RESEARCH PAPER

Human Population, Biodiversity, and Protected Areas: Science and Policy Issues – The Indian Situation

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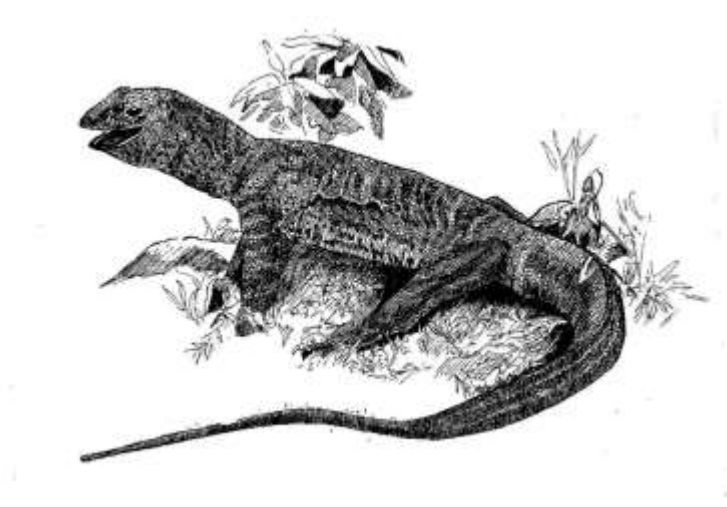

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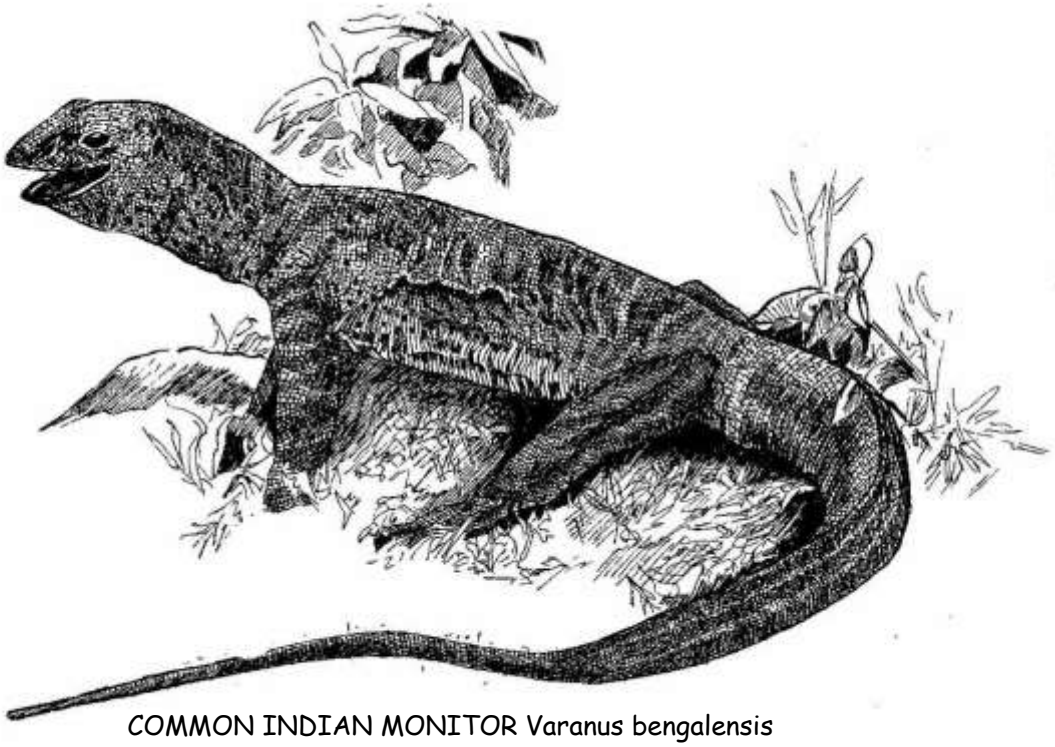

COMMON INDIAN MONITOR Varanus bengalensis

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Sketch above and on the cover by Pratibha Pande.

ABSTRACT

The first part of the paper attempts a summary of the important protected area (PA) conservation issues in India. The second part of the paper presents some facts about the state of PAs in India, based on a survey of Indian protected areas done by the author in the 1980s and published in 1989 [IIPA 1989]. The paper goes on to describe in detail three of the ten PAs for which the author has been involved in designing an ecodevelopment project. These three areas are Gir National Park in Gujarat, Western India, Periyar Tiger Reserve in Kerala, South India, and Great Himalayan National Park in Himachal Pradesh, North India.

These three PAs are in a sense representative of the diversity of population and PA issues present in India. Great Himalayan National Park is located in a low population density area and is threatened by migrant sheep graziers and herb collectors from surrounding areas. Gir, the last surviving home of the Asiatic Lion, is located in a medium population density region and has population pressures from within, from Maldharis or cattle graziers. Periyar Tiger Reserve, on the other hand, is located in a high population density region, and is threatened both by a huge number of tourists and religious devotees, and by a high and growing population in its surrounds.

INTRODUCTION

India is one of the twelve "megadiversity" countries in the world, which collectively account for 60-70% of the world's biodiversity. The country has a broad range of ecosystems and species within its ten recognised biogeographic zones. Its flora comprises 15,000 flowering plants, representing 6% of the world total, some 33% of which are endemic. India's faunal diversity is also high. Its 1,178 bird species represent 14% of the world total. As many as 3,000 to 4,000 plant and over 250 animal species are endangered and in need of immediate protection. About 90% of all medicines in India come from plant species, many harvested in the wild. In 1991, forests were estimated to have covered nearly 20% of the total land area, with a little over 10% covered by closed forest. India has a network of nearly 500 wildlife protected areas covering over 4% of the country's land area [IIPA 1984]. There are two types of wildlife protected areas (PAs), national parks and sanctuaries, set up under the Wild Life (Protection) Act of 1972. Legally, national parks have a higher level of protection with no human use activities being allowed in them, except tourism. In sanctuaries, grazing and the continuation of those rights that are not considered inimical to the objectives of the sanctuary, can be permitted.

India has the second highest population density among the Asian countries. It has about 15.4% of the total world population concentrated in a little over 2% of the world's land area, growing annually at a rate of 2.3%. About a third of this total population subsists below the poverty line. This, coupled with a very large livestock population, is regarded as an important issue affecting biodiversity conservation in the country. Frequent grazing of cattle in PAs and forest land, cutting trees for firewood and timber, and extracting non- timber forest products (NTFP) necessary for the subsistence of the human population is widely practiced. Local people, who often have limited rights, have little incentive to use the forest in a sustainable way. Consequently, large areas of legally designated forest lands are being degraded [IIPA 1994].

I. PROTECTED AREA CONSERVATION ISSUES

Protected areas (PA) in India are subjected to pressures primarily from four types of activities:

1. *Commercial activities by corporations, business concerns, individual entrepreneurs and the government, aimed at reaping financial profits from the PA and its resources. Such activities include commercial extraction of timber and other non timber forest resources (NTFP), commercial fishing and mining, location and impact of industry, and of tourist facilities and activities, and organised poaching.*

2. *Development (infrastructural) activities by the government and its agencies aimed at economic development of the region and the country. These include the construction of irrigation and hydro-electric projects, of roads and transmission lines, and the location and impact of towns and cities.*

3. *Subsistence activities by the local people aimed at meeting their basic survival needs including their need for biomass, water, raw materials and incomes, and for their and their livestock's physical well being.*

4. *Religious and cultural activities, including pilgrimages, fairs, and ritual hunting.*

A few PAs are also affected by political unrest and local insurgencies, the most notable among these being the Manas Tiger Reserve in Assam.

Commercial and Development Activities

Though there are significant commercial and development pressures on the PAs in India, due to shortage of space they are not being discussed in detail in this paper. Also, many of the legal and institutional mechanisms required to regulate such pressures are already in position. For example, the Wildlife (Protection) Act prohibits commercial activities within PAs. Also, before certain types of development activities can be taken up in a PA, environmental clearance, based on an environment impact assessment, has to be obtained from both the state and the central governments. Where forest land has to be used for such activities, additional clearance of the central government has to be obtained under the Forest (Conservation) Act.

There are also stringent laws, and state and central Pollution Control Boards, to ensure that industrial and municipal effluents are within prescribed standards.

Despite all this, many of the PAs in India continue to be degraded because of commercial and development activities. This is because enforcement is poor, at least partly because of the lack of a political will to conserve PAs. This lack of a political will, given that India in many senses is a robust democracy, is at least partly due to the lack of popular public support for conservation. Political will also weakens when corporations and governments are confronted with the option of foregoing profits and revenues, if PAs are to be conserved.

The lack of popular public support is, at least in part, a result of the alienation of the public from PAs. These PAs have been exclusively managed by the government, and

managed in a manner where their conservation has meant that the local poor, who can least afford it, have been forced to bear major deprivations. But more of this later.

Apart from the lack of a political will and the consequent lack of enforcement, other factors also contribute to the inability to check commercial and development pressures on PAs. For one, there is, yet, no national land use plan or a natural resources budget which could establish the legitimacy of PAs in the overall scheme of things. There is much talk, nationally and globally, about sustainable development, yet no one seems to know what it means and how it could translate into action for India, or even for a region in India.

Methods to assess the impact of commercial and development activities on biodiversity resources are inadequate. Though the laws now permit intervention by citizens, access to information is still not a right and, therefore, it becomes difficult for NGOs and individual citizens to ensure that the laws are being respected. Bureaucratic answerability is also poor.

Recent initiatives at promoting industrial and commercial "liberalisation", and consumerism, in India, have significantly increased the commercial pressures on PAs. Infact, as a new and growing phenomenon, PAs are now being denotified in order to meet commercial demands.

Subsistence Activities

A significant proportion of India's population is still partly or wholly dependent on nature for their basic needs. They do not get water by turning on a tap but from a stream. Cooking energy does not come from the plug point or the gas line, but by collecting firewood from the forests. They do not buy the construction material for their houses from the super market but collect clay, mud and timber from their natural surrounds. They do not go to offices but till the land or make artifacts, for which they need green manure and raw materials from nature. Milk does not come from cartons but by herding cattle, for whom fodder is required.

Unfortunately, most of these demands are seen to be at variance with what is considered generally as the requirements of biodiversity conservation. Consequently, Indian laws stipulate that none of these activities are permitted in a national park and only limited grazing is permitted in a sanctuary. This means that the network of PAs in India effectively displace hundreds of thousands of often the poorest of poor people by denying to them access to the resources that they require for their survival.

Over the years (since independence), though the proportion of the population living below the poverty line has decreased, their absolute numbers has greatly increased. This growing population of wilderness dependent people, their growing aspirations, and the growing consciousness regarding biodiversity conservation, at least among environmentalists, has created conflicts which are becoming increasingly difficult to resolve.

The conservation of PAs, in the face of such multifarious conflicts and pressures, has been sought to be effected by using one or more of the following strategies:

1. *By policing the PAs and restricting entry and use, sometimes through the construction of physical barriers like walls and fences, and by using punitive measures like fines, confiscation of livestock, and even imprisonment for those who violate the law.*

2. *By relocating villages and people from within the PA to locations outside the PA.*

3. *By providing alternatives to those biomass, income and other resources that local communities have traditionally got from the PA.*

4. *By involving the local people in its management and making them the sole or primary beneficiaries of financial benefits flowing from it, thereby giving them a stake in the conservation of the PA,*

However, each of these approaches have serious limitations and throw up important science and policy issues.

Policing

Till recently, this was the sole method of conserving PAs in India. However, with the growth in population and in aspirations, and with people becoming increasingly aware of their political rights, it has become difficult, and in some cases impossible, to keep people out of PAs just by policing. This has led to growing tensions and clashes between the people and PA authorities, and has also isolated the PA authorities within the government.

Officials from other departments, especially the District Collector, who has the primary responsibility for law and order, and for social and economic development of the district, have increasingly begun to see PA staff as anti people, obstructionist, and creating problems for the district authorities. This has not only seriously affected the morale of PA managers, but has also made it difficult for them to get the cooperation of other departments in the task of conserving the PA.

The political leadership also rarely supports the PA manager as their vote banks get negatively affected if the local people are disaffected.

But, most important, in the absence of real alternatives for the local people, the task of withholding access to the resources in the PA seems morally wrong, even if it has legal sanction. There is also the dilemma, particularly in a democracy, of how justified is the imposition of a law which has no mass support and is often considered unjust. Is it not essential to, first, persuade the public of the necessity for conserving PAs, and provide them real alternatives to the resources in the PA, before such a law should be implemented? Should not, first, the wasteful and opulent consumption of the urban and rural rich, which significantly impacts on our biodiversity resources, be curbed before the rural poor are asked to further cut their minimal consumption?

Relocation

In most cases people living within PAs are in violation of the law and also pose a threat to the integrity of the PA. However, relocating them is not an easy task, especially as most of them have strong socio-cultural roots in the area and are usually unwilling to shift out voluntarily. Usually their ability to integrate successfully with a non forest-living community is low. Their life style has evolved within their specific environment and often does not relocate well.

There are also problems with the host communities, especially as in almost all the areas the relocated population would have to share the resources of the host community. In some cases, in ensuring that the relocated community gets a fair economic deal, their economic status becomes better than that of the host community, leading to resentment and the resolve, among the host community, to illegally settle in PAs so that they could also be "rewarded" for breaking the law.

Alternatives

The provision of alternatives to those subsistence needs that are being met from the PA, is being promoted through ecodevelopment and joint forest management (JFM) programmes. Essentially the idea is to prepare village level, site specific, micro plans, with the participation of the local people, so that investments can be channelised by the government for developing alternate sources of biomass and incomes. Though these investments would be for a specified period of time, say five years, it is expected that income generation and biomass regeneration activities would become self sustaining by then.

Where forest land is available outside the PA, this is converted into a forest jointly managed by the local community and the forest department, where the local communities protect and regenerate the forest and, in return, have exclusive rights to the NTFP and to a proportion of the revenue earned from the sale of timber.

The participating communities enter a memorandum of understanding (MOU) with the government, where the investment inputs and the access to jointly managed forests is contingent on their desisting from impacting on the PA and helping conserve the PA.

Unfortunately, variations of this approach (also known as Integrated Conservation Development Project or ICDP) has faced various problems in other countries. Some of these are also relevant to India.

1. *How does one prevent ecodevelopment investment in the area adjacent to the PA from becoming a magnet and attracting immigrants from other areas, thereby swelling the human population around PAs and, in the medium to long term, doing more harm than good?*

2. *How does one ensure that the inputs provided under ecodevelopment and JFM are seen as trade offs, or replacements, for closing access to the PA's resources, and not as an additionality to them? This is especially a problem after ecodevelopment funding stops.*

3. *What level of human use can and should be allowed inside and on the periphery of the PA?*

4. *Would investments in the periphery of a PA create a middle class of consumers who, by becoming participants in the market economy, pose a greater rather than a lesser threat to the PA?*

5. *How does one sensitively and humanely move people out of those traditional ways of earning their livelihoods which are no longer environmentally sustainable, especially when they have few other skills and an inherent suspicion of change?*

6. *How does one enhance biomass productivity around a PA, in order to absorb the demands being met from within the PA, without doing damage to the biodiversity of the region by, for example, introducing high yielding, yet exotic, species?*

7. *How does one establish an economic value for biodiversity resources, thereby creating income generation opportunities for the local people, without commoditising the resource and unleashing a demand that would destroy the resource (like tiger bones, or musk)?*

8. *Though earnings from tourism, if channelised to the local people, could supplement their incomes, how does one regulate tourism to sustainable levels without raising the costs so much that only the rich have access to the PA?*

Stakes

There is evidence to believe that local communities would better tolerate PAs, and even cooperate and participate in their conservation, if they had a sense of continued ownership and an economic stake in the PA. This has been amply demonstrated in the case of JFM, where the assured returns from the forest, and a shared responsibility for their protection, has inspired villagers to form forest protection committees and to conserve and regenerate the forests.

Joint Protected Area Management: *Many conservationists and social activists have, in the past few years, demanded that the JFM experience be extended to PAs and joint protected area management (JPAM) be initiated. As in JFM, the PAs would be protected by PA protection committees and the villagers would have a first right over the revenues earned from the PA.*

Unfortunately, the very thing that makes JFM work is missing in the case of PAs. Whereas it is worthwhile for the villagers to spend time and effort protecting forest areas because they can, in return, get the non timber forest produce and a share of the revenues earned from the sale of timber, none of this is possible in a PA. As the law stands today, no timber or any other forest product can be extracted from a PA. Only a limited amount of grazing can be permitted, and that also only in a sanctuary.

In the circumstance, it does not seem worth while for the villagers to make the effort of conserving the PA without any returns coming to them. Only earnings from tourism, which would hardly be enough to justify the trouble, could be diverted to them, but this would also need major policy changes as, at present, almost all of this goes to commercial corporations and entrepreneurs.

In order for JPAM to work, PAs would have to be opened up to some level of human use. However, current thinking among scientists seems to be opposed to this as PAs are seen as biological reference points where the process of succession and evolution must be allowed to proceed without any interference. Concerns regarding animal rights also require that some areas be left totally free of human interference.

"Pure" Biodiversity *: Perhaps underlying this demand for "pure" biodiversity conservation areas is the assumption that, in nature, what is or was the case, ought to be the case. In other words, there is a constant urge to preserve and recreate pristine conditions. This is, of course, at variance with our approach to human society, where there is ordinarily an urge to move away from the is to the ought . There is a constant urge to change and "improve" upon primitive social practices and organisations. Even*

those few who are nostalgic about the past and want to go back in time, very rarely want to go right back to the origin of humans.

The urge to maintain a certain proportion of ecosystems in their pristine form might also be fuelled by the recognition that we still know very little about nature and her processes (not that we know very much more about human social processes). Whether our ignorance should inspire greater efforts at understanding nature, or whether keeping natural areas in suspended animation, so to speak, is the right way, especially considering the price that the poorest of the poor have to pay for this, is an issue that needs resolution. And if our ignorance and curiosity requires that PAs be maintained without any human use, then should not the cost of this be shared by all, for the potential benefits would be universal.

Rights over the Resources: *There is also the additionl complication of determining who has a right over the resources of the PA, and to what extent. Should only those who are living in the proximity of the PA have a right over its resources? But if so, then will not all local communities, districts and states start demanding exclusive rights over their own resources? Would this not undermine national integration and adversely affect regional balance and equity?*

Alternatively, can use over time, or traditional rights, be a basis for determinig current access? Unfortunately, much of the historical use might turn out to be illegal and, therefore, a questionable basis for current access.

On the other hand, traditional rights were often acquired as a part of an oppressive system where only members of the dominant classes and the landed class had rights. Should such an inequitable system become a basis for the distribution of natural resources?

Religious and cultural activities

Almost all the PAs in India have shrines or locations of religious or cultural significance within their boundaries [IIPA 1989]. Often these become a source of great disturbance, as in the case of Periyar Tiger Reserve (described later) where nearly 20 million pilgrims visit the Shabrimala shrine in a two month period. In other PAs, like for example in Simlipal Tiger Reserve, local tribals insist on going out for annual ritual hunts where a large number of animals, including some very endangered species, are slaughtered. The presence of religious deities also becomes an added reason why local communities within some of these PAs refuse to be shifted out for this would remove them from the protection of their gods. Religious sentiments across the country also make it impossible for wildlife managers to cull any animal species even if it has become a pest or has far exceeded the habitat's carrying capacity. The important question is : Can an action b justified solely on the basis of it being a traditional ritual and a part of a particular community's cultural etos, even if it is in the present circumstances environmentlly unsustainable, and generally perceived as unethical?

However, on the plus side, these religious sentiments have also been the bedrock of much of the conservation ethics that exists in India today. Communities like the Bishnois of Rajasthan have protected the black buck with their lives, and in many parts of the country killing an animal is considered a sin.

Despite the fact that most traditional conservation imperatives in India had a basis in religion, contemporary conservation practices do not link up at all with religious

beliefs. Perhaps because secularism is an important value in modern India, there is a hesitation at invoking religious sanctions in support of conservation. There is also the legitimate fear that any attempt to use religious doctrines for conservation might give credibility to religious fundamentalists and fanatics. The challenge is to harness some of the religious energy of India and channelise it for conservation, but to do this in a non partisan manner. The question is : can religion be used to serve the cause of conservation without contributing to social divisiveness and bigotry?

II. THE STATE OF INDIA'S PAs

A survey of the protected areas in India [IIPA 1989] reveals major human population pressures on PAs. Some of these pressures are described below.

Human Population

Information was obtained separately for human populations residing inside each park or sanctuary and those living in areas adjacent to it (i.e. within a 10-km. radius). A limit of 10 kms was taken because studies have shown that ordinarily livestock are not herded into PAs from distances greater than 10 kms, at least on a regular basis.

Population within parks and sanctuaries

Of the 32 national parks and 138 sanctuaries responding, 18 (56%) and 100 (72%) respectively reported human populations within their boundaries.

Since the absolute quantum of population inside is not a good indicator of the potential biotic pressure it can put on to the ecosystem, the data base was used to work out population densities. This has been worked out by a simple division of the total population with the total area of each park and sanctuary. The resultant list is reproduced in the Table below, with areas arranged in descending order down to a density of 0.01.

Density (*No of people per ha.*)	*No. of N/S*		
	N	*S*	*T*
> 10.00	*0*	*3*	*3*
5.00 to 10.00	*0*	*3*	*3*
1.00 to 4.99	*0*	*24*	*24*
0.50 to 0.99	*1*	*14*	*15*
0.10 to 0.49	*4*	*35*	*39*
0.01 to 0.09	*11*	*22*	*33*

Population adjacent to parks and sanctuaries

Of the 23 national parks and 132 sanctuaries responding, 19 (83%) and 115 (87%) respectively, reported populations in their adjacent areas. *These high*

percentages are only to be expected in a country like India where the only areas left uninhabited are the most inaccessible ones.

An index of population pressures was worked out for each protected area by dividing the total population reported from adjacent areas with the total area of the park or sanctuary, both sets of data obtained from the extended data base. (Note that the index thus worked out is in relation to the area of each park and sanctuary, and not in relation to the area adjacent).

Pressure (No. of Persons per ha.)	No. of N/S		
	N	S	T
> 1000.00	0	2	2
100.0 to 1000.00	0	3	3
10.0 to 99.00	2	9	11
5.0 to 9.90	2	11	13
1.0 to 4.99	6	38	44
0.5 to 0.99	1	19	20
0.1 to 0.49	3	26	29
0.01 to 0.09	2	6	8

Rights and Leases

In 19 (43%) of the 44 national parks and 128 (68%) of the 187 sanctuaries responding there exist some rights or leases. *In national parks the most common types of rights and leases pertain to grazing, which was present in 60% of the 20 parks with rights and leases, habitation in 50%, religious yatra in 45% and agriculture in 45%. Similarly, in sanctuaries grazing is by far the most common right, present in 84% of the 128 with rights. The other common ones are fuelwood collection in 54%, collection of minor forest produce in 47%, agriculture in 43%, and habitation in 42% of the sanctuaries with rights.*

Grazing by Livestock

Of the 36 national parks and 138 sanctuaries responding, 14 (39%) and 101 (73%) respectively, allow grazing of livestock within their boundaries.

Of the 36 national parks and 138 sanctuaries responding, 24 (67%) and 114 (83%) respectively report incidence of grazing. *In other words, grazing is occurring, though it is not authorised, in 10 of the national parks responding (42% of those which have grazing) and in 13 (11% of those with grazing) of the sanctuaries.*

The range of densities obtained is as follows:

Cattle

Density (No. of cattle per ha.)	*No. of N/S*		
	N	***S***	***T***
>10.00	*0*	*1*	*1*
5.0 to 10.00	*0*	*1*	*1*
1.0 to 4.99	*1*	*10*	*11*
0.5 to 0.99	*0*	*22*	*22*
0.1 to 0.49	*5*	*57*	*62*
0.01 to 0.09	*8*	*32*	*40*

The national cattle density (1977) was 0.75 per ha. Consequently, 65 of the 174 (37.4%) PAs responding had cattle density higher than the national average.

Goats

Density (No. of goats per ha)	*No. of N/S*		
	N	***S***	***T***
1.0 to 4.99	*0*	*6*	*6*
0.5 to 0.99	*1*	*7*	*8*
0.1 to 0.49	*1*	*22*	*23*
0.01 to 0.09	*6*	*36*	*42*

The national goat density (1977) was 0.24 per ha. As such, 24 PAs out of the 174 responding (13.8%) had densities greater than the national average.

Extraction of Fodder

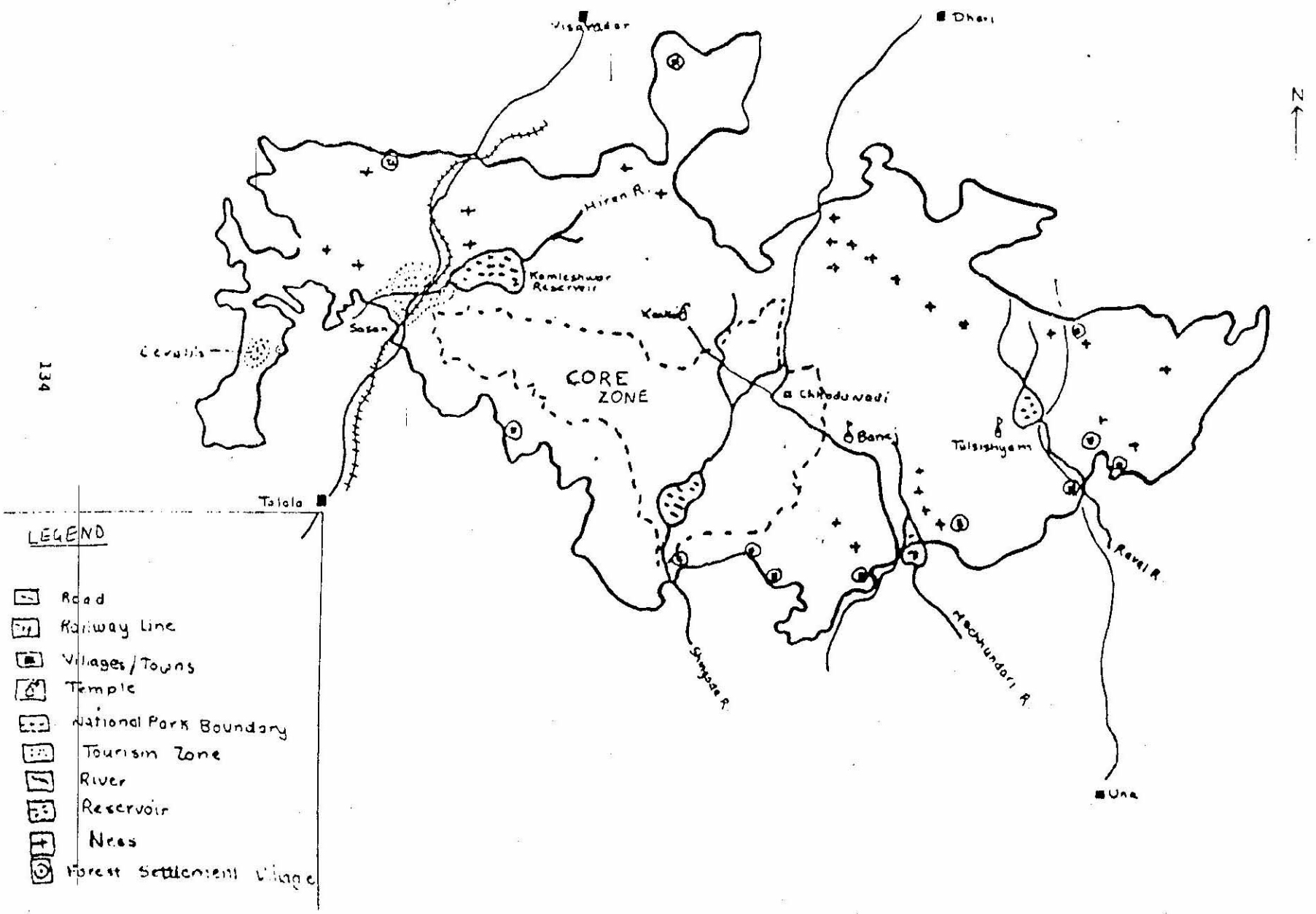
Of the 51 national parks and 204 sanctuaries responding, 7 (14%) and 63 (31%) respectively reported permitting extraction of fodder and from all these areas fodder was, in fact, being extracted.

Extraction of Timber and Non Timber Forest Products

Timber

Of the 44 national parks and 183 sanctuaries responding, 7 (16%) and 78 (43%) respectively reported extraction of timber.

GIR NATIONAL PARK



Non Timber Forest Produce

14 (36%) of the 39 national parks and 104 (56%) of the 185 sanctuaries responding reported extraction of non timber forest produce (NTFP).

Thoroughfare

Of the 47 national parks and 204 sanctuaries responding, 22 (47%) and 117 (57%) respectively, reported the existence of a public thoroughfare.

Illegal Use and Activities

Illegal Occupation and Use

Of the 36 national parks and 176 sanctuaries that responded, 3 (8%) and 46 (26%) respectively reported incidence of illegal occupation or illegal use, or both. *"Occupation" in this context, means the spatial location of people or buildings, or both, while "use" refers only to activities without involving spatial location of people or buildings.*

The most frequently reported illegal ***use*** *was cultivation, 37% of all reported cases (of illegal uses and occupations). Next came grazing (20%), encroachment (20%), and fishing (5%). The other illegal use activities were all below 5% of the total number of cases reported.*

Encroachment (20%), was the most frequent form of illegal ***occupation****, followed by labour camps (2%) and temples (2%).*

In response to the query "by whom", villagers were said to be responsible in 52% of the cases, Scheduled Tribes in 13%, "private persons" in 12%, agriculturists in 7% and lessees in 5% of the cases. The Government and nomadic tribes tied for sixth place with 3% each. Gujjars, mineworkers and "hillmen" were each mentioned in 2% of the cases. It might be noted that the term villager could also cover most of the other categories mentioned above.

Though prima facie these activities cannot be judged in terms of their ecological impact, their illegality certainly seems to imply that they have not been evaluated and found acceptable.

Encroachment

3 (7%) of the 44 national parks and 32 (20%) of the 160 sanctuaries responding reported encroachment (extended data base).

Offences

Of the 45 national parks and 172 sanctuaries responding, 31 (69%) and 96 (56%) respectively reported incidence of one or more types of offences.

Of the different types of offences, for national parks, destruction of habitat (average of 971 per park over the period 1979-84), illegal grazing/entry of cattle (369), causing

fire hazards (38), illegal hunting (28) and improper entry (22) were the most common. Similarly, for sanctuaries destruction of habitat (471), improper entry (221), illegal grazing/entry of cattle (158), and causing fire hazards (22) were the most common. However, these averages do not give a very good picture, as variations between different areas was significant.

Conflicts

Injury or Death to Human Beings

A disturbing aspects of the human pressures in and around parks and sanctuaries is the incidence of injury or death of human beings caused by wild animals.

Of the 39 national parks and 167 sanctuaries responding, 14 (36%) and 49 (29%) respectively reported incidents of injury or death of human beings due to attacks by wild animals.

A total of 629 cases were reported for the five year period (1979-84) of which 379 (60%) were reported from national parks and 250 (40%) were reported from sanctuaries.

Fatal Cases: *Of the 629 cases reported, 485 (77%) were fatal. Of these 485 fatal cases, 329 (68%) were in national parks and 156 (32%) in sanctuaries. Seen another way, of a total of 379 cases reported from national parks and 250 reported from sanctuaries, 87% and 62% respectively were fatal.*

Clashes

The alienation of the local people from the natural resources around them and the inadequate alternative sources of fuel, fodder, water, timber and of earning a livelihood, often force the local people to make demands on the resources of parks and sanctuaries, thereby coming into conflict with park and sanctuary authorities. Sometimes vested interests also provoke, or directly participate in, such confrontations.

Whatever the reasons, very often conflicts over the use and control of natural resources become law and order problems and result in physical clashes between the people and the authorities.

16 (37%) of the 43 national parks and 31 (17%) of the 179 sanctuaries responding, reported the incidence of such clashes.

The major reasons given for these clashes were: illicit felling of trees, poaching, illegal grazing, encroachments and other forest offences.

III. THREE SELECTED PROTECTED AREAS

1. GIR NATIONAL PARK

The Gir National Park, in Gujarat, Western India, has an area of 1,41, 213.15 hectares (1412.13 sq.km.). Gir is world famous for containing the last surviving population of the Asiatic lion, and is also the last remaining patch of natural forests in that part of Gujarat.

Gir is located in a semi arid zone and has low rainfall and a general scarcity of water.

Biological Profile

***Flora**: The PA is the only remaining patch of natural forest in the entire Saurashtra peninsula [RC]. There are 81 common tree species, 48 herb and shrub species, 18 species of climbers and 14 species of grasses, including bamboo, occurring in Gir National Park.*

***Fauna: Gir contains the last wild population of the Asiatic Lion (Panthera leo persica), with the 1990 count being 284 lions**. The forests of Gir contain 31 mammals, at least 24 species of reptiles, almost 300 species of birds and more than 2000 species of insects [Note].*

Apart from the Lion, some of the other endangered species are Chowsingha (Tetracerus quadricornis), Chinkara (Gazella gazella bennetti), Rusty spotted cat (Felis rubiginosa), Ratel (Mellivora capensis), Pangolin (Manis crassicaudata), Marsh crocodile (Crocodilus palustris), and Indian python (Python molurus).

Human Population:

There are 54 nesses (small pastoral settlements of cattle graziers called Maldharis) within the PA. These are inhabited by 2540 people and 9820 livestock [EP].

There are also approximately 65 people (and 110 heads of cattle) permanently occupying the three main temple complexes within the PA.

In addition, there are 14 forest settlement villages inside the PA with a total human population of about 4494 people and a cattle population of 4241 [EP1]. One of these is a settlement of Siddis who are of African origin and are classified as a Scheduled Tribe. There are 239 Siddis in this village [DCH].

There are 97 villages within a six kilometer radius from the boundary of the PA, with a total population of 1,31,087 people and a cattle population of approximately 94,600 [EP1].

Human Population Pressures

Summary of Impacts on/of PA

Negative Impacts of the People on the PA:

- *Degradation and alteration of the ecosystem due to grazing.*
- *Destruction of habitats due to forest fires, both accidental and intentional, started by people collecting NTFP, and by trains.*
- *Air and noise pollution due to traffic on thoroughfares.*
- *Disturbance to animals due to the large number of pilgrims and tourists within the PA.*
- *Accumulation of solid waste around temple complexes, Maldhari nesses and forest settlement villages.*
- *Degradation of forest due to removal of fodder and small timber.*
- *Change in the behaviour and diet of the lions due to the availability of a large number of livestock prey within the PA.*

Negative Impacts of the PA on the People:

- *Shortage of biomass due to restrictions on use of the PA for grazing, removal of fuelwood, NTFP and fodder.*
- *Decrease in income due to restrictions related to collection of fuelwood.*
- *Socio-cultural deprivation because of restriction on the activities and movements of pilgrims within the PA.*
- *Restriction on use of certain thoroughfares and payment of fees for the use of certain roads.*
- *Crop damage by wild animals.*
- *Cattle depredation by wild animals.*
- *Injury and loss of human life due to attacks by wild animals, especially by lions and leopards.*
- *Restriction of people's movements, especially at night, due to danger of attack from lions and leopards.*

Some of these pressures are described in greater detail below.

Grazing: *The Maldharis, who live in the nesses inside the PA, and the residents of the forest settlement villages, have concessions for grazing their cattle inside the PA. An estimated 14,171 heads of livestock (including cattle and horses) from the nesses and forest settlement villages within the PA graze inside the PA [EP]. In addition, an estimated 94,582 cattle from villages adjacent to the PA graze within the PA.*

The requirement for grass, from the PA, for the PA cattle and cattle within the 6 km radius works out to 3,22,518.86 metric tonnes annually [EP]. Grazing has modified the habitat. Most Maldhari nesses are located close to rivers, and the composition of the riverine habitat is gradually changing due to domestic livestock. Acacia and Zizyphus species have established themselves in the shrub layer of the habitat [Khan]. Due to excessive grazing there has also been a spread of the weed Lantana camara.

Temples and tourism: *There are three main temples located within the PA - Kankai, Banej and Tulsishyam. Approximately 80,000 pilgrims visit these annually.*

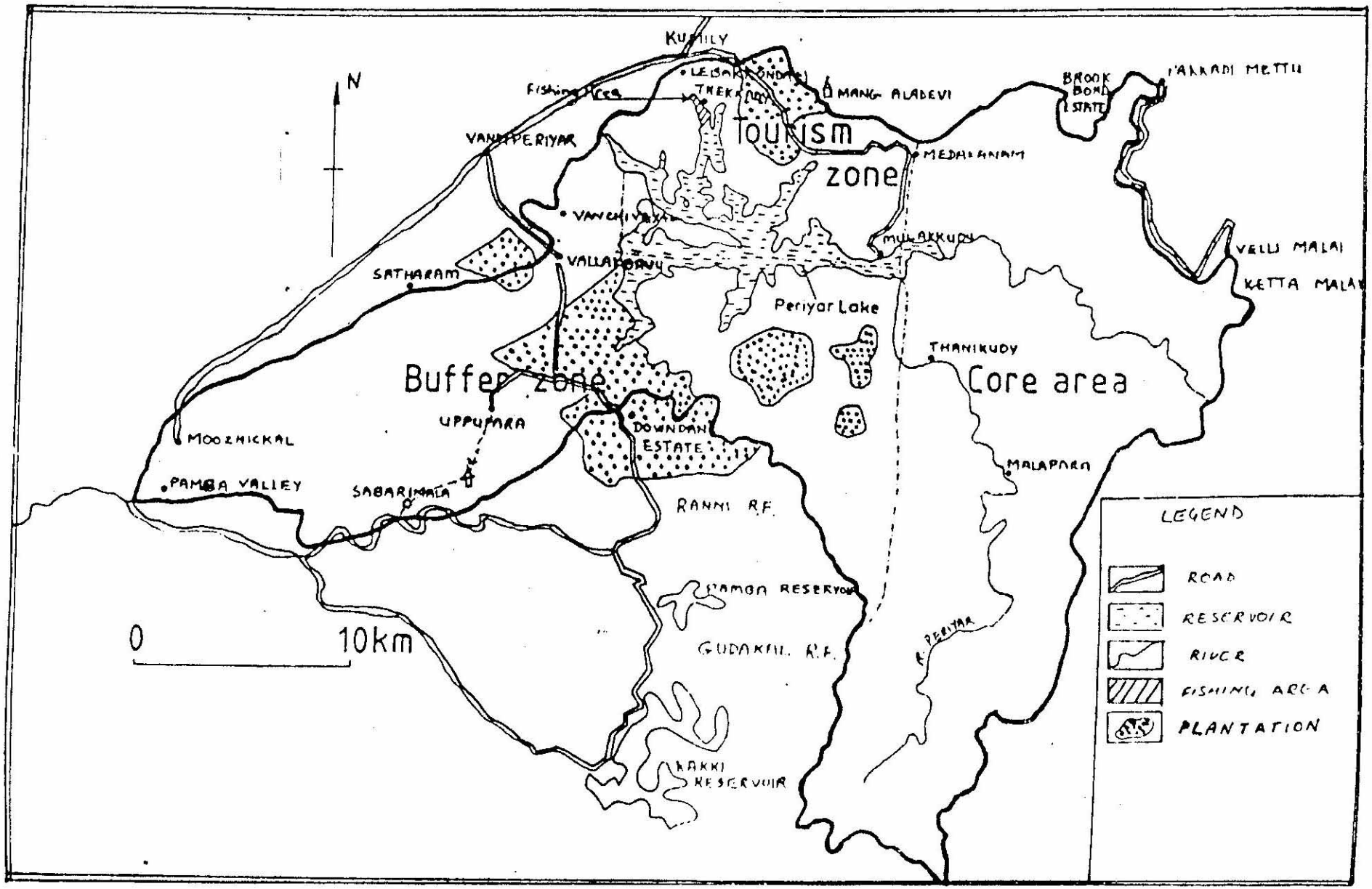
Approximately 45,000 tourists visit the tourism zone within the PA annually [pers. com. Mr. Asari, CF].

Thoroughfares: *The PWD roads that pass through the PA are heavily used by tourists, pilgrims, inhabitants of the nesses and forest settlement villages within the PA, and by the inhabitants of villages adjacent to the PA.*

There are regular bus routes along these roads. The impact on the PA is in the form of noise and air pollution, accumulation of litter along the roads, fires caused by carelessness, and disturbance to animals. In addition, people often leave their vehicles and wander off the road into the forest.

Fuelwood Extraction: *Temple complexes, forest settlement villages and Maldhari nesses within the PA are dependent on the PA for fuelwood. Villagers along the boundary of the PA depend almost exclusively on the PA for fuelwood needs. The*

PERIYAR TIGER RESERVE



fuelwood requirement for nesses/villages in and within the 6 km radius of the PA is 1,54,050 kg. daily and 56,228.25 metric tonnes annually [EP1].

Attacks on Humans by Lions: *In the last three years, 120 people were attacked, 20 of them fatally [R. Chengappa, 1993]. The presence of lions in revenue (private) lands surrounding the PA had long been considered an acceptable consequence of living near the PA. More recently, however, the increase in the number of attacks and in the ferocity of the attacks, from just mauling to direct predation, has aggravated the human-Lion conflict [Saberwal et. al., in press].*

Local villagers have increasingly become hostile to the Lions because of the threat that they pose to their lives and to the lives of their livestock. The Lions also curtail the villagers movements at night.

Livestock Kills: *There were 1648 livestock lifted from within the PA and 3322 lifted from adjacent areas in the period between 1979-80 and 1983-84 [Q1]. According to a recent study, the species composition of prey killed by lions within the PA, from 1987 to 1990, showed that 64.8% of kills were wild prey and 35.2% were livestock.[RC]. The easy availability of livestock prey in and around the PA has significantly changed the diet of the Lion and consequently affected its "wildness". Infact, the lions that have dispersed out of the PA are totally dependent on livestock for their survival, though this is at least partly due to the sparsity of wild prey.*

Weed Infestation: *There is a problem of Lantana camara and Neurocanthes spherostachys infestation in certain areas adjacent to the nesses and the forest villages in the PA.*

2.PERIYAR TIGER RESERVE

The Periyar Tiger Reserve (PTR), situated in Kerala State, in South India, has an area of 77,700 hectares (777 sq km) comprising of a core zone, which is an intended national park (350 sq km), a buffer zone (377 sq km) and a tourism zone (50 sq km), both of which are a part of the Periyar Sanctuary.

PTR contains an artificial lake, created by the damming of the Periyar river, which is a great tourist attraction.

Biological Profile

***Flora** : The forest types occurring in PTR, as per the Champion and Seth classification are:*

1. *Tropical Evergreen Forests (IA/C4)*
2. *Semi Evergreen Forests (2A/C2)*
3. *Moist Deciduous Forests (3B/C2)*
4. *Grasslands (IIA/C1/DS2)*

In addition, 70 species of grasses, 75 species of herbs, 130 species of shrubs, and 132 species of trees have been identified [Anon. undated(a)].

***Fauna**: So far, 49 species of mammals, 243 species of birds, 28 species of reptiles, 8 species of amphibians, 22 species of fish, and 112 species of butterflies have been identified in PTR. Periyar is a home to both the Indian tiger and the Asian elephant. In recognition of its suitability as a tiger habitat, it was declared a Tiger Reserve in 1978.[Anon. undated(a)]*

Human Population

There is no human habitation within the core zone of the reserve. Some tribal villages were relocated from the core zone to the buffer zone during the 1950s. The details of these are:

1. *Members of two tribal communities. the Mannans (236 families) and the Paliyans (105 families) are settled within and on the northern edge of PTR, in its tourism zone, and are occupying an area of 88.40 ha. The total population of this settlement is 1185.*

2. *Another group of tribals, the Uralis (38 families) are settled within and close to the northern edge of the buffer zone of PTR, and are occupying an area of 39.39 ha. The total population of this settlement is 174.*

3. *The Arayans (186 families), also tribals, are settled within and on the western tip of PTR, and are occupying an area of 112 ha. The total population of this settlement is 677.*

In addition to the above, 692 landless families were allotted land within the Periyar Wildlife Sanctuary, in 1962, under the "Grow More Food Scheme". They now occupy an area of 460.50 ha. The total number of people living in this area is 1820.

Also, some families have reportedly encroached on forest land within the PTR [Anon. Undated(b)].

According to the District Census Handbook, 1981, the number of people living in a 10 km radius from the boundary of PTR in Kerala is 3,64,815, while the number of people living in a 10 km radius from the boundary of PTR in Tamil Nadu is 2,72,122, a total of 6,36,937.

Human Pressures

Impacts on/of PA

The major negative impacts of the people on PTR are:-

- *Air and noise pollution, and disturbance to wild animals, due to the movement of vehicles transporting pilgrims inside PTR.*
- *Pollution and threat of infectious diseases due to accumulation of solid wastes inside PTR during the pilgrim season.*
- *Degradation of forests due to extraction of fuelwood, and timber for sale.*
- *Incidence of forest fires accidentally caused by people entering PTR for collection of NTFP.*
- *Debarking and the resultant damage of Cinnamon trees inside PTR due to collection of NTFP.*
- *Disturbance to animals due to the presence of a large number of tourists and pilgrims in PTR.*
- *Deforestation due to clear felling by Ganja (cannabis) cultivators in PTR.*
- *Reduction of animal population due to animal poaching.*
- *Infestation of weeds due to grazing and forest fires.*
- *Growing and extraction of eucalyptus to provide raw material to the Industry*
- *Disturbance due to the high number of tourists visiting the Reserve.*

The major negative impacts of the PA on the People are:

- *Shortage of biomass due to restrictions related to the collection/extraction of biomass from, or access to, the forest, for activities like grazing, fuelwood collection, fodder collection, and small timber extraction.*
- *Reduction in incomes because of restrictions related to NTFP collection, and head loading of fuelwood for sale.*
- *Socio-cultural deprivation because of restriction on the activities and movements of pilgrims inside PTR.*
- *Damage to crops in the adjacent areas of PTR, by wild animals, especially wild boars.*

Some of the main pressures are described below.

Pilgrimage: *The Shabrimala Shrine, dedicated to Lord Ayyappa, is located within PTR. The number of people visiting the shrine is now reported to be between 10 and 20 million per annum. The bulk of pilgrims visit the shrine during a two month period between 15 November and 15 January. To provide fuel to this massive influx of pilgrims, hundreds of trees are cut for firewood. The presence of such a large number of people, most of whom stay over night in the PTR, results in pollution due to accumulation of solid wastes, air and noise pollution due to the movement of vehicles, especially on unmetalled roads, accidental fires, and disturbance to animals.*

Tourism: *In 1991-92, around 2,50,000 people were reported to have taken boat rides at PTR, while in 1986-87, around 2,00,000 people were reported to have taken boat rides [Anon. undated (a)]. These figures show a 25% increase in about 6 years. The PA authorities believe that the total number of tourists visiting PTR might well be close to 3,50,000. The influx of so many people in the area, apart from exerting a direct pressure, also exerts an indirect pressure. Almost all the hotels and restaurants in Kumily town, all of which cater to the tourists visiting PTR, use fuelwood for cooking and heating. This is extracted from the forests of PTR. Kumily is a town situated adjacent to the northern boundary of PTR near Thekkady.*

Grazing: *2000 cattle are reported to enter PTR for grazing from Kumily, from estates adjoining the northern boundary of the buffer zone of PTR, and from areas around Vallakadavu. They graze in the reserve along a length of about 40 km [Anon. undated(b)]. At least partly due to the grazing, the weed, Lantana camara, has come up in PTR, all along the edge of the Periyar Lake, as well as along many of the paths and roads in the Reserve. There is also infestation of Eupatorium [Anon. undated (b)].*

3. GREAT HIMALAYAN NATIONAL PARK

The Great Himalayan National Park (GHNP) is located in the north-western Himalayan state of Himachal Pradesh. The Park has an area of 62,000 ha (620 sq. kms). The GHNP ranges from 1300 m to 5805 m above sea level, and the eastern reaches of the park are under permanent snow.

GHNP is a remote area with low resident human population densities. There are no motorable roads inside the GHNP and the steep terrain inside makes much of it inaccessible to all but the fit and experienced trekker.

Biological Profile

The GHNP contains some of the least disturbed areas of natural vegetation in Himachal Pradesh, including the catchment areas of the Jiwa Nal, Sainj and Tirthan rivers, which together comprise the upper catchment of the Beas river. The Park also contains several threatened species of wild flora and fauna and is contiguous to Tirthan Sanctuary (6,112.98 ha) to the south and to Rupi Bhaba Sanctuary (26,914.50 ha) to the east. The Rupi Bhaba Sanctuary is in turn contiguous to Pin Parvati National Park (67,500 ha) to the north. These four wildlife conservation areas together comprise the largest and best preserved area of wildlife habitat in the State and possibly in the Western Himalayas [Gaston & Garson, 1991].

***Flora**: About one third of the Park comprises closed canopy forest. Most forest cover occurs in belts around the Jiwa, Sainj and Tirthan and their tributaries, in the western half of the Park.*

Fourteen forest types have been recorded in the Park according to Champion and Seth's (1968) detailed classification. A more general categorization is used by Gaston et al. (1981) as follows:

- *subtropical pine forest, characterized by chir pine, between 600-1700m*
- *Himalayan moist temperate forest, characterized by both coniferous and broad-leaved species, between 1,500-3,600 m;*
- *subalpine forest dominated by birch and fir species, between 3,000-3,400 m;*
- *moist subalpine scrub characterized by Rhododendron species, between 3,000-3,5000 m, and*
- *dry alpine scrub characterized by juniper species, between 3,400-3,800m*

The area of grassland in the Park is not fully known. However, grasslands are known to be found in the valleys. Alpine meadows occur above c. 3,800 m, the upper limit of subalpine and alpine scrub communities [Gaston & Garson, 1991]. These meadows have a high diversity of herbaceous species, many of which have medicinal or aromatic properties and are of great commercial value. Grasslands are also found below the tree-line, and it is not clear whether these have been created and maintained by human activities such as pastoralism, especially grasslands surrounded by natural forest. In general, the Park has very high floral diversity.

***Fauna** : Very little is know about the Park's fauna, other than some general information on bird and mammal species. A number of threatened* mammal and bird*

species are found in the Park, including endangered species such as snow leopard, musk deer and Western tragopan pheasant. Other threatened species found in the Park include the Himalayan brown bear, Himalayan tahr, the Blue sheep, The Himalayan weasel, the Himalayan palm civet, the flying squirrel, the jungle cat and possibly the leopard cat, the wolf and the Himalayan ibex, but the presence of the last two remains to be confirmed. Occurrence and distribution of other fauna (reptiles, amphibians, fish, invertebrates) does not appear to be comprehensively documented.

Gaston et al. (1981) identified 117 bird species in the Sainj and Tirthan Valleys alone. Thus, the total number for the whole Park may be higher. The Management Plan cites 150 bird species. Thus, a bird list of over 300 species has been compiled, based on Gaston et al. (1981) and Gaston (1986), and the list provided by Park authorities. The classification of the 221 species sighted in the whole upper Beas catchment area by Gaston et al. (1981) suggests that a large proportion, if not the majority of species found in the Park are residents. However, a significant number of summer migrants and a smaller proportion of winter migrants are also present.

The majority of species are passerines. A number of major raptor and pheasant species also occur in the Park. Notable among the latter, is the highly endangered Western tragopan, of which a viable population is believed to be present in the Park, as well as the threatened monal and cheer pheasants.

Human Population

Until recently, there were four small villages with between 20-30 families, with the right of habitation in the Park. As of 1990, there has been no permanent habitation in Kundar, but the other three villages remain inhabited throughout the year. Park villagers practice small-scale cultivation, herd livestock and also have other rights, including the right to various forest products.

Most of the human habitation outside the Park, is to the west, south-west and south, and is concentrated in the lower Jiwa, Sainj and Tirthan valleys. There appear to be nearly 200 hamlets and villages within a radius of 10 km (tp). According to Park authorities, there are 22 villages within a radius of 10 km with an estimated population of 1200 (QA2).

Human Pressures

Impacts on/of PA

The major negative impacts of people on GHNP are:

- *Grazing of sheep and goats in the Park and in high altitude thaches (meadows) is degrading the habitat and disturbing the animals.*
- *Collection of medicinal, aromatic and edible herbs and plants is degrading the habitat, disturbing the animals, and threatening many species with local extinction.*
- *Collection of fuelwood is degrading the habitat*
- *Extraction of timber is deforesting the area*
- *Poaching of animals, especially the Musk deer (Moschus moschiferus),is threatening the species with local extinction*

The major negative impacts of GHNP on the people are:

- *Restrictions on habitation within the Park*
- *Restrictions on cultivation within the Park*
- *Restrictions on grazing and fodder collection*
- *Restrictions on herb collection*
- *Restrictions on the collection of fuelwood and NWFP*
- *Restrictions on hunting*
- *Restrictions on the right of way*

Grazing of Livestock

livestock is one of the most important economic resource of the local people. Every household invariably keeps a few cows, and many more sheep and goats. These animals are usually kept for wool and manure. Sheep's wool is used by the villagers for making "Pattus" (shawls and blankets), while Goat hair is used for making "Shelas" (rugs). The dung of these animals is, of course, good manure for the fields. Meat is eaten only on special festive occasions.

Local people, as well as people from neighbouring areas graze their livestock in the park. Migrant grazing is seasonal, from May to October, when goats and sheep are herded to high altitude pastures or "thaches".

Grazing of sheep and goats in what is now GHNP has been taking place for generations, and for many local people it is more a way of life than an economic activity. The graziers come mainly from the 200 odd hamlets where many of the people claim traditional grazing and herb and mushroom collection rights. These rights have been recorded in the Rights and Settlements of Kullu District, 1886, by Alex Anderson (mp).

Flock sizes are variable and the number of graziers accompanying each flock is related to flock size. For example, a flock of 400-500 animals is generally accompanied by a group of 5 or 6 graziers. Each flock consists of sheep and goats belonging to several families from one or more villages. Graziers coming from beyond adjacent areas often pick up sheep and goats from the villages they pass through on their way to the Park. Such graziers often stay in farmers' fields so that their flock can manure the fields, while the graziers are given food and shelter in exchange. The graziers are paid by the other villagers, often in kind rather than cash, for taking their sheep and goats into the Park.

There are 500 sheep and goats, 135 cattle and two mules in the Park villages (QA2). The two resident families of Manjhan claimed to have more than one hundred livestock between them (FV2). In addition, several thousand sheep and goats come to the Park on a seasonal basis: according to Park checkpost records, nearly 19,000 sheep and goats in roughly equal numbers came to the Park during the summer of 1989.

The impact of grazing on the Park is not fully known, but livestock are known to transmit diseases to wild animals and to encourage weed growth and prevent regeneration of trees in low altitude thaches. Studies of the impact of grazing on forests have shown that grazing of livestock not only hinders regeneration of naturally dominant tree species, but can also lead to significant changes in the structure and

composition of shrub and herb communities on the forest floor. (Garson and Gaston, 1985).

Studies of the impact of grazing on forests elsewhere in Himachal Pradesh have shown that grazing of livestock not only hinders regeneration of naturally dominant tree species, but can also lead to significant changes in the structure and composition of shrub and herb communities on the forest floor (Garson & Gaston, 1985).

Herb Collection

Herb (jaddibooti) collection, which here includes the collection of medicinal herbs, and of edible and aromatic plants, is considered to be one of the most serious pressures on the Park. Thousands of people enter the Park from May to November to collect herbs. Many of the herbs are found only in the high altitude meadows, but some are also found in forests. The peak collection season is from June/July to August/September.

Nearly 60 herb species are reportedly collected from the Park but the main species collected are Dhoop (Jurinea macrocephalla) and Gucchi or Morel mushroom (Morchella esculenta) [QQ, FV2].

Herb collection is a physically strenuous, and sometimes dangerous, activity as the herbs are often found in not readily accessible places, at high altitudes and on difficult terrain, e.g. very steep slopes, and a number of fatalities occur every year.

The sale of herbs appears to be a principal source of monetary income for many collectors. An individual herb collector may be able to earn upto about Rs. 20,000 a year, and the total household income may be much higher. As the low-input agriculture practiced by the local people does not yield sufficient food for the whole year, food and many other commodities have to be purchased. Sale of herbs is the main source of income for these people.

The collectors generally sell their herbs to local shopkeepers at the nearest road head. Local shopkeepers then sell the herbs to local herb exporters from nearby towns. The exporters in turn send the herbs to cities like Delhi and Amritsar. The final price of the herb, in the city, is many times the price given to the herb collector from GHNP.

Some of the herbs collected from the park and other nearby forests are also directly used by the villagers. A strong tradition of using medicinal herbs, and a lack of allopathic medical facilities, has resulted in a heavy dependence on medicinal plants.

Herb collection has probably been taking place in this area for centuries. Some details of this activity are given in Anderson's Settlement Report. Anderson suggests that herb collection may have been an occupation of the "....poorer classes....(who) by the sale..... eke out a scanty livelihood" [Anderson 1886]. Until recently it was believed that herb collection was an exclusively male activity. However recently women have also been observed collecting Gucchis and Dhup [AQHCSH Sainj 01].

Park authorities, other local people and herb collectors themselves, reported that herb collection has increased significantly over the last ten years, both in terms of quantities extracted and the number of collectors coming to the area. The number of non-rightholders coming to the Park has increased and rightholders are apparently now extracting herbs outside the areas specified in the Settlement (FV1 & FV2). Apparently, the children of rightholders are not very keen to collect herbs themselves, but may employ others to do so (Vijay Kumar, pers. comm., 1991).

Though not comprehensive, Park records indicate that more than 9,000 kg of herbs, mainly Dhoop and Nehani, were extracted between July to November, 1989.

***Impact on the Park** : Of all the human activities taking place in the Park, herb collection is believed to be having the most serious impact. Herb collectors themselves report that there is over exploitation of certain species and a progressive decline in the quality and quantity of herbs. For example, some six to eight years ago there was an abundance of four or five year old Dhoop plants with roots as thick as a persons forearm. Today, four or five year old plants are difficult to find. As such, one year old plants, with roots no thicker than a finger, are being collected [AQHCS # Sainj 01].*

Also, a large number of people enter the Park every year for herb collection. They disturb the animals and their habitat, and also consume fuelwood and other park resources, and leave their refuse. Furthermore, collectors are going into new or previously not often visited areas as herbs are becoming scarce.