ISSN 1014-2789

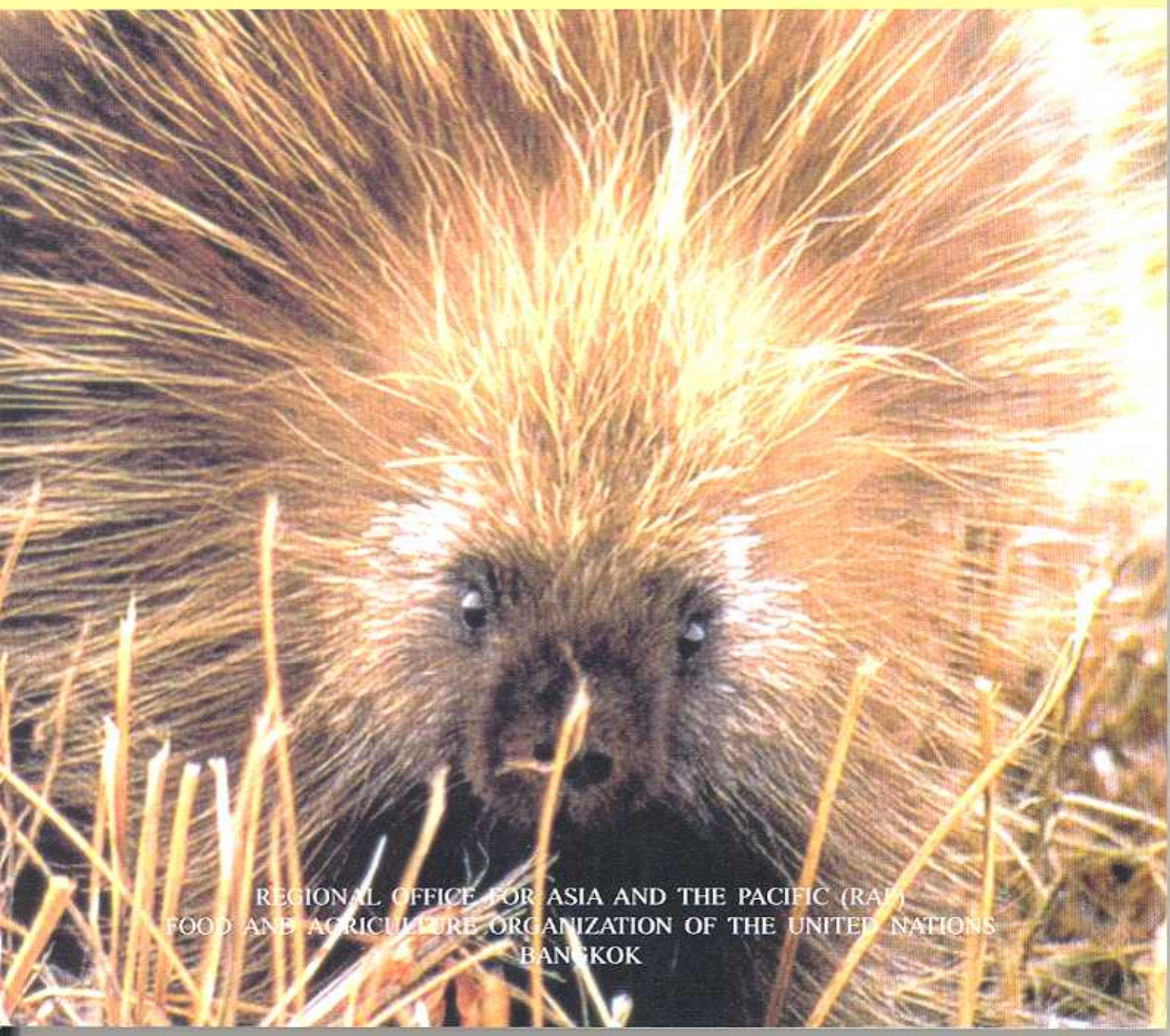
FEATURING FOREST NEWS

TIGER PAPER

Regional Quarterly Bulletin on Wildlife and National Parks Management

Vol. XXVIII: No. 4

October-December 2001



REGIONAL OFFICE FOR ASIA AND THE PACIFIC (RAP)
FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS
BANGKOK

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ON THE PORCUPINE (*Hystrix indica*) IN WESTERN THAR DESERT

by R.N. Bhargava, L.S. Rajpurohit, Prashant Bissa and S. Madan

Introduction

The Indian crested porcupine (*Hystrix indica*) has a wide geographical distribution in the Middle East, Turkmenia and India (Ellerman and Morrison-Scott, 1951). It occurs from Kashmir to Nepal in the northern Indian subcontinent, to the Peninsula and Sri Lanka. Extensive studies on this large rodent have been carried out in Israel (Gutterman, 1988), but this species has not been well studied in India. The earlier naturalists and zoologists recorded its occurrence in hilly terrain and rocky slopes. Therefore, the report of occurrence in the tall sand dune habitat in a 100 mm rainfall zone, west of Jaisalmer in the Thar desert was quite revealing (Prakash, 1977).

The authors have been working in the extreme northwestern zone of the Thar desert in Rajasthan for the project "Impact of Indira Gandhi Canal Irrigation on the Mammals in Western Rajasthan", sponsored by the Ministry of Environment and Forests, Government of India, for the last two years and have found that the Indian crested porcupine is quite common in the region. During our field work on several mammalian species, we have made some observations on the distribution and burrowing behavior of this interesting rodent in the desert environment.

Observations

Characteristics

The porcupine is the most spectacular, heaviest and largest amongst the Indian rodents. It is easily recognized with a body and tail covered with stiff quills of varying lengths interspersed with bristles. These bristles grow profusely and are long so long on the head and neck that they form a crest – hence this rodent is popularly referred to as the crested porcupine. It has tufts of short, hollow, open-ended quills attached to the skin. These can be rattled together as a warning to enemies.

Distribution

Sri Ganganagar district

1. Investigations were made along the Indo-Pak border. An adult specimen was observed along the zero line of the international border.
2. A burrow with two side entrances between zero line and barbed wire fencing close to a wheat field was observed at Anupgarh. The burrows were found to descend several meters deep into the ground.

Bikaner district

3. 750 RD Escape Channel ca 39 kms southwest of Pugal. Two dens of porcupine were observed, one of which was already excavated beside an *Acacia tortilis* tree. The forest guard reported that some tribal poachers from nearby villages killed them for food. Porcupine quills were seen scattered in heaps of waste soil at the burrow opening. Another deserted burrow was found about 20 meters away in the sand hills.
4. Bharamsar at 1095 RD. A porcupine den located in the interdunal plain away from the crop field was investigated. Again, two animals had already been taken away by tribal poachers. A good number of quills were found scattered in the sand.

Jaisalmer district

5. Magnewala tanka ca. 70 kms northwest of Nachna and 12 kms from Bayla near the international border. Several dens of the animal were found. Quills were observed near the burrows.

6. Forest department nursery ca. 37 kms west of Mohangarh (113 RD from O RD Mohangarh). There were 3 dens spread about in an area of about 15 meters.
7. Barsingh Khan Ki Dhani ca. 23 kms northwest of Nachna (near 1309 RD main canal on Nachna Mohangarh road). Two dens about 10 meters apart with quills in the sand seen at the burrow entrances.

   Another den was found about 200 meters from the first two. The quills and fresh pugmarks of the animal were observed. A large Acacia tortilis tree was growing over the burrow. The height of the burrow opening was 60cms, width at the base was 45 cms and at the middle it was 30 cms. The depth of the burrow was about 2.4-3 m by visual estimates.

8. A porcupine den was seen in the sand hill about 2 kms from Miazlar forest enclosure towards the international border.

The burrow

From the preceding account it is quite apparent that the so-called hill inhabiting porcupine is fairly distributed in the extreme arid environment in the Thar desert. Since no faunistic surveys were conducted in this region in the past, it is not clear whether this large rodent occurred in this part of the desert when drinking water was not at all available to them, or if it spread as a result of the impact of the Indira Gandhi Canal, due to which conducive conditions have been created during the last two to three decades. It is, however, clear that the porcupine has attained a pest status of a serious nature as reported by the farmers of the region.

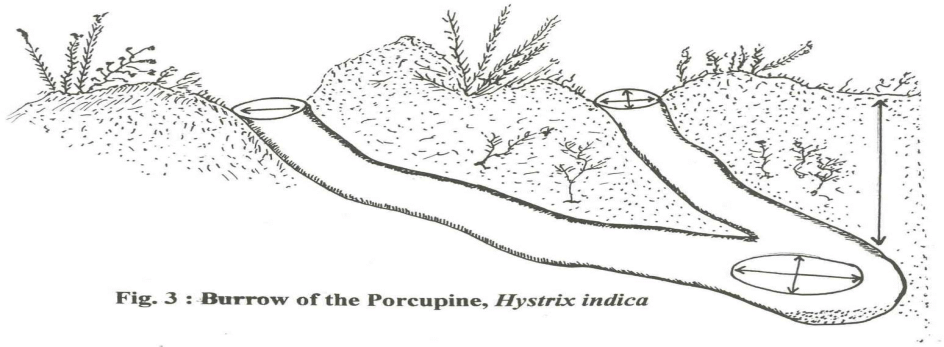

Fig. 3 : Burrow of the Porcupine, *Hystrix indica*

The burrow excavated at 1095 RD near Barhamsar in the interdunal plain had two side openings. The main entrance was slightly arched, 30 cm in height and 45 cms maximum width. From the entrance it sloped down steeply and then gradually descended for a length of 4 m, terminating in a round chamber. The two openings on either side of the mound traversing about 2.5 m deep in the soil to meet the main canal. The height and width of these side entrances were 15x20 cm and 20x30 cm respectively. The maximum depth f the den was 1.5 m from the surface of the mound.

The burrows thus observed were found to be situated in typical interdunal plains, far away from the crop fields. During the day the animals remain hidden in their burrows, but at night they venture out and raid the crop fields and inflict damage to wheat and gram crops.

Observations were also made on the porcupine behavior at Bikaner zoo. The porcupines were quiet and became aggressive when disturbed. They immediately erected the quills on their back and stamped their feet on the ground. Simultaneously they shook and rattled their tails and quills were sometimes dislodged in this

process. The quills were never shot out as is sometimes believed. The only information available on their breeding season and litter size in the Thar Desert is from Bikaner Zoo. They breed from March to October and the litter size varies from 1 to 3 (Prakash, 1971).

Acknowledgments

Gratitude is expressed to the Ministry of Environment and Forests, Government of India, for the financial support to the project.

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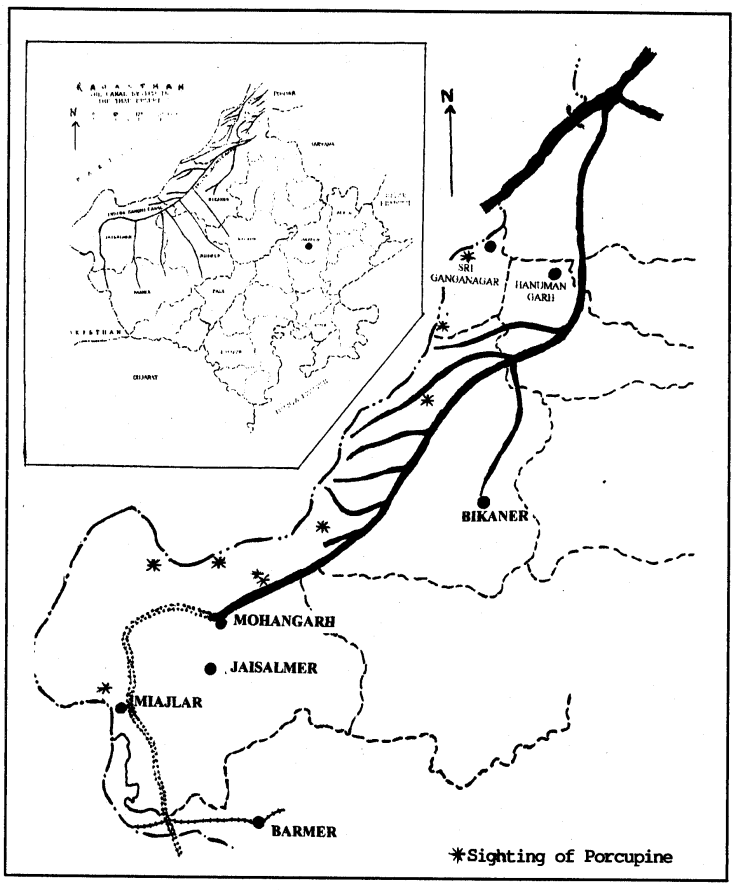
INDIRA GANDHI NAHAR PROJECT, RAJASTHAN



DEFORESTATION AND ITS IMPLICATIONS FOR CONSERVATION OF ELEPHANT IN SUMATRA AND SRI LANKA

by Charles Santiapillai

Introduction

Sumatra and Sri Lanka are both land-bridge islands that were formerly connected to the Malayan and Indian mainlands respectively. As such, the two islands might have had a full complement of the continental species at the time of their separation. Therefore, it is reasonable to assume that their faunas have been slowly dwindling since then. This slow process of species loss is being accelerated today as a result of deforestation. We can expect large species to be extinction-prone when confined to a limited area because of their intrinsically low population densities (Terborgh, 1974).

The importance of Asian elephant (*Elephas maximus*) in Sumatran and Sri Lankan ecosystems stems not only from the animal's enormous size, its intemperate appetite and its high mean age of survival, but also from the fact that as a "keystone" species, the elephant plays a very important role in structuring habitats and maintaining biological diversity on a large scale. The Asian elephant is a megaherbivore, which by definition refers to any plant-eating mammals that typically attains an adult body mass in excess of one megagram, or one metric ton (Owen-Smith, 1988). Today, in both islands, natural habitats are on the decline and as far as the elephant is concerned, the situation has reversed from one in which human islands existed in a sea of elephants, to a sea of people with elephant islands! Changes in land-use patterns by a rapidly growing human population in Sumatra and Sri Lanka are resulting in continuous contraction of habitat available to the elephant. Such changes serve to cut off certain channels of response usually available to elephants, such as emigration and dispersion (Watson & Bell, 1969).

Elephants probably require larger areas of natural range than any other mammal species in tropical Asia, and therefore are among the first animals to suffer the consequences of development activities (Olivier, 1980). Over large areas of Sumatra and Sri Lanka, there is no longer room for elephants to move about and adjust their densities to changing patterns of land-use. As forests are converted to other land-use, all remaining elephant populations are undergoing, or are threatened with, fragmentation. This leads to what has been called the "pocket-herd" phenomenon, which represents an extreme stage in the human-elephant conflict (Olivier, 1980). The "pocketed" herds are created when elephants, living in development areas, are cut off from adjacent forest tracts, or when a clan or subgroup moves into a project area that was formerly used for foraging (Seidensticker, 1984). These elephants, like other wildlife, have lost so much of their former habitats that they are often forced to invade the communities that have displaced them. This is the crux of the elephant-human conflicts in Sumatra and Sri Lanka.

Status of Elephants in Sumatra and Sri Lanka

The Sumatran elephant (*Elephas maximus sumatranus*) is the smallest of the three subspecies of Asian elephant, and is endemic to the island of Sumatra. Prior to the large-scale destruction of its habitat, the elephant was widely distributed throughout Sumatra across a wide variety of ecosystems. It was found in primary forest at altitudes above 1,750 m in the Gunung Kerinci in West Sumatra (Frey-Wyssling, 1933). However, its preferred habitat was always the lowland forest. In the past, when the island was more substantially forested, elephants made extensive migrations. These movements usually followed river courses where the canopy was broken, and included both hill forest as well as dipterocarp lowland forest.

Elephants moved from montane areas to the coastal lowlands during the dry season, and retreated into the hills once the rains came (van Heurn, 1929; Pieters, 1938). Such a strategy enabled the elephant to maintain relatively high numbers even in primary forests, where the absence of seasonal variation in rainfall and plant productivity usually results in very reduced biomass in terrestrial herbivores (Eisenberg, 19880). But today, with the conversion and/or clearance of lowland forests in Sumatra, the elephants are forced to move to higher altitudes, where the remoteness, difficulty of terrain and density of cover provide some degree of protection.

The Sumatran situation is just the reverse of what is seen in Sri Lanka, where the elephant (*Elephas maximus maximus)* has been almost completely squeezed out of its former habitats in the hills with the clearance of forest for the establishment of first coffee and later tea plantations. Today, the low country Dry Zone has become the last stronghold of the elephant in Sri Lanka. In both Sumatra and Sri Lanka, the elephant occurs in a number of small, fragmented and discontinuous populations, both within and outside protected areas. Despite the difference in size of the two islands of Sumatra and Sri Lanka, each supports about 3,000 elephants in a variety of ecosystems. This is due to the fact that the largely mountainous areas in Sumatra where the elephants currently occur offer climax forest habitats where elephant densities are intrinsically low. By contrast, in Sri Lanka the dry scrub vegetation and the villu grasslands offer an increased diversity of habitat patches at different successional stages, which substantially improve the carrying capacity for elephants. This is the reason why Sri Lanka, despite being just one-seventh the size of Sumatra, still supports a comparable number of elephants.

Deforestation

Prior to 1900, when agricultural settlement in Sumatra and Sri Lanka first led to a substantial degree of deforestation, much of these islands was heavily forested. In both, the conversion of forest into agricultural holdings is a particularly serious cause of conservation problems, and the elephant has been among the species most seriously affected by it. In recent decades, the primary forest in Sumatra has been shrinking rapidly in extent. It is estimated that between 65 and 80% of the forest in the lowlands have already been lost (Whitten *et al.*, 1984). Stands of ironwood (*Eusideroxylon zwageri*) of great commercial value, have almost been destroyed in the lowlands. The Barisan chain of mountains has extensive montane forests, while the lowland evergreen forests are dominated by the commercially important timber species belonging to the family dipterocarpaceae. The mountain areas to date have been less seriously affected, but the disruption of continuous cover is already substantial in some cases, and perhaps 15% of their total area may tentatively be estimated as already removed. According to Collins *et al.* (1991), about 230,660 km^2 (or 49%) of the original forest cover remains. In Sri Lanka, the natural closed-canopy forest cover declined in extent from 29,000 km^2 (44% of the land area) in 1956 to 16,590 km^2 (27%) in 1980. By 1983, forests accounted for 12,260 km^2 (19%), of which only 1,440 km^2 was rain forest (Collins, *et al.*, 1991).

Agents of Deforestation

A number of factors, both natural as well as man-made, continue to threaten the tropical rain forest habitats of the elephant in Sumatra and Sri Lanka. Logging, human settlements, shifting cultivation, agricultural expansion, forest fires, fuelwood collection, and road building are some of the more common agents of forest destruction and fragmentation.

1.Logging: The tropical rain forests of Sumatra contain a very high proportion of commercially valuable timber species of the family Dipterocarpaceae. On average, these forests contain as much as 200 m^3 per ha of commercial-size trees (GOI/IIED), 1985). In Sumatra, timber production means harvesting old growth timber from natural forests. The Department of Forestry has laid down strict limits on the exploitation of commercial species, stipulating a minimum diameter of 50 cm at breast height (dbh), and a cutting cycle of 35 years, leaving more than 25 years per ha of commercial species of 20 cm dbh or greater

(GOI/IIED, 1985). Commercially valuable dipterocarps, such as *Shorea* sp., take about 70 years to attain 60-70 cm dbh. As long as timber extraction is carried out selectively, and within strict limits, it can enhance the carrying capacity for elephants. Crude density of elephants in logged-over forests can be more than twice that in primary forests (Olivier, 1978a). In practice, however, logging companies often cut trees well below the official limit of 50 cm dbh. Selective logging in Indonesia entails the removal of up to 20 trees/ha, which can cause up to 40% damage to the residual stand (Kartawinata *et al.*, 1981). Furthermore, elephants may not have any escape routes to move from a disturbed area to a mature forest, which may be some distance away from the logged area. The maintenance of unlogged strips along water courses to link logging areas with mature forests would be a practical solution to the problem (Shelton, 1985).

2.Human settlements: Indonesia will face serious demographic problems in the medium-term future. The population, currently about 205 million and concentrated in Java, is growing at 2.1% per annum, with no controlling mechanism in sight, and with a forecast which must be regarded as optimistic, of ultimately stabilizing at 400 million. More than 2.5 million people from Java have already been decanted into the "outer islands" of Sumatra, Kalimantan, Sulawesi and Irian Jaya, and the movement of 65 million additional people is planned for the next 20 years (Colchester, 1986). Even with the best advice and control, this would risk causing serious environmental damage if done rapidly and on such a large scale. In addition to government-sponsored settlers, twice as many unassisted people reach these outer islands in search of a better life. The southern province of Lampung has been the target of most of the pioneers. Today, 80% of the 4.6 million people in Lampung are migrants. Conflicts between elephants and settlers have become serious conservation problems.

3.Shifting cultivation: General shifting cultivators are blamed for much of the forest destruction in Indonesia. According to Myers (1980), they have been a major contributory factor to the loss of 15,000 km^2 of forest each year. However, much of the damage to the forests is caused by the new or shifted settlers, rather than by the traditional shifting cultivators, who in the past operated on a sufficiently long rotation to allow good forest regeneration. The new settlers clear forest for crops, but after two or three rapid rotations, the declining fertility of the soil and poor yields force them to move elsewhere. The land is taken over by *Imperata cylindrica* or "alang-alang", which is a coarse weed, extremely difficult to eradicate once established, and unpalatable to most wild herbivores, including the elephant. But shifting cultivation, in its classical form, is the only self-sustainable system of agriculture in the tropical rain forest (Moss, 1984). When it functions correctly it can enhance elephant conservation. In Sri Lanka, some of the best elephant areas today had previously been subjected to chena (swidden) cultivation. Wharton (1968) has provided convincing evidence that the distribution of the major large mammals of Southeast Asia is highly dependent on shifting cultivation. Traditional shifting cultivation is a system that is well adapted to tropical moist forest environments (Collins *et al.*, 1991). However, excessive use of forest resources, including over-cutting and removal of tree cover and inappropriate farming practices, have resulted in a total of almost 8.6 million ha in 1984 being classified as "critical land" (i.e. land which has lost its normal soil functions). Sumatra contains the greatest total area of such critical land in Indonesia (GOI/IIED, 1985).

4.Agricultural expansion: An area of 2,250 km^2 is under oil palm in Sumatra, while rubber plantations occupy 2,280 km^2 (Scholz, 1983). Oil palm is very vulnerable to raids by elephants and in Sumatra, estates in the vicinity of elephant habitats have experienced constant depredations. Oil palm and rubber estates have greatly reduced the life-support systems of the elephants in Sumatra. This is especially evident in the so-called "estate belt" of northeast Sumatra – an area of about 17,000 km^2 (Scholz, 1983). In the long run, existing lowland forests would prove to be far more valuable than oil palm plantations. In the provinces of North Sumatra and West Sumatra, a combination of high human population and the clearance of enormous tracts of forest for oil palm, rubber and coconut plantations has virtually eliminated

the elephants. Lampung has experienced some of the worst elephant problems because of the rapid loss of forest. In Aceh, almost all lowland forests under 1,500 m have been allocated for timber production (Blouch & Simbolon, 1985). Elephants are now being forced to move out of their preferred habitats in the lowlands to more rugged and less attractive montane forests, from which they periodically raid crops. The situation in Riau is even worse. Although about 35-40% of Sumatra's elephants occur in this province, the areas designated for nature conservation are "woefully inadequate" (Blouch & Simbolon, 1985). Unlike in Aceh, the elephants have no mountainous retreats in Riau when development programs constrict their habitats. Forests are still cleared to make way for oil palm plantations in Riau.

In Sri Lanka, the establishment of the Pelwatte sugar cane plantation so close to the western boundary of Ruhuna National Park in 1980 has led to constant depredations by elephants, causing an estimated loss of US$2,000,000 in 1988/89. With the establishment of an electric fence (280 km) around the perimeter of the plantation, the losses were reduced to US$200,000 in 1994 (Thouless, 1994).

5.Forest fires: Fire is one of the most destructive forces in deforestation. During the period 1978-1982, an average of 28.5 thousand ha of forest land was razed annually by fires, virtually all caused by man (Statistik Kehutanan Indonesia 1982/83). All fires are, however, not necessarily destructive to the environment. The burnt area regenerates quickly, attracting elephants and other herbivores.

6.Fuelwood collection: In both Sumatra and Sri Lanka, fuelwood collection by rural people for their domestic energy needs is probably the most important cause of forest degradation. In many parts of Southeast Asia, this surpasses logging in the intensity and extent of the damage caused. According to FAO (1981), about one-half of all the wood cut in the world ends up as fuel wood, mostly in Southeast Asia.

7.Road construction: Construction of roads and pipelines has fragmented the forest and isolated elephant populations. They provide easy access for illegal settlers, shifting cultivators and poachers.

7.1Poaching: Unlike in Africa, elephant poaching is not considered a terminal threat in Asia. Nevertheless, poaching in recent times has had a far more serious effect on the elephants in Sumatra than in Sri Lanka. This is due to the fact that Sumatra has more tuskers among its elephant population than does Sri Lanka. According to Deraniyagala (1955), 98% of the Sumatran elephant bulls were tuskers. In Sri Lanka, by contrast, only 7.3% of the bulls possess tusks (Hendavitharana *et al.*, 1994). Tuskers are being poached for their ivory in Sumatra and to a lesser extent in Sri Lanka. Poaching affects the adult sex ratio. In Sri Lanka, where the poaching pressure is low, the adult sex ratio of the males and females is 1:2.9 (Hendavitharana *et al.*, 1994). In Sumatra, where poaching has been rampant, even within protected areas, the adult sex ratio is 1:5 in favor of the cows (Santiapillai & Suprahman, 1995). As Sukumar (1989) points out, hunting of male elephants will further widen this disparity in the sex ratio and at some ratio there would be far too few males around to ensure that all the available females are successfully mated, resulting in a lower rate of conception and a longer inter-calving interval. This lowered fertility could reduce the rate of population growth. An extreme example comes from Kerala (South India), where the poaching pressure was so intense that the adult sex ratio was found to be 1:52 (Menon, 1990).

Conclusion

Disturbed areas that are a result of deforestation are rarely considered useful in maintaining wildlife populations (Foster, 1980; Johns, 1983). While some agents of deforestation do cause irreparable damage to the habitats, yet others could in fact enhance elephant conservation, if they are carefully controlled. While the need to retain large tracts of undisturbed climax ecosystems in the humid tropics is axiomatic, the dependence of elephant on primary tropical rain forest habitat should not be pushed too far. It is not *ipso facto* essential to stop the commercial exploitation of timber in forests for them to also be managed as a habitat for

elephant; it is simply necessary to control it strictly, since a logged forest has a great potential value in the long-term conservation of rain forest animal species (Johns, 1985). Trees must be taken on a strictly selective basis and extraction limited to those exceeding 50 cm diameter, 1.5 m from the ground, leaving the remainder to provide open canopy until saplings grow up to replace the trees that have been removed. Such a policy is in any case required to provide sound long-term forest management to replace the destructive exploitation that has been turning large areas in Sumatra and Sri Lanka into degraded environments of no economic or wildlife value.

In both Sumatra and Sri Lanka, the human population is growing rapidly. At the beginning of the 20th century, Sri Lanka had a population of 3.6 million people, equivalent to a density of 55 individuals per km^2. During the 40 years between 1956 and 1996, while the human population more than doubled, from 8 to 17 million, the forest cover was more than halved from 44% to less than 20%. In Sumatra too, the trend in natural forest cover runs opposite to the human population: while the human population increased six-fold from 6 million in 1930 to 36 million in 1990, the forest cover during this period declined form about 80% to less than 50%. Given this background, it is inevitable that in the tropics, many conservation areas will shrink in the face of development, human competition for resources, and changes in political ideologies. Existing conservation areas are prone to environmental disturbances outside their boundaries. It would be a serious mistake to rely on the elephant being safe in perpetuity, living in one or two large national parks only. The best opportunity for elephant conservation at present lies in some form of multiple-use pattern of land development. As Olivier (1990) pointed out, the existence of forms of land use compatible with elephant conservation is important, as it creates opportunities for compromise with the political objections that are likely to arise in response to any call to annex large tracts of land exclusively for conservation purposes. Olivier (1978b) recommended the establishment of "Managed Elephant Ranges", where priority is given to the requirements of elephants, but compatible human activities such as sustained-yield forestry, slow-rotation shifting cultivation, controlled livestock grazing, and subsistence hunting are permitted. Man and elephant need to live together through mutual adjustment. Such an approach may be the last hope for the elephant in such densely populated islands as Sumatra and Sri Lanka.

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CONSERVATION AND UTILIZATION TREND OF MARINE TURTLES IN INDONESIA

by Matheus H. Halim, Saddon Silalahi and Jito Sugarjito

Introduction

Indonesia, with its 17,508 islands, 70 km^2 of coral reefs, sea grass beds and 81,000 km length of beaches (including sandy beaches), offers excellent habitats for marine turtles. Six of the world's seven species of marine turtles occur in Indonesia. Four of these species – Hawksbill (*Eretmochelys imbricata*), Olive ridley (*Lepidochelys olivaceae*), Leatherback (*Dermochelys coriacea*) and the Green turtle (*Chelonia mydas*) are definitely known to nest in varying numbers on beaches throughout the archipelago and a fifth, the Loggerhead (*Caretta caretta*) is believed to do so (Salm, 1984; Salm and Halim, 1984; Kitchener, 1996). The sixth species – the Flatback (*Natator depresus*) – nests exclusively in Australia, but has been observed feeding in Indonesian waters (Kitchener, 1996). Only one of the seven species – *Lepidochelys kempi*) does not occur in Indonesia, as it is found only in the Atlantic Ocean, particularly in the coastal zone of America and Mexico (Nuitja, 1996).

Concern about the continuing decline of the marine turtle population and the potential impact of the growing commercial fisheries has prompted the Indonesian government to develop an action plan for conserving marine turtles. In addition, several efforts in marine turtle conservation, particularly on Green and Hawksbill, have been undertaken by the government with help from international agencies such as World Wide Fund for Nature (WWF), the Food and Agriculture Organization (FAO) and the Japan Bekko Association (JBA).

Man is the primary cause of the over-exploitation of marine turtle resources. In some areas, the turtles are hunted for meat, while in other areas the eggs are still harvested. These creatures are widely used for food and ornaments by fishermen and people living along the coastal areas. In spite of the abundance in species diversity of marine turtles, little research has been conducted on their biology and management in Indonesia. One obvious trend, however, is that the population of marine turtles in Indonesia has decreased dramatically over the last 50 years. An indication of the decline of the marine turtle population in Indonesia can be seen in the difficulty that Balinese and Bugis turtle hunters are now experiencing in their pursuit of large turtles, which results in high prices. The former hunting grounds around Bali have been depleted through over-exploitation, and turtle hunters now must travel to the remotest parts of the Indonesian archipelago in pursuit of large turtles, which have become scarcer (IUCN, 1984; Schulz, 1984; Greenpeace, 1989; Ketut Sarjana Putra, 1996; Wamafma, 1996).

This report presents a summary of the current condition of marine turtle research, management and conservation in Indonesia.

Population Status and Distribution

All six species of marine turtles found in Indonesia have already been protected since the enactment of legislation no. 7/1999, but the exploitation of the eggs and of the adult turtles is still going on in some areas throughout Indonesia. Current details about the populations are given below:

1. **Green turtle (*Chelonia mydas*)**

In Indonesia, the Green turtle has been traditionally utilized by people for a few centuries, particularly by the Balinese. The Green turtle is the most commonly encountered marine turtle in Indonesia. It can be found nesting throughout the archipelago in varying numbers from the large rookeries on the islands in Berau-East Kalimantan, to isolated nesting sites on small beaches in many regions of

Indonesia (Wicaksono, 1992).

However, many of the larger rookeries have decreased in the last 50 years, due to over-harvesting (Schulz, 1984; Salm, 1984; Kitchener, 1996). Schulz (1984) reported that more than 70,000 turtles are caught every year throughout Indonesia – mostly Green and Hawksbill turtles. Meanwhile, Salm and Halim (1984) recorded that this turtle trade ended in Tanjung Benoa Harbour, Denpasar-Bali. However, the Green turtle trade in Denpasar-Bali has dropped significantly to 32.37% in the last ten years. In 1991, 24,157 turtles registered the highest trade since 1988, which then dropped to 7,819 turtles in 1998. In 1990, the Governor of Bali Province issued a decree limiting the utilization of turtles to a maximum of 5,000 turtles per year. According to WWF-Bali, turtle trade statistics at Tanjung Benoa Harbour show that it is still 58.38% over the quota. In addition, the size limitation that specifies that the turtles caught must be larger than 50 cm CCW (Curved Carapace Width), as stated in the decree, is still ineffective. In 1998, the number of turtles of less than 50 cm CCW was found to be 256, or 3.27% of the total number landed in Tanjung Benoa Harbour. One of the good results of the WWF-Semiloka Penyu Laut (Marine turtles workshop on utilization and protection) held 9-11 August 1999 in Wisma Bumi Asih, Denpasar, Bali, was the recommendation that the turtle trade in Bali has to be at zero point in 2005. A grace period of 5 years was given to the Balinese turtle hunters to replace turtle hunting with other legal fishing methods.

Egg harvesting of all marine turtle species is done by local fishermen. Almost every kind of egg laid by marine turtles is collected for human consumption in Indonesia. Some areas such as Derawan region-East Kalimantan, Pangumbahan beach-West Java and Paloh beach-West Kalimantan are offered to businessman for harvesting the turtle eggs under an auction process every year. According to figures for the period 1994-1999, the total number of eggs harvested at Pangumbahan beach has dropped dramatically (75%). The total number of eggs harvested in 1998 was 10,046, or 24.5% of the highest egg production during that period. Pangumbahan beach is one of the major Green turtle nesting beaches in Indonesia and the only remaining important nesting beach in Java. Meanwhile, Berau District Government in Derawan region-East Kalimantan obtains part of their "original district income" (Pendapatan Asli Daerah/PAD) from turtle egg harvests from six nesting sites in the Derawan region. In 1999, the Berau government earned more than 900,000,000 rupiah (1US$=7,500-10,000 rp.). This value equals 36.71% of the whole PAD of Berau District in the fiscal year 1998/1999. The total value of auctions of egg harvests has increased 6.5 times in the last 10 years, particularly since 1995 when the auction value increased rapidly due to high demand in the market share. Since 1996, the auction value per year has increased by more than 300%. This case has signaled a serious warning about the turtle egg harvest problem. However, the bid value of the egg harvest of Derawan region significantly contributes to the development of Berau district. In this case, the Berau government actually has to spend money on improving the turtle nesting habitat in Derawan region, rather than on developing the infrastructure in Tanjung Redap city in the mainland.

In Derawan region, the Green turtle population looked relatively stable between 1985-1990 and 1994-1996, but started decreasing in 1997. The total egg production in 1998 was nearly equal to the production in 1970, i.e. 1,650,000 eggs (Anon, 1977). Based on the data, it could be assumed that the Green turtle population in the Derawan region does not significantly influence the egg harvest. This is probably because of the successful head-start program for hatchlings that has been implemented in this region since 1969. According to the report of the Berau District Government (1999), as many as 66,441 hatchlings have been released back to the sea by the Berau District Fishery Agency (Dinas Perikanan Daerah TK II Berau, Kaltim).

Sangalaki Island (6 ha) is the most productive rookery among the 6 nesting sites in the Derawan region. Sangalaki was established as a "Nature Recreation Park" in 1982 with an area of 280 ha (including extended reef and waters) and some cottages have been built on the island.

This may create some problems in the future.

Although once a subsistence take, the eggs are now sold to distant markets within the country and many are even illegally exported to Singapore and to Sarawak (Malaysia). A good example of the devastating impact of this egg collection can be seen on Pangumbahan beach, where the population has been decreasing dramatically in the last ten years.

The nesting season of the Green turtle occurs all year round, but peaks at different times according to the nesting site, e.g. in Pangumbahan beach the peak period is July to November, but in Derawan it is February to June.

2. **Hawksbill turtle (*Eretmochelys imbricata*)**
Hawksbill turtle is protected under a Ministry of Forestry decree. Hawksbill populations are also declining but presently can still be found throughout Indonesia in significant numbers (Salm, 1984; Salm & Halim, 1984; Schulz, 1984, 1987, 1989; Halim, 1998). Important nesting areas are the many islands in the Anambas and Natuna-Riau, Lima, Momperang, Pesemut-Belitung, Segamat Is.-Lampung, south of Ujungpandang, Bira-birahan, Derawan-East Kalimantan (Salm & Halim, 1984; Shulz, 1984; Soehartono, 1993; Halim, 1998). The Hawksbill turtle is exceedingly difficult to monitor for long term trends for a number of reasons. First of all, small numbers of the animals nest on a wide variety of beaches across a broad geographical area. Secondly, Hawksbill beaches tend to be remote, inaccessible and sometimes so narrow that the turtle leaves no crawl trace. Finally, the Hawksbill also exhibits the large year-to-year fluctuations in nesting counts characteristic of Green turtles. For instance, in Kepulauan Seribu Marine National Park (108,000 ha), off Jakarta Bay, the Hawkbill turtle nests are dispersed on a few small rookeries among 110 coral cays. The records show that Hawksbills nest in small quantities in three different locations: Alas Purwo National Park -East; Jamursba-Medi beach - Irian Jaya; and Sukamade beach, Meru Betiri - East Java. There was a significant decline in the Hawksbill population in Meru Betiri NP and Alas Purwo NP, but in Jamursba-Medi beach (Irian Jaya), the number of Hawksbill nests increased from 1994-1997.

The Hawksbill nesting season is varied: Kepulauan Seribu NP (December-April), Segamat Is.-Lampung (December-April), Belitung (January-June), Paloh-West Kalimantan (February-May) and Tambelan, Riau (February-May).

The high market value of raw tortoiseshell (up to US$11/kg in 1993) provides an irresistible incentive to indigenous coastal inhabitants, regardless of local protective legislation. During the period 1978-1982 10 countries imported tortoiseshell & other turtle products from Indonesia, i.e. Australia, People's Republic of China, Denmark, France, Germany, Hong Kong, Italy, Japan, Malaysia and Singapore. At the time, Japan was the leading importer of tortoiseshell from Indonesia, taking 40% of the total Indonesian tortoiseshell exports. When Japan became a signatory to the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) in 1981, it took reservations on three species of marine turtles, including an annual quota of 30,000 kg of tortoiseshell. Nevertheless, between 1978-1982 Japan's imports of tortoiseshell from Indonesia ranged from 29,100 - 98,168 kg. 1989 was the last year Indonesia exported tortoiseshell to Japan, amounting to 4,100 kg with a value of US$114,340 or equal to 14% of the total Indonesian tortoiseshell exports during 1989-1993. South Korea took over Japan's position for importing tortoiseshell from Indonesia, followed by Singapore, Hong Kong, Japan, Malaysia and Thailand. Indonesia completely ceased exports of tortoiseshell in 1994, although exports of Hawksbill shell should have stopped in 1979 when Indonesia joined CITES.

3. **Olive ridley (*Lepidochelys olivaceae*)**
Olive ridley turtles have been under protection by the Ministry of Agriculture since 1980. They are found in small numbers throughout Indonesia, with main nesting areas in Sumatera, Alas Purwo-East Java, Paloh-West Kalimantan and Nusa Tenggara (Salm and Halim, 1984; Shulz, 1984; Kitchener, 1996; Darmawan, 1996). Ngagelan beach in Alas Purwo NP is the most important nesting habitat of Olive ridley and is shared with other turtle species. In some

areas Olive ridley eggs mixed with clutches of other turtle species are still taken by local fishermen who do not distinguish the eggs by species during collection. In certain areas such as Kai and Aru Island, local fishermen also harvest Olive ridley and Leatherback eggs and market them near where they nest (Compost, 1980; Dethmers, 1999). The meat and carapace of Olive ridleys are generally not as favored as those of Green and Hawksbill turtles by fishermen and businessmen.

4. **Leatherback (*Dermochelys coriacea*)**
The Leatherback has been protected since 1978. It can be found nesting on the western coast of Sumatera (south Java) and in isolated areas of Nusa Tenggara (Salm and Halim, 1984; Kitchener, 1996). However, the largest rookery in Indonesia, and one of the largest known Leatherback rookeries in the world, can be found on the north coast of the Bird's Head Peninsula of Irian Jaya, on the beach of Jamursba-Medi (Bhaskar, 1987). Nababan and Jacob (1996) reported that the Leatherback population in Jamursba-Medi has declined rapidly in the past few years because of over-utilization and habitat destruction. In 1984, up to 250 clutches per night were laid during the nesting season (May-September) on and 18 km stretch of beach. But by 1996 it dropped dramatically to 25-30 clutches per night. Still, the nest total in 1996 was 5,058 clutches, which was much higher than the totals of the preceding three years. Leatherbacks nested in very small numbers among other species at Ngagelan beach-Alas Purwo NP (East Java) compared to the number of nests at Jamursba-Medi, Irian Jaya.

5. **Loggerhead (*Caretta caretta*)**
Loggerhead turtles have been protected since 1980. They are rare in Indonesia but there have been unconfirmed reports that they may be nesting in the province of Maluku where they have been found feeding (Salm and Halim, 1984). Loggerhead turtles can also be found feeding in waters close to Taka Bona Rate Atoll, south of Sulawesi (Wicaksono, 1992).

6. **Flatback (*Natator depresus*)**
This species has received more protection status since 1992 and is currently unexploited in Indonesia. It ventures into Indonesian waters only to feed and nests exclusively in Australia. As such, it must be considered a shared resource. Flatback is fully protected in Australia, as are all other marine turtle species. It was found feeding in Irian Jaya but never found nesting (Sumardja, 1991; Limpur, 1993; Kitchener, 1996). However, Nababan and Jacob (1996) found one nest of Flatback on Jamursba-Medi beach in 1995.

Management and Conservation Efforts

National level

a. Marine turtle policy
In essence, local legislation provides that species shall be protected, regulated and used for the benefit of humankind for now and for the future. Specific to marine turtles, conservation efforts are necessary to promote wise and sustainable use of the species to ensure their continued survival. Legal instruments in Indonesia provide for the conservation and protection of marine turtles.

The Indonesian government has declared the Hawksbill, Leatherback, Olive ridley, Loggerhead and Flatback turtles as endangered and protected animals. The sixth and most common marine turtle occurring in Indonesia, the Green turtle, received protection in 1999. However, due to its relative abundance and its use in traditional Hindu ceremonies in Bali, the Green turtle is still legally harvested under a careful quota system. The quota for 1993 was 5,000 turtles, mostly allocated for Bali Island. It is acknowledged that the yearly harvest may exceed the endorsed quota due to difficulties in maintaining control.

b. Action plan
The action programs listed below have been undertaken to save the marine turtle species. They are aimed at increasing conservation efforts to protect turtles and their habitats by:

- enhancing conservation areas for marine turtles primarily for habitats that are most vulnerable to human disturbance such as nesting beaches and marine areas where juveniles, subadults and breeders occur;

- conservation awareness programs focusing on saving marine turtles;
- strengthening knowledge, capabilities and facilities for marine turtle conservation;
- management and control of Green turtle utilization, including the regulation of egg harvesting; and
- marine turtle research and development.

Presently, the government is putting emphasis on the first two action plans. Many nesting habitats have been declared as protected areas. Private beach ownership has been abandoned. Fishing zones have already been designated, established and regulated by the Ministry of Agriculture.

c. Marine turtle programs

The continued threatened status of marine turtles in Indonesia and in the world in general, mandated Indonesia to develop aggressive and comprehensive short- and long-term programs to accelerate population recovery. The immediate goal of any conservation plan is to arrest population decline. The ultimate goal is to provide the conditions that will stabilize the breeding populations to a sustainable level. The following are short-term programs that have been developed and implemented to save the marine turtle:

- Turtle habitat and survey. As a result of the surveys, 143 nesting beaches throughout the country have been identified.
- Designation of nesting beaches as conservation areas. Until now, 37 marine protected areas with marine turtle nesting sites have already been established and 50 areas are still being proposed.
- Conservation awareness campaign. Conservation officers, NGOs (Non-Government Organizations) and students are involved in this activity. The target communities are fishermen and people who live along and near the coastal zones.
- Regulation and monitoring of Green turtle egg collection. Egg collection is regulated through limited harvests and a juvenile restocking system that is usually carried out by a community-owned cooperative.

Long-term programs consist of the following:

- research and development on population, migration and rehabilitation of populations and habitats;
- regional management and control of marine turtle exploitation (ASEAN and Pacific region);
- formulation of an educational curriculum for marine turtle conservation;
- development of an efficient information system and GIS for marine turtle conservation;
- development of a system that will ensure the sustainability of the resource;
- establishment of a specific institution mandated to manage and conserve marine turtles in Indonesia; and
- upgrade the capability of the PHPA for management and conservation of marine turtles.

Many agencies and organizations in Indonesia are involved in marine turtle research and management. The Directorate General of Nature Protection and Conservation (PKA) of the Ministry of Forestry and Estate Crops is involved in several marine turtle conservation projects, including a Hawksbill project on Pramuka Island, north of Jakarta, and nesting beach management throughout Indonesia. The Ministry of Environment is also active in marine turtle conservation, and coordinated the production of the National Marine Turtle Conservation Strategy and Action Plan in 1991 (Subagio, 1991; Sumarja, 1991; Sutikno, 1991). The Directorate General of Fisheries of the Ministry of Agriculture recently conducted a workshop in Tegal, West Java, on the use of turtle-excluder devices (TEDs). The use of TEDs in fisheries has already been announced since the Ministry of Agriculture decree was issued in 1982. The aims of this regulation are to minimize the incidental catch of turtles and non-target species (Kukresno, 1997). In addition to the government agencies, the Indonesian universities, often in cooperation with the above agencies, conduct research into the biology and ecology of marine turtles. Several NGOs are also involved in marine turtle conservation. The Worldwide Fund for Nature (WWF) has projects focusing on conservation, which concentrate on awareness and education in relation to marine turtle utilization. Wetlands International -

Indonesia Program, is involved in environmental education, which includes the plight of marine turtles. Many other organizations conduct surveys and awareness campaigns related to marine turtle conservation in Indonesia.

Local community participation in marine turtle conservation has been established in several places in Indonesia. PKA, through one of its KSDA (Konservasi Sumber Daya Alam) offices in Irian Jaya, is currently cooperating with local people around Jamursba-Medi in a joint KSDA-WWF Indonesia Program Project aimed at protecting the Leatherback nesting beaches by combining conservation with local community development. Community participation has also been tried in the Aru Islands as a means to efficient conservation of the islands' considerable Green turtle population (Ating, 1991). A very successful example of local community participation is Proyek Penyu in Pemuteran village, north Bali, where local people assist in the protection of the marine turtles in the area.

The importance of marine turtle conservation efforts in Indonesia has been identified as part of the Biodiversity Action Plan for Indonesia (BAPPENAS, 1993).

2. *Regional level*

A Memorandum of Understanding on ASEAN Sea Turtle Conservation and Protection was signed on 12 September 1997 by the governments of ASEAN countries (Indonesia, Brunei, Laos, Malaysia, Myanmar, Philippines, Singapore, Thailand and Vietnam). The MOU was signed in recognition of the significance of marine turtles populations and their habitats in ASEAN waters; that marine turtles are migratory species and that the waters of ASEAN countries form a contiguous area of waters without any interval; that effective conservation efforts cannot be independently realized at the national level and that multilateral efforts are necessary to ensure the long-term survival of sea turtles in the ASEAN region.

3. *International level*

Since Indonesia joined the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) on 28 March 1979, the export of marine turtle products has been legally prohibited under CITES. PKA is the management authority and LIPI (Indonesian Scientific Research Center) is the scientific authority.

Research Activities

Despite the widespread distribution and species diversity of marine turtles in Indonesia, limited research has been conducted on their biology and management, particularly on the Hawksbill turtle. Most studies of turtles were of short duration and confined to the nesting beaches on Java and nearby islands (Erwan, 1980; Nuitja *et al.*, 1979; Rekoswardojo, 1961; Salm, 1981; Silalahi, 1976; Sunawan, 1978). Data on population sizes and dynamics, including the ecology and behavior which supports the management of marine turtle utilization and conservation are lacking. With the increasing interest in marine turtles in Indonesia, data on the ecology and distribution of turtles is needed. Head starting and tagging activities are being done in several conservation areas such as Kepulauan Seribu NP, Meru Betiri NP, Alas Purwo NP, Pangumbahan beach and Cikepuh Wildlife Reserve. Monitoring post-nesting migration for Hawksbill turtle is planned for Seribu Islands (Java) and at Jamursba-medi beach (Irian Jaya) for Leatherbacks.

Some on-going research activities on marine turtles in marine conservation areas in Indonesia are as follows:

1. *Tagging program*: Tagging activities on Green turtles have been done quite intensively on Sukamade beach, Meru Betiri NP since 1984. From 1994-1998, as many as 1,172 Green turtles (mostly female) were tagged and 1,135 were recaptured. However, the recapture data does not specify the number of multi-recaptures of tagged turtles.

   Japan Bekko Association funds the Hawksbill turtle tag-monitoring program that started in 1995. So far, 124 Hawksbills have been tagged.

2. *Head starting program*: Head starting activities for Hawksbill are being conducted in Kepulauan Seribu NP. The size and growth rate of hatchlings are recorded and then the size and weight of eggs. Hatching activities are still running well in other places such as: Meru Betiri NP, Alas Purwo NP-East Java, Komodo NP, Ujung Kulon NP, Silndangkerta beach, Citirem beach, Pangumbahan beach-West Java (Gunawan *et al.*, 1999; BAPEDALDA DATI I Jabar, 1999), Sangalaki Isl-East Kalimantan (Pemda Tkt II Berau, 1999), Paloh beach-West Kalimantan (Karim, 1999), Bengkaru Is.-Aceh (Moesa, 1999), Senayang Is.-Riau (Aribowo, 1996), Segamat Is.-Lampung, Prancak beach-Bali, Aru-Moluccas, etc.

3. Nest monitoring program: Nest monitoring by counting the body pits of Hawksbill turtles is continuing in Kepulauan Seribu, Belitung and Segamat. This activity is a joint project between PKA-JBA.

4. Satellite tracking program: The monitoring of post-nesting Hawksbills in Kepulauan Seribu NP. Transmitters attached to the carapace of adult females will be monitored by ARGOS satellite for 6 months. At Jamursba-medi beach in Irian Jaya the satellite tracking program will be conducted on Leatherback.

5. mtDNA analysis of Hawksbill: The mtDNA analysis of tissue samples of Hawksbill is being carried out at Khushu University (Japan) in collaboration with PKA-Department of Forestry and Estate Crops (Indonesia).

Acknowledgments

This study was funded by Japan Wildlife Research Center. We would like to thank Prof. Dr. Hiroko Koike, Dr. Masaaki Yoneda, Dr. Nabuo Isshi, Mr. Ir. Suwignyo, Mr. Ir. Andra Arinal, Mr. Ir. Yacob Bakarbessy, Mr. Ir. Agus Dermawan, Mr. Hiroyuki Suganuma, Mr. Akil Yusuf, Mr. Ismu Sutanto Suwelo, Ir. Deden Sugandhi, Ms. Wanda (WWF) and the field staff of the PHPA-JBA project in Pramuka Island.

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STATUS OF CAPPED LANGUR AND RHESUS MACAQUE IN SOUTHWEST MADHUPUR DECIDUOUS FOREST AND PROPOSED CONSERVATION MEASURES

by Mohammad Sazedul Islam and Md. Zahirul Islam

Introduction

Zoogeographically, Tangail is an important district of Bangladesh. It links the highlands of Madhupur Tract to the alluvial floodplain of Jamuna River. Fauna from the Garo Hills on one side and those of North Bengal on the other side might have penetrated into this district. The Madhupur Forest, though much reduced in size, is still the only large and single unit forest of its kind outside the Sundarbans and the Chittagong Hill Tracts. Due to population pressure, the agricultural and industrial sectors have expanded rapidly, which has resulted in the disappearance of forests from several areas of the country. Madhupur Forest is the largest moist deciduous forest in Bangladesh, and is bordered by the Bangshi and Banar Rivers. It once encompassed an area of 963.4 km^2. Today, an area of 64.7 km^2 has been declared a national park.

There is a good concentration of Capped langur (*Presbytis pileatus*) and Rhesus macaque (*Macaca mulatta*) in the Madhupur Forest. Within Madhupur National Park there are still more than 200 Capped langur living there. However, during recent years, due to mass movements and widespread destruction of the tropical forest, the climate of the whole area has changed to a great extent, with terrible consequences for the Capped langur. The forest is partly deep, partly light and there are also scrub jungles. The forest and the park are under high pressure from grazing, illicit felling and fire hazards. In winter, almost all the leaves fall and the tribal people cut trees to clear patches of forest and live there. In the national park, some areas have been cleared by cultivators and utilized for growing various crops. Therefore, it is not a continuous and undisturbed forest.

A survey was carried out to determine the presence of Capped langur and Rhesus macaque in the forests at the southwest side of Madhupur Forest. The area lies between latitudes 24°15'N to 24°25'N and longitudes 90°05'E to 90°15'E, and is within the Madhupur Tract, east of the Bangshi River. A few decades ago the area was deeply forested and joined with the Madhupur Forest. Geographically, the area is the same as the Madhupur Tract. In terms of topography, drainage, relief and age factors of soil formation, the characteristics of the area differ from the western and southern landforms. The area is more elevated from the surrounding floodplain of Jamuna to the west. The conditions of the area indicate the present status of the forest and of these two primates at the peripheral zone of Madhupur Forest.

The topography is full of contrasts and diverse in nature. It has ditches and small forests with irregular depressions, while the tilas or hillocks lie between dressings. High terraces (chalas) have flat level summits and the narrow winding valleys between them (baids) are where paddy is mainly cultivated. In the rainy season, these low-lying depressions accumulate water and become marshy, but dry up in summer and winter. The greater part of the area lies above flood level and only a small low-lying area immediately to the east becomes deeply flooded. According to the drainage porosity, there are four principal types of soils in the area: a) shallow red-brown terrace; b) deep red-brown terrace; c) brown molted terrace; and d) grey terrace soil.

The area lies within the tropical belt and the climate is monsoonal. The average annual rainfall is about 2,500 mm. The average humidity varies from 87%-96% in the morning and 46%-87% in the evening. Temperatures can reach a maximum of 35°C in April and fall to 12.2°C in December-January.

Locations of Capped langur and Rhesus macaque

Capped langur (*Presbytis pileatus*) and Rhesus macaque (*Macaca mulatta*) live in deciduous and evergreen forests. In Bangladesh they are found in the Madhupur Forest, Sylhet, Chittagong and Chittagong Hill Tracts. The Capped langur is an almost completely arboreal and forest-dwelling animal and the increasing shrinkage of the forest has threatened its survival. These two species appear to be scantily distributed in Sakhipur Thana of Tangail district. The Thanas located around Sakhipur Thana are Mirzapur to the south, Basail and Kalihati to the west, Ghatail to the north, and Bhaluka and Mymenshingh of Mymenshingh District to the east. Madhupur Tract has some isolated parts in the northwest, northeast and south. Several small patches of forest are located at the northwest side of Madhupur's main forest. This area was deeply forested a few decades ago, but is now detached from the main forest due to mass movements. The Capped langur is present here in only two places. One female langur was sighted by the authors at Dhopar Chala village in 1992, living in an isolated forest two miles west of Sakhipur, which is why it could not move towards deeper forest. According to the local people, there were many Capped langurs in the area during the 1960s. Most of them gradually left the area due to deforestation, human disturbances and to flee capture.

A few Capped langurs and Rhesus macaques are present in Kalia and Katubpur, 6.4 km northeast of Sakhipur. Rhesus macaques are more common than Capped langurs in the area, but they are also gradually decreasing in number, having either been killed or moved to Madhupur Forest. This state of affairs calls for immediate steps to save these invaluable assets from completely disappearing from this area. There are a considerable number of Capped langurs and Rhesus macaques in Madhupur Forest. The national park, which has an area of 64.7 km, contains more than 100 Capped langurs, including troops of 25-30 individuals. However, their numbers are decreasing day by day. The main cause of langur deaths are road accidents, predation by dogs, trapping and capture of infants, and the scarcity of drinking water in Madhupur Forest. The present survey indicates the need for a thorough survey of Madhupur Forest and its conservation requirements. If reforestation is properly carried out, the capped langurs and Rhesus macaques in Dhoparchala and Kalia will enjoy a better environment in the future than they have had in the past few decades.

Proposed Conservation Measures

The importance and role of forests in the socio-economic well-being of the country is recognized. Current data on what type of timber exists, the causes of deforestation and the forest growth rate should be recorded in order to strengthen forest management. The strategy for the conservation of forests and wildlife is to introduce higher value trees and crops, and at the same time convince farmers to plant trees.

Environmentalists blame deforestation on over-logging and not shifting cultivation. Excessive and uncontrolled cutting of trees impoverishes the soil strata. The lack of vegetation reduces soil moisture and the ability of the soils to retain rain water.

The langur's diet at present is almost wholly vegetarian, consisting mainly of the leaves, shoots, buds, flowers, fruits and seeds of a number of plants. A rich forest could support a large number of insects, which would make up a major portion of the diet of langur and macaque. The first step is to identify the trees in the survey area that the langurs feed in and preserve them. The following plants have been found to be preferred by langur: *Acacia* sp. (leaves), *Adina cordifolia* (leaves), *Artocarpus lakoocha* (fruit), *Capparis* sp. (leaves), *Cassia fistula* (leaves and fruits), *Dalbergia sissoo* (leaves), *Dillenia pentagyna* (leaves, fruits, flowers), *Hibiscus rosa-sinensis* (leaves),

Lagerstroemia parviflora (leaves, flowers), *Mangifera indica* (fruits), *Miliusa velutina* (leaves), *Phyllanthus emblica* (leaves, fruits), *Randia* sp. (leaves, fruits), *Shorea robusta* (leaves, flower buds), *Spondias mangifera* (fruits), *Streblus asper* (leaves), *Syzygium cumini* (fruits), and *Terminalia arjuna* (fruits). Also included in the langur's diet are *Enterlabuim saman*, *Micromelum pubescens*, *Mucuna prudita*, *Tephrosia candida* and *Vitis* sp.

Langurs usually drink water from the baids, where less water has accumulated in the pools and streams. The soils of poor vegetation forests cannot check the downward flow of water due to severe soil erosion; thus, the baid floor becomes dry, even in the rainy season, causing the langurs to move to other areas. In order to conserve the forest, the following actions are recommended: a) the existing forest land should be protected and further afforestation carried out; b) overgrazing must be checked; and c) training courses should be organized at the national level to teach modern aspects of forest management.

A few decades ago, the forest of the Sakhipur area was attached to the Madhupur Forest zone. Now, however, it is totally separated and the scattered forest does not offer a good shelter or environment to wildlife. As a result, very small populations of langurs and Rhesus macaques are now living in captive conditions in the detached forest. Thus, it is necessary to enlarge the detached forest through reforestation to create a linkage with the Madhupur Forest. Otherwise, the wildlife population will soon disappear. In the meantime, the detached zone should be conserved properly by taking the following steps:

1. Plantations should be established according to the soil conditions and climate.
2. Multispecies plantations are better than single species plantations in the same zone and should contain species that are eaten by the langurs and macaques.
3. Where possible, villagers living around wildlife areas should be involved in the conservation activities by giving them economic incentives. This can be done through a well-planned education and awareness program. The participation of neighboring communities in the protection, conservation and management of wildlife resources should be ensured.
4. Firewood plantations should be established for people who directly or indirectly depend upon the forest for firewood. This will lessen the pressure on the natural forest.

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ASSESSMENT OF CROP DAMAGE BY WILDLIFE IN CHUNATI WILDLIFE SANCTUARY, BANGLADESH

by Md. Danesh Miah, Md. Lutfor Rahman and Md. Farid Ahsan

Introduction

Conflicts between wildlife and man have emerged as a problem in the arena of wildlife management. The conflicts, which result from the destruction of crops and damage to property, are serious conservation issues, both in and outside the reserve. Efforts to keep animals out of crop fields by frustrated wildlife officers are often futile and sometimes result in people perceiving the animals (e.g. elephants) as being malevolent.

Chunati Wildlife Sanctuary is an important protected area in Bangladesh containing a considerably high faunal and floral diversity. The sanctuary sustains about 178 species of wildlife, including 27 species of mammals, 137 species of birds, 8 species of reptiles and 6 species of amphibians (Husain, 1991). This sanctuary has already registered a number of complaints about the continued disruption of agriculture by nuisance wildlife species, including elephants. There is a growing perception among local people of an increase in crop raiding by elephants and other wildlife during the last few years. More and more local people are questioning whether elephants have become more important than people in being permitted to harvest crops while farmers are starving. The frequency of news media reports on the havoc that elephants cause to people's property and the magnitude of the conflicts has led a number of farmers to harvest crops before they are mature or to abandon their land, and there are continual calls for the culling of culprit elephants and other wildlife.

Crop raiding is likely to become one of the most difficult and pressing management problems in Chunati Wildlife Sanctuary due to the increase in the human population and the expansion of agricultural land, coupled with likely increases in the elephant and other wildlife populations as a result of law enforcement in the sanctuary area. A total of 230 ha of agricultural lands are located inside the sanctuary, which are cultivated by a settler population of around 7,322 (IUCN, 1998). These agricultural lands are frequently damaged by wildlife. The present study presents the dimensions of agricultural crop damage by wildlife, and makes some practical suggestions as to how the human-wildlife conflict can be reduced.

Study Site

Chunati Wildlife Sanctuary was formally established in 1986 and covers an area of 7,764 ha, including two forest ranges (Chunati and Jaldi). The sanctuary lies within the Banshkhali and Lohagara thanas of Chittagong District (Husain, 1991). The soils of the study area are mainly silt loam to silty clay loam, moderately to strongly structured with a neutral to medium acid subsoil. Numerous creeks (clear and gravely) and stony beds traverse the area. They provide good drainage to the area and clean water to the wildlife and the people, as well as irrigation in the surrounding areas (IUCN, 1998).

The climate in the sanctuary has three seasons: summer (March-May), monsoon (June-October) and winter (November-February). The monthly rainfall ranges from 7.6 mm in January to 519.8 mm in June. Average monthly temperature ranges from 15.3°C in December to 32.5°C in summer (IUCN, 1998).

Flora

The sanctuary contains 477 species of plants, which gives a fair idea of its diversity (Khan, 1990). The high forest is generally dominated by *Dipterocarpus* spp., *Artocarpus chaplasha* and *Stereospermum chelonioides* mixed with other species such as *Burserra serata, Grewis microcos* and others, while the low forest is generally bush to brush vegetation composed of

mixed species such as *Ficus religiosa, Clerodendrum indicum*, and others. The undergrowth in both forests is generally comprised of saplings and shrub species such as *Clerodendrum indicum*, *Mussaenda roxburghii* and others (Khan, 1990).

Fauna

A good number of important mammal species exist in the sanctuary such as elephant (*Elephas maximus),* hoary-bellied squirrel *(Callosciurus pygerythrus) and wild dog (Cuon alpinus).* Bird species such as *Loriculus vernalis, Nectarinia zeylanica, Hirudo rustica, Motacilla alba, Pycnonotus cafer, Dicrurus aeneus* and others are also present. Reptiles such as *Mabuya carinata, Rhabdophis subminiata*, etc. and amphibians like *Rana limnocharis, Bufo melanostictus* and others are also found in the sanctuary (Husain, 1991; IUCN, 1998).

Habitat

The remaining natural forest habitat found in the sanctuary is generally very poor in quality. Unfortunately, the gathering of forest products such as fuelwood and other products collected by the people residing inside and around the sanctuary, and the clearing of areas for the cultivation of agricultural crops, have been adversely affecting the quality of the wildlife habitats (IUCN, 1998). The cultivation of rice, betel leaf and other seasonal agricultural crops such as vegetables and spices are the main agricultural activities inside the sanctuary. The gathering of forest products such as firewood, small-sized construction timber, grasses and others is rampant in the area. These activities have long been a continuing problem in the management of the sanctuary (IUCN, 1998).

Human Population

According to the 1991 census, 6,000 people were settled inside the sanctuary. This population was estimated to increase at a growth rate of 2.01% and by the year 2000, a total of around 7,322 people were speculated to reside inside the sanctuary (IUCN, 1998). Around the sanctuary, there is no visible major employer. There are a few small-time seasonal employers in the area. These are the agricultural landowners who employ farm and household laborers. Evidently there are not enough sources of employment in the area. To augment their household income, most of the people do small-scale farming, cattle raising, fishing, and hauling (by rickshaw, bullock cart and cart) inside and outside the sanctuary.

Survey Methods

The survey team collected data by means of a semi-structured questionnaire pertaining to agricultural practices and problems with crop destruction by animals and traditional methods of deterrence. From every compartment 10 families were interviewed, which formed a total of 70 respondents from the seven compartments of the reserve. The aim of the interview was to encourage participants to build consensus by discussing an issue amongst themselves and agreeing on an answer, or agreeing to reject a statement. This allowed a broad view of the scope of opinions in the community and identified possible points of contradiction. The household was considered as the sample unit and defined as a group of people with family links who shared the basic resources of common crop land. In this respect, elephants and other wildlife were rarely witnessed foraging in the sanctuary during field visits by the authors and it was therefore necessary to rely on the experiences of local people, spoor, footprints, uprooted trees or other signs such as dung piles, to identify the crop-raiding species.

Results

The agricultural systems were observed to be land extensive and generally comprised small-scale subsistence-oriented farming strategies adapted for the local climate and topography and using simple technology (e.g. hoe, machete and fire). Farmers practiced rotational cultivation with different crops on the same unit of land.

A mixture of food crops with varying growth periods including rice (*Oryza sativa*), banana (*Musa ornata*), betel leaf (*Piper betel*), potato (*Solanum tubersum*), watermelon (*Citrullus colocynthis*), pepper (*Capsicum frutescens*), and vegetables such as okra (*Abelmoscus*

esculontus), eggplant (Solanum melongena), sweet potato (*Ipomoea batatus*), cabbage (*Brassica oleracea*), bottle gourd (*Lageneria siceraria*) and spinious gourd (*Momordica cochinchinensis*) were the most widely distributed in the area. These enabled a continuous supply of food throughout the year long growing seasons.

About 0.03 percent of the sanctuary was under active cultivation. Areas under cultivation inside the sanctuary were increasing daily at an alarming rate. Much of the extensive forest clearance in the reserve was reportedly carried out by poor landless forest dwellers.

The survey revealed that the elephant was the major destructive agent to agricultural crops in the study area. Although other wildlife species such as wild boar (*Sus scrofa*) and porcupine (*Hystrix indica*) also damaged crops, elephants were the most widely feared because of their ability to eat and trample down huge quantities of crops in a single raid, plus the difficulty of stopping them while raiding crops and the permanent danger they pose to human life.

Farmers identified the eight common species of wildlife causing crop damages as elephant, wild boar, porcupine, rhesus macaque (*Macaca mulatta*), hoary-bellied squirrel, barking deer (*Muntiacus muntjak*), red-breasted parakeet (*Psittacula alexandri*) and wild dog. The study revealed that the number of wildife species which were found to damage different crops varied considerably, possibly due to their food habits and food choices. Six species of wildlife were recognized to damage rice crops, three species targeted banana, five species preferred potato, two species liked pepper and vegetables and one species damaged betel leaf vines and watermelons.

Estimated crop damage

Elephants were reported to cause severe damage to rice crops (52.46%). It was found that elephants were solely responsible for 84.47% of the damages to the banana crop, followed by rhesus macaque (9.87%) and wild boar (5.66%). Rhesus macaque was reported to be the most damaging agent (32.49%) to potato, followed by wild boar (29.54%) and barking deer (19.81%). Pepper and vegetable crops were reported to be damaged mostly by wild boar (69.96% and 56.48% respectively), followed by porcupine (30.04% and 43.53% respectively). Betel leave vines were reported to be usually damaged by elephants only while entering and exiting the crop field and forest. Parakeet were reported to make holes in watermelons and consequently reducing the market price of the crop.

Wild boar and macaque were the most frequent crop-raiders accounting for damage in the surveyed areas. They were far the most common species reported as frequent pests of crops. Macaques were considered to be highly destructive and raided crops repeatedly. Elephants were less frequent raiders, but inflicted important damage in the sanctuary area.

Crops destroyed by wildlife through eating and/or trampling in the sanctuary cause a loss of food as well as reduced income to the villages. On an average, US$961.82 worth of damage per ha of seven crops was caused by wildlife as a whole, and if destruction had not occurred, the total yield could have been US$2,151.15. In terms of crop loss, betel leaf was at the top of the list (US$3,791.65/ha) and rice at the bottom (US$71.84/ha).

Crop raiding time

It was reported that elephants, wild boars, squirrels, porcupines and wild dogs raided crop fields at night, while parakeet and macaque plundered in broad daylight. Most of the wildlife caused crop damage during March-April and October-November. The number of individuals of a species group varied due to species-specific habits. Parakeets attacked crops in a flock of 50-100 individuals, while others raided in fewer numbers.

Extent of crop damage by wildlife in the study area

Crop	Quantity damaged/ha (US$)	Total Yield/ha (if not damaged) (US$)
Betel leaf	3791.65	7944.42
Potato	1085.21	1899.73
Watermelon	1083.30	2527.75
Vegetables	1073.01	1960.31
Pepper	455.50	1854.84
Banana	134.08	336.84
Rice	71.84	693.33
Average	961.82	2152.15

Crop protection techniques

Farmers were asked to give details about the local methods they employed to circumvent or deter wildlife from their crop fields. Different groups in the sanctuary have developed a variety of traditional methods of minimizing crop damage from small to large mammals and from birds as well. From interviews with the local people, it can be concluded that the following methods have been developed and are being used to mitigate man-wildlife conflicts:

1. Frightening animals by shouting or beating of tree barks, drums or empty barrels.
2. People staying in the huts in crop fields, keeping a fire burning around the crops and chasing the animals with guard dogs, as well as by using wooden sticks and burned earthen pillets.
3. Cables, ropes and/or vines were hung with bottles and tin cans (to make a sort of scarecrow), and the setting of traps were used in some areas. Most of the traps were set for capturing small mammals like squirrels.

Discussion

Unlike in Kenya, where 119 local people were killed by elephants between 1990 and 1993 (Kiru, 1995), elephant attacks on humans are rare in Chunati Wildlife Sanctuary. The low human population density, clumped distribution of settlements along roads, and general lack of active defense of crop fields, offered easy opportunities for wildlife to raid crops. This is because crop fields are often fully unprotected, frequently far from villages and located on forest edges. Thus, they are highly vulnerable to crop raiding by a variety of animals.

Crop damage events by elephants in the sanctuary take place throughout the year, but the rate of attacks is greatest on mature crops, or close to harvest time, usually in April and September. The results of recent wildlife observations show that crop raiding occurs both day and night. Such a situation is different from that found in Kenya (Kiru, 1995), where in many densely settled agricultural areas adjacent to forest reserves, elephants hide in the forest during the daytime and raid crops only at night.

The attraction of elephants to particular habitats may influence the frequency and occurrence of crop raiding. While Barnes (1991) demonstrated that elephants show a preference for secondary regrowth, Lahm (1993) and Ekobo (1995) found strong associations between elephants and wet habitats (swamps, marshes and seasonally inundated forests). Elephants have a digestive system which makes them particularly susceptible to toxins and tannins (Olivier, 1978). They must search for plants and plant parts which contain only small amounts of such chemicals. The fast-growing plant species which spring up in abandoned villages and crop fields usually lack toxins and tannins. Therefore, elephants prefer to feed in secondary forests which have been disturbed by former human occupation.

The study in Chunati Wildlife Sanctuary recognized that wildlife caused few problems during January-February and June-August, when

they congregated around swamps and rivers in the forest where there was sufficient water and food. A preference for bamboo by elephants was noticed during sprouting time. That a family herd did not show any clear tendency to aggregate while raiding should provide clarification for the seasonality of crop raiding and habitat preference by elephants in the long run. However, there is a clear relationship between high wildlife densities and important crop raiding in Jaldi Range. Once a particular crop field or cluster of crop fields was selected, wildlife (mainly mammals) continued to raid it for a few consecutive days before turning their attention to another location. It was obvious from our observations that during the dry period, when most of the land was in full crop, raiding was sporadic.

Policy issues

Existing protection principles for forests and wildlife resources follow the conventional strategies that do not recognize the popular participation of the local communities in the planning and management of forest and natural wildlife habitats (Rahman, 1995). Obviously a change in policy is needed, not only to ameliorate the problem, but also to improve the strained relations between the villagers and the wildlife agents. As wildlife crop raiding is widespread and the agricultural system is no longer strategically organized for defense against crop raiding animals, crop fields cannot be protected efficiently. Finally, agriculture, which is the basis of forest subsistence, is inherently in conflict with some of the large fauna (Hart and Hall, 1996). Banana was the most attractive food for elephant, this pattern being similar to that observed in Gabon (Lahm, 1993) and in the Queen Elisabeth National Park in Uganda (Abe, 1992), where elephants appeared to target banana stems first, then search for other foods in an exploratory manner. Banana stems were usually planted on the forest edge where there was humus as mineral fertilizer, and were better adapted to the newly opened crop land. This implied the clearing of great expanses of forest every year, which made them more vulnerable to potential crop raiding since crop raiding can be thought of as an extension of the elephant's natural optimal foraging strategy (Sukumar, 1989). This was consistent with elephant patterns elsewhere in the Kibale Forest National Park in Uganda, where Naughton (1996) found that the most vulnerable Shambas were those growing food crops on a small scale (<1 ha) adjacent to the forest. The policies on wildlife preservation need to be updated, revised, strengthened and linked with other related policy frameworks for effective and realistic implementation (Rahman, 1995).

Problematic animal species versus pattern of crop damage

This study suggested that there was an inverse relationship between the ranking of crops with respect to their vulnerability to raiding and the percentage of farmers claiming crop raiding. The discrepancy between perceived and real damage inflicted was often attributed to the local farmer's hopes for substantial compensation (Bell, 1984). With respect to naming the animal inflicting the greatest costs, several researchers suggested that megafauna, such as elephants, received a disproportionate amount of the blame over time (Bell, 1984). This agrees with the general observation that larger animals receive greater attention, both in management response and in farmers' complaints. However, other researchers have proposed that small animals, rodents in particular, cause greater damage (Dudly *et al.*, 1992). In addition, assessing the direct economic costs of crop raiding is difficult, because one has to calculate the projected crop yield in the absence of elephants. Often people harvest rice early because the rate of attack is greatest on mature crops. This reduces the value of the harvest even if the elephants do not eat it (Thouless, 1994). In the absence of systematically collected field data, the relationship between damage by large versus small animals (including insects) remains unclear (Caldecott, 1988).

It is apparent from this study that elephant movements in some areas are concentrated along traditional corridors and they appeared in some particular areas such as the open wallows and clearings and even salt licks on an irregular basis year after year. The secondary forest, which supports high levels of elephants in the

sanctuary, is likely to be a potentially preferred habitat among the elephant migration route.

Perhaps one of the most important findings by the study has been the identification of the current attitudes and perceptions regarding wildlife and its conservation in the area. The study revealed that people view wild animals in general, and elephants in particular, as government property. They do not connect the revenue earned by the treasury from the wildlife industry with its being used to support local government work in the area. There was a tendency for the farmers to suggest that gazetting the Chunati Wildlife Sanctuary in 1986 had increased the crop-raiding problems. Although this remains to be verified, it appears that the main driving force behind this statement is the farmers' hope to share in elephant culling, since wild game is important to the local community, not only as a primary source of protein, but also as an exchange item within the sanctuary, where hunting for domestic consumption and for the market is the greatest threat to populations of bush meat species. Within such crosscutting and overlapping conflicts, identifying areas of common concern and concentrating on these rather than on contentious differences is crucial.

Management Recommendations

Relocation and grouping of crop fields may be one of the options that may enhance protection from wildlife raids. A buffer zone should be established between the sanctuary and non-sanctuary areas (Hussain, 1991; pers. obs.). The method, which requires that all crop fields be grouped in a single large clearance, should be further well researched, since it can provide collective shifting and thus assure protection of all plots of a village. Attempts to deal with human-wildlife conflicts in the sanctuary have been crisis management oriented. A clear policy on the human-elephant conflict is needed at a number of levels. On a national scale, the designation of areas for wildlife conservation within broad land-use policies is of crucial importance. There needs to be a definition of the present and future range in the context of land-use planning and a clear demarcation of boundaries. From that prospect, high potential areas suitable for hunting, settlement and agriculture are not likely to be areas where elephants can be maintained without considerable levels of conflict, which would require intensive and expensive means to reduce them (Kangwana, 1995). Policies are also required on how to deal with the results of conflict. It needs to be ascertained who holds responsibility and what actions are appropriate in a specific conflict situation.

Research Recommendations

Further study of crop damage in and around the sanctuary should be carried out with the specific aim of reviewing the trends and determining the economic implications of crop damage with a view to strengthening planning and introducing integrated management.

We stress that these results are preliminary ones and thus the predictions proposed should be regarded as tentative. From that perspective, continued data collection, long-term observations, coupled with a thorough knowledge of wildlife migration routes and habitat use, will provide powerful information and help to identify patterns and then define sound and long-term conservation recommendations for the benefit of both the local people and the wildlife populations in the sanctuary.

Wildlife managers will be needed to integrate the results of our knowledge of wildlife and their requirements with the development challenges facing Bangladesh as a whole, and managers, scientists and planners will be needed to work together for years to come. Finally, a Research Unit should be established in collaboration with the concerned scientific societies and universities.

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MAMMALS OF GIBBON WILDLIFE SANCTUARY, ASSAM, INDIA

by D. Chetry, R. Medhi, P. Bujarbarua and P.C. Bhattacharjee

Introduction

Gibbon Wildlife Sanctuary is the only sanctuary in India to be named after a non-human primate – the Hoolock gibbon (*Hylobates hoolock*). The former Hollongapar Reserve Forest was declared a wildlife sanctuary in July 1997. The sanctuary has an area of 1,915.06 ha and lies between 26°45'N and 94°25'E. Altitudes in the sanctuary range from 100 to 120 meters above sea level. The annual rainfall during 1998 was 870.5 mm and the average minimum and maximum temperatures were 20.15°C and 28.75°C respectively. With distinct dipterocarp-dominant forests, the sanctuary is the sole refuge for a majority of the wildlife from the adjoining areas that have been cut off from other forest patches by human settlements and tea plantations.

Vegetation

The sanctuary is a lowland forest with numerous nallahs (streams) and is surrounded by human habitations and tea gardens, making it a sort forest island. The vegetation is dominated by tropical moist deciduous dipterocarp forest. The principal trees which form the top canopy are: *Dipterocarpus macrocarpus, Sapium baccatum, Artocarpus chaplasha, Lagerstroemia flos-reginae, Canarium resiniferum, Castanopsis indica, Mangifera indica, Anthocephalus cadamba, Amoora wallichii, Duabanga sonneratioides* and *Mansonia dipikae.* The middle storey is generally composed of *Vatica lanceaefolia, Mesua ferrea, Dillenia indica, Aquilaria agallocha, Bischofia javanica, Ficus glomerata*, and *Elaeocarpus ganitrus*. The lower storey is composed of three bamboo species: *Pseudostachyum polymorphum, Bambusa pallida* and *Calamus* sp. The undergrowth consists of species such as *Clerodendrum, Eupatorium, Mikania scandens* and *Commelina*, among others.

Methods

A study was conducted from 1997 to 1999 to document the mammalian fauna in the sanctuary. The survey was carried out from morning to evening following existing trails and roads, with observers stopping to look for mammal species at 500 m intervals. Sometimes the animals could be traced after hearing the sounds of their feeding or locomotion and calls or barks. Secondary information was collected from scats, dung, pellets, kills and pugmarks. Information was also obtained from the villagers living in the fringe areas of the sanctuary.

Results

The species which were recorded during the study period are listed below. The status of the species according to the Wildlife (Protection) Act, 1972 and CITES are also given.

Order: Primate		
Family: Lorisidae		
1. Slow Loris	*Nycticebus coucang*	Schedule-I; Appendix II (CITES)
Family: Cercopithecidae		
2. Rhesus macaque	*Macaca mulatta*	Schedule-II; Appendix-II
3. Assamese macaque	*Macaca assamensis*	Schedule-II; Appendix-II

4. Stump-tailed macaque	*Macaca arctoides*	Schedule-II; Appendix-II
5. Pig-tailed macaque	*Macaca nemestrina*	Schedule II; Appendix-II
6. Capped langur	*Trachypithecus [Presbytis] pileatus*	Schedule-I; Appendix-I
Family: Hylobatidae		
7. Hoolock gibbon	*Hylobates hoolock*	Schedule-I; Appendix-I
Order: Carnivora		
Family: Felidae		
8. Tiger	*Panthera tigris*	Schedule-I; Appendix-I
9. Leopard	*Panthera pardus*	Schedule-I; Appendix-I
10. Clouded leopard	*Neofelis nebulosa*	Schedule-I; Appendix-I
11. Jungle cat	*Felis chaus*	Schedule-II; Appendix-II
12. Fishing cat	*Felis viverrina*	Schedule-I; Appendix-II
13. Leopard cat	*Felis bengalensis*	Schedule-I; Appendix-I
Family: Viverridae		
14. Large Indian civet	*Viverra zibetha*	Schedule-II; Appendix-III
15. Small Indian civet	*Viverricula indica*	Schedule-II; Appendix-III
16. Binturong	*Arctictis binturong*	Schedule-I; Appendix-III
Family: Canidae		
17. Jackal	*Canis aureus*	Schedule-II
18. Indian fox	*Vulpes bengalensis*	Schedule-II
Family Herpestidae		
19. Common mongoose	*Herpestes edwardsi*	Schedule-IV; Appendix-III
20. Small Indian mongoose	*Herpestes auropunctatus*	Schedule-IV; Appendix-III
21. Crab-eating mongoose	*Herpestes urva*	Schedule-IV; Appendix-III
22. Spotted linsang	*Prionodon pardicolor*	Schedule-I; Appendix-I
Family: Mustelidae		
23. Common otter	*Lutra lutra*	Schedule-II; Appendix-I
Family: Ursidae		
24. Himalayan black bear	*Selenarctos thibetanus*	Schedule-II; Appendix-I
Order: Rodentia		
Family: Hystricidae		
25. Indian porcupine	*Hystrix indica*	Schedule-IV
Family: Sciuridae		
26. Malalyan giant squirrel	*Ratufa bicolor*	Schedule-II; Apendix-II
27. Common giant flying squirrel	*Petaurista petaurista*	Schedule-II;; Appendix-II
28. Particoloured flying squirrel	*Hylopetes alboniger*	Schedule-II
29. Three-striped palm squirrel	*Funambulus palmarum*	Schedule-IV
Family: Thyzomydae		

30. Bay bamboo rat	*Cannomys badius*	Schedule-V
Family: Muridae		
31. Indian mole rat	*Bandicota bengalensis*	Schedule-V
32. Large bandicoot rat	*Bandicota indica*	Schedule-V
Order: Proboscidea		
Family: Elephantidae		
33. Elephant	*Elephas maxiums*	Schedule-I
Order: Artiodactyla		
Family: Suidae		
34. Wild boar	*Sus scrofa*	Schedule-III
Family: Cervidae		
35. Sambar	*Cervus unicolor*	Schedule-III
36. Barking deer	*Muntiacus muntjak*	Schedule-III
Order: Pholiodota		
Family: Manidae		
37. Pangolin	*Manis crassicaudata*	Schedule-I; Appendix-II
Order: Chiroptera		
Family: Pteropidae		
38. Indian flying fox	*Pteropus giganteus*	Schedule-V; Appendix-II
39. Common yellow bat	*Scotophilus heathi*	Schedule-V
Family: Vespertiiionidae		
40. Indian pipistrelle	*Pipistrellus coromandra*	Schedule-V
Order: Insectivora		
Family: Talpidae		
41. Eastern mole	*Talpa micrura*	

Discussion

It is evident from the table above that Gibbon Wildlife Sanctuary is a treasure house of mammalian diversity. The status of most of the species according to CITES also shows the importance of the area from a conservation perspective. Considering its limited area, this diversity is very high, and this isolated forest patch is thus a safe refuge for most of the big and small mammals and other fauna of the surrounding areas. With seven species of non-human primates, the sanctuary has the highest primate diversity in India. It also has a high diversity of carnivores, in particular the cat species. Compared to the high diversity of carnivores, the herbivore diversity is low. The probability of the prey species opting for non-target species can, therefore, not be ignored. An in-depth prey/predator-based study is needed as the prey/predator unit plays a key role in maintaining the energy balance in the ecosystem. Plus, a thorough status survey of various mammalian species would be helpful in formulating a conservation and management plan for the sanctuary.

Acknowledgments

We are thankful to the Indo-US Primate Project (Grant Agreement No. INT/FWS-22) for providing financial and technical support.

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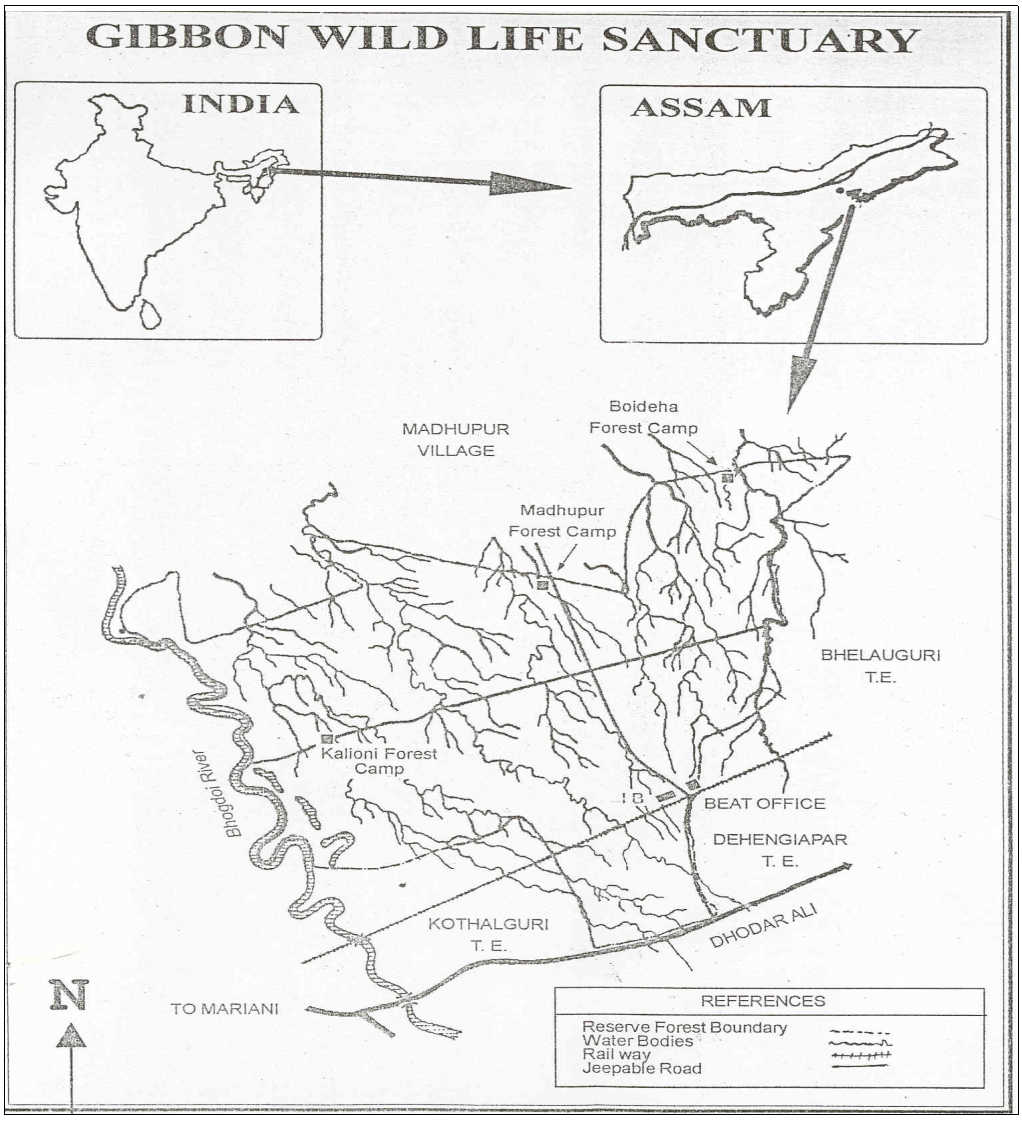


FOREST NEWS

Vol.XV:No.4

SEEKING INNOVATIONS IN COMMUNITY FORESTRY

Summary report of the International Conference on Advancing Community Forestry: Innovations and Experiences 25-28 September 2001, Chiang Mai, Thailand

Organized by

RECOFTC	FAO/RAP	ICRAF	IUCN	SMRP

The move toward community-based forest management is undoubtedly one of the most important forest policy developments of the past half-century. This shift from centralized forest management toward more decentralized local management has resulted in the evolution, testing, and occasional institutionalizing of a wide range of community-based forest management approaches throughout Asia.

To explore recent experiences and innovations in community forestry, more than 300 participants from 29 countries gathered at an international conference on advancing community forestry, 25-28 September 2001, in Chiang Mai, Thailand. The conference was organized by the Regional Community Forestry Training Center for Asia and the Pacific (RECOFTC), FAO, the International Center for Agroforestry Research (ICRAF), the World Conservation Union (IUCN), and the German-funded Sustainable Management of Resources in the Lower Mekong Basin Project.

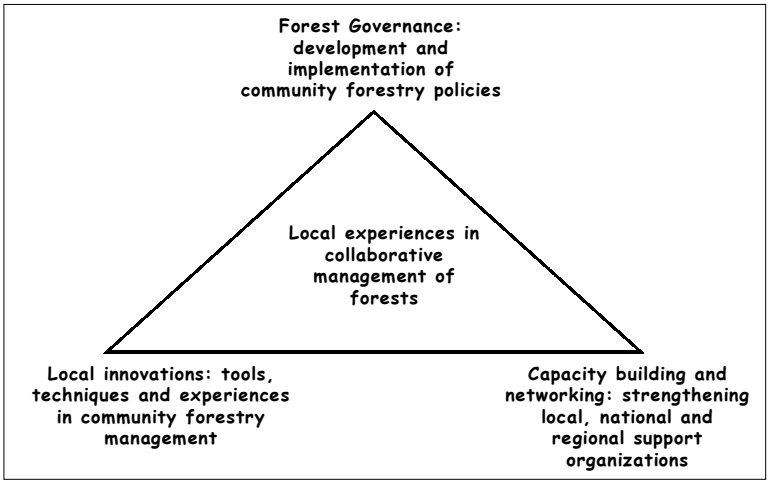
Objectives and innovative features of the conference

The main purpose of the conference was to provide participants with opportunities to exchange experiences and contribute to better understanding of the dynamic context in which community forestry is implemented, and where community forestry is heading. The objectives of the conference were to:

- expose participants to the latest innovations, concepts, ideas and lessons learned in community forestry;
- share and exchange information and knowledge related to effective tools and techniques in community forestry;
- identify the challenges, gaps and opportunities for successful implementation of community forestry; and
- provide opportunities for participants to network and develop new partnerships.

The conference itself was consciously designed to ensure that the participants had the time, resources and structured space to participate and share experiences, rather than sit and listen. Formal presentations and papers were dispensed with in favor of "non-conventional" processes, including:

- a managed debate to introduce key issues at the start of the conference;
- an information market which included "learning kiosks," skits, distribution of materials and community forestry maps (used to illustrate conceptual and practical issues in community forestry);



- eight parallel discussion groups on cross-cutting themes covering the major challenges facing community forestry; and
- eight field visits highlighting field-based issues in community forestry development.

Professional video-graphers documented the entire conference and produced an informative and entertaining 20-minute video that was presented at the conclusion of the conference.

Overall themes and issues from the conference

The conference critically examined the full spectrum of innovations driving community forestry development. It further worked to identify ways of expanding and strengthening these experiences by focusing on the crucial linkages that exist between and among governance, capacity building, and local innovations in community forestry management (see diagram).

Two strong underlying and inter-related themes emerged from the conference. The first was the need to develop improved processes and tools to identify and bring together the full range of stakeholders to develop mutually recognized agreements. At the local level, this could mean bringing together various interest groups (including forest-dependent people, local elite, forest department staff, etc.). At the national level, the challenge is to develop policies and laws that recognize local people's access to forest resources while simultaneously ensuring accountability.

To ensure that agreements are implemented accordingly, there is a need to better define the rights and responsibilities of different stakeholders. There are various perceptions about how such rights and responsibilities should be defined and about who should be involved. Some feel that government has the responsibility to define rights; others feel that the role of government, above all, should include safeguarding and protecting the rights of communities.

In most countries, forest-use rights and responsibilities have been defined almost solely by the government. In such instances, the requirements for local people to gain access to forest resources can be overwhelming, especially for the people who are most dependent on forests, but who are often ill-equipped to meet the rigid requirements set by governments. In the end, groups may become trapped in one-sided "collaborative" agreements that force them to assume an unfair share of management responsibilities in exchange for minimal forest-use benefits.

Key related issues include:

- Ensuring accountability and transparency from all stakeholders and institutions.
- Benefit-sharing arrangements.
- Developing policies that allow for flexible implementation rather than blanket prescriptions.
- Monitoring and testing of practices with a view toward revision and re-orientation to improve equity and effectiveness.

Information market

Roughly one full day (spread over three days of the conference) was allocated for participants to interact and exchange ideas at the information market. Twenty-four learning kiosks presented experiences and innovations in community forestry in interactive ways. The learning kiosks featured innovative processes, tools, and technologies for advancing community forestry. In addition, information booths and display areas complemented the learning kiosks with information from participating organizations.

Some of the main themes within the information market included:

- Innovative tools and processes for assessing, planning, implementing and monitoring community-based forest management (CBFM) systems such as: the adaptation of forest certification to CBFM in Indonesia, participatory resource inventory and mapping techniques, processes and issues in marketing non-timber forest products, and alternative techniques in community forestry management and silviculture.
- Different aspects of networking, including: forest user group federations, watershed-level networks, and information management systems (including regional internet-based systems for supporting CBFM).
- Various approaches to educate and increase awareness about community forestry.

One of the more popular displays in the information market featured the "community forestry maps." The maps illustrated the conceptual development and range of actors involved in community forestry, and the linkages among them. In addition to geographical maps, this exhibit also included thematic "maps" and charts that elaborated on specific experiences in community forestry.

Parallel discussion groups

Eight parallel discussion groups focused on the following thematic topics:

Planning and managing dynamic and sustainable collaborative agreements.

In many countries, processes are being established to recognize collaborative forest management agreements on a limited scale. Although legal frameworks to support the development and implementation of collaborative agreements are rare, such agreements are increasingly proving to be effective for:

- avoiding or minimizing conflicts related to forest management;
- clarifying roles, rights and responsibilities;
- promoting transparency and accountability;
- unifying diversity and providing common direction in forest management; and
- promoting equitable sharing of benefits from forests.

Discussants recognized that the most effective collaborative agreements are generally written, legal documents that contain stakeholders' information, provide a vision and objectives for forest management, define roles, rights and responsibilities, and identify mechanisms and structural arrangements for implementation. The best results have resulted from dynamic negotiations among collaborating groups. On the other hand, collaborative agreements rarely work in situations where power is highly skewed among groups and individuals, where the rights and desires of only the privileged are imposed and enforced, where trust is lacking, where there is a lack of transparency and information, or where there are few mutual benefits to be gained from entering into an agreement.

Community forestry management practices

Innovative management practices play an integral role in achieving the goals of community forestry. However, countries are at various stages of development of community forestry, which creates particular challenges in transferring management practices directly from one site to another. While most countries are just beginning to develop community forestry, a few are already revising management practices based on initial experiences.

Appropriate technologies (including silvicultural techniques, forest monitoring, and livelihood activities) should be applied throughout the various stages of community forestry development, but must take into consideration local situations, cultures, and management objectives. Innovative management practices can emerge from indigenous knowledge or can be borrowed and adapted from outside sources. However, active community participation in identifying and applying technologies will help ensure that traditional knowledge is effectively integrated with modern scientific knowledge.

Income generation and livelihoods

With modernization and increasing globalization, community-based enterprises are essential components of successful community forestry. It was suggested, however, that attention should be focused on *viable* enterprises rather than the more-frequently described *sustainable* enterprises, since the latter term implies that enterprises will last forever. In reality, enterprises are dynamic and should be expected to change or sometimes cease operations in response to external factors. Concepts of comparative advantage are important in identifying viable enterprises; solutions and opportunities for one situation cannot necessarily be applied elsewhere.

Experience has shown that building effective partnerships and networks – both horizontally and vertically – are essential elements in developing successful community-based enterprises. These include linkages among producers, among specialists, across regions, between producers and buyers, and among local, national and global institutions. At the community level, there is a need to diversity enterprises, collaborate with the broader business community, develop better understanding of marketing strategies, and efficiently add value to products.

Much remains to be learned about successful community-based enterprise development, and more efforts are needed to improve understanding through documentation, monitoring, and case studies.

Institutional reform in the forest sector

It is evident that substantial institutional reform is needed in most countries if community forestry is to progress significantly. Reform is urgently required to improve accountability of institutions, re-orient attitudes of forest departments, mainstream participatory approaches, and "scale up" innovative programs and practices. In various countries, institutional reform has resulted in the following:

- merging of agriculture and forestry ministries;
- inclusion of community forestry in forestry curricula;
- legal reforms;
- allocation of land and forest resources to households and communities;
- support to household and farm management;
- greater democratization and participatory decision making in forest management.

It is import to recognize what and who drives institutional reform, and to work with effective agents of change. Among the external factors that drive reform of the forestry sector are: economic restructuring, political pressure, debt repayment requirements, logging and trade issues, and the international forestry agenda. Reform can be catalyzed by donors, academics, political leaders, progressive bureaucrats and agency leaders, NGOs, advocacy groups, and civil organizations.

Key elements of institutional reform in support of community forestry relate to decentralization of planning, budgeting, decision making, monitoring,

revenue collection and spending, and human resources development.

Policy development and implementation

Although policies for community forestry exist in many countries, effective implementation remains weak in most instances. A critical problem is that policies are often formulated at central government levels with minimal input from local people. This leads to a distinction between policy on paper (*de jure* policy) and policy in action (*de facto* policy). Bringing different stakeholders (particularly those reflecting local people's interests) together in policy development processes is crucial for bridging the gap between policy and implementation.

Implementation of community forestry policies tends to be constrained by the following:

- lack of political commitment, inconsistent policies, lack of trust, and inadequate budgetary resources;
- top-down approaches and inflexibility (including excessively rigid planning and management requirements);
- uncertain land and resource tenure;
- inadequate knowledge and capacity of local people related to forest management;
- inadequate skills of forest department staff in facilitating participatory processes;
- lack of legal frameworks to support community forestry;
- lack of awareness (on the part of local people and forest department staff) of existing community forestry policies and implementing regulations; and
- inequitable distribution of forest benefits.

Perhaps the most important opportunity for overcoming these constraints is the creation of effective institutional mechanisms that facilitate consultation and coordination between local people, government agencies, and other stakeholders. It is also important to raise awareness and build capacity of all stakeholders involved in policy development and implementation. Appropriate legal frameworks must be established at national levels to support community forestry, but implementation must be flexible to accommodate local conditions. Finally, power relationships and differences among stakeholders must be recognized and addressed in policy-making and implementation.

Education

Continuing efforts are needed to educate foresters and development workers who are knowledgeable and effective in supporting and implementing community forestry. Since formal education lays the groundwork for future reforms and directions, it is essential that education programs be carefully reviewed to ensure students are well versed in various aspects of community forestry. Curricula reform is needed in many countries and institutions to provide greater balance between the social and technical aspects of forestry. Efforts are also needed to create efficient feedback mechanisms to bring promising field-tested innovations back to individuals involved in community forestry education and decision making. Some of the key lessons learned included the following:

- institutional change is necessary for education reform to be effective;
- curriculum development is an on-going process requiring constant adjustments and feedback; and
- stakeholders must be involved in curriculum development, and initiatives must be seen to add value to the community.

Training

Community forestry training needs can be identified at two levels:

- for community members involved in managing community forestry resources; and
- for institutional staff (government and non-government) responsible for implementing and supporting community forestry programs.

Experience suggests that substantial training is needed to enhance technical knowledge related to community forest management, strengthen social and organizational capabilities, and improve the ability of trained individuals to train others.

Given the monumental task of training that is required, perhaps the only practical approach is one that focuses on "training of trainers." Such an approach can be very effective, but it requires

highly skilled lead trainers, a great deal of coaching and support, and clear linkage of concepts being taught with the conditions and circumstances of the areas in which trainers work and live. Suggested strategies include the following:

- Each organization should have an internal system of planning, implementing and monitoring human resources development.
- Mechanisms should be put in place so that developed training contents and materials are incorporated in the regular education systems.
- Coordination and networking of people involved in research and development at different levels needs to be encouraged.
- Efficient training processes developed in other fields should be identified and adopted for use in the natural resources sector.

Networking and information managment

The information era has brought great opportunities and great challenges for community forestry. Never before has there been so much potential for sharing experiences and information, and for establishing contacts for marketing, advocacy, problem solving, capacity building, and decision making.

Information translates to power; thus, sharing information means sharing power. This implies certain threats and challenges (particularly to those who traditionally have had greater access to information) as well as opportunities vis-à-vis control in managing forest resources. Proponents of community forestry can gain considerable power through effective networking and information management.

An ideal network has internal accountability, external legitimacy, and is responsive to constituents and changing times. It should also have clear goals and objectives. Successful networking is fostered by members' attitudes of sharing, cooperating, listening and learning. Networking should not be seen as an end unto itself, but as a means to foster improved learning and understanding.

Field trips

Eight field trips were organized to allow conference participants opportunities to interact in less formal settings and to share experiences with local communities. The field trips highlighted different issues related to community forestry, largely related to the main themes of the eight parallel discussion groups.

Conclusion and follow up

The range of experiences shared during the conference demonstrates that understanding and appreciation for the benefits of community forestry have grown considerably in recent years. However, the degree to which the rights of local users have been recognized varies throughout the region. Likewise, there is still debate regarding how much control and decision making power should be devoted to local users. The challenge ahead is to develop practical processes and approaches to better deal with multi-stakeholder decision making at both local and national levels.

A range of post-conference materials are being developed, including:

- A VCD version of the highlights video presented at the end of the conference (copies will be produced and distributed to all participants and other interested individuals).
- A summary report will be published and distributed by early next year.
- An interactive multi-media CD will be produced to support users in learning more about community forestry and the key concepts and issues discussed at the conference.

ASEAN MINISTERS FOR AGRICULTURE AND FORESTRY ADD THEIR ENDORSEMENT OF THE CODE OF PRACTICE FOR FOREST HARVESTING

The Asia-Pacific Forestry Commission (APFC) Code of Practice for Forest Harvesting in Asia-Pacific was recently given another important political boost when the ASEAN Ministers for Agriculture and Forestry endorsed the code at their annual meeting, held in Medan, Sumatra, Indonesia, in October. In endorsing the code, the ministers reinforced recommendations made by the ASEAN Senior Officials on Forestry (ASOF) in July, to adopt the code, "which serves as a useful tool for improving forest harvesting and management in the region and as a guide for developing specific national codes." The ministers also accepted the recommendatin of ASOF to establish "a network for the regional implementation of the Code of Practice for Forest Harvesting in Asia-Pacific [to] be established to develop and implement the various national codes.

FAO continues to give high priority to supporting member countries in developing and implementing national codes of practice. Based on discussions held during regional consultations and workshops organized by APFC, FAO recently published a regional training strategy supporting the implementation of the Code of Practice for Forest Harvesting in Asia-Pacific. In collaboration with the Sarawak Timber Association and the Sarawak Forest Department, and other partners, FAO is also organizing a "Regional Seminar on Sustainable Forest Management: From Theory to Practice," 3-7 December 2001, in Kuching, Sarawak, Malaysia.

TELL US ABOUT A WELL-MANAGED FOREST!
CALL FOR NOMINATIONS
IN SEARCH OF EXCELLENCE: EXEMPLARY FOREST MANAGEMENT IN THE ASIA-PACIFIC REGION

Background

To enhance the exchange of information on successful approaches to forest management, the Asia-Pacific Forestry Commission (APFC) with support from FAO, is initiating a participatory process to identify forests in Asia and the Pacific with exemplary management systems. Particularly noteworthy forest management experiences will be documented and analyzed, with a view toward highlighting and sharing these positive experiences within and among member countries. This initiative supports the continuing efforts towards improving sustainable forest management in many forest areas in the Asia-Pacific region.

The idea of *In Search of Excellence* comes from Tom Peters and Robert Waterman, who published in 1982 an enormously popular business management textbook titled *In Search of Excellence*. Peters and Waterman chose a sample of highly successful firms and tried to identify the features that had led to those successes. APFC and FAO seek to borrow the approach from Peters and Waterman in identifying, recognizing, and documenting positive instances of improved forest management.

APFC and FAO believe that part of the process of striving for improvement in forest management is to promote examples of success. This serves as a means of disseminating good ideas and as a source of encouragement to achieve better forest management. It is expected that the *In Search of Excellence* initiative will partly balance the attention which has been focused on poor forest management, deforestation and degradation of forests.

APFC/FAO's *In Search of Excellence* seeks to identify instances of exemplary forest management in the Asia-Pacific region and examine some of the characteristics that support high-quality forest management. Specifically, the initiative seeks to identify:

- A broad cross-section of instances of exemplary forest management in Asia-Pacific.
- Forests that can be held up as examples of forest management that show promise for the future. These may be forests that have a long history of good management, or forests that have implemented innovative systems to improve management outcomes.
- Examples across a broad range of forest eco-types from many countries in the region, exemplifying management for a variety of objectives and under a variety of different ownership structures.
- Examples of both large and small forest areas – the key requirement is quality of management.

Call for Nominations

APFC and FAO aim to ask a wide range of people to help in identifying and acknowledging efforts that are moving towards sustainable forest management. The nomination process for exemplary forest management in Asia and Pacific region strives to give credit where it is due, to spread information, and to encourage others to take up some of the ideas, methods and approaches.

APFC/FAO are now calling for nominations of forests in the Asia-Pacific region that demonstrate forms of exemplary management. Nominations are welcome both from people and organizations that wish to nominate their own forest(s), and from those who wish to nominate others' forests.

The Process

The call for nominations of forests is being widely distributed throughout the Asia-Pacific region. Nomination forms are being sent to government agencies, forestry organizations, universities, environmental agencies, individuals, NGOs, and industry associations. The activity is also being advertised in forestry journals and trade magazines, and on forestry list-servers. Interested parties could also download the nomination form from http://**www.apfcweb.org**.

APFC/FAO plan to establish a Panel of Experts to review the nominations, and to select outstanding examples for further in-depth analysis. Case studies on management of these forests will appear in a publication that documents and analyses these examples.

When submitting your nomination, it will be very helpful to include additional documentation related to the management practices and features that led you to consider the forest well-managed. Useful supporting documentation could include copies of forest management plans, documentation demonstrating compliance with forest policies and regulations, codes of practice, corporate profiles, press releases and other promotional material. It will also be very helpful to name a contact person(s) who could provide additional information.

Nominations close 1 February 2002. *Completed nomination forms should be sent to Patrick Durst.* To nominate a forest, please complete and forward a nomination form. Copies (electronic or paper) may be obtained from:

Patrick B. Durst
Senior Forestry Officer
FAO Regional Office for Asia and the Pacific
39 Phra Atit Road, Bangkok 10200, THAILAND.
Tel: (+662) 697-4139; Fax: (+662) 697-4445
E-mail: patrick.durst@fao.org

Asia-Pacific Forestry Commission

Food and Agriculture Organization of the United Nations

NOMINATION

IN SEARCH OF EXCELLENCE
EXEMPLARY FOREST MANAGEMENT IN THE ASIA-PACIFIC REGION

Organisation or entity managing the forest

Name of Forest

Forest location

Province/State

Country

Forest type: **Natural Forest/Plantation/Agroforest/Mixed** (*delete as appropriate*)

Ecological type:

Forest area (*hectares*)**:**

Management objective:

Formal management certification: YES/NO (*if YES by whom*?.....)

What are the exceptional management features of this forest? (*i.e. Why do you consider this forest to be particularly well managed?*)

What are the key elements in the management of the forest (as currently being practiced or as stated in the forest management plan)?

Continue on another sheet if necessary

What silvicultural management is applied? What type of conservation measures are in place? What types of harvesting are carried out?

Continue on another sheet if necessary

Who is managing the forest? To what extent and how are other stakeholders involved in taking or influencing management decisions?

Continue on another sheet if necessary

Name of person making nomination.....

e-mail.....

Phone:..... Fax:.....

Contact person for more information:.....

e-mail:.....

Phone:..... Fax:.....

Please also enclose any supporting information (e.g. management plans, company profiles, etc.)

WHAT MOTIVATES PLANTATION DEVELOPMENT? NEW STUDY TO ASSESS THE IMPACT OF INCENTIVES ON THE DEVELOPMENT OF FOREST PLANTATION RESOURCES IN THE ASIA-PACIFIC REGION

Forest plantations have long been recognized as offering significant potential for meeting the future increases in demand for wood. More recently, the potential role of plantations in sequestering carbon and providing other diverse benefits has also been recognized.

The International Conference on Timber Plantation Development held in Manila, Philippines, 7-9 November 2000, concluded that timber plantation development is a key strategy to address the problem of deforestation and to supplement the diminishing supply of timber from natural forests, in part due to timber harvesting restrictions imposed over the last two decades in several countries in the Asia-Pacific region. To realize the potential, the conference recommended that governments, in partnership with the private sector and other stakeholders, should formulate and implement appropriate policies and strategies, and create effective incentive systems to support plantation development by large- and small-scale investors.

Incentives and disincentives are policy instruments that change the comparative advantage of any economic activity and thus stimulate or deter specific behavior. In the case of plantations, effective incentives lead to investments in plantation establishment and better management, while disincentives deter investments in tree growing.

Incentives can be direct or indirect. Direct incentives include, among others:

- free inputs such as seedlings;
- provision of local infrastructure;
- grants and subsidies;
- low-interest loans; and
- tax exemptions on sale proceeds and similar schemes.

Indirect incentives can be divided into variable and enabling incentives. The first comprise sectoral incentives (e.g. guaranteed input and output prices and tariffs) and macro-economic incentives (e.g. exchange rate stability, low interest rates and other fiscal and monetary measures).

Enabling incentives mediate the investors' potential response to variable incentives. They include land security and availability, accessibility and distance to major markets, market development, credit facilities, strength of the judicial system, policy consistency and national security.

Little is known about policy instruments, especially incentives, that encourage establishing and managing plantations in the Asia-Pacific countries, despite the region leading the world in plantation development. Even the existing knowledge on policy support to forestry plantations has not been organized or analyzed clearly. As a result, countries of the region have not benefitted adequately from lessons learned.

As a follow-up to its studies of the implications of logging bans in the regions, the 18th Session of the Asia-Pacific Forestry Commission (APFC) recommended conducting collaborative activities in the area of forest plantations. In light of the above, the APFC, with support from FAO, the EC-FAO Partnership Programme, the USDA Forest Service and the Center for International Forestry Research (CIFOR), is undertaking a comprehensive multi-country study on the "Impact of incentives on the development of forest plantation resources in the Asia-Pacific region."

The purpose of the study is to provide clear, balanced and objective information in support of the development of forest plantation resources. The study will cover ten countries, i.e. Australia, China, India, Indonesia, Malaysia (Sabah), New Zealand, Philippines, Thailand, USA and Viet Nam. It focuses on forest plantations established and managed for the production of wood by the private sector (small- and large-scale). Country case studies will be conducted by national consultants and a regional overview will be jointly prepared by the supporting agencies. The coordinator for this study is Devendra Pandey (Devendra.Pandey @fao.org). The results of the study will be presented to the 19th Session of the Asia-Pacific Forestry Commission, scheduled to meet in Mongolia in August 2002.

For further information on the study, please contact:

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SETTING PRIORITIES FOR FORESTRY RESEARCH IN THE ASIAN REGION

Report of a workshop organized by FORSPA & APAFRI 3-4 September 2001, FRIM, Kuala Lumpur, Malaysia

Prepared by S. Appanah

Foresters, one must admit, are a conservative lot, and rarely venture outside their turf. Hence, a recent move by APAFRI and FORSPA/FAO to join in discussions with agriculture scientists during the forthcoming "CGIAR Expert Consultation on Agriculture Research and Development Priority Setting" is a welcome change. The CGIAR Consultation Meeting will review the research issues in Asia that will require donor support over the next 5 to 10 years. As part of the preparations, the agriculture and fishery scientists under the auspices of APAARI and ICLARM, respectively, have held their discussions. In a similar vein, APAFRI and FORSPA organized a workshop on priority setting for forestry issues in Asia, in Kuala Lumpur, Malaysia. Besides APAFRI and FORSPA/FAO representatives, others from ACIAR, CIFOR, IPGRI, and Treelink attended the meeting.

To stimulate debate during the workshop, FORSPA drafted a background "Review of Forestry Research Priorities in the Asian Region". The paper reviews the status and priorities of forestry research for 15 countries in the Asian region. For each country, an overview of the forestry sector is presented, along with a summary of forestry research management and research priorities. An assessment of common research needs and constraints is also presented. The concluding chapters review regional priorities, historical developments in research prioritization, and common approaches for prioritization. A matrix of the priorities for each country is appended to the report.

Despite wide differences in their social, economic and environmental status, the review revealed that the 15 countries do not differ markedly in their choice of research priorities. In general, priorities emphasize the narrower technical aspects of forest management rather than its wider social, political

or economic aspects. The bias appears to stem from a general lack of multi-disciplinary, program-oriented research, which unfortunately discourages collaboration and coordination among researchers.

The Kuala Lumpur workshop recommended that prioritization be conducted in a broad context, keeping in view the main problems that should be addressed by research in all countries to determine the priorities at regional levels. Discussion also touched on the approaches to be taken in setting priorities including: i) the need for assessment using the CSIRO approach; ii) streamlining priorities in accordance with those of donors; iii) focusing on current gaps in forestry research; and iv) forward/future-looking research that targets new research areas.

Due to differences among countries, the workshop participants recognized that it was not practical to do a priority ranking for each country. The preferred option was to divide the countries into two groups: those that are rich in forest resources and those that are relatively poor in forest resources. It was argued that the common basis for research needs, to a considerable degree, depends on the amount of forest resources available. Another factor that also influences research priorities is the population pressure on forestland and resources.

With the above background discussions, the following issues emerged as high priorities for research: natural forest management, forest plantations, non-timber forest products, social/community forestry, environmental protection/biodiversity conservation, and policies and institutional arrangements. Agroforestry, biomass/wood utilization and urban and landscape forestry were not accorded high priority.

The workshop also identified overarching issues that are pertinent to all forestry research issues: socio-economics, institutional issues, policy research, interdisciplinary linkages, constraints to adoption, pricing and markets, supply and demand, information dissemination, and criteria and indicators for sustainable forest management. It was recommended that these overarching issues be taken into consideration when conducting research on any of the high priority technical issues.

The output of the workshop has been posted on APAFRI's website (iufro.boku.ac.at/iufro/asiapacific/apafri/), and has been sent to various experts worldwide. Their feedback will be incorporated into the final report that will be presented at the forthcoming CGIAR Consultation Meeting in November.

Alphabet soup related to this piece:

APAARI	-	*Asia-Pacific Association of Agricultural Research Institutions*
APAFRI	-	*Asia Pacific Association of Forest Research Institutions*
CGIAR	-	*Consultative Group on International Agricultural Research*
CIFOR	-	*Center for International Forestry Research*
CSIRO	-	*Commonwealth Scientific & Industrial Research Organization*
FAO	-	*Food and Agriculture Organization of the United Nations*
FORSPA	-	*Forestry Research Support Programme for Asia and the Pacific*
FRIM	-	*Forest Research Institute of Malaysia*
ICLARM	-	*The World Fish Center (formerly the International Center for Living Aquatic Resources)*
IPGRI	-	*International Plant Genetic Resources Institute*

ENHANCING THE ROLE OF FORESTRY IN POVERTY ALLEVIATION

It is often assumed that what is good for forests must be good for society as a whole, and all the various segments of society. Thus, forest management tends to focus on forest protection, sustainable management of forests, and sustained yield of timber and other products. Forest managers usually give less attention to the lives and needs of people living in and near forests, particularly the poor. While there is a recognition that forestry can support and enhance the livelihoods of the poor, it is seldom an explicit objective of forest management.

To enhance the awareness of the potential for forestry to contribute to poverty alleviation, FAO recently organized a forum on this topic. The forum, which was supported by DFID, was convened 3-7 September 2001, at Azienda Cortevecchia, Semproniano, Italy. Approximately 50 individuals from numerous international organizations, donors, and NGOs attended.

The forum focused on the impacts of forest policies (and those of related sectors) and donor approaches on the poor, and on strategies for enhancing awareness of the potential for forestry to contribute to poverty alleviation. Efforts were made to review the effectiveness of policies, programs, institutions, and regulations with respect to their impacts on the poorest segments of society.

The forum drew from six country profiles (Bolivia, Honduras, Mali, Tanzania, Nepal, and Vietnam) that described that policy, regulatory framework, and implementation environment in each country. Reviewing the country profiles, working groups identified key issues, constraints, and themes for further discussion in small groups organized around topics and organizations.

The forum recognized the key relationships of forests to the livelihoods of the poor, including the provision of subsistence products, income and employment, and "safety nets" for the most vulnerable. Participants noted the critical importance of access by the poor to forest resources, especially issues of land and resource tenure, and regulations that govern the use and management of forests. Policies and practices that govern access to forest product markets were also recognized as being vitally important, particularly regulations governing the production, transport, and sale of forest and tree products.

The forum identified a number of shifts in thinking and practice that appear to have potential for increasing the poverty orientation of forestry policies and programs:

- Recognize that poverty *alleviation* (including meeting subsistence, survival, and reduced vulnerability needs) can be as important as poverty *reduction* and increased participation in market activities – and restructure forestry initiatives to reflect this.
- Seek solutions to mitigate the impacts of liberalization (e.g., privatization of common property forest resources).
- Encourage developments in complementary sectors (e.g., infrastructure, education, and agricultures) that will assist the very poor in acquiring the assets and skills necessary to benefit from, and compete in, an increasingly liberalized and market-driven forest products environment.
- Facilitate partnerships with the industrial sector that extend the range of mechanisms whereby the forest-dependent poor can participate in, and benefit from, forest product market opportunities.
- Revise policies and practices that hinder participation of the poor in accessing benefits

from forests (e.g., competition from the State, unnecessary or excessive regulations and taxes, forest management regulations overly biased toward global rather than local environmental values and practices, etc.).

The forum was particularly effective in encouraging participants to assess their own programs and activities with respect to their impacts on the poor. Through such "soul searching," it was clear that many forestry programs and activities of donors and international organizations are not maximizing their potential for poverty alleviation. Forum participants generally agreed that organizations need to apply more systematic approaches in reviewing and re-focusing programs in forestry to sharpen their impact in alleviating poverty.

The output from the forum discussions will be used in drafting a policy statement aimed at raising the awareness of policy makers to the potential for enhancing the role of forestry in poverty alleviation. The policy statement will be prepared for distribution at the upcoming World Food Summit. A practitioner's guide will also be prepared for distribution next year.

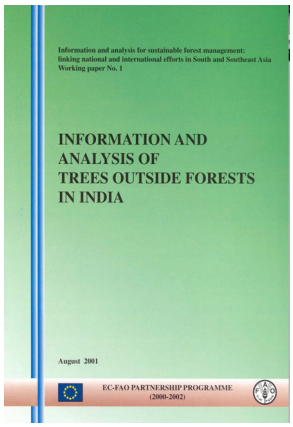
"If there is one lesson in the past half century of economic development, it is that natural resources do not power economies, human resources do."

– International Herald Tribune, 28 April 2001 –

NEW RAP FORESTRY PUBLICATIONS

INFORMATION AND ANALYSIS FOR TREES OUTSIDE FORESTS IN INDIA

In India, trees outside forests (TOFs) are an important source of wood, other products and environmental services. About 80 percent of the requirements of the wood-based industries are met from TOFs. Unfortunately, TOFs have been neglected by foresters and sound assessments of this important resource are incomplete or do not exist. One reason for the weak knowledge of TOFs is the lack of cost-effective and practical inventory and assessment techniques. Various institutions within India have initiated work on TOFs. There is immense potential to coordinate efforts and to develop a common methodology by drawing on the strengths of different approaches used. For this purpose the Indian Institute of Forest Management (IIFM) in Bhopal organized a national workshop that brought together more than twenty experts on the subject matter. The workshop was financed by the EC-FAO



Partnership Programme and a workshop report has been published as Working Paper No. 1.

FAO ASIA-PACIFIC FORESTRY CALENDAR

3-7 December 2001. Kuching, Malaysia. ***Seminar on Sustainable Forest Management: From Theory to Practice.*** Contact: Thomas Enters, Forestry Sector Analysis Specialist, FAO/RAP, Maliwan Mansion, Phra Atit Road, Bangkok 10200, Thailand; Tel: (66-2) 697-4328; Fax: (66-2) 697-4445; E-mail: Thomas.Enters@fao.org

4-7 December 2001. Phnom Penh, Cambodia. ***Training Workshop on "Designing Local Auditing Systems for Sustainable Forest Management.*** Organized by FORSPA, APAFRI and GTZ. Contact: Dr. S. Appanah, Senior Programme Advisor, FORSPA, c/o FAO/RAP, Maliwan Mansion, Phra Atit Road, Bangkok 10200, Thailand; Tel: (66-2) 697-4106; Fax: (66-2) 697-4411; E-mail: Simmathiri.Appanah@fao.org

22-24 January 2002. Kuala Lumpur, Malaysia. ***EC-FAO Partnership Programme Policy Seminar.*** Contact: Thomas Enters, Forestry Sector Analysis Specialist, FAO/RAP, Maliwan Mansion, Phra Atit Road, Bangkok 10200, Thailand; Tel: (66-2) 697-4328; Fax: (66-2) 697-4445; E-mail: Thomas.Enters@fao.org

January 2002 (tentative schedule/venue). Hanoi, Vietnam. ***Workshop on "International Mechanisms to Promote Sustainable Forest Management: Effective Participation and Implementation".*** Contact: Dr. S. Appanah, Senior Programme Advisor, FORSPA, c/o FAO/RAP, Maliwan Mansion, Phra Atit Road, Bangkok 10200, Thailand; Tel: (66-2) 697-4106; Fax: (66-2) 697-4411; E-mail: Simmathiri.Appanah@fao.org

10-13 June 2002. Rome, Italy. ***World Food Summit: five years later.*** More information is available at the following website: www.fao.org/worldfoodsummit/

26-30 August 2002. Ulaan Baator, Mongolia. ***19th Session of the Asia-Pacific Forestry Commission.*** Contact: Patrick Durst, Senior Forestry Officer, FAO/RAP, Maliwan Mansion, Phra Atit Road, Bangkok 10200, Thailand; Tel: (66-2) 697-4139; Fax: (66-2) 697-4445; E-mail: Patrick.Durst@fao.org

2-11 September 2002. Johannesburg, South Africa. ***World Summit on Sustainable Development ("Rio+10").*** More information is available at the following website: www.johannesburgsummit.org

21-28 September 2003. ***XII World Forestry Congress.*** Québec City, Canada. Contact: Secretariat General, XII World Forestry Congress 2003, P.O. Box 7275, Québec City, Canada G1G 5E5; E-mail: sec-gen@wfc2003.org

FOREST NEWS is issued by the FAO Regional Office for Asia and the Pacific as part of TIGERPAPER.
This issue of FOREST NEWS was compiled by the FAO/RAP Forestry Group

"Behold the turtle; it makes progress only when it sticks its head out."
– James Conant –

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2. Asia-Pacific Tropical Forestry: Ecological Disaster or Sustainable Growth? (RAPA Publication 1994/18)
3. Workshop Report: Reform of the Forestry Sector: Towards a Market Orientation in China, Laos, Mongolia, Myanmar, and Vietnam (RAPA Publication 1995/4)
4. Beyond Timber: Social, Economic and Cultural Dimensions of Non-Wood Forest Products in Asia and the Pacific (RAP Publication 1995/13)
5. A Guide to the Identification of Diseases and Pests of Neem (*Azadirachta indica*) (RAP Publication 1995/41)
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13. Directory of Selected Tropical Forestry Journals and Newsletters (2nd Edition) RAP Publication 1997/17 - FORSPA Publication No.19/1997.
14. Forest Dependent Survival Strategies of Tribal Women: Implications for Joint Forest Management in Andhra Pradesh, India (RAP Publication 1997/24)
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16. Ecotourism for Forest Conservation and Community Development (RAP Publication 1997/42
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25. Development of National-level Criteria and Indicators for the Sustainable Management of Dry Forests in Asia: Workshop Report (RAP Publication 2000/07); Background Papers (RAP Publication 2000/08)
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30. Regional Training Strategy: Supporting the Implementation of the Code of Practice for Forest Harvesting in Asia-Pacific (RAP Publication 2001/15)
28. Trash or Treasure? Logging and Mill Residues in Asia and the Pacific (RAP Publication 2001/16)
31. Proceedings of the International Conference on Timber Plantation Development
32. Information and Analysis for Trees Outside Forests in India (Working Paper No.1. EC-FAO Partnership Programme)

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