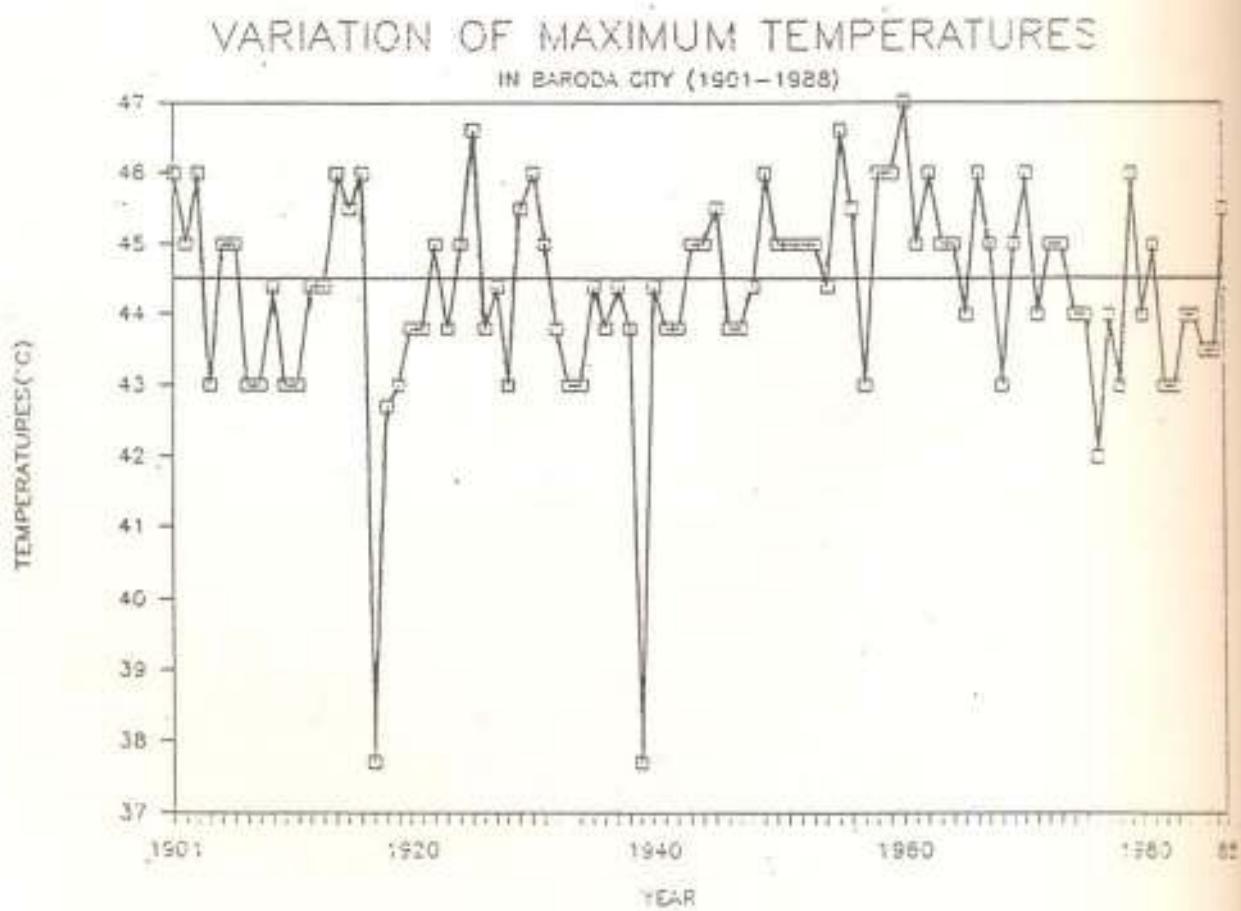

VARIATION OF MAXIMUM TEMPERATURES
IN BARODA CITY (1901-1988)
TEMPERATURES('C)
47
46
45
44
43
42
41
40
39
38
37
1901
1920
1940
1960
1980
YEAR

Table 1. Average changes in climatic elements caused by urbanization. (From Landsberg 1970.)

Element	*Comparison with Rural Environment*
Radiation	
global	15 to 20% less
ultraviolet, winter	30% less
ultraviolet, summer	5% less
sunshine duration	5 to 15% less
Temperature	
annual mean	0.5 to 1.0°C more
winter minima (average)	1 to 2°C more
heating degree days	10% less
Contaminants	
condensation nuclei and particulates	10 times more
gaseous admixtures	5 to 25 times more
Wind speed	
annual mean	20 to 30% less
extreme gusts	10 to 20% less
calms	5 to 20% more
Precipitation	
totals	5 to 10% more
days with less than 5 mm	10% more
snowfall	5% less
Cloudiness	
cover	5 to 10% more
fog, winter	100% more
fog, summer	30% more
Relative humidity	
winter	2% less
summer	8% less

TABLE - 2

⊕

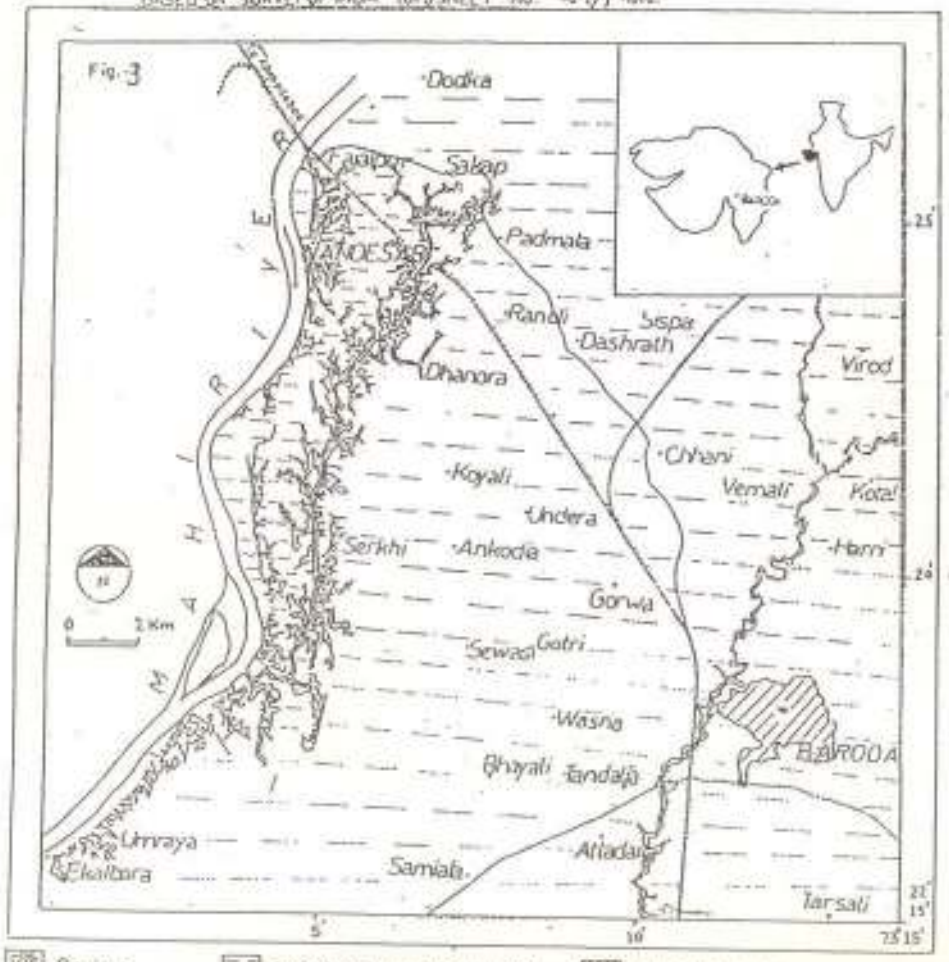
COMPARATIVE STATEMENT OF LAND-USE DATA (BEFORE AND AFTER INDUSTRIALISATION) AND URBANISATION OF BARODA CITY AND ITS SURROUNDINGS

Sr. No.	LAND USE⊕ (Sq. Km.)	Before industrialisation and urbanisation Based on Survey of India Toposheet No.46 F/3.		After industrialisation and urbanisation Based on Satellite Imagery (SPOT-I HRV_2 MLA)	Total Difference		Rate of degradation Sq.Km./year	
					Before industrialisation and urbanisation 1876-1959 (84 years)	After industrialisation and urbanisation 1960-1988 (28 years)	Before industrialisation and urbanisation. 1876-1959 (84 years)	After industrialisation and urbanisation 1960-1988 (28 years)
		1876	1960	1988				
1.	Total Area	460	460	460	-	-	-	-
2.	Residential Area	12.70	21.53	53.20	8.83⁺	31.67⁺	0.10⁺	1.13⁺
3.	Industrial Area	-	-	21.56	-	21.56⁺	-	0.77⁺
4.	Agricultural Land	395.95	349.62	108.00	46.33⁻	241.62⁻	0.55⁻	8.62⁻
5.	Waste/Barren Land	51.35	54.80	109.60	3.45⁺	54.80⁺	0.04⁺	1.95⁺
6.	Degraded Land	-	-	132.74	-	132.74⁺	-	4.74⁺

⊕ LAND-USE NOMENCLATURE USED IS AS GIVEN BY ANDERSON, et al (1976).

GENERALISED LAND USE MAP AND URBAN SPRAWL OF BARODA AND ITS SURROUNDINGS.

BASED ON SURVEY OF INDIA TOPOSHEET NO. 46 E/3 -1976.



Ravines | Agricultural and Pasture Land | Residential area

GENERALISED LAND USE MAP AND URBAN SPRAWL OF BARODA AND ITS SURROUNDINGS

LEGEND

RESIDENTIAL AREA
INDUSTRIAL AREA
AGRICULTURAL LAND WITH VEGETAL COVER
DEGRADED AGRICULTURAL LAND
DEGRADED LAND OR WASTE LAND
WASTE / BARREN LAND
ROADS AND RAILWAYS
RIVERS AND CANALS

BIRDS OF MAHADAYI RIVER VALLEY, WESTERN GHATS

Dr. J. C. Uttangi

The above said avifaunal survey and other wildlife study in the forest reserves of Mahadayi River Valley in Western Ghats Khanapur Taluka, Belgaum District, Karnataka State, Southern India, was carried out during the summer months of April and May 1993, thanks to the "Oriental Bird club(OBC)U. K. and their Forktail-Leica small survey Grant, 1993 .

Methods

More than 12 field trips to cover the 5 forest reserves in Mahadayi River Valley Complex at intervals of time chiefly during early to very early morning hours of the days of April and May. The 5 forest reserves covered during the survey include (1) the northern region of the river valley encompassing Jamboti, Kapoli, Chapoli and Amgaon areas, (2) the eastern region of the river basin surrounding the catchment area of Dhaynagar and Kabnali indicating the origin of the River Mahadayi, (3) the southern and most densely vegetated forest reserve covering Gavali and Hanbarwadi areas (4) the south-western region of Krishnapur,the core area of the river valley and (5) the Southern -most reserve of Talewadi area touching the Goa border and North Canara Circle near Anmode. A minimum of 2 trips atleast were devoted for each reserve area.

A total of more than 40 families of birds in the 5 survey areas have been recorded. The family Timalidae including babblers and thrushes appears to be the most dominant family in the core areas of the semi-evergreen forest tree community followed by Turdidae, Pycnonotidae Sylvidae and others along the forest-edges. To illustrate the specialities of birds of Western Ghats a selected list of birds studied during April and May 1993 survey is furnished below :-

1> Oriental White eye	Zosterops palpebrosa
2> Jungle Myna	Acridotheres fuscus
3> Yellow-headed Wagtail	Motacilla citreola
4> Malabar Whistling Thrush	Myiophonus horsfieldii
5> Shama	Copsychus malbaricus
6> Magpie Robin	Copsychus saularis
7> Grey Tit	Parus major
8> Whitebellied Woodpecker	Dryocopus javensis
9) Great Hornbill	Buceros bicornis
10> Mountain Imperial Pigeon	Ducula badia
11> Wynaad Laughing Thrush	Garrulax delesserti
12> Greater Racket-tailed Drongo	Dicrurus paradiseus
13> Black Bulbul	Hypsipetes madagascariensis
14> Red-whiskered Bulbul	Pycnonotus jocosus
15> Yellow-browed Bulbul	Hypsipetes indicus
16> Great Barbet	Megalaima virens
17> Malabar Grey Hornbill	Tocus griseus
18> Heart-spotted woodpecker	Hemicircus canente
19> White-bellied Treepie	Dendrocitta leucogaster
20> Malabar Trogon	Harpactes fasciatus

21> Asian Paradise Flycatcher	Terpsiphone paradisii
22> Plaintive Cuckoo	Cacomantis merulinus
23> Grey Jungle Fowl	Gallus sonneratii
24> Red Spur Fowl	Galloperdix spadicea
25> Grey Fronted Green Pigeon	Treron pompadora
26> Tickell,s Blue Flycatcher	Muscicapa tickelliae
27> Southern Brown Dipper	Cinclus pallasii
28> Verditer Flycatcher	Muscicapa albicaudata
29> Fairy Bluebird	Irena puella
30> Black and Rufous Flycatcher	Ficedula nigrorufa
31> White-throated Ground Thrush	Zoothera citrina
32> Velvet-fronted Nuthatch	Sitta frontalis
33> Scarlet Minivet	Pericrocotus flammeus
34> Red-breasted Flycatcher	Muscicapa parva

Bird counts along road sides were taken at intervals of half a kilometer distance to one kilometer and the total number of different species from each reserve area was noted down. It showed that many bird species normally sheltering in the core area of the valley occasionally move out and came to either feed or carry on nesting activities along the forest edge or along roadside trees.

Similarly the 30-kilometere distance forest road connecting Khanapur town and Anmode seemed to attract many birds from the core area to nest and forage in the tangled branches of trees and shrubs. Bird counts were also taken along this road at various points.

Occurrence of mixed bird flocks of different sizes and their composition were studied at certain spots along road- sides. At altitudes of more than 1000 meters an association of the Malabar Trogon, Harpactes fasciatus, of the Trogonidae family with Blue-tailed Bee- eater,Merops philippinus of the Meropidae family was common. It formed an interesting combination of two entirely dfferent families of birds. The Trogon with its wide mouth and a short bill and rounded wings though swift in flight went on to feed upon slow moving winged insects while the long and slender beaked bee-eater easily caught the agile insects like bees and dragon-flies. Similar associations of mixed feeding flocks smaller in size but larger in number like the Grey Tit, Parus major of the family Paridae and White eye Zosterops palpebrosa, of the familly Zosteropidae, Tickell's Flower-Pecker, Dicaeum erythrorhyncus of the family Dicaeidae and the Grey-headed Flycatcher - Warbler, Seicercus xanthoschistos of the family Sylviidae and a pair of Common Iora, Aegithina tiphia of the family Irenidae and the Small Minivet, Pericrocotus cinnamomeus of the family Campephagidae as well as the Black and Rufous Flycatcher Ficedula nigrorufa of the family Muscicapidae all of different families were observed in one of the localities in the southern region of the river valley near Talewadi-Krishnapur area.

Distributional trends

From the 5 areas surveyed during April and May 1993 more than 44 families of birds were recorded. Most species studied were resident breeding in semi-evergreen to moist deciduous biotopes. Few of them however, were found in the open scrub vegetation outside the forest

edge along patches of cultivated or deforested areas. In the Bamboo growth tangled with scrub vegetation and forest trees like Pterocarpus, Hopea, Ficus and underwood trees, bird families such as Campephagidae, Pycnonotidae, Sylviidae, Nectariniidae, Passeridae, Meropidae, and Accipitridae were common. Other families such as Ardeidae and Ciconidae occured near water spots in open areas.Thrushes and Babblers seemed confined to the dense and dark canopy of tangled trees. The Hornbill family Bucerotidae and the pheasant family Phasianidae stuck to the undisturbed dense semi-evergreen forest close to the valley near Gavali and Krishnapur area. Similarly, the Parakeet family Psittacidae and pigeon, family Columbidae and the Barbet, family Capitonidae occured mostly on fruit-bearing trees. The Dicaeidae, Nectariniidae, and Sylviidae were common on flower-bearing trees. Others occurred in bushes.

In the valley the survey area was confined mostly to the edges of streams. Every bird or mammal seen in the area was noted down. Pug marks of Barking-deer, Wildboar, Sloth Bear, Bison and Tiger were noticed on soft soil early in the morning in core areas. the Malabar Giant Red-squirrel was often seen on branches closely hemmed in with twigs near Anmode. The Kabnali reserve area on the northern end is deforested as the land close to it is managed by a private body. A large population of Warblers and Red- Whiskered Bulbuls was commonly seen over bamboo branches during early morning hours. The survey was generally focused on the interior valley for Pheasants and other rare birds. However, no individual of the Jungle Fowl was seen in the semi-evergreen forest zones except the Pea Fowl. Perhaps the Jungle Fowl is confined to moist deciduous patches elsewhere in Western Ghats. It needs further confirmation. Along the outskirts and adjacent to semi-evergreen patches rare birds like Grey Jungle Fowl and Red Spur Fowl were observed. On the occasion two members of the Grey Jungle Fowl crossing the 30 Kilometer road between Khanapur and Anmode were photographed during early morning hours. The Krishnapur and Talewadi areas near Anmode are thickly populated with birds of diverse families.

A boundary line encompassing all the 5 forest reserves in the North, South, East and West has been laid down to demarcate the area to be protected for nature preservation. Vegetational difference between the areas need examination through a more intensive survey. But to our eyes the difference appeared little at least in the core area. The composition of plants in the area is so rich and diverse that there may be not less than a thousand-odd species. If the Dam proposed now by the K. P. C. is allowed to come up in this valley in the Western Ghats all the pristine vegetation will be engulfed. As one goes up from the dense valley to the less dense forest-edge the bird population increases. May be this is due to habitat selection for nesting and breeding. To get an idea of the year-round avifaunal diversity one has to make a study of birds occurring in all seasons of the year. A surprising feature was the occurrence of a single Dipper bird in one of the small streams with water still flowing in it in May near Krishnapur area near a bridge. Hornbills were of rare occurrence. The number of doves and especially the Green Pigeons was astonishingly poor.

Threats and Disturbances.

The pressure on the birds and animals in the forest reserve under study mainly is from illegal hunting. It is believed that labourers employed by Forest Department and nearby agriculturists are the culprits. Cultivators are misusing the crop-protection gun licence facility granted to them. Doves and Pigeons are shot at on private lands where birds flock during sowing season. This must be controlled through constant education. Legal action fails in the absence of evidence.

On the other hand the Karnataka Power Corporation (K. P.C.) has other ideas and they are trying hard to acquire the entire valley to construct a series of seven odd dams at various points along the River Mahadayi. When these seven Dams are ready a total area of 2145 hect areas of pristine forest and private lands will go under water. An area of more than 1608 hect of semi-evergreen forest rich with a variety of rare plants, herbs, shrubs,and forbes will get engulfed. Similarly,rare animals such as Flying squirrel, Mouse-deer,Barking-deer, Amphibians and Reptiles, millions of Arthropodes and a host of rare Birds like Green Pigeon,Thrushes, Warblers, Hornbills and old world Wood-peckers, etc will lose their original habitats. Who knows whether or not they will adjust themselves to new environments? It is therefore, not wise to allow further power projects to come up in Western Ghats where already more than one lakh hectares of forest land has been sacrificed for projects such as Sharavati, Kadra, Kodsalli, Supa and Kaiga. In addition a few more are being added to this list namely, Bedti & Aghanashini.

The Rio conference has adopted recently the " Biodiversity Convention" to which we are a party. An integrated strategy for conservation of nature and natural habitats is extremely essential. Biotopes which are pristine in character need identification and wherever they occur they must be saved. Mahadayi River Valley in Western Ghats is one such biotopes, which deserves attention and it should be protected for the reasons stated above.

Recommendations

(1) To avert the impending disaster to the ever-green forest reserves of Mahadayi River Valley the seven Dams at present proposed by the K.P.C. for power development should be abandoned.
(2) Very strict legislation should be imposed to stop the illegal hunting at present going in the area.
(3) The area marked out around the river valley should be declared as sanctuary.
(4) An action plan to plant more fruit and nectar yielding species of plants wherever necessary should be worked out.
(5) Construction of roads should be stopped in the valley.
(6) The present 30 kilometer road running between Khanapur and Anmode should be closed for heavy vehicles.
(7) The manganese mining industry contract in force at present at Hemmadaga area should not be extended after its term finally

terminates in the year 1995.
(8) Cattle grazing in core areas should be stopped.

Acknowledgements

I would like to thank the then Conservator of Forests (C.F.) Forest Utilisation, Bangalore, Sri.A.N.Yellappa Reddy who is now raised to the rank of Special Secretary, Goernment of Karnataka, Department of Ecology and Environment, Banglore, for sharing his knowledge on conservation outlook and to the forest staff of Dharwad and Belgaum Divisions for their kind assistance in providing useful guides in hiking in the dense forest biotopes.The recipient is grateful to the working plan D.C.Fs and A.C.Fs of Belgaum and Dharwad Districts for their assistance with transport and for providing necessary information on the Ghat Forests and ranges of Londa, Khanapur, Jamboti, Hemmadaga, Kanakumbi and Anmode areas near Goa border. Thanks are also due to Professors G.R. Hegde and M .V. Shivalingaradhya of the Department of Botany, Karnataka University, Dharwad, for their kind co-operation in identifying the plants and to Sri.N.T. Hagargi of Dharwad for his fine photography. I am specially grateful to the Range Forest Officer (R.F.Os) of Khanapur and Londa for geographical and physical information and also for their photography.

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POLLUTION AND SUSTAINABLE LIVING

Prakash Gole.

(Text of the keynote address delivered on the occasion of the seminar on "Environmental Pollution : a threat to furure sustainable life on the earth" The Padmashree Vikhe Patil College of Arts, Science and Commerce, Pravaranagar, Maharashtra.)

Mr Chairman, Dignitaries and Friends,

I am glad that this college is holding a seminar on pollution of the environment and its impact on sustainable development. Any effort to create awareness in this direction is always welcome, more so when the Government is embarking on an ambitious programme of economic development, doing away with most of the previous restrictions and when there appears to be general support among the public for this programme.

Key words

The key words in this seminar will of course, be pollution, environment and sustainable life on earth. But before I comment on any or all of these, I must make clear my own limitations. I am neither an engineer nor a technocrat. I cannot therefore, comment on the technical or technological efficacy of the pollution control or abatement mechanisms used by different industries. I have studied economics but the data on the proportion of costs devoted to pollution control and their place in the total corporate or even a small-scale industry cost structure, are not available to me. What I can comment upon is: 1. the different aspects of pollution in the modern world, 2. their economic, ecological and social impacts and 3. some indication of what I feel about the developments in future.

First let us see in what sense the key words are used at present. Pollution is defined as "defiling of the natural environment by a pollutant." A pollutant is defined as" a substance that enters the enviroment or becomes concentrated within it and that has or may have a detrimental biological effect" (Oxford Dictionary of Natural History). Both these definitions speak of natural environment and biological effects. What is a natural environment? It may be one that has remained independent of man's influence. Such environments may be found in the Antarctic or Siberian wildernesses or deep inside the forest of Amazon and Congo where even the existence of primitive tribes is doubtful. All other environments are influenced by man to a more or less degree. Modern techno-agricultural and industrial societies have influenced the environment in a far greater measure than hunter-gatherer or pastoral societies.

But from the point of view of non-human beings, the environment had already been polluted by man even before the rise of modern technology. There was a steady extinction of species brought about by the pre-industrial man in their natural habitats. The rate of extinction accelerated greatly in societies that adopted the techno-agro-industrial culture. In our country too, the pace of adoption of this

modern culture is quickening as we increasingly discard traditional technologies and cultural practices. The word pollution is used here in the broadest sense. It is the man-induced change or disturbance that so defiles the natural habitat of non-human species, both plants and animals, that their extinction becomes imminent.

Pollution news

Pollution is normally used in a much more restricted sense. When I was invited to deliver this address, I glanced through news reports of the past year to find out what are the items that made pollution news. Fortunately there was no major tragedy like Bhopal except the nature-induced one of the earthquake in Maharashtra. Of the 12 events that had a major pollution content, 7 concerned industries where discharge of industrial effluents endangered human life; 1 where it threatened a national park; there was a case in which cultivation was threatened by an exotic insect; and 3 cases where sewage and human waste had destroyed lake and wetland eco-systems.

These cases are fairly representative of the threats as well as our perception of the threats. Undoubtedly modern industries like chemicals, petroleum, steel, cement and fertilizers have emerged as the major pollutants of the environment. At one time these were considered to be core industries on which all our economic progress was to be based. We can only do away with them on pain of denying progress and falling back from the race in which all developing countries are engaged today. Alternatively we can control their pollution by adopting pollution abatement technologies. Many industries are reluctant to adopt these as they involve additional costs which, if passed on to consumers, will make their product uncompetitive. Not only is there an increase in fixed costs, but running costs are increased also, presumably because additional inputs of energy are required. If the state makes abatement compulsory, it will have either to subsidize additional costs, or take the risk of inflation by passing them on to consumers and raising prices. Multinational corporations can sell their obsolete pollutive plants to less developed countries, adopt modern pollution control technologies and try to offset cost increases. All these methods are prevalent today.

But they are not a solution to the basic problem of avoiding pollution. Modern industry is going to remain pollutive as long as it uses non-renewable, fossil and other forms of energy. Price increases beyond a threshold will not be tolerated by the society. The state have to cancel production subsidies and other incentives and offer pollution control subsidies.

In a way the problem of controlling point-source pollution from industry or municipalities is easier than controlling non-point source pollution from technology-dominated agriculture where heavy doses of inorganic fertilizers and insecticides are used. Agricultural run-off from such areas contaminates water sources heavily. When I enquired about the death of cattle due to insectiside poisoning, a government lab refused to share any data saying that they were confidential! When I was working on a research project on Ujni reservoir, I found that not only the BOD and COD of the reservoir water high, but the MPN count terrible also, indicating high bacterial content from mixing of faecal matter. Water was supplied from the reservoir to the peripheral

villages without any kind of treatment resulting in great incidence of intestinal diseases. Yet all this hardly made any news. Probably good quality drinking water is not considered to be an essential component of cultured living !

The perception of dangers from bad water is now slowly emerging as the number of people carrying bottles of Bisleri, the saviour mineral water, is increasing. Yet we scarcely bother to enquire where the bottles come from and why they do not carry an ISI mark. The perception of dangers from air and noise pollution is still less. The atmosphere of New Delhi is heavily polluted due to thermal power exhausts, car exhausts, and industries. The saving grace of Bombay is the fresh air blown in from the sea. The towns and cities that are converted to modern industry and traffic have high air and noise pollution levels. We are doing precious little for the abatment of this pollution.

Basic reasons

Why all this pollution? The basic reason is the high energy demand of this machine age and the tremendous rates at which machines require the conversion of matter into energy. Many people agree that these demands must be reduced: bicycles should replace cars. This is happening in many European towns at least for short distances. Electric cars are replacing conventional cars in US cities. Waste is being recycled, municipal effluents treated in a better way than before. Yet I feel that these are only palliatives and not cures. The high energy demands of machines have accelerated the pace of human life to such an extent, that a modern executive cannot maintain that pace without his jet plane and high-powered car. Only a major break-through on the non-conventional energy front, be it solar, laser or superconductivity, will reduce the danger of pollution; whether this will bring in some new kinds of pollution only future will tell.

I can, only smile at persons who advocate return to simpler, older technologies; that bicycles must replace cars in all instances. Yet a bicycle can only be produced by machines. It is impossible for us to come out of the machine age. Civilized man is, by culture, education and temperament, forward-looking. Cultures that look inward and hark back to a golden age that perhaps never was, are consigned to slavery or inhospitable environment. People with high brain power, energy and enterprize will always push hard to change their environments for what they consider to be a better one and in their efforts bring in pollution. Pollution, I think, is inherent in human nature.

Sustainable strategy

Where does this leave us in the debate on sustainable living? Frankly speaking, the advocates of sustainable living, I feel, do not stretch this concept to its logical conclusion. A report published jointly by the World Conservation Union, United Nations Environment Programme and Worldwide Fund for Nature sets out the folowing 3 objectives for its strategy for sustainable living:

1. essential ecological processes and life-support systems must be maintained;
2. genetic diversity must be preserved and

3. any use of species or eco-systems must be sustainable.

How can we translate these into practice? Let us take the example of soil. You can only use a given amount of soil sustainably by perpetuating its qualities: the proportion of N, P, K etc. which makes it productive for man. This can either be done by application of fertilizers or by resting it for a number of years so that it regains its lost ingredients.The first cannot be practised indefinitely, not at least in the tropics. The second can only be practised if there is less pressure of population and of demand on the patch of soil.If a forest is to be used sustainably, the cutting rotation must be long enough; if the sea is to be used sustainably, the harvest of fish and other marine creatures has to be regulated. No natural resource can tolerate the high levels of exploitation demanded by modern machines and the high consumption society. Sustainable living is impossible witout regulating consumption.

Now the two issues are : who will regulate consumption and who will follow the regulated consumption patterns? the report quoted above says: The earth has its limits; with the best technology imaginable, they are not infinitely expandable. To live within those limitts and see that those who now have the least can soon get more, two things will need to be done: population growth must stop everywhere; and the rich must stabilize, and in some cases, reduce, their consumption of resources.

Developed countries are already asking developing countries to regulate their population so that they would not consume more, irrespective of the fact that more than 50 p. c. of the population in the third world does not get even the bare necessities of life. Will the developed countries reduce their consumption? The above report is rather guarded when it makes that recommendation. These countries, instead of cutting their consumption, are trying hard to find substitutes. But many of the natural and genetic resources are still concentrated in developing countries. The develpoed countries will make every effort to acquire them before they even think of changing their consumption pattern. Unfortunately the developing countries are helping them in this by bartering their natural heritage for machine-made goods. The stocks of natural resources may be shifted to developed countries in future, either willingly surrendered by developing people lured by modern conveniences or a new form of imperialism may shape itself. The genetic material is already being intensely hoarded by developed countries to be used in biotechnology.

Unless the developing countries scrupolously guard their plant and animal stock, nurture it with wisdom and care and adopt sound conservation practices, its sustainable use cannot be guaranteed. What we really need is a national consensus, transcending politics, on how to save our natural heritage: all existing plants, insects, birds, animals and their habitats. These are the bases of sustainable living. The pattern of consumption that will lead to sustainable living cannot be defined unless there is basic agreement on how and what to save of the non-human beings who share the planet with us.

I am very happy and honoured to be with you and thank the organizers for their kind invitation; and thank you also for your attentoin.

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CONSERVATION STATUS OF GREAT INDIAN BUSTARD IN MADHYA PRADESH, INDIA.

Dr. R. J. Rao

The Great Indian Bustard (Ardeotis nigriceps) is an important indicator species of the dry grassland ecosystem. It prefers slightly grazed areas with low vegetation, where it lives in groups. It feeds on grains, young shoots as well as insects. Breeding season varies from area to area.

This bird was formerly distributed in almost all the arid and semi-arid regions and grasslands in India, (Rehmani, 1988). Due to the demand for large quantities of food for ever-increasing human populations, many of these grasslands were converted to agricultural fields. This in addition to indiscriminate hunting and destruction of Bustard habitat by over-grazing has led to the endangered status of the bird.

At present, the 1500 to 2000 strong population of Bustards (Rahmani & Manakadan, 1990) survives in a few isolated pockets in Rajasthan, Madhya Pradesh, Maharashtra, Andhra Pradesh and Karnataka. Most of these Bustard habitats have been declared protected areas.

A number of steps have been taken to prevent the extinction of the bird. Schedule I of the Indian Wildlife (Protection) Act, 1972 prohibits capturing & killing of the bird. Management programmes in the protected areas aim at preserving the existing population & increasing the population by providing necessary facilities for successful breeding. The major Bustard habitats in Madhya Pradesh have been made sancturies to ensure greater protection.

Research on the status, distribution & bio-ecology of the Great Indian Bustard is being carried out by field biologists of the Bombay Natural History Society & Jiwaji University, Gwalior.

One of the largest populations of the Bustard is in the Karera Bustard Sanctuary, Madhya Pradesh (25-30 birds in 1986, but 10 in 1992-Rahmani & Manakadan). However, the future is bright if adequate protection & proper management are not relaxed in any way. In addition to the Bustard, other animals associated with the bird like Black Buck, Chinkara etc. have also received incidental protection.

The Bustard population has increased in many protected areas, due to effective management practices and succesful breeding. Further a holistic approach which will avoid conflict between man and wildlife, will go far in ensuring the safety of the Great Indian Bustard.

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OCCURRENCE OF THE PACIFIC GOLDEN PLOVER, PLUVIALIS FULVA IN IRRIGATION TANKS OF DHARWAD DISTRICT, KARNATAKA (INDIA).

Dr. J. C. Uttangi.

Project survey of irrigation tanks in areas of Dharwad district, Karnataka was carried out in February and March 1992. This was funded by the British Oriental Bird Club's small survey grant.

During this project, a flock of golden plovers, consisting of 30 individuals was sighted on the grassy edge of a semi-dry irrigation tank near Hawanagi village, in Hangal Taluka of district Dharwad.

Species identification of golden plovers is a difficult exercise due to overlapping characteristics and similar external features. Further, their unusual plumage pattern poses a problem in identification if light conditions are not optimum. Nevertheless, the following features were noted, after close observation of the sighted flock:

(1) Body size : partridge.
(2) Upper parts of the body plumage spotted brown and golden yellow & not silver white.
(3) A continuous white flank line in adult males.
(4) Undertail blotched black and white.
(5) Typical plover-like movements -stopping erect periodically and then dipping forward steeply to pick up the food.

There are 4 species of Pluvialis. Of these, P. apricariae is large and P fulva look almost identical except in shape; they were treated as the same and the flocks from this stock that migrated to India were designated as Eastern race, P.dominica fulva(Salim Ali and S. Dillon Ripley, 1987). Now, however, P. fulva enjoys independent status from the taxonomic point of view.

Since the first migrants arrive in the interior grasslands from coastal lands in March/April, irrigation tank habitat surveys in Dharwad in January, have not reported these birds previously.

However, on the basis of the aforementioned characteristic features observed in the sighted flock, it is suspected that this flock consisted of members of the P.fulva species. It is, nevertheless necessary that the coastal lands of the Indian sub-continent and moist grassy edges of freshwater ponds, jheels and irrigation tanks are further explored and investigated in order to ascertain the occurrence of this species.

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THREAT TO THE ONEHORNED RHINO - A BRIEF NOTE ON A VISIT TO KAZIRAANGA.

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Once renowned for the best wild-life management in India the Kaziranga National Park "today" faces the problems of protecting wild -life from poachers. This is the major aim the NP is working for.

The NP is endowed with excellent ecological features viz. grasslands, swampy areas, meadows, treelands, interspersed with beels". This unique combination of natural features not only makes the area picturesque, but also provides a very suitable niche for wild-life. Besides, the climate is also extremely congenial for wild-life, except for the occurrence of floods.

As reported by the authorities every year about 50 Rhinos are killed by poachers. By reproduction there is an annual average addition of 15 Rhinos to the existing population. Thus there is a reduction of 35 Rhinos every year. Moreover, since the adults are being killed the rate of reproduction will reduce drastically. Further, a few Rhinos are killed every year because of floods. Taking the ambitious figure of 1000 as the total population of Rhino in the NP, as claimed by authorities, within less than 30 years the species will completely vanish from the earth, if the current rate of poaching is not checked.

It is shocking that a unique species will be forced to extinction due to lack of adequate protection. Simultaneously it is feared that the other species of the NP will also meet the same fate.

The present protection system needs a thorough review. The protection measures need to be examined and a well- thoughtout protection system should be evolved and implemented. The management of NP requires improvement in protection techniques. Removal of horns as practised in Kenya and other countries may be adopted on trial basis.

At the same time the forest officials of the NP should be well equipped with all protection aids viz. vehicles, wireless sets and the forest officials should have protection under CRPC act 197(3) like police officials.

The protection system of the NP has to be integrated with other developmental works viz. rural development, tourism, veterinary services etc. It is a great advantage that inside the NP there is no village. The villagers around the NP should be assimilated in the protection system of the NP by motivating them through developmental and welfare activities. The Revenue and Police departments should be actively involved in the process and they should be made accountable as the protection of natural heritage is not the responsibility of the forest department alone.