Status, Conservation and Management of Primates in India

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Abstract

India has an exceptionally rich heritage of non-human primate populations totalling 15 species and 39 subspecies. This richness mirrors the biological and environmental diversity of India, ranging from montane habitats in the Himalayas, the deserts of Rajasthan, agricultural plains of the Gangetic basin, subtropical forests of the northeast, mangrove estuaries of coastal India, tropical forests and the coral reefs of South India. Indeed, India has been named as one of Earth's biologically wealthiest nations. This biological and cultural wealth faces tremendous challenges with the current pressures of population and economic development. India is well known, not only for its magnificent biological and cultural heritage, but also as the world's most populous democracy. With over one billion people in less than half the land area of the United States, India's task of maintaining environmental quality is daunting. There is an awareness of conservation and respect for life in both the citizens of India and its government officials, but maintaining this awareness with the increasing demands for economic growth will be a difficult assignment for India's scientists, conservationists, and educators. It will require the best available knowledge, outstanding management skills, and an educational system capable of convincing the people of India of the importance of conservation and wise stewardship of India's biological wealth including primates.

Primates are important components of the Indian biota and its culture. They play a major role in both the natural and the cultural environments, and have contributed to the health and welfare of the entire world by virtue of their role in scientific research. It is vitally important that this important aspect of India's biodiversity be conserved. The present communication will consider conservation issues with regard to endangered primates, and then some of the problems of pest species. This is not intended to be a thorough or comprehensive account but an attempt to provide examples to illustrate the wide range of issues that have to be addressed in Indian primate conservation.

Basic Issues of Primate Conservation and Management

Different species of primates in India represent widely different conservation and management problems. Many species, such as the Golden langur (*T. geei*), Phayre's langur (*T. phayrei*), and Lion-tailed macaque, (*M. silenus*) have small populations, limited distributions, and face serious habitat loss. Other species, especially those that are commensal and can capitalize on human habitats, such as Rhesus (*M. mulatta*) and Bonnets (*M. radiata*), are abundant, widespread in distribution, and are often pests in villages, towns, cities and agricultural areas. In this sense, primate conservation in India involves two ends of the spectrum: (I) rare and endangered

species facing possible extinction and (2) overly abundant species, which can cause agricultural damage, give rise to health and safety issues, or pose general pest problems in local areas. Hence, conservation of primates in India needs to address these different issues and approaches to conservation and management.

Endangered Primates in India

Those species that are primarily forest dwellers and may not adapt readily to human environments face the greatest threat. These threats are common to wildlife throughout the world: habitat loss and hunting. Forest habitats in India as elsewhere in the world, are currently undergoing several types of changes: commercial logging for timber production, clear-cutting for agricultural expansion, conversion to mono-culture plantations of eucalyptus, teak, oil palm or cloves. In all cases, those species which require forest habitats, are lost or threatened. Although, primates and most wildlife species in India enjoy a religious status, their habitat requirements are usually secondary to the pressures of human populations. In India, with human populations increasing at the net rate of approximately 1.4 million people per month, the pressures are severe. Added to these population pressures are regional catastrophes, which add to the environmental pressures, faced by people and wildlife in India.

Another source of wildlife loss in India is hunting. Although primates in India do not face the widespread hunting pressures of those in Africa, Indonesia, or countries of South America, hunting of primates for food is practised by tribal peoples in some localities, like in Northeast India, especially Nagaland and many areas of Arunachal Pradesh.

Two regional examples will illustrate the points mentioned above: (1) Northeast India, and (2) South India. Northeast India is one of the world's most biologically and culturally diverse areas, with great environmental diversity, ranging from the eastern Himalayas to the lowlands of the Brahmaputra valley, extensive subtropical and tropical forests, rich agricultural areas, and coastal zones near the Bay of Bengal. Northeast India represents a fusion of Indo-Chinese, Burmese and southeast Asian, flora and fauna. This region contains 9 species of non-human primates (Rhesus, Assamese, Pig-tailed and Stump-tailed macaques, Capped, Golden and Phayre's langurs, Slow loris, and Hoolock gibbon. This represents 60% of all primates in India, of which, 7 are endangered, 4 of which are critically endangered (Srivastava, 1999). Except for Rhesus macaques, practically all the other primate species have suffered extensive forest loss and some hunting pressures.

The Golden Langur in Northeast India

The geographic range of the Golden langur is confined to a small area of Western Assam and adjacent portions of Bhutan. Two field teams working over the past 5 years in Assam and adjacent provinces of Northeast India have carefully surveyed its complete range in India and have located a little over 1,000 individuals (Mukheerjee, 1998; Srivastava, 1999). The groups are small, averaging 8 to 9 individuals per group, with scattered populations, and their habitats suffer from increasing disturbance. There is an urgent need for greater protection of the forests and wildlife, and more basic research on the habitat requirements of Golden langurs to help insure their survival. Despite field observations on Golden langurs since they were first named and recognized as a

valid species in the 1950s (Gee, 1956), and many subsequent observations (Khajuria, 1961; Mukherjee & Saha, 1974; Mukherjee, 1978, 1994), there is a need for more information on basic ecology and behavioural characteristics, movements and home range patterns, dietary needs, reproduction, recruitment, survivorship, and habitat requirements. Data on these topics are necessary for a scientifically based conservation programme.

Other Primate Species in Northeast India

There are similar problems for the other primate species as well in Northeast India, all of which have suffered habitat losses and many of which are hunted in the hill regions although their geographic distributions are greater than that of the Golden langur. Primate populations in Reserve Areas have suffered serious declines as shown by the recent population trend studies on the Hoolock gibbon in the Gibbon Sanctuary of Hollongapar Reserve Forest (Choudhury, 1999), and the Borajan Forest Reserve (Medhi, 1999), both Wildlife Sanctuaries in eastern Assam. These 2 areas are isolated forest reserves surrounded by tea plantations and cultivated areas. Poaching has not been a major problem, but encroachment of local people results in serious forest degradation, as the villagers have access to the forests for timber cutting, plant and firewood collecting. In Hollongapar Reserve Forest, field surveys from 1987 to 1991 indicated the presence of 15 gibbon groups in 9 km^2 of forest, with an average group size of 3.3 and a total population of only 130 gibbons (Choudhury, 1999). A repeat survey in 1998 and 1999 in Hollangapar Reserve Forest showed only 10 groups, with an average group size of 3.1, and a total gibbon population of 31. This represents a decline in this gibbon population by 76% in approximately 10 years.

An even more serious picture of primate loss has been observed in the Borajan Reserve Forest in Digboi division of eastern Assam. Systematic field surveys over 4 years from 1995 to 1998 revealed a decline in Hoolock gibbons from 11 groups, totalling 34 individuals in 1995 to only 4 groups totalling 15 individuals in 1998. The number of immature individuals in the 1998 population was only 3, indicating very poor prospects of recruitment and survival for this gibbon population (Medhi, 1999).

Two additional aspects of this decline are alarming: Firstly, 3 other species of primates in Borajan Reserve Forest showed serious decline. Capped langurs declined from 59 individuals in 1995 to 36 in 1998; Assamese macaques declined from 65 to 20, and Rhesus, surprisingly, disappeared entirely. Secondly, this decline in the primates occurred in the absence of primate poaching or hunting, however, there was increased grazing pressure, as domestic elephants were releazed in the forest to feed on natural vegetation. Human traffic also increased in the forest. All this led to increased disturbance and opening of the canopy. Canopy measurements showed a loss of over 55% of the canopy cover (Mohnot *et al.,* 1999).

These results dramatically show the effects of human population pressures on forest habitats and their drastic consequences suffered by forest-dwelling primates. This emphasizes the urgent need for total protection of Reserve Forests and the wildlife therein. Forest cutting must be controlled and encroachments by people and domestic animals reduced.

Lion-Tailed macaque and Nilgiri Langur in South India

The Lion-tailed macaque (LTM) is one of India's most endangered primates, and its

precarious status was highlighted by Green & Minkowski (1977). Their field surveys in South India estimated a total population of <1,000 individuals, an alarming conclusion about the status of this magnificent primate. In fact, their actual population estimate in 1975 was only 405 individuals based on 4,000 km of field travel in Tamil Nadu, Karnataka, and Kerala from September 1973 to April 1975. As inhabitants of monsoon forests of the Western Ghat mountains, the Lion-tailed macaque's habitat was disappearing rapidly as a result of agricultural expansion and conversion of natural forests to teak, eucalyptus, cardamon, coffee and tea plantations. Lion-tailed macaques were also threatened by hunting, primarily for the pet trade. Outside of Reserve Forests and National Parks, their natural habitats were being reduced to the woody patches in steep narrow ravines, which are usually isolated and scattered, and often could support only single groups averaging 15 individuals. Green & Minkowski (1977) expressed the opinion that the Lion-tailed macaque 'faces imminent extinction, primarily due to habitat destruction'. This conclusion galvanized conservation efforts in South India and helped to secure other forest areas as Reserve Forests.

As a result of conservation, and that the original population estimates of this species were too low, subsequent population figures give a more encouraging picture. Ali (1985) estimated a minimum population of at least 915 animals, and Karanth (1985), undertaking more widespread field surveys in Karnataka, estimated as many as 3,000. More recent surveys and estimates have placed the total numbers in the wild between 3,000 and 4,000 (Singh, 1999).

The Nilgiri langur (*Trachypithecus johnii*) is an obligate dweller of the Western Ghats and it has received much less attention than the Lion-tailed macaque. In the early 1980s, its population was variously estimated at 5,000 to 15,000, (Wolfheim, 1983), but these were primarily educated guesses. Today, the Nilgiri langur is considered as endangered by the International Union for the Conservation of Nature (Rowe, 1996).

Rhesus and Bonnet Macaques

Rhesus and Bonnets are among the most commensal of non-human primates in India, often thriving in agricultural areas and human habitats: villages, towns, cities, temple sites, and public parks. They live in forest areas, but are most conspicuous in human-dominated environments where they are frequent pests. As such, they are at the opposite end of the conservation spectrum—the problem becomes one of population control of excessive numbers, rather than total protection of declining numbers.

These problems are most clearly demonstrated by population studies of Rhesus monkeys in North India, and this section will focus on data from Uttar Pradesh, especially Aligarh district, an agricultural area in the Gangetic plains 130 km southeast of Delhi. Forty years of population counts of Rhesus macaques in an area of approximately 500 km^2 showed different stages of population trends (Figure 1). An initial population of 337 monkeys in 17 groups in 1959 increased to 403 in 22 groups by 1962. Then a period of population decline occurred over the next 8 years, which led to a population of only 163 monkeys in 10 groups by 1970 (Southwick, 1989). This was attributed to excessive trapping and export of monkeys for biomedical research, vaccine production, and pharmaceutical testing during the 1960s when the export trade in Rhesus

monkeys from India was often 50,000 juvenile monkeys/year. The age structure of populations showed a conspicuous shortage of juvenile monkeys despite high birth rates. Broader population surveys throughout Uttar Pradesh and adjacent provinces showed even greater population declines of Rhesus in village and roadside habitats (Figure 2). Other factors were probably at work in causing decline in Rhesus population, including high rates of human population growth, and relatively slow increases in agricultural production. We found many villagers with strong feelings against monkeys raiding their crops, and as a result they harassed them, chased them away, and encouraged trappers to remove them, and in a few cases actually killed them.

By the 1970s, the export trade of Rhesus monkeys had declined to less than 20,000 monkeys/year. Rhesus population numbers stabilized and began to show slight increases (Figure 1). In 1978, a total ban on Rhesus export resulted in an increase in their population numbers, since then the Rhesus population of Aligarh district has more than doubled, from less than 250 monkeys to over 500 (Southwick & Siddiqi, 1999). Extensive village and roadside surveys throughout Uttar Pradesh have shown population increases of several hundred per cent (Southwick & Siddiqi, 1999). In selected areas, such as Tughlaqabad at the southern edge of New Delhi, Rhesus populations increased from less than 100 to over 400 between 1970 and 1988 (Malik, 1989). At Qasimpur, northeast of Aligarh, a translocated group of 20 Rhesus monkeys in 1983 increased to 140 by 1998, a seven-fold increase in 15 years.

The basic cause of such large increases in Rhesus numbers is the high reproductive rates and low mortality rates given adequate food supplies. The Aligarh Rhesus population has consistently shown annual birth rates averaging 80% and annual mortality rates < 30% over 40 years (Southwick & Siddiqi, 1999). In ecological terms, Rhesus are classic 'r' selected animals, capable of rapid population growth and aggressive utilization of commensal habitats. For these reasons, Richard *et al.,* (1989) have named them 'weed macaques,' an appropriate designation in an ecological and behavioural sense.

In agricultural habitats, Rhesus obtain the great majority of their food from crop raiding and from other human sources, including direct handouts from people or thievery from roadside

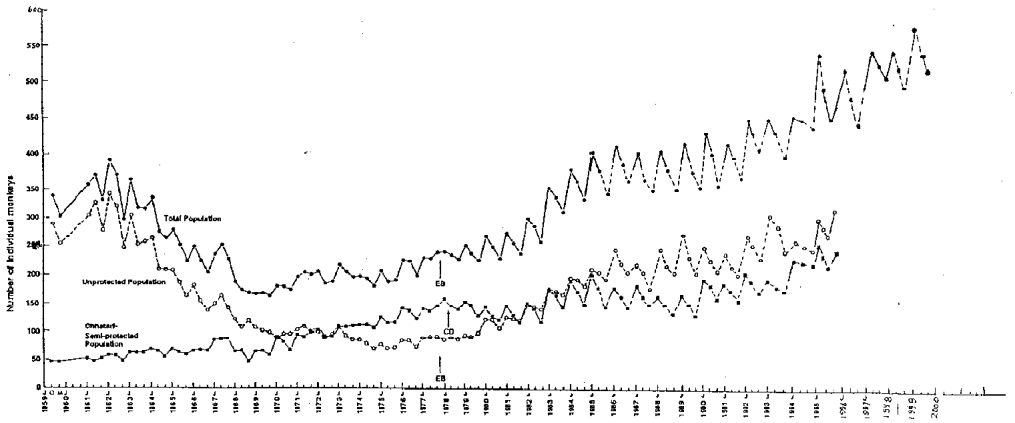

Figure 1. Population changes of Rhesus monkeys in Aligarh District, North India (1959–2000)

Top line = total population; Mid line = unprotected population prior to 1978; Bottom line = Chhatari semi-protected population prior to Chhatari displacement (CD) 1978, EB = Export ban on Rhesus applied in 1978. J = July–August census

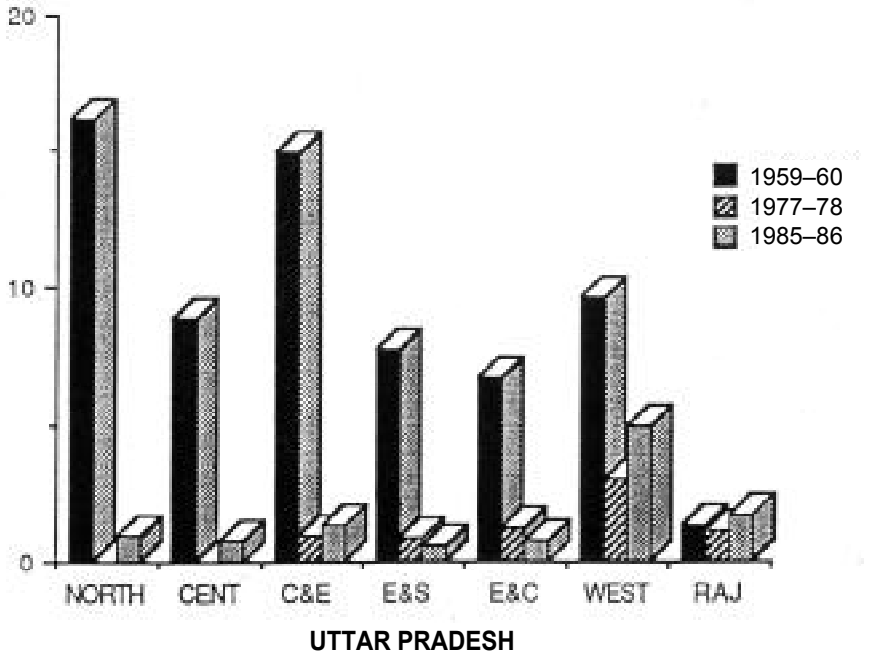

Figure 2. Regional comparisons of Rhesus populations: roadside surveys (1959–1986)

North = northern UP; Cent = Central UP; C&E = Lucknow to Gorakpur, Azamgarh and vicinities; E&S = Azamgarh to Varanasi and vicinities; E&C = Varanasi, Allahabad to Kanpur–Lucknow; E&S; Lucknow to Banda and MP; West = Aligarh to Delhi, Agra and Rajasthan; Raj = Jaipur, Sariska and eastern Rajasthan.

and village shops and bazaars (markets). The latter is especially true in towns and cities, where monkeys in large numbers can also become a public health problem.

Malik & Johnson (1994) have studied an overpopulation of Rhesus macaques in Vrindaban, a Hindu town with many sacred temple sites, near Agra. Monkeys were so abundant in and around the Hindu temples of Vrindaban that the monkeys had harassed 95% of the local people. Monkeys entered houses, stole food, clothing and other goods, uprooted vegetables and garden plants, pulled on electric wires and TV antennae sometimes disrupting service, threatened and attacked people, often causing serious bites. The majority of people held hostile attitudes towards the monkeys and requested authorities to do something about the problem. The situation reached a crisis when a large male monkey lurched aggressively at a small boy on the flat roof of his house, causing the boy to fall to his death.

Dr Malik's surveys (1995–1996) found 1,338 monkeys living in an area of 4.4 km^2. Group sizes ranged from 14 to 142, with an average of 43 individuals/group. A trapping and translocation programme was undertaken to reduce the population by 50%, and remove monkeys to forest patches and open areas where Rhesus could survive without harassing people or causing crop damage. This programme effectively relieved the immediate problem in Vrindaban, but it is not a long-term solution. It is likely that this population will grow again to higher levels, and those translocated monkey groups may also expand to pest proportions in their new habitats.

Urban Rhesus have also been abundant in Jaipur and have been extensively studied by Mathur and her colleagues (Mathur & Lobo, 1988; Mathur & Manohar, 1999). The old central city of Jaipur had a high population density of 358 Rhesus monkeys/km^2 (Mathur & Lobo, 1988), even greater than that of

Vrindaban prior to trapping and translocation (3,041/km^2). In recent years, however, there has been a natural decline in the Rhesus population in the old central city of Jaipur and apparent movement of monkeys into newer suburbs and parks (Mathur, reported in Mohnot, *et al.,* 1999). Hanuman langurs (*Semnopithecus entellus*), which also exist in Jaipur, have shown a even greater reduction in density from 111/km^2 to 68/km^2. Mathur expressed the opinion that the reduction of primate numbers and density in the old city of Jaipur may be due to human crowding, traffic and general 'anthropogenic disturbance'. She and her colleagues felt that translocation is not needed at this time.

Hanuman langurs are also commensal, but rarely reach the pest proportions of Rhesus macaques. They are the true sacred monkeys of India, based on the Hindu epic of *Ramayana*, but all primates in India enjoy a certain religious status among Hindus. Hanuman langurs are the most widespread geographically of all of India's non-human primates, and they live in a very wide range of habitats from montane forests in the Himalayas, to agricultural plains in the Gangetic basic, deserts in Rajasthan, and tropical forests in South India. They not only enjoy a higher level of cultural esteem in India, but they are more elegant and less aggressive than Rhesus, and are seldom considered to be common pests. They are common in some tourist locations such as the Mandore Gardens in Jodhpur, Rajasthan, Akbar's Tomb and Sanctuary near Agra in Uttar Pradesh, and the temples and parks of Mount Abu, Rajasthan. Long-term behavioural and ecological research around Jodhpur by Mohnot and colleagues (Roonwall & Mohnot, 1977; Mohnot, *et al.,* 1999), have shown fluctuating populations, which are relatively more stable than those of Rhesus macaques. Langur birth rates are generally lower than Rhesus and infant mortality rates are higher. In Mount Abu, Hrdy (1974) found that approximately 50% of all infants died in their first year. Typical mortality rates for infant Rhesus are less than 20%. Nonetheless, the Hanuman langurs of Jodhpur have been increasing in recent years from a population of 1,512 in 1994 to 1,907 in 1999 (Mohnot *et al.*, 1999), an increase of 26% in 5 years. By way of comparison, the Qasimpur Rhesus population (only one group) increased 84% during the same 5 years. Langurs rely more on natural vegetation in most habitat situations and less on crop raiding, and in general, they represent neither the danger nor the economic loss to people characteristic of some Rhesus populations. Crop damages attributable to Rhesus in Shimla and Chamba districts of Himachal Pradesh (S.K. Sahoo reported in Mohnot, *et al.,* 1999) have been found to be unacceptably high, whereas crop damages attributable to langurs were minimal. These findings were based on surveys of 86 cropland sites, 155 villages and 950 farmers.

Bonnet macaque's have been less studied than Rhesus and langurs, but there are prominent situations where they show some of the undesirable aspects of commensalism typical of Rhesus. This is the case on the Elephanta Island in Bombay Harbour, where the population has increased around the commercial bazaars and tourist areas. They harass tourists and shopkeepers much as Rhesus do. In South India, anecdotal reports indicate Bonnets to be an agricultural pest.

Discussion

India's rich and diverse primate populations present a range of conservation and management problems. At the risk of oversimplification, the problems fall into two main

categories, each with its particular needs and solutions: (1) rare and endangered species, some on the verge of extinction, and (2) overly abundant species which become pests in some situations. More than half of India' s primate species are rare and endangered, facing serious habitat disturbances and losses, and sometimes subject to hunting. These are the Golden langur, Phayre's and Capped langur, Pig-tailed and Stump-tailed macaque, and Hoolock gibbon. These species need total protection and habitat improvement.

At the opposite extreme, one or two species are locally overabundant, posing pest problems in terms of agriculture and public health. These are Rhesus and in some instances, Bonnet macaques. Here different management approaches must be used, including reduction in supplemental feeding, translocation from trouble areas, and fertility control if new and reasonable methods can be developed. Translocation is a temporary solution; fertility control may be a long-term solution but this requires research and development of new methods of birth control in pest animals, that are practical, economically feasible, and humane.

Between these extremes, several gradations occur. Hanuman langurs are neither endangered nor do they pose pest problems in most cases. They are highly revered by the people of India, and in most cases they live in reasonable balance with their local environments. Also Nilgiri langurs in South India and Assamese macaques in Northeast India are somewhat intermediate between the two extremes listed above. In many cases they are not seriously endangered (although this may be questioned and more data may reveal that they are indeed threatened), nor are they significant pests to agriculture or human health.

Still a fourth type of situation is that in which we know so little about true abundance and ecology that it is difficult to classify the nature of conservation issues. This is true of India's two prosimian species, the Slow and Slender loris. Both are nocturnal and secretive, and only recently have field studies been undertaken to determine some facts about their population status and habitat relations (Singh, 1999; Srivastava, 1999).

Of the situations listed above, certainly the most urgent are the conservation problems of rare and endangered species. These have been known for the Lion-tailed macaque for at least 20 years, and substantial efforts, both scientific and political, have gone into Lion-tailed macaque conservation. The response has been international, with scientists and conservationists of many nations studying the problems of habitat protection and expansion, ecological and behavioural studies of natural populations, and more careful management of captive populations with a view towards increasing reproduction and insuring genetic quality.

Much less effort has gone into the endangered species of Northeast India, virtually all of which are threatened and endangered. The most critical of these is the Golden langur, facing critical habitat loss in Assam, and highly endangered by virtue of its small numbers, small group sizes, scattered populations, and very limited geographic range. Similar problems in India exist for the Hoolock gibbon, Phayre's and Capped langur, Pig-tailed, and Stump-tailed macaques. These species are endangered in India but they have broader ranges throughout Southeast Asia, and are hence not endangered. Golden langurs also occur in Bhutan, but their total geographic range still remains quite limited.

For these highly endangered species in India, two approaches can be pursued at the present time. In the first case, they require immediate conservation attention: total protection and enforcement of all local statutes protecting them and their habitats. The second major need for these endangered species is more field research to provide accurate data on habitat requirements and population ecology. Such information is essential to design and administer the most effective conservation and management programmes. A few examples of the types of data needed have been obtained in recent years, represented by the work of the Indo-US Primate Project (Mohnot, *et al.,* 1999; Srivastava, 1999), and the earlier studies of several leading primatologists in India, including Drs Alfred (1992), Gupta (1996), and Mukherjee *et al.,* (1998). Their field studies are exemplary of the types of scientific information that are needed. Effective conservation programmes require sound knowledge of the species and its habitats and knowledge of economic, social and political factors pertaining to the region. Conservation efforts must involve the local communities and regional environmental NGOs as well as field biologists and government officials. Community based and regional conservation efforts can be successful, and they represent our best hopes for the survival of wildlife habitats and endangered species. Some focus can be directed toward individual species, but emphasis must also be placed on the entire spectrum of biodiversity.

Acknowledgments

Many people have contributed to this research since 1959. We are indebted to the late Dr M.B. Mirza of Aligarh University who first encouraged the study of Rhesus monkeys in North Central India. Our first colleagues, Dr M. Rafiq Siddiqi and Dr M.A. Beg were essential in the first year of the fieldwork. Many others who have participated in field work in subsequent years include Drs K.K. Tiwari, R.A. Lahiri, M.Y. Farooqui, R.P. Mukherjee, J.R. Oppenheimer, R. Johnson, G. Whitesides, M. Bertrand, and numerous field assistants. We have received logistic support and encouragement from many others including M.L. Roonwal, F.B. Bang, T. Simpson, T. W. Ananthakrishnan, I. Malik, D. Lindburg, M. Koshy, S.M. Mohnot, and D. Ferguson. We have further benefited from the wise advice of many colleagues in India, including R. Horwich, P.K. Seth, A. Srivastava, J.C. Daniel, J.R.B. Alfred, B.C. Pal, N. Alim, P. Ohja, R. Mathur, P.C. Bhattacharjee, M. Singh, I. Prakash, L.S. Rajpurohit, and S.K. Sahoo. Numerous students and research fellows have also contributed to our understanding of primate ecology, behaviour, and conservation in India, including A. Changani, P. Sarkar, D. Chetry, J. Das, R. Medhi, J. Bose and J. Biswas. This research began when the senior author was a Postdoctoral Fulbright Fellow at Aligarh University. In subsequent years, we have received support from the US Educational Foundation in New Delhi, the US National Institutes of Health, the Johns Hopkins University International Centre for Medical Research and Training, the National Geographic Society, and the Indo-US Primate Project supported by the International Office of the US Fish and Wildlife Service. Recently, we are indebted to Prof. S.M. Mohnot of Jodhpur, Director of the Indo-US. Primate Project, and Dr Arun Srivastava, Scientist-in-Charge of the Northeast Centre.

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