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POPULATION ECOLOGY OF HANUMAN LANGURS (*Semnopithecus entellus*) IN THE ARAVALLI HILLS OF RAJASTHAN, INDIA

by Anil Kumar Chhangani and S.M. Mohnot

Introduction

The Hanuman langur, *Semnopithecus entellus* (Primates: Cercopithecidae: Colobine), is the most widely distributed of the 19 non-human primate species found in the Indian sub-continent. It is a highly adaptive species (Roonwal and Mohnot, 1977; Wolfhemin, 1983); Chhangani, 2000). It is found from the snow-clad peaks of the Himalayas (up to about 4,100 m altitude) in the north to Cape Camorin in the south, and from the fringes of the great Indian desert in the west to Bengal in the east (Roonwal and Mohnot, 1977; Mohnot, 2001).

Langur is largely a deciduous or dry deciduous forest animal and prefers dry tropical forest, scrub jungles and arid rocky areas with xerophytic vegetation. Since the natural habitat of the langur is being eroded at a fast pace, its presence near human habitations and religious places is a common sight (Chhangani, 2000). Because of its ruminant-like digestive system (Bauchop and Martucci, 1968), it can utilize a wide variety of food items.

Hanuman langurs live in social groups of various sizes and compositions. There are *unimale bisexual* groups comprised of one male adult, male infants, juveniles and females of all ages. *All-male* groups are comprised of males of all ages except infants or nurslings, with group sizes ranging from 2 or 3 members to 80-90, and even in exceptional cases up to 125 or more. The number of adult males in *multi-male bisexual* groups may vary from one to several.

Materials and Methods

Study site

Kumbhalgarh Wildlife Sanctuary (KWS) lies between 20°5' and 23°3' N and 73°15' and 73°45' E, some 200 km south of Jodhpur in the western Aravalli hills of Rajasthan, India. The total area of KWS is 585 km^2. The altitude ranges from 274 to 1,155 m above sea level.

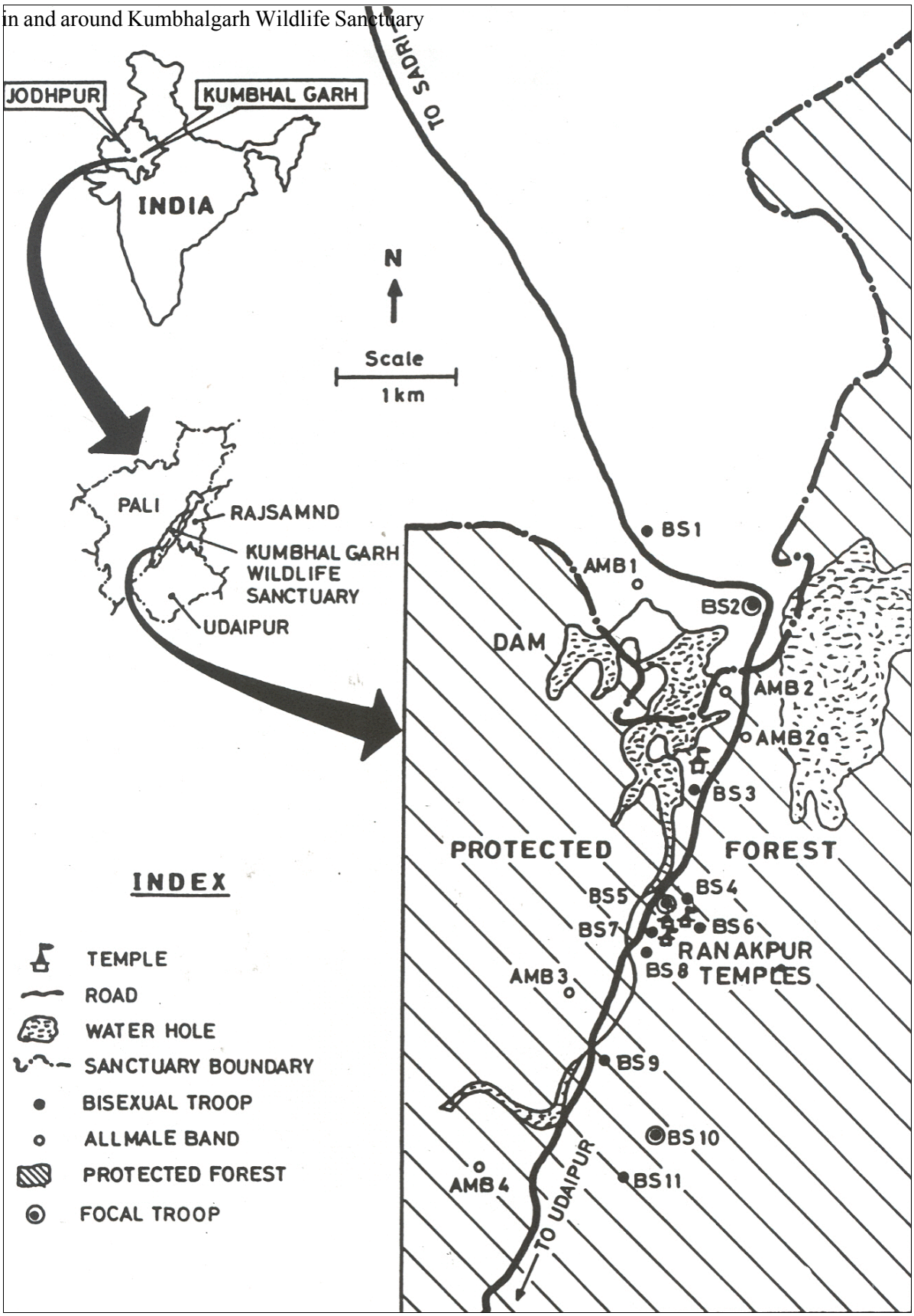
The sanctuary experiences distinct winter, summer and monsoon seasons. During summer the temperature fluctuates around 30°C and can rise up to 48° during May and June. The minimum temperature in winter is 5°C, and can fall as low as 2°C in December-January. The average annual rainfall is 725mm (minimum 403mm - maximum 950mm). The forest is mainly a dry deciduous or woodland type dominated by *Anogeissus pendula, A. latifolia, Boswellia serrata, Lannea coromandelica, Wrightia tinctoria, Acacia senegal, Acacia catechu, Ziziphus mauritiana, Butea monosperma*, etc. The undergrowth consists mainly of *Ziziphus nummularia, Adhatoda zeylanica, Grewia tenax, G. flavescens, Capparis sepiaria, Lantana camara*, etc. Some climbers and grasses are also present.

The main fauna species found in KWS include: leopard (*Panthera pardus*), hyena (*Hyaena hyaena*), Indian wolf (*Canis lupus*), jackal (*Canis aureas*), sloth bear (*Melursus ursinus*), fourhorned antelope (*Tetracerus quadricornis*), chinkara (*Gazella gazella*), porcupine (*Hystrix indica*), sambar (*Cervus unicolor*), bluebull (*Boselaphus tragocamelus*), toddy cat (*Paradoxorus hermaphordiatus*), jungle cat (*Felis chaus*), fox (*Vulpes bengalensis*), crocodile (*Crocodylus palustris*) and rock python (*Python molurus*).

Methods

This study of Hanuman langur was carried out

in and around Kumbhalgarh Wildlife Sanctuary



over a period of three and a half years from December 1995 to August 1999. Over 6,500 hours of field observations were carried out in the 40 km^2 study area. This included more than 4,500 hours devoted to focal troop studies and the rest for census, phenology of plants, scat collection, etc. In addition to an annual population census, groups were also followed periodically. The census data was obtained during the animals' progressions from one site to another during early mornings and late evenings, plus occasional counts made when troops were resting in the afternoon. Efforts were made to identify the sexes of all individuals, including infants and juveniles. Large troops were counted 2-3 times to ensure correct identification of young animals. However, there may have been a moderate degree of error in determining age classification, especially with animals that confined themselves to tree canopies in the interior of the forest or individuals that were in the transitional stages, i.e. between sub-adults and young adults, juveniles and sub-adults, or between infants and juveniles.

In this study Altmann's (1974) scan and focal sampling methods were also used. Ecological conditions were classified into three categories on the basis of certain biotic factors as shown in Table 1.

Factors	Ecosystem I	Ecosystem II	Ecosystem III
	Focal Troop 1 (B-2)	Focal Troop 2 (B-5)	Focal Troop 3 (B-10)
Human interference	Present	Present	Absent
Human settlements	Present	Present	Absent
Grazing	Permitted	Permitted	Not permitted
Tree cutting	Present	Present	Absent
Artificial feeding	Absent	Present	Absent
Agricultural activity	Present	Absent	Absent
Highway traffic	Present	Present	Absent
Predators	Panther, jackal, wolf, dog, etc.	Dog	Panther, hyena, wolf, jackals, etc.

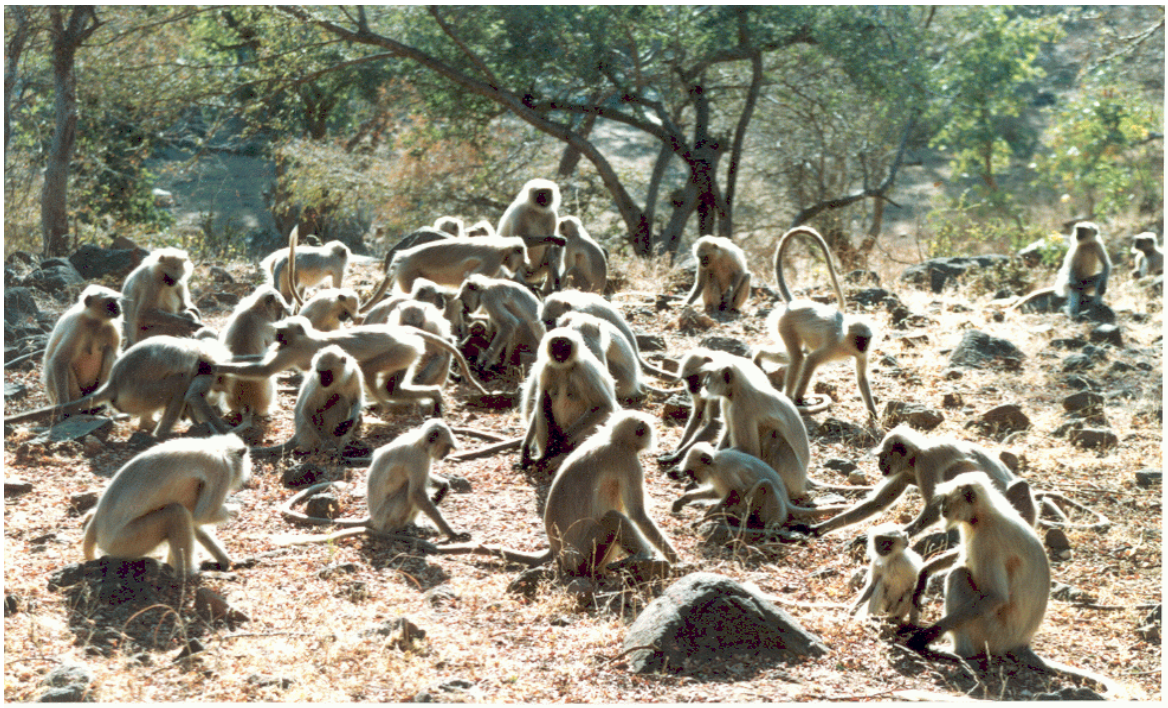
Results

During the study at KWS, one survey was carried out each year. The census of 1977, covering 11 bisexual troops and 4 all-male bands, recorded 497 animals. By 1998, this population had increased to 513, and in 1999 it rose to 540. In June 1999, focal band AMB-2 split into two bands – AMB-2 and AMB-2a. The 16 troops occupy three different ecosystems. Troops 1-6 (including AMB-2a) belongs to the disturbed forest ecosystem; troops 7-11 belong to the temple ecosystem; and troops 12-16 belong to the undisturbed forest ecosystem.

According to the 1999 census, of the 16 groups in the study area, 68.75% are bisexual troops and 31.25% are all-male bands. The mean troop size is 41.7 (ranging from 19 to 113) and the mean band size is 15.6 (ranging from 8 to 32). The 16 groups are dispersed over an area of 8 km^2; thus, the population density of the study area comes to about 67 langurs/km^2.

The adult male-female sex ratio of langurs at KWS is female-biased at 1:4.6, although it is 1:1 at birth. This is due to high male infant and juvenile mortality. Weaned male juveniles are often expelled from their natal troops after male takeovers. These juveniles either join the all-male bands nearby or form sub-groups and stay away from mothers, which exposes them to higher risks compared to individuals living in bisexual troops. The census data at KWS suggests a definite increase in the number of animals in the temple ecosystem troop and also

Hanuman langur (Semnopithecus entellus) group feeding on Samel (Bombex ceiba) flowers and fruits (Photo: A.K. Chhangani)



Hanuman langur (Semnopithecus entellus) feeding on ground (Photo: A.K. Chhangani)

in the disturbed forest ecosystem, while populations in the undisturbed forest ecosystems have marginally dropped.

On an average, the langurs spent 34.6% of their daily activity time on feeding. The daily activity period for Hanuman langurs ranged from more than 14 hours in the longer daylight period of summer (May-June) to 11 hours during winter (December-January). The time spent on feeding activities differed among the three focal troops. For the Savika troop (B-2) it was 35.08%; for the Ranakpur temple troop (B-5) it was 29.50%; and for the forest troop (B-10) it was 39.30%. On the basis of data gathered at KWS, the Hanuman langurs may be regarded as being wholly vegetarian. The langurs eat about 184 types of food items, including natural and cultivated plant parts and artificial food provided by people. Natural food includes leaves, flowers, fruits, seeds, gum, bark and arial roots. Cultivated food in the form of fruits, seeds, grains, vegetables, flowers and parts of garden bushes are commonly eaten. The animals also receive a variety of artificial food from the people in the form of raw, cooked, fried and roasted stuffs. In addition, langurs were observed eating sand, chewing bee-wax and licking plant latex and rocks.

The Savika troop (B-2) eats natural and cultivated food but does not receive artificial food from the people. The Ranakpur temple troop (B-5) eats natural, cultivated and artificial food provided by the people. The forest troop (B-10) was completely dependent on natural food and was not observed eating cultivated or artificial food (which they had no access to).

Discussion

The census and social organization studies conducted at KWS revealed a definite unimale-bisexual and all-male pattern within the langur population. The same situation prevails in the Jodhpur langur population as found over the last three decades. According to the 1999 census at KWS, based on 16 groups, some 68.75% of the troops were unimale and 31.25% were all-male. In Jodhpur, the 1999 census revealed 55 groups with 71.6% unimale and 28.4% all-male bands (Mohnot, 1999). About 150 km from KWS, the langur population at Mt. Abu was comprised of 86% unimale and 16% all-male bands as observed by Hrdy (1977). Likewise, in Madhav National Park, 71.4% were unimale and 28.5% were all-male bands in the 14 troops surveyed by Kankane (1984).

Kumbhalgarh, Jodhpur, Mt. Abu and Kanha are strikingly unimale troop habitats. There are also habitats in India which contain only multimale troops, such as Kaukori and Orcha (Jay, 1963), Bhimtal (Vogel, 1971) and Shimla (Sugiyama, 1976). In Nepal, at Melemchi (Bishop, 1975, 1979) and at Sukhumbu (Boggess, 1979) the troops were mostly multimale.

The population status fluctuates according to births, deaths, immigration, availability of food, predation, etc. among the troops and bands. There appears to be some variation in troop composition from habitat to habitat. The mean troop sizes at various locations were as follows: KWS - 42.72 (range 19-113); Sariska, Rajasthan - 64 (range 30-125); and Bhimtal (Kumaon Hills) - 23 (range 15-30) (Vogel, 1971, 1973); Kanha - 21 (range 15-30) (Newton, 1987); Gir forest, Gujarat - 30 (range 16-48) (Rahman, 1973); Madhav National Park - 21.2 and 21.7 (range 8-37) (Kankane, 1984); Ramnagar (Nepal) - 18.3 (range 6-41) (Koenig *et al.*, 1998); Jodhpur, Rajasthan - 44.9 (range 6-129) (Mohnot, 1999).

In this study the female-biased sex ratio is clearly visible among adult langurs with 1 male:4.6 females. In other words, 22.5% of female infants reach adulthood while only 5% of male infants reach puberty. For a stable population it appears that the female bias is an advantage for the population as evidenced from the KWS and Jodhpur studies.

The amount of time spent in foraging for food differed among the three focal groups (B-2, B-5 and B-10). The forest troop (B-10) devoted more time to foraging compared to the Savika troop (B-2) and the Ranakpur temple troop (B-5). B-5 spent less time in foraging compared to B-2 and B-10. In winter, B-2 and B-10 spent the most time in foraging, whereas B-5 spent more time foraging in July when artificial feeding was as low as 26% and natural feeding as high as 74%

of the total foraging time. The reason for this variation for B-5 is directly related to the kind of food available to the langurs. For troops B-2 and B-10, the foraging variation is also related to the availability of food, which is composed of young leaves, flowers and fruits, which are less abundant in winter and therefore these troops had to spend more time foraging to get a balanced diet. Troops B-2 and B-10 did not receive as much artificial food as B-5, which got plenty of artificial food in the winter months. However, this restricted troop movements in a limited area.

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Hanuman langur group raiding crops (Photo: A.K. Chhangani)

STATUS AND CONSERVATION OF GANGETIC DOLPHIN (*Platanista gangetica*) IN THE KARNALI RIVER, NEPAL

by Nilesh Timilsina, Bijay Tamang and Nabin Baral

Introduction

The Ganges river dolphin (*Platanista gangetica*), also known as Susu, is a freshwater dolphin distributed throughout the Ganges, Brahmaputra and Meghna river systems in India, Bangladesh and Nepal (Jones, 1982). The World Conservation Union (IUCN) regards the species as being endangered and has listed it in Appendix I of CITES.

The total world population of Gangetic dolphin has been crudely estimated by Jones (1982) to be only 4,000-5,000 animals, with an unknown, but probably very small, number in Nepal. In Nepal, dolphins have been reported from the Karnali River (Shrestha, 1989; Smith, 1994). In the past, dolphins occurred in great abundance in the Mahakali (Sarda), Koshi and Gandaki or Narayani river systems. But at present there are small, isolated populations confined to only three rivers, viz. Mahakhali, Karnali and Koshi.

The dolphin population is decreasing day by day. The main causes of its decline are habitat deterioration and modification, inadvertent trapping in fishing nets, segregation of breeding populations by dams, and – to some extent – poaching. In comparison to India, very few studies have been carried out on dolphins in Nepal. Pilleri and Tagliavani (1982) visited Nepal for a few weeks and made general observations about the habitat of the Narayani River. Shrestha (1989), Smith (1994) and Smith *et al.* (1996) studied dolphins and other aquatic fauna in the Karnali, Koshi and Mahakali Rivers of Nepal.

Shrestha (1989) recorded 20 dolphins in the Karnali River, but within 5 years the population had plummeted to 7 animals (Smith, 1994). Regular monitoring of the population status is crucial from a conservation perspective, especially for endangered species, because the population status will need to be considered when drawing up a management plan. Therefore, a study on the status and conservation of the Gangetic dolphin was carried out in order to provide depth and insight for its conservation and as a follow up to the previous studies. During this study, only four dolphins were recorded in the Karnali River.

Downstream from Chisapani, the Karnali River fans out into two main channels – Geruwa on the left and Karnali on the right. After about 52 km, these by-rivers rejoin to form the Ghorga or Sanju river about 3 km upstream of Girija Barrage in India. The total drainage area of the Karnali River basin is 44,000 km^2, out of which 41,550 km^2 lies in Nepal. The average annual discharge of the Karnali was about 1,370 m^3 for the period 1965 to 1995. The Karnali flows along its channel to join with the Ganges River.

For this project, the main study area was a stretch of river approximately 31.92 km long, of the Geruwa branch of Karnali River from Chisapani Bridge to Kothia Ghat. The Geruwa branch of Karnali River forms the western boundary of Royal Bardia National Park.

Methodology

Potential sites for observing dolphins were located by searching literature for reports of sightings and from interviews with local people and park staff. Because of the low number of reported animals, and following the recommendations of a panel of experts (Perrin *et al.*, 1989), the direct count method was used.

Observations of the river dolphin population were carried out in April 1998 (pre-monsoon season) and November 1998 (post-monsoon season). The river is not so wide and deep at

most of the places chosen, so a raft was rowed down the middle of the river and surfacing dolphins were observed on both sides. At least two persons were posted to spot the dolphins on the two sides. Counting was done from the raft. Searches were also made at potential dolphin habitats where the convergent streams form an eddy counter current system.

During the raft survey it was found that most of the dolphin movement was concentrated in the confluence (generally called ghats), so a multi-platform count was done to increase the chances of recording all the individuals and to reduce sampling biases. There were two persons were posted in each of five different ghats in a single day. During the fixed time period, observers noted the times of all surfacing dolphins in each ghat. Data collected from the raft survey and multi-platform count were pooled to get less biased results. In addition, notes on dolphin habitat, human disturbances and other associated fauna were also made.

Results

During the pre-monsoon season (April/May) raft survey, three dolphins were recorded in Gola, Banjariya and Kothia ghats. Another post-monsoon dolphin survey by raft was carried out during November. This survey recorded three dolphins in Gola, Manau and Kothia ghats. Banjariya ghat is closer to Manau, so it was strongly suspected that the dolphin observed in Manau and Banjariya was one and the same. The multi-platform count made in the pre-monsoon survey recorded four dolphins in four ghats; this time a dolphin was observed in Saijana ghat as well. The multi-platform count after the monsoon recorded only three dolphins, one each in Gola, Manau and Kothia ghats. The majority of these surveys of the relatively pristine habitat along the Karnali River between Chisapani to Kothia ghat yielded counts of three dolphins, with only a single count of four dolphins.

Two types of dolphin habitat were identified. Primary habitat was the location where the river flows along a single channel slightly downstream of convergent streams. With the resulting deflection of the main flow, an eddy counter current system was created with a center pool where little or no flow could be detected. Water velocity at these slow-flowing habitats was 0.24 m/sec (SD=0.05) and the water depth ranged from 5 to 15 m. Gola, Manau and Kothia ghats were the primary habitat, where most of the dolphin movements were confined.

The second type of habitat was marginal, and located either on an ancillary branch of the main river flow or where upstream divergent branches diminished the main flow. These habitats were with or without point bar and eddy counter current systems similar to that of primary habitats; if present it was of much small dimensions. The mean water velocity of these habitats was 0.8 m/sec (SD=0.3). Saijana, the Lalmati area and the stretch of river between the primary ghats were marginal habitats.

Though there was lack of conservation awareness among the local people, illegal poaching was not reported. Harmful practices like the use of gill nets and explosives for fishing, removal of woody debris and rock mining were prevalent. The survey of other associated aquatic fauna recorded 12 species of fishes, 32 species of birds, two species of crocodiles, otters and turtles.

Discussion

Shrestha (1989) reported 30 dolphins and Smith (1994) counted a maximum of seven dolphins in the Karnali. This study with its maximum count of four dolphins confirms that the population is declining. Dolphins were not sighted in the places where Smith (1994) and Shrestha (1989) had previously recorded them from (Patharboji, Lalmati and the area upstream of Gola ghat up to Kachali). This may be due to the low number of animals and also may be due to the larger order of human exploitation in those areas.

Construction of barrages, especially Kailashpuri dam on the Indian side, has isolated wildlife populations from any possible genetic interchange with animals inhabiting downstream waters. This may be the prime cause of the population decline. This survey did not record any sub-adults or infants. In order to preserve the endangered Gangetic dolphin, along with

other associated fauna, including the gharial, mugger crocodile and important food fishes for future generations, it is vital that the riverine habitat be preserved in an undisturbed state to the degree practically possible.

Recommendations

The present population of four individuals is not genetically viable for the long-term survival of the animals, but there is an exigent need to conserve this unique natural heritage for the conservation of the riverine ecosystem. Active management will definitely boost the dwindling population of dolphin. The following points are strongly recommended:

1. Regular monitoring should be done and surveys should be conducted in other potential rivulets.
2. Upstream and downstream migration should be facilitated so that there a gene flow is possible between the now isolated upstream and downstream populations.
3. The area between Chisapani Bridge and Kothia ghat up to the Nepal/India border should be established as a dolphin sanctuary so that the area outside the national park will be well protected.
4. Stringent fishing laws should enacted and enforced and extension programs should be launched for the local people.
5. The present habitat sites should be kept free from human disturbance and environmental degradation.

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POPULATION ESTIMATION OF TIGERS IN MAHARASHTRA – EMERGING TRENDS

by Ramanuj Choudhary

The State-Level Committee formed for carrying out the population estimation of wild animals in Maharashtra has estimated that the tiger population in the State during 2001 was around 238, including 155 tigers in the protected area (this includes the Multiple-use Area (MUA) of Melghat Tiger Reserve (MTR)) and about 83 tigers in the forest area outside protected areas (PAs) such as sanctuaries and national parks. The Committee also tried to find out the trend in the population over a period of 8 years, which can be seen in the table below:

Estimated numbers of tigers in the State

	1993	**1997**	**2001**
Protected Area (PA) (incl. MUA of MTR)	140	163	155
Territorial Area (Non PA)	136	94	83
Total	276	257	238

Trends in Tiger Populations in Non-PAs (Territorial) of the State

The trend of the tiger population in non-PAs in Maharashtra shows a steep decline. Although eight Territorial Circles out of eleven indicate the presence of tigers, only four circles, viz Amravati (17), North Chandrapur (27), Nagpur (19) and to a certain extent South Chandrapur Circle (15) seem to indicate that they will be able to sustain their tiger populations in the near future. Kolhapur Circle (1) has the potential to bounce back. The populations in Nasik, Yavatmal and Dhule are just relict populations. Most of the tigers in Amravati Circle, North Chandrapur and Nagpur Circle seem to be in the buffer areas (adjoining forests) of the three tiger reserves in the State and, therefore, it has been suggested that management as well as the Working Plans of these forest areas need to take note of this scenario when planning prescriptions for these areas.

A disturbing trend has emerged from the results in South Chandrapur Circle, which shows a steep decline in the tiger population within a period of eight years, from 57 animals in 1993, dropping to less than 25 in 1997 and further down to less than 15 in 2001. South Chandrapur Circle, with an area of 10,275.74 km^2, is one of the biggest circles in the State and past records indicated high densities of tiger, especially in the areas around Allapalli and parts of Central Chanda Division. If one assesses the possible reasons for the decline in tiger numbers, the most obvious one is the fragmentation of the habitat as a result of the refugee settlement camps set up in this area over the past 30 years and increased activity of insurgents. There is also increased access into to the area due to the large network of roads that were built to facilitate patrolling and also for development of

the region. Such fragmentation has a critical effect on an animal like the tiger. The increased accessibility and influx of outsiders into the area has also taken its toll in the form of increased poaching.

Interviews with villagers and local officials who served in this area suggested that the area still has the potential to support a good population of tigers, provided that the infrastructure available for protection is increased immediately and the monitoring is improved. Enhancement of the status of Chhaparala and Bhamragarh sanctuaries and extension of their areas could also be considered to secure the future of tiger in Allapalli, Sironcha and Bhamragarh sectors.

Trends in Tiger Populations in Protected Areas

Fifteen out of 31 protected areas in the State indicate the presence of tiger. The tiger populations in the State's three tiger reserves are estimated to be as follows: Melghat Tiger Reserve: 70-75; Tadoba-Andhari Tiger Reserve: 36-40; Pench Tiger Reserve: 12-15.

As these areas along with their adjoining forest areas harbor about 60% of the tiger population, including interstate forest areas as in the case of Pench and Melghat, it is these areas which hold promise and hope for the future of tiger conservation in the State and all out efforts should be made to secure these areas. As these reserves remain the flagship areas for the State with contiguous rich and diverse flora and fauna, including tigers and leopards, it is time for the State to direct attention and priority to these areas to strengthen management.

Trends in Population Estimates of Tigers in Maharashtra State

	1993	1996	1997	2001
Protected Areas (PAs)	140	150	163	155
National Parks	48	51	60	49
Project Tiger areas	106		115	119
Sanctuaries	92		89	89
Non-PAs	136		94	83

The tiger populations in the tiger reserves and national park have remained stable, whereas in the sanctuaries they show an increasing trend because of new areas being given protection recently.

The Principal Chief Conservator of Forests, in consultation with the chief Conservator of Forests (Wildlife), has directed all field officers in charge of non-PAs to be more vigilant and alert and continue to monitor trends.

The author is Conservator of Forests and Field Director, Melghat Tiger Reserve, and Chairman of the State Level Committee for Population Estimation (M.S.).

USE OF CAPPED LANGUR HABITAT SUITABILITY ANALYSIS IN PLANNING AND MANAGEMENT OF UPLAND PROTECTED AREAS IN BANGLADESH

by Richard E. Salter and M. Khairul Alam

Introduction

Upland protected areas in Bangladesh typically are small and include little if any undisturbed primary forest. Rather, they primarily comprise a gradation of cover types including agricultural settlements and permanent cropland areas, shrubland, scattered trees, open forest, short and long-rotation tree plantations, and limited closed forest areas. Even where natural forest cover remains it is typically fragmented, and understory and ground layers are disturbed. Previous and ongoing disturbance factors include conversion to agriculture, livestock grazing, burning, collection of fuelwood and non-timber forest products, selective felling for subsistence use, and conversion to tree plantations, the latter including periodic thinning and (potentially) clear-felling at maturity. The challenge in managing these protected areas is to understand the value of the various cover types to wildlife populations and to biodiversity conservation in general, and to ensure that vegetation cover is maintained accordingly.

The necessity that forest cover in and around protected areas be both protected and used, that some areas be at least temporarily cleared of forest cover (*e.g.,* as part of forest or plantation management), and that still others (*e.g.,* facilities sites) remain permanently devoid of forest cover, requires a decision-making system for optimizing retention of biodiversity within the context of sustainable land use management. A well-established technique for land use situations requiring simplified, easily understood multi-species management is to select one or more key or representative species, and to ensure that vegetation cover is managed in such a way that habitat suitability for this species or group of species is retained.

This paper describes the use of habitat suitability analysis as a means of assessing current value of upland protected areas and potential impacts of protected areas habitat management in Bangladesh, using the capped langur (*Presbytis pileatus*) as a key species. The capped langur was selected as a focus of the analysis because:

- it remains widely distributed in Bangladesh, occurring in most of the country's protected areas. This provides the opportunity for replicating proven habitat assessment and management techniques;
- it is considered to be endangered within its world range of eastern Bangladesh, northwestern India, northern Myanmar and a small part of southern China (Hilton-Taylor, 2000; IUCN Bangladesh, 2000), and hence is of high conservation value. Bangladesh is considered to represent the best opportunity for the long-term maintenance of a genetically viable population of this species (Stanford, 1986);
- it is essentially a forest-dwelling species that requires relatively contiguous forest cover to survive, but can also make at least some use of plantation forests, degraded forest cover and open areas. This provides the opportunity for evaluating and incorporating the value of both intact and human-influenced habitats in the analysis; and
- it is strikingly marked, easily identified and readily observed, and hence is an excellent species for use in promoting public awareness of conservation and protected areas management issues.

Habitat Suitability Analysis

Quantitative, map-based assessments of wildlife habitat suitability provide resource planners with a powerful tool for evaluating management alternatives, particularly where landscape scale assessments and predictive capabilities are required (*e.g.,* USFWS, 1981; Verner *et al.,* 1986; Irwin, 1994; Roloff and Haufler, 1997). Applications in Asia have as

yet been relatively limited, but include a variety of mapping, monitoring and planning studies, some of which have been oriented towards protected area management (*e.g.,* Porwhal *et al.,* 1996; Kushwaha *et al.,* 2000).

The methodology used in our study was a modification of the habitat suitability modelling approach initially developed by USFWS (1981). Habitat suitability models describe, in quantitative terms, the relationship between habitat suitability for a given wildlife species and measurable habitat features or other environmental variables. Habitat features and their assigned values for each species suitability model are selected on the basis of known habitat requirements, as described in the literature and/or as determined from field studies.

The modelling process permits the assignment of a species- and time-specific habitat suitability index (HSI) value for any given area, based on remotely sensed measurements (*e.g.,* from aerial photographs, satellite imagery, forest cover maps), field measurements, or both. It also permits an assessment of how habitat changes (*e.g.,* as resulting from forest harvesting, plantation establishment, forest protection) affect habitat suitability of a given area for a given species. The theoretical range of HSI values is from 0.0 (indicating no habitat value) to 1.0 (the best possible habitat). HSI values normally are assigned to circumscribed areas each having relatively uniform habitat conditions for the species in question. These HSI values can be mapped to provide a spatial portrayal of habitat quality.

An additional feature of this approach is that it permits the incorporation of area measurements; multiplying the HSI value by area yields Habitat Units (HUs), which can be summed to obtain a measure of the habitat value of large, diverse areas within which a series of HSI and HU values have been calculated. This permits an evaluation of spatial changes in habitat availability over time, and/or in response to different management regimes.

Wildlife species selected for habitat suitability analysis generally are broadly representative of local wildlife communities in terms of habitat use, but may also be economically important, threatened, or conform to some other defined criteria. In our study, the capped langur broadly represents leaf and fruit-eating species that are able to utilize a variety of forest types, including forest edges, plantations and regenerating forest areas.

Study Area

The capped langur habitat suitability model was initially developed as part of the management planning process for Lawachara National Park, located in the hill forest zone of northeastern Bangladesh. A five year management plan was prepared for this area in mid-2000 by the Forestry Sector Project, for implementation by the Bangladesh Forest Department (Tecsult, 2000). This plan delineated a resource management and protection programme that included provisions for land use zoning and other measures for managing human land use. The capped langur habitat suitability model was developed and incorporated in the plan in order to assess the current status and distribution of wildlife habitat, to guide the development of land use zoning and other management measures, and to provide a quantitative, transparent basis on which to base ongoing decisions on management of forest cover during plan implementation.

Lawachara was gazetted as a National Park in 1996, and comprises slightly less than the southern half of the 2600 ha West Bhanugach Reserve Forest (RF). The Park covers an area of low hills formed primarily from soft sandstone, and originally supporting a vegetation cover of mixed tropical evergreen forest (Das, 1968; Alam, 1988). Most of the original forest cover has been removed or substantially altered, and the conservation value of the Park now stems from old plantations (dating back to 1921) of primarily indigenous species that have developed a tall, multi-storied structure, including regrowth of creepers and naturally occurring tree and undergrowth species. In the oldest of these areas, the vegetation cover has taken on the structure of natural forest, and evolution towards a natural structure and species composition is expected to continue with the implementation of protective measures. An estimated 483 ha of plantations over 50 years

of age are included within the Park, representing 40% of the total area. Much of the remainder of the area (244 ha, or 20%) is covered by mixed species plantations greater than 25 years of age. A proposed extension of 281 ha adjoining the Park to the north incorporates most (189 ha) of the remaining plantations in the RF that are greater than 25 years old.

In addition, some remnant patches of rich primary forest remain, most significantly including an 8.6 ha, unlogged research plot in the proposed Park extension (currently under the stewardship of Bangladesh Forest Research Institute), but also including small patches of natural forest cover now incorporated in old plantation areas within the Park. Other areas of natural forest cover (approximately 130 ha) are utilized for betel-leaf cultivation, and although the structure of these forests has been altered by the annual removal of undergrowth and the removal of lower limbs to provide a substrate for the growth of betel vines, the overstory composition remains essentially intact (Alam and Mohiuddin, 1995). In addition to their *in situ* conservation value, these natural forest patches represent a seed bank for enrichment planting in other areas of the Park. The betel leaf cultivation areas also retain the potential for conversion back to natural forest structure.

Other major cover types occurring in the Park and proposed extension are long-rotation plantations less than 25 years of age (186 ha) and short-rotation plantations (171 ha). Cane and bamboo plantations, failed plantations, experimental plantations, agriculture, transportation and utility corridors and Forest Department offices and camps comprise the remaining area (91 ha). The portion of West Bhanugach RF outside of the Park and proposed extension is covered primarily by short-rotation plantations (486 ha), long-rotation plantations (320 ha), and agriculture (185 ha), with smaller areas of failed plantations, brush and low forest (107 ha). Lands adjacent to the RF (including the Park and proposed extension) are predominantly managed as tea estates.

The Park is crossed by a local highway, a railroad line and power transmission corridors, which in addition to habitat loss represent sources of mechanical and human disturbance to the capped langur population, and habitat fragmentation. The area is also heavily used for fuelwood and other NTFP collection by people from outside, representing an additional source of human disturbance and some forest habitat degradation. The Park incorporates two villages (63 households), and two others (total 147 households) are located on the periphery.

The Park is well known for its avifauna, which includes at least 237 resident and migratory species. It also supports a primate community of at least seven species, which in addition to capped langur includes slow loris (*Nycticebus coucang*), pig-tailed macaque (*Macaca nemestrina*), rhesus macaque (*M. mulatta*), Assamese macaque (*M. assamensis*), Phayre's leaf-monkey (*Presbytis phayrei*), and hoolock gibbon (*Hylobates hoolock*).

Model Development

The first step in development of the capped langur habitat suitability model was a review of relevant field studies to identify what environmental features are the best predictors of habitat suitability for this species. The background review focussed on the life requisites of food, cover and special habitat requirements such as space (minimum area) and juxtaposition of habitat components, and on the effects of habitat change.

This review indicated that high quality capped langur habitat is characterized by:

- mature, closed canopy moist deciduous or semi-evergreen forest, with gaps and openings providing forest edge habitats;
- a species mix of fruiting and leaf-bearing trees that provides a year-round food source;
- low levels of mechanical and human disturbance; and,
- contiguous areas of habitat sufficiently large to support a genetically viable population.

In the HSI approach to habitat assessment, species-specific HSI values normally are calculated or otherwise assigned to defined areas or land units with uniform ecological conditions. Typically these areas are vegetation types or other habitat units derived from forest cover, biophysical or other ecological maps. The next step in model

development was therefore a review and assessment of available mapping for the Park and surrounding area, in order to identify the land units within which the model would be applied.

The Resource Information Management System (RIMS) database maintained by the Forest Department was assessed as being the best available descriptor of land units having uniform ecological conditions. This database, and associated mapping based on interpretation of SPOT satellite imagery, existing forest cover maps, topographic maps and FD plantation records, has the following features:

- it divides the whole of West Bhanugach RF (including all of the Park and proposed extension) into 88 polygons based on current vegetation cover (natural forest, long-rotation plantations, short-rotation plantations, bamboo, agriculture *etc.*);
- it provides an identification number and area measurement (varying from 2.3 to 196.6 ha) for each polygon; and,
- (for plantation areas), it includes information on year of establishment and species planted.

The final step in model development was to develop a standard table for assigning HSI values to each polygon type. Measures of habitat structure (stand maturity, canopy closure, fruiting tree abundance) were not available for individual polygons, but were inferred from cover type, species composition and stand age descriptors in the database, and on the basis of limited field checking. A judgement of how well these inferred measures match the habitat requirements of capped langurs was then used to assign generic HSI values to each generalized land use type (Table 1). This provides a first approximation of the overall suitability of habitat in any given polygon, on a scale of 0.0 to 1.0.

Table 1: Habitat Suitability Index values for capped langurs assigned to generalized land use types

		Inferred value of:		
Land use type	**Stand age**	**Canopy closure**	**Fruit tree abundance**	**Assigned HSI value**
Natural forest (high forest)	old	closed	high	1.0
Natural forest (low forest)	mid	near closed	moderate-low	0.6
Natural forest/betel garden	old	closed	low-nil	0.4
Long-rotation plantations:				
>50 years old, mixed species	old	closed	high	1.0
>50 years old, mostly teak	old	closed	moderate	0.8
=50 but >25 years old, mixed species	mid	closed	moderate	0.8
=50 but >25 years old, mostly teak	mid	closed	moderate-low	0.6
=25 but >10 years old, mixed species	young-mid	near closed	low	0.6
=25 but >10 years old, mostly teak	young-mid	near closed	low	0.4
=10 years old	young	open	nil	0.2
Short-rotation plantations:				
>10 years old	young	near closed	low	0.2
=10 years old	young	open	nil	0.1
Bamboo, scrub, failed plantations	young	no canopy	low	0.2
Agriculture	N/A	N/A	nil	0.1
Transportation/utility corridor	N/A	N/A	nil	0.0

The assignment of HSI values in Table 1 assumes that there is a direct relationship between habitat structure (*i.e.,* as described by stand age, canopy closure and fruit tree abundance) and utility as capped langur habitat, and that there is a continuum from the best habitats (old, closed canopy habitats with high food abundance) downward to habitats having little or no value (young, open habitats with low food abundance). On this basis

natural forests and old, mixed species plantations provide the best capped langur habitat (having the requisite food trees, sleeping trees and closed canopy required for travel), and degraded or converted areas such as scrub and bamboo, young and/or exotic plantations, agriculture and other encroached areas provide much reduced or no habitat value.

Assigned HSI values for predominantly teak plantations are lower than for mixed species plantations of the same age, based on the observation that teak tends to shade out the growth of other species, resulting in a generally poorer forest structure and much lower diversity of fruiting trees. Also, although teak is used for feeding by capped langurs, it sheds its leaves and hence does not provide a year-round food source.

Short-rotation plantations are assigned low HSI values because fruiting trees are not normally planted as short-rotation crops, and the rotation period is too short for natural ingress and development of fruiting species. Short-rotation plantations do, however, provide a source of leaves that can be used as food, presumably mostly in near-mature plantations that have the tallest and best developed trees, and which provide at least minimal escape cover in addition to a food source.

Agricultural lands are assigned a very low HSI value on the assumption that use occurs only when adjacent forest habitats are degraded, and that agricultural lands themselves are not valuable capped langur habitats.

It needs to be borne in mind that the assigned HSI values in Table 1 are "averages" for the given land use type. Actual value as capped langur habitat is likely to differ among polygons of the same land use type (*e.g.*, within natural forest, one patch will have a somewhat higher or lower value than any other patch, and within the 25-50 year old mixed species plantation type, 1950 plantations will generally have a higher value than 1974 plantations), but these differences are considered unlikely to be important within the overall accuracy level of the model.

Model Application

The capped langur HSI model was applied to three scenarios:

1. A "pre-development" scenario representing a recreation of conditions that would prevail had no plantation development or other human uses of forest occurred in the area (*i.e.*, if all of the area had remained covered by mature evergreen and semi-evergreen forest). For purposes of this scenario, it was assumed that all of the area had an HSI value of 1.0 prior to development.
2. A "current" scenario representing current (year 2000) area and type of forest cover, including plantations and other land uses, as determined from the RIMS database and limited field checking. This scenario utilized the HSI values in Table 1. However, the calculated habitat value of each polygon (standard HSI multiplied by area) was reduced by 10% to account for reduced utilization by capped langurs in response to human presence (small-scale woodcutters and other NTFP harvesters). Based on the observation that human use was continuous and widespread, this reduction was applied throughout the area.
3. A "management plan implementation" scenario representing area and type of forest cover that will be retained and/or developed under the management zoning and forest management schemes outlined in the Park's management plan. For purposes of this scenario, current vegetation cover in all Ecosystem Management Zone and Habitat Management Zone polygons was "aged" by 10, 25 and 50 years, HSI values equivalent to these forest/plantation ages (see Table 1) were reassigned, and HU values were recalculated. The following assumptions also were applied:

- that all short-rotation plantation areas in Habitat Management Zones will be converted to permanent tree cover using "framework" species (defined as fast-growing species that also are attractive to seed-dispersing wildlife) for forest restoration and enrichment planting, and that HSI values will therefore be equivalent to long-rotation, mixed species plantations;
- that plantations currently comprised mostly of teak will be converted to mixed species plantations, using framework species and/or capped langur food trees (HSI equivalent to long-rotation, mixed

species plantations);

- that the disturbance effects of human presence and mechanical noise will be removed within 10 years;
- that all Transportation Corridors, Intensive Use Zones, Village Use Zones and Sustainable Use Zones will continue to be utilized for their stated purpose, and will retain the same HSI values throughout; and,
- that External Buffer Zones and the remainder of West Bhanugach RF will be maintained under periodically harvested short-rotation plantations (HSI value therefore equivalent to short-rotation plantations).

For both the current and management plan implementation scenarios, areas occupied by transportation and utility corridors were assigned an HSI value of zero, reflecting a complete loss of habitat within these long, narrow corridors due to vegetation clearing. These corridors may also act as partial barriers to langur movements, depending on width, length, and location in relation to sleeping and feeding areas. Construction and maintenance of such corridors may thus make some segments of otherwise suitable habitat less accessible, and expose capped langurs that do cross them along the ground to increased risk of predation and traffic mortality. Although this barrier effect may generally lower habitat suitability where forest cover is segmented by corridors, the effect is not sufficiently predictable to be incorporated in the model application. It may be at least partially counteracted by a proclivity for feeding in the proximity of forest edges and gaps, although the overall impact of corridors on habitat suitability for langurs is still likely to be negative.

Similarly, other low value habitats (*e.g.,* agricultural areas, newly established plantations) may effectively inhibit capped langur movements through or across them. Depending on size and other factors (*e.g.*, history of land use), otherwise suitable habitat may not be used or may be used only minimally when surrounded by such low value habitat areas. This habitat fragmentation effect is not sufficiently predictable to be included in the model application, but is at least partially reflected in the general lowering of calculated habitat availability (HSI value multiplied by area) where low value habitats are extensive.

Observations from Model Application

Results of application of the capped langur HSI model to the pre-development, current and management plan implementation scenarios are summarized in Table 2.

Table 2: Availability of capped langur habitat under different development scenarios

	Number of Habitat Units				
Scenario	**Notified NP area**	**Proposed NP Extension**	**Proposed External Buffers**	**Remainder of West Bhanugach RF**	**Total**
Pre-development	1221	281	87	1011	2600
Current	584	130	14	193	921
Management plan implementation (10 years)	873	188	14	193	1268
Management plan implementation (25 years)	925	251	14	193	1383
Management plan implementation (50 years)	952	268	14	193	1427

When interpreting these results it needs to be borne in mind that the model utilizes only a crude measure of habitat conditions, and that changes in habitat availability indicated by the model results are best viewed as overall trends. The model results do, however, provide useful

insights into changes in temporal and spatial availability of capped langur habitat in relation to land use and management actions. The results of the model application suggest that:

1. Only approximately 35% of the original (pre-development) capped langur habitat that occurred in West Bhanugach RF remains (*i.e.*, 921 of 2600 HUs).
2. Of the currently available habitat (921 HUs), most is located within the existing Park boundaries (584 HUs, or 63%) and the proposed extension (130 HUs, or 14%). However, even within these areas capped langur habitat has been reduced to a fraction of its pre-development level; only 48% of original habitat within the Park and 46% of original habitat within the proposed extension remains. The External Buffer Zones and remainder of West Bhanugach RF also retain some habitat value (207 HUs, or 22% of total currently available habitat), but these areas have been greatly modified and currently available habitat is less than 20% of the pre-development level.
3. Clear-felling of 62 ha of mature plantation in the proposed extension during late 1999-early 2000 removed 33 HUs, comprising approximately 20% of the then available capped langur habitat in the proposed extension, and ~4% of the then available habitat within the whole of West Bhanugach RF.
4. Remaining capped langur habitat occurs in a contiguous block, with the exception of the western External Buffer Zone which is cut off by the above clear-felled area. Currently available habitat is a mosaic of low, moderate and high suitability areas, with most of the moderate and high suitability habitat included within the Park and proposed extension. Low suitability areas generally are confined to the remainder of West Bhanugach RF, the External Buffer Zones, and peripheral areas of the Park (Figure 1).
5. Within the Park and proposed extension, 82 ha (5% of area) are currently classified as non-habitat (HSI=0.0), 360 ha (24%) as low suitability habitat (HSI=0.1-0.3), 477 ha (32%) as moderate suitability habitat (HSI=0.4-0.6) and 584 ha (39%) as high suitability habitat (HSI=0.7 or more).
6. Implementation of the management plan could potentially increase capped langur habitat availability within the Park and proposed extension by a predicted 346 HUs after 10 years, 461 HUs after 25 years, and 505 HUs after 50 years, representing increases of 48%, 64% and 71% over current levels. This increase would be achieved by expanding the spatial extent of capped langur habitat (*i.e.*, by converting current non-habitat areas to useable habitat) and by improving the suitability of current habitat areas.
7. Achievement of gains in capped langur habitat would require close adherence to the forest management prescriptions outlined in the Park management plan. Chief among these are:
   - retaining all existing mature/maturing forest cover;
   - adding the proposed extension to the Park;
   - converting selected areas to mature forest cover by planting framework tree species;
   - using selected capped langur food plants as framework species;
   - avoiding creating gaps in forest cover, especially linear gaps; and,
   - narrowing existing linear gaps by planting framework tree species along margins.
8. Predicted capped langur habitat availability within the Park and proposed extension after 50 years of management represents approximately 80% of pristine or pre-development habitat. A complete return to pristine conditions is not possible because selected areas are zoned such that they are permanently removed from the capped langur habitat base (5.0 ha of Intensive Use Zone, 14.8 ha of Transportation Corridor, 18.5 ha of Village Use Zone). Also, a large area (318.6 ha) currently designated as Sustainable Use Zone provides very limited capped langur habitat, and for purposes of the management plan implementation scenario it has been assumed that this will continue to be the case. Reduction in the area currently designated for betel leaf production (129.8 ha) and under short-rotation plantations (170.7 ha), and conversion of the recaptured areas to a natural forest management regime, could potentially result in additional gains in capped langur habitat area. However, the

potential for conversion is limited given current and expected future land use demands within the Park.

Discussion and Conclusions

The capped langur was selected as a key species representing the biodiversity of mature evergreen/semi-evergreen forest and earlier seral stages. As such, retention and expansion of these habitat types is expected to benefit all other included species. Because it is generally representative, the capped langur model provides useful insights into total current habitat availability, spatial extent of suitable habitat, and potential impacts of management measures on the forest wildlife community as a whole. This makes it an extremely useful tool for incorporating biodiversity conservation considerations into protected areas boundary delineation, zoning, and habitat management and monitoring over time. Because the model mechanics are simple and transparent, and the results are amenable to mapping, the model is also a useful tool for demonstrating and discussing the benefits and drawbacks of selected management measures across a wide variety of audiences, including land use planners, protected area field managers, visitors and resource users.

In addition to West Bhanugach RF/Lawachara National Park, the capped langur model has been formally applied to Tarap Hill RF/Rema-Kalenga Wildlife Sanctuary, approximately 30 km to the southwest. This application showed that less than half of the original (pre-development) habitat that occurred in the RF remains, that most of this habitat is located within the notified sanctuary boundaries, and that (similar to Lawachara) implementation of selected management measures could potentially increase capped langur habitat within the sanctuary and buffer zone over the long term.

Although currently considered endangered in Bangladesh due to habitat loss (IUCN Bangladesh 2000), capped langurs remain widely distributed in the mixed evergreen hill forests of the northeast and southeast, and in the deciduous (sal) forests of the central part of the country, with strongholds in a number of protected areas. This broad but locally concentrated distribution makes it an ideal focal species for the uniform development and application of conservation measures across most of Bangladesh's current and proposed protected areas, with the notable exception of the Sundarbans mangroves. The habitat suitability model presented herein is broadly applicable within the mixed evergreen hill forest zone, but modifications would be required for application in deciduous forest areas.

Habitat suitability assessments for additional species can easily be developed for other areas or other applications. For example, a hoolock gibbon model was developed and applied as part of the management planning process for Lawachara. Hoolocks are much more restricted to mature, contiguous forest areas than are capped langurs, and are more sensitive to human and mechanical disturbances, and incorporation of these features in the model provided useful insights during the management planning process. However, this species is much rarer and has a much more limited distribution than the capped langur, and hence the model is less widely applicable.

The main management aim in most of Bangladesh's protected areas is retention of maximum extent of forest cover, and maintenance of this forest cover in the best possible condition, to ensure long-term biodiversity conservation. Key species that utilize high, closed canopy forests (such as capped langurs and hoolock gibbons) are therefore the first choice for habitat suitability modelling. However, the RIMS database, which currently covers most of Bangladesh's forested areas, also contains sufficient information to enable modelling for species that primarily use secondary vegetation, a good example being the Asian elephant (*Elephas maximus*). A habitat suitability model for this species is currently being developed and applied to Teknaf Game Reserve (which was established specifically for purposes of elephant management), and used for evaluating proposed extensions, zoning, habitat management measures, and movement corridors. Although developed specifically for habitats found in southeastern Bangladesh, the model will also be applicable to other areas, and (with modifications) much more broadly within this species' regional range.

Based on the experience accumulated elsewhere in world over the past 20 years, and more recently in Bangladesh and elsewhere in Asia, it can be concluded that habitat suitability analysis for selected key species is a productive, broadly and readily applicable, and easily understood tool for protected areas planning and management. Primary requirements are a spatially based habitat (or vegetation) classification system, and a good understanding of key species habitat requirements.

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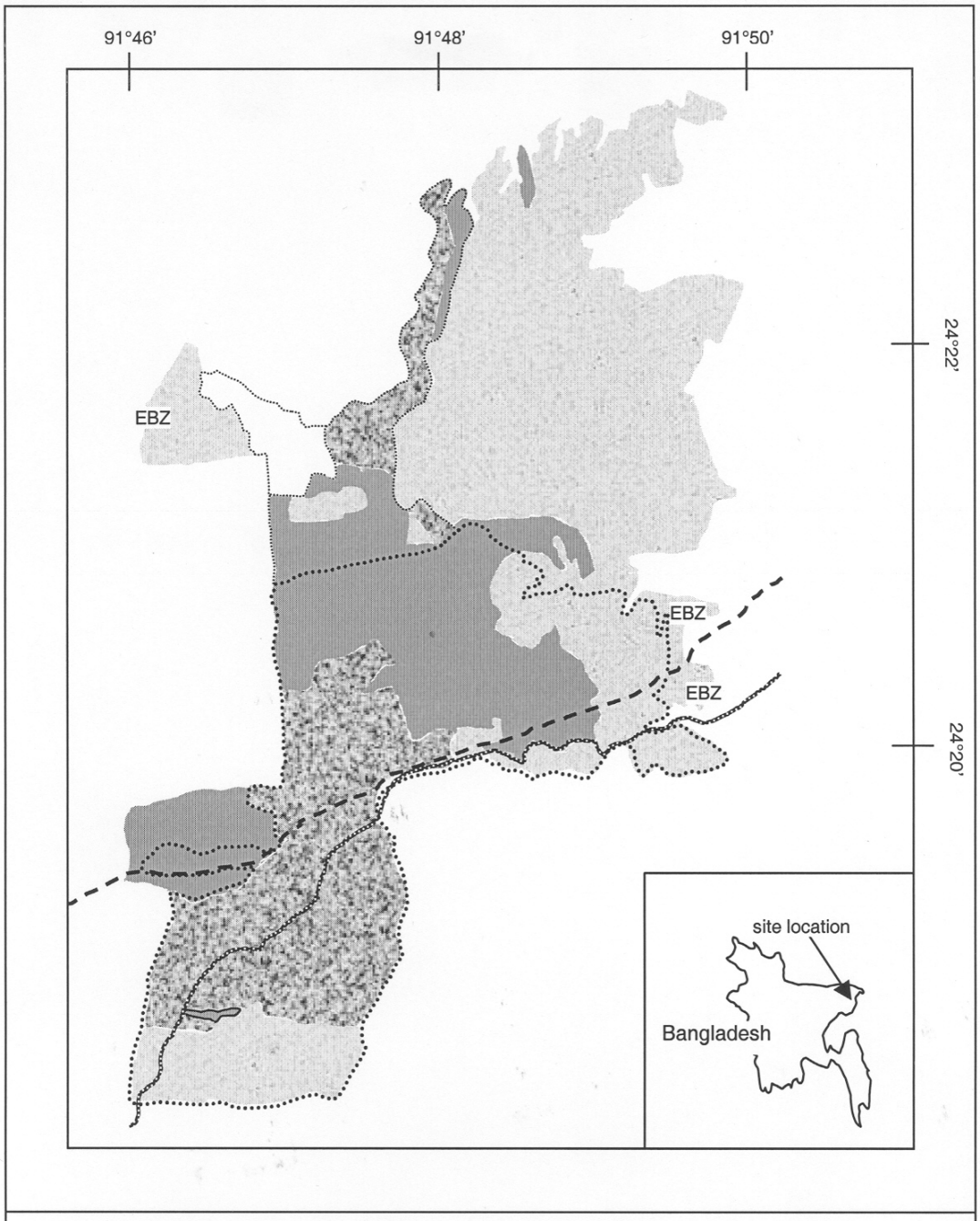

Figure 1. Current habitat suitability for capped langur in West Bhanugach Reserve Forest

- non-habitat (HSI = 0.0)
- low suitability habitat (HSI = 0.1-0.3)
- moderate suitability habitat (HSI = 0.4-0.6)
- high suitability habitat (HSI = 0.7-1.0)
- railway corridor (comprises ~10 m width of non-habitat)
- highway corridor (comprises ~10 m width of non-habitat)
- Lawachara National Park boundary
- proposed park extension
- EBZ proposed External Buffer Zone

scale

1 km

ECO-FRIENDLY MANAGEMENT OF ROSE-RINGED PARAKEET (*Psittacula krameri*) IN WINTER MAIZE CROP

by Tejdeep Kaur Kler

Introduction

Agricultural bird problems in India and elsewhere in the world are as old as agriculture itself. Birds are known to cause considerable economic damage to a variety of crops viz, pearl millet, sorghum, maize, sunflower, wheat, apple, banana, etc. during vulnerable stages (Dhindsa and Saini, 1994). Among cereal crops, maize is particularly vulnerable to avian attack during the sowing, seedling and ripening stages. Rose-ringed parakeet (*Psittacula krameri*) and the house crow (*Corvus splendens*) have been identified as proven 'pest' species (Dhindsa *et al.*, 1992).

Punjab is a small state (50,376 km^2) in northwest India, and is known as the grain bowl of the country with a net sown area of 4,237 thousand ha out of a total geographical area of 5,036 thousand ha (Anon[2], 2002). Maize occupied 163 thousand ha with a production of 427 thousand ha in Punjab State in the crop year 1999-2000 (Anon[2], 2002).

Materials and Methods

In the present study, the combined potential of two or more bird scaring/deterring methods like reflective ribbon, manual drumming and scarecrows was tested on the 'sheetal' variety of winter maize at its different developmental stages (e.g. silky, milky and maturing grain stages) to assess their effectiveness in providing crop protection from avian pests. The test was carried out at Punjab Agricultural University, Ludhiana, Punjab.

Winter maize was sown on 4 November in an area of 0.80 ha, as per agronomic practices recommended by Punjab Agricultural University (Anon[1], 2001). Rose-ringed parakeet was the main pest species in the study area and its surroundings.

In the experimental field, combining the use of reflective ribbons and manual drumming to scare away the birds was tested at the silky and milky developmental stages of winter maize. Reflective ribbon was strung about 30 cm above the crop height and installed at 5 m intervals across the field in parallel rows, perpendicular to the prevailing wind direction. Manual drumming was carried out for two hours a day in the morning and evening. The application of these two methods was disrupted by unfavorable weather conditions for three days at the crop's milky stage with more than 90% grain setting. In addition to the these methods, scarecrows were set up in the field from the maturing grain stage up to the crop harvesting stage. The scarecrows were raised 1 m above the crop height and had human-like heads supported on wooden sticks and were clothed in human dress. The position of the scarecrows was changed at 10-day intervals.

Bird damage estimates were made by randomly examining 25 cobs each from the north, south, east and west peripheral rows and 100 cobs from the central portion of the crop field at different developmental stages up to harvesting of the matured crop. The percentage of the surface area of each cob damaged by birds was visually estimated and the average damage for the field was calculated from the data (Dhindsa *et al.*, 1989). Similarly, an unprotected field of almost the same size, situated at a distance of 300 m from the protected field, was selected and 100 cobs were taken both from the field periphery and the central portion; damage values were accordingly estimated.

Bird-related observations were taken once or twice a day in the morning or evening from the initiation of tassel formation up to its harvesting.

Results and Discussion

The 'sheetal' variety of winter maize matures in 180 days and tassel formation starts about 147 days after sowing. Rose-ringed parakeets were observed attacking the crop at the initiation of tassel formation on 21 March. Rose-ringed parakeets inflicted damage by cutting the stem of the developing tassel at its base and were later seen perching on trees in the vicinity of the experimental field with tassels firmly held in their curved beaks, which they then ate undisturbed. Flocks totaling about 50 parakeets were observed in the experimental field. During the entire period, manual drumming was also done. Birds were seen shifting their positions/places in the field to avoid the drummer, but did not leave the field altogether. Loss of tassels at this stage was #1% from the entire field area. It is the first time that the tassel formation stage was observed to be vulnerable to rose-ringed parakeet attack in India. At this stage, the study area was surrounded by maturing wheat (*Triticum aestivum*) on the eastern and southern peripheries, bordered by a road to the north, and by a field of maturing gobhi sarson (*Brassica napus*) on the west side. There were nearly 10 trees (mainly of *Eucalyptus* and *Morus* spp.) on the road side, which provided excellent bird perching/roosting sites. Electric wires also passed over the field area.

Reflective ribbon was installed on 8 April at the silky stage of winter maize. Manual drumming was also kept up. For 18 days after the installation of the reflective ribbon, virtually no rose-ringed parakeets entered the experimental field. Parakeets approaching the field from above were observed to abruptly change their direction to avoid the reflective ribbon bedecked field, landing instead on electric wires or trees. A flock of 40-50 rose-ringed parakeets remained in the area, roosting in the trees, and were observed switching over to feed on maturing gobhi sarson in the adjoining field. The weather was sunny and hot (>32°C); during the period of sunshine the reflection and humming noise produced by the reflective ribbon scared the rose-ringed parakeets away from the entire field. The effect was striking as it is usually difficult to alter the established feeding pattern of rose-ringed parakeets.

The combined effect of reflective ribbon and manual drumming was found to provide 100% protection to the winter maize from rose-ringed parakeet attack during the 18 day post-installation period and the crop reached the milky stage with $90% grain setting. At this stage, harvesting of wheat and gobhi sarson was in progress in the adjacent fields.

Strong winds and cloudy weather conditions prevailed on 28 April, which tore down the parallel rows of reflective ribbon almost completely, plus making it ineffective under poor light conditions.

Rose-ringed parakeets took full advantage of the situation and re-entered the field and began feeding on the cobs. An avian damage assessment was made on 29 April, revealing that the mean damage was 1.5±2/78, 0.25±8.87 and 5.25±7.33 on the north, south, east and west peripheral rows of the crop and 0.69±2.82 in the central portion of the field. Peripheral damage was more severe on the west side as the adjoining field had freshly harvested gobhi sarson still lying in the open. The overall mean peripheral damage value was 2.44±6.22, which is greater compared to the mean damage value of 0.69±2.82 calculated from the central portion. These results indicate that the birds avoided venturing deep into the field.

The repaired reflective ribbon was re-installed on 29 April and the scarecrows were erected in the field to stop the onslaught of bird attacks. Manual drumming was also carried out. Rose-ringed parakeets gradually re-entered the winter maize field, with 12-18 birds counted feeding on the periphery and others soon joining them. A possible reason for this may be that the birds got habituated to the reflective ribbon and drumming. Another factor could be the non-availability of alternative food in the adjoining fields. The pre-harvest damage estimate was made on 11 May, with results indicating that the mean damage value was 4.91±12.26 on the peripheral rows as compared to 0.6±3.10 from the central portion of the field. Bird damage stress was again higher on the periphery.

The damage values of 4.51±1.01 and 2.12±3.95 from the periphery and central portion of the unprotected field are significantly higher than respective values from the protected field at the milky stage. Similarly, damage values of 10.34±17.21 and 3.11±7.15 calculated from the peripheries and central field are significantly higher than from the protected field at the maturing grain stage. In the unprotected field, a flock of 40-50 rose-ringed parakeets were observed inflicting damage at the milky and maturing grain stage.

These eco-friendly bird scaring techniques to protect crops have enormous potential for repelling pest bird species. The absence of alternative crops in the vicinity, unfavorable weather conditions, the location and area of the crop under cultivation and pest bird habitations are among the factors that will influence the response of pest species to different management techniques. Combining the use of more than one method can have an added benefit under such circumstances. These methods are simple, inexpensive, safe, effective and easily acceptable to farmers. They only need to be modified with further imaginative installation techniques to repel or remove pest species for longer time durations.

Acknowledgments

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Table 1: Combined effect of reflective ribbon, manual drumming and scarecrows on the avian damage to winter maize crops

Stage of crop	Bird scaring method adopted	Post-Installation period of bird scaring method	Protected field Surface area of cobs damaged (%) Mean ±S.E.						Unprotected field surface area of cobs damaged (%) Mean ±S.E.	
			Field Periphery					Central portion of the field		
			N	S	E	W	Over all value			
Tassel formation stage	Manual drumming	10	<0.6%					<0.4%	Field Periphery	Central portion of the field
Silky stage	Reflective ribbon + manual drumming	12	Nil					Nil	Nil	Nil
Milky stage	Reflective ribbon + manual drumming	6	Nil					Nil	4.51±1.01	2.12±3.95
	Damaged reflective ribbon	For three days	1.5± 2.78	0.25± 1.09	2.75± 8.87	5.25± 7.33	2.44± 6.22			
Matured grain stage before harvesting	Reflective ribbon + manual drumming + scarecrows	12						0.60±3.10	10.34±17.21	3.11±7.15

THE WILDLIFE VALUE: EXAMPLE FROM WEST PAPUA, INDONESIA

by: Freddy Pattiselanno

Introduction

The latest assessment indicates that West Papua Province (formerly Irian Jaya) has the highest value of biodiversity and endemism level of flora and fauna in Indonesia. The faunal species include 146 mammals, 329 reptiles and amphibians and 650 birds that are present and utilize a variety of ecosystems as their natural habitat in West Papua. This accounts for more than 50 percent of Indonesia's biodiversity (Conservation International, 1999). Petocz (1994) stated that West Papua has a wide variety of ecosystems situated from the coastal to highland areas, providing a unique and specific habitat for the distribution of endemic animals.

The flora and fauna are very important natural resources which are utilized by many people in West Papua to fulfill their daily needs. For example, many people in West Papua value forests for the benefits obtained from the extraction of plants and animals

The present paper reviews and discusses the results of research on wildlife in West Papua, in terms of local peoples' approaches to the value and utilization of wildlife as natural resources. This could contribute to the decision-making in connection with wildlife management aspects.

Endemic Species

From previous exploration and research it is known that most of the well known endemic species in West Papua are mammals and birds. Other species (e.g. reptiles, insects and amphibians) are now being seriously studied to make up for the lack of information about these species and their existence has become an interesting part of the research regarding the issue of biodiversity and conservation.

According to the Biodiversity Action Program for Indonesia (1993), some endemic bird species that are being added include cassowary *(Casuarius benneti)*, megapodes (*Aepypodius arfakianus*), crowned pigeon (*Goura christata),*, and bird of paradise (*Paradisea minor*). In addition, several mammals were identified by Petocz (1988) as endemic species from West Papua, including: porcupine (*Zaglossus bruijni*), cuscus (*Phalanger gymnotis*, *P. orientalis, Spilocuscus maculatus*), bandicoot (*Echymipera kalubu*, *Isoodon macrourus*), kangaroo (*Dendrolagus inustus*, *Macropus agilis*), bats (*Pteropus* sp, *Nyctimene albiventer*), and rodents (*Hydromys chrysogaster, Melomys lorentzi*).

Wildlife Utilization

For the people in West Papua, hunting is one of the main ways of living. McKinnon (1984) and Petocz, (1994) have indicated that in the past, hunting activities by local communities in West Papua were important for catching animals for food and for use in ceremonies. People in the Cenderawasih Bay area often use traditional weapons and traps to catch animals for subsistence hunting (Pattiselanno, *et al.*, 1999).

According to Beehler (1985), some birds were hunted not only for food, but also for their plumes. He concluded that the most prominent birds being hunted for food are three species of crown pigeons. Moreover, certain birds (e.g. New Guinea eagle, vulturine parrot, bird of paradise) are utilized for the valuable parts of their plumes.

Others hold the point of view that wildlife is also valuable because people can earn money from them, in other words for their commercial value. Whitaker *et al.* (1985) cited by Wibowo and Suyatno (1998), noted that since the 1950s, in Mamberamo and Merauke, the two species of crocodiles (*Crocodylus porosus* and *C. novaeguineae*) have been heavily hunted for skins, which are sold in great number due to the premium price they bring. According to Philip (1999), certain kinds of lizards (*e.g. Varanus jobiensis*) in Birds Head Peninsula (West Papua) were trapped by local hunters and sold to local reptile dealers.

Wildlife also used as a symbol by some institutions in West Papua to remind people how important and valuable our wildlife resources are. For example Cenderawasih University in West Papua uses the bird of paradise as a logo. Merauke, one of the cities in West Papua province, has been nicknamed the 'city of deer', because it is well known for itsdeer habitats in West Papua.

Another example is the role of the Bird and Orchid Park in Biak, as a source of wildlife information in West Papua, which is not only important for ecotourism, but also in terms of education and scientific purposes. Many papers have been produced from this park based on research conducted by students and researchers in West Papua. The Forestry Research Institute is now developing their research station in Manokwari to study the natural habitats of some endemic birds and mammals of West Papua.

Government Policy

Much of the loss of biodiversity in West Papua and elsewhere is due to misguided economic policies that encourage rapid rather than sustainable exploitation of biological resources (Craven, 1989). To define biodiversity conservation as it relates to economic development in Indonesia, a national action plan for biodiversity is being prepared by the government to provide guidance in preparing a rational plan for action and investment in biodiversity conservation (National Development Planning Agency, 1993).

In collaboration with the Indonesian Government's Directorate General of Forest Protection and Nature Conservation, a conservation and development strategy is being developed for West Papua Province to designate terrestrial and marine protected areas as national parks, nature reserves, game reserves and recreational reserves. Moreover, new legislation regarding the conservation of natural resources and ecosystems and the basic law on environmental management are being enacted to protect the biodiversity.

People's Concern for Wildlife

Regarding the issue of wildlife conservation, some well-known NGOs such as WWF, WCS and CI are now establishing branch offices in West Papua to run programs to protect the wildlife from the extinction. They also collaborate with local NGOs on some research projects with financial support from some donor countries. Some scholarships and research funding are being offered to students who are interested in wildlife study and

research. Awards will also be given to local people who have practiced wildlife conservation, as a part of increasing people's awareness.

Conclusions

The biodiversity in West Papua is from the richness of the natural resources that have many different values to the people. As concern over the issue of wildlife conservation is now increasing, the Government should recognize the value of wildlife not only for the development of the province, but also for the conservation of the wildlife itself. Wildlife conservation is a global concern and even foreign nations (through WWF, WCS and CI) have been willing to provide financial support for research and wildlife development.

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THE BUTTERFLY FAUNA OF VISAKHAPATNAM IN SOUTH INDIA

by C. Subba Reddi, J.B. Atluri, S.P. Venkata Ramana and G. Meera Bai

Introduction

Three important ecological objectives of the world conservation strategy are: 1) maintenance of essential ecological processes and life-supporting systems; 2) preservation of genetic diversity; and 3) insurance of sustainable utilization of species and ecosystems. The insects (Arthropoda:Insecta) are a vital component of the life-supporting system that requires intelligent management, both to restrain harmful species and to conserve and augment beneficial species. The insects are the most numerous of all terrestrial animals, both in terms of species and total abundance. Their numerical abundance is amazing with estimates of over 10 million species, around 60,000 of which occur in India.

Insects take part in such natural processes as pollination of flowers, decomposition of dead organisms, and form important links in the food chains, thus playing real and vital roles in maintaining the balance of nature. Maintenance of key species contributes to the stability of ecosystems and their sustainability.

Among the flying land insects, the butterflies (Lepidoptera:Rhopalocera) are the most beautiful, surpassing many of the larger animals in loveliness and color. They are the most popular and attractive of insects and can be easily seen. The variety of color combinations and patterns and the characteristic shapes of their wings provide immense aesthetic joy. India is virtually a paradise of butterflies, supporting 1,500 species of the world's estimated total of 20,000 species. Thus, India is known for its rich butterfly fauna, one of which is the Krishna peacock butterfly, found in northeast India and one of the most beautiful butterflies in the world.

The Western Ghats enjoys a rich butterfly diversity, including the southern birdwing and the Malabar banded peacock, neither of which are found anywhere else in the world. An impressive 250 species occur along the east coast of India. Poaching of these spectacularly showy and fascinating butterfly species is widely prevalent in the country and no less than 50,000 specimens are smuggled out of the country every month. The Government of India has extended the scope of the Wildlife (Protection) Act, 1972 to the butterflies in order to curb the poaching and smuggling trade of butterflies.

Since butterflies are holometabolous, their life history is rather complicated with four distinct stages: egg 6 larva 6 pupa 6 adult. The larvae represent the early stage of feeding and growth. They are entirely phytophagous and, therefore, the butterflies are dependent on the presence of food plants in sufficient quantity for their larvae to feed upon. The larvae consume the food voraciously and accumulate energy reserves for use in the metamorphic process in the quiescent phase of the pupa, and also to pass on to the adult the needed energy to concentrate almost exclusively on its function of reproduction. The adults of most butterfly species feed on floral nectar, which provides energy for flight to find mates and to locate the host plants for oviposition and for subsequent larval feeding. Intake of nectar may also contribute to egg production and egg maturation and also may improve adult longevity. Thus, habitat suitability for butterflies depends on the availability of larval food plants in abundance and suitable nectar resources. To elaborate further, an area occupied by any given butterfly population should include a 'mating habitat', a 'breeding habitat' and a 'foraging habitat'. For most of the Indian butterflies, the habitat requirements are insufficiently known. Because

both as larvae and adults, butterflies enter into complex feeding relationships with green plants, the clearing of forests and other vegetation to provide areas for cultivation of food crops, use of monocultures, indiscriminate application of pesticides and herbicides and the growing urban and industrial processes have had a detrimental effect on butterfly species and their numbers.

It is not known how many butterfly species have become extinct in the past, but now many are in the shadow of extinction. In order to conserve and manage these useful and delightful creatures, the Government of India has proposed the establishment of butterfly farms. For this purpose and for the formulation of efficient and effective conservation management programs, it is necessary to have adequate baseline data on the biology and ecology of butterflies. Such knowledge of the biology and ecology of each of the butterfly species will provide the key for their intelligent conservation management.

By virtue of their functional role as pollen vectors benefitting nature and agriculture, butterfly conservation is one of the priorities of the global conservation agenda. Geographically, the tropical regions of the world are gifted with a diverse and rich butterfly fauna. However, most butterflies have a limited distributional range and their numbers fluctuate to a greater or lesser extent in both time and space. Moreover, butterfly distribution is dependent on the availability of suitable larval host plants and adult nectar resources, which in turn are governed by climatic factors.

In the tropics, the climatic conditions may vary from region to region, and the rainfall conditions greatly influence the butterfly numbers and species distribution. India receives rains during the southwest and northeast monsoons, and the rainfall situation is very complicated in southern India. Hence, it is thought that regional studies of butterflies could be of great help to maintain certain species which are likely to become extinct, and to successfully carry out the captive breeding of desirable and uncommon species. Furthermore, 60 butterfly species in India are reported to be migratory in nature; hence, checklists of butterflies made available for different regions in the country will help understand butterfly migrations and thus protect their migration corridors. The importance of migratory pollinators cannot be overemphasized as the conservation of such butterflies is reaching the top of the global conservation agenda.

Butterflies of Visakhapatnam

Visakhapatnam is a sprawling industrial city on the east coast of India, situated at a latitude of 17°42' N and longitude of 82°18' E. Accordingly, it experiences a maritime climate, receiving rain during the southwest (June-September) and northeast (December-February) monsoons. Moderate temperatures occur throughout the year and the difference between the daily maximum and minimum temperatures rarely exceeds 10°C. The hottest months are May-June and the coldest months are December-January.

The few vacant spaces and the city surroundings support secondary vegetation, small hills and scrub forests. During the rainy season, there is a luxuriant growth of a variety of herbaceous vegetation. Enough vegetation is available throughout the year to serve as foliar and floral hosts for the butterflies. A number of searches were made during the past several years for the butterflies on the wing. So far, over 52 species have been sighted and identified (Table 1). In all, eight families are represented. The number of species in each of the families is as follows: Pieridae - 14, Nymphalidae - 11, Papilionidae - 9, Lycaenidae -7, Satyridae - 4, Danaidae - 4, Hesperiidae - 2, and Acraeidae - 1. It is thus evident that Lycaenidae and Hdesperiidae are poorly represented in this region. The family Acraeidae is represented in India only by two species – one of these, *Acraea terpsicore*, is found to be common at Visakhapatnam. Of the entire butterfly fauna at Visakhapatnam, the largest species is *Papilio polymnestor*, with a wingspan of 138 mm, and the smallest is *Castalius rosimon*, with a wingspan of 29 mm. *Princeps demoleus* is endemic to South India and Sri Lanka. Some of the species are very attractive with multihued wings, and these include *Papilio polymnestor, P. polytes, Princeps demoleus, Pachliopta aristolochiae, P. hector, Graphium agamemnon, G. doson,*

Junonia orithyia, J. Hierta, Hypolimnas misippus, H. bolina, Danaus chrysippus and *Tirumala limniace*.

Because of industrialization and urban expansion, Visakhapatnam city is undergoing rapid growth, which is engulfing the few available green patches and posing a danger to the existence of butterflies. This calls for urgent action to take appropriate measures to provide food plants to the larvae and a succession of flowers to the adult butterflies. The concept of 'flora for fauna', developed in Britain, could be adopted to grow the needed plant species in the parks and gardens. To be successful in this direction, creating the necessary awareness among the Municipal Corporation officials and among the public is vital.

Table 1: Butterflies of Visakhapatnam, South India

Scientific Name	Common Name	Season (by months)	Relative abundance
DANAIDAE			
1. *Danaus chrysippus chrysippus*	Plain tiger	1-12	*****
2. *D. limniace leopardus*	Blue tiger	10-4	****
3. *D. plexippus*	Common tiger	3-10	*
4. *Euploea core core*	Common crow	1-12	****
SATYRIDAE			
5. *Elymnias hypermnestra caudata*	Common palm fly	9-12	*
6. *Erites falcipennis*	Common cyclops	9-3	*
7. *Melanitis leda ismene*	Common evening brown	9-5	***
8. *Mycalesis visala subdita*	Tamil bush brown	1-3	*
NYMPHALIDAE			
9. *Ariadne merione merione*	Common castor	8-3	****
10. *Euthalia garuda*	The baron	5-8	*
11. *E. nais*	The baronet	6-10	****
12. *Hypolimnas bolina*	Great egg fly	6-12	****
13. *H. misippus*	Danaid egg fly	7-3	****
14. *Junonia almana*	Peacock pansy	7-12	***
15. *J. hierta*	Yellow pansy	6-12	****
16. *J. lemonias*	Lemon pansy	1-12	*****
17. *J. orithyia*	Blue pansy	7-12	***
18. *Neptis hylas*	Common sailer	10-4	***
19. *Phalanta phalantha phalantha*	Common leopard	1-12	****
ACRAEIDAE			
20. *Acraea terpsicore*	Tawny coster	1-12	*****
LYCAENIDAE			
21. *Apharitis vulcanus*	Common silverline	8-10	*
22. *Castalius rosimon rosimon*	Common pierrot	1-12	****
23. *Euchrysops cnejus*	Gram blue	1-12	****
24. *Everes lacturnus syntala*	Indian cupid	6-10	****
25. *Jamides celeno aelianus*	Common caeru lean	1-12	****
26. *Rapala iarbus sorya*	Indian red flash	5-7	**
27. *Spindasis vulcanus vulcanus*	The silverline	6-10	****
PAPILIONIDAE			
28. *Graphium agamemnon menides*	Tailed jay	1-12	*****
29. *G. doson*	Comon jay	5-10	*
30. *Pathysa nomius nomius*	Spot sword tail	6-7	**
31. *Pachliopta aristolochiae aristolochiae*	Common rose	1-12	****
32. *P. hector*	Crimson rose	1-12	****
33. *Papilio polymnestor*	Blue mormon	10-3	**
34. *P. polytes polytes*	Comomon mormon	1-12	****

35. *P. crino*	Common banded peacock	5-8	*
36. *Princeps demoleus*	Lime butterfly	3-11	****
PIERIDAE			
37. *Anaphaeis aurota*	The pioneer	1-12	****
38. *Appias pandione*	Spot puffin	7-2	**
39. *A. albina darada*	Common albatros	12-2	**
40. *Catopsilia crocale crocale*	Common emigrant	1-12	***
41. *C. c. pomona*	Lemon emigrant	6-10	****
42. *C. pyranthe*	Molted emigrant	1-12	*****
43. *Colotis danae danae*	Crimson tip	1-12	*****
44. *C. eucharis eucharis*	Plain orange tip	1-12	*****
45. *C. fausta*	Large salmon arab	6-11	*****
46. *Cepora nerissa nerissa*	Common gull	1-12	****
47. *Delias eucharis*	Common jezebel	9-12	**
48. *Eureme hecabe simulata*	Common grass yellow	1-12	****
49. *Leptosia ninanina*	The psyche	11-4	**
50. *Valeria valeria anais*	Common wanderer	1-4	***
HESPERIIDAE			
51. *Borbo cinnara*	Rice swift	1-12	****
52. *Pelopidas mathias mathias*	Small branded swift	1-12	****

** very rare; **rare; ***less common; ****common; *****very common*

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FOREST NEWS

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WHAT WERE THE MOST SIGNIFICANT DEVELOPMENTS IN THE FORESTRY SECTOR IN ASIA-PACIFIC IN 2002?

Perception is strong and sight weak. In strategy it is important to see distant things as if they were close and to take a distanced view of close things.

Miyamoto Musashi (Japanese swordsman and author)

Perceptions of important changes and trends are important in forestry, since it is these perceptions that will guide strategies and actions. Therefore it is useful to determine what people from different countries in the region perceive as important developments. Not only is this helpful in keeping abreast of recent developments, it provides important opportunities to learn from other's experiences and initiatives, and it helps to guide strategy development in response to key changes.

At the beginning of 2003, FAORAP conducted a simple e-mail exercise, requesting people concerned with forestry in the region to reflect on recent developments in the forestry sector – in their own countries and in the Asia-Pacific region as a whole. Respondents were asked to identify developments, events or issues that most influenced, or are likely to influence, the forestry sector, positively or negatively. Comments were received from more than 60 individuals, providing a range of interesting perspectives. Responses, which are summarized below, are not listed in any particular order. Nor do they necessarily reflect the views of FAO or *Tigerpaper* editors.

Question 1: What were the most significant issues, developments or events that occurred in the Asia-Pacific region in 2002, that had major implications for forests or forestry?

Responses:

- Increased recognition of corruption in the forestry sector – especially related to illegal logging – as a serious constraint to sustainable forest management.
- Rapid increases in timber imports by China (as a result of domestic logging restrictions and the expanding economy), significantly affecting timber markets and suppliers regionally and globally.
- Focus on terrorism, effectively diverting attention and resources away from environment and sustainable development programs.
- Adoption of new forestry policies and strategies by the World Bank and Asian Development Bank.
- Continuing economic recession in Japan and its negative effects on housing starts, timber imports and official development assistance allocations.
- Instability in Afghanistan and parts of Nepal, Pakistan, Bangladesh, Indonesia, the Philippines and elsewhere, hampering implementation of forestry initiatives.
- Observance of 2002 as the *International Year of Mountains.*

- Convening of the 19th session of the Asia-Pacific Forestry Commission (APFC) in Ulaanbaatar, Mongolia.
- Progress of efforts to control forest fires, including adoption of the ASEAN Agreement on Transboundary Haze Pollution.
- Launching of the Asia Forest Partnership at the World Summit on Sustainable Development (WSSD).
- Launching of the Initiative for Good Forest Governance by community forestry development organizations and nine Asian countries at WSSD.
- Expanding desertification in northeastern Asia.
- Agreement to make Global Environmental Facility (GEF) funding available to finance activities in support of the UN Convention on Combating Desertification (UNCCD), including efforts to control land degradation through forestry.
- Discussions (at WSSD and elsewhere) on rural livelihoods and the links between forestry and poverty.
- Adoption of the regional strategy for the implementation of the Code of Practice for Forest Harvesting in Asia-Pacific.
- Widespread development of national codes of practice for forest harvesting and rising awareness of the long-term ecological and economic benefits of reduced-impact logging.
- Accelerated pace of devolution and decentralization of forest management responsibilities and increasing stakeholder participation (while the seeds for this were planted in many countries long before 2002, momentum is now discernible).
- Shifting philosophies toward broader participation in forest management, such as through Adaptive Collaborative Management.
- Broadening awareness of the impacts of global warming and implications for forestry.
- Rising prominence of forest certification and criteria and indicators as recognized tools for promoting sustainable forest management; emergence of tertiary wood industries using certified wood imported from outside the region.
- Increased emphasis on biodiversity conservation and forest protection.
- Growing importance of forest plantations to restore cover and produce wood; increased interest in using native species in plantations.
- Renewed attention to reforestation issues, reflected in the convening of the Bringing Back the Forests conference and adoption of ITTO guidelines on forest rehabilitation.
- Growing importance of wood substitutes in housing.
- Listing of mahogany in CITES Appendix II, putting the forestry community on notice that forest management decisions will increasingly be made in "external" forums if foresters fail to directly advance conservation objectives.

Question 2: What were the most significant issues, developments or events that occurred in your country in 2002, that had significant impacts for forests or forestry?

Responses:

Australia

- Launching of the Australian Forestry Standard (AFS) – Australia's first domestic forest management certification standard.
- Enactment of the Regional Forest Agreement Act 2002.
- Rising interest in small-scale (farm) forestry to counter salinity.
- Breaking of a forest conservation blockade at the Goolengook Forest by the Victorian Government.
- Decline in the volume of woodchips exported from Australia to Japan.
- Restoration of Government subsidies and tax concessions for the establishment of pulpwood plantations.
- Extensive clearing of natural forests and bush, in many cases to be replaced by monoculture plantations.

Bangladesh

- Legal and institutional reforms in the forestry sector (including revision of the social forestry rules, creation of new professional posts in the Forestry Department, and regional stakeholder consultations on forest policies and industry).
- Banning of tree felling in Sundarban mangrove forest.

Cambodia

- Enactment of a new Forest Law designed to reform forestry practices and administrative structures.
- Controversies over forest concession management approval processes.
- Cancellation of GAT concession for widespread illegal logging.
- Implementation of the World Bank-funded Forest Concession Management and Control Pilot Project involving controversial issues in concession management and public consultation.
- Continuing conflicts over land and resource tenure.
- Government dismissal of Global Witness as the officially recognized Independent Monitor of forestry development activities in the country.
- Accusations of a forcible break-up of villagers protesting against the Department of Forests and Wildlife.
- Designation of the Central Cardamom Mountains Protected Forest.

China

- Development of six priority programs:
  - Natural forest protection program;
  - Program for conversion of cropland to forest and grass land;
  - Program to combat desertification in Beijing and Tianjin;
  - Shelterbelt development program for the middle and lower reaches of the Yangtze river;
  - Wildlife conservation and building of nature reserves program;
  - High yield timber plantation development program.
- Passage of the *Law of Preventing and Combating Desertification*, providing a solid legal basis for controlling land degradation.
- Major acceleration of tree planting, estimated at around 7.5 million hectares in 2002 – the largest annual planting total in China's history.
- Designation of 249 new protected areas totaling 3.6 million hectares.
- Development of the *Forestry Strategic Study for Sustainable Development in China*, a study outlining a 50-year strategy for achieving sustainable development of forestry in China.

DPR Korea

- Major outbreak of Siberian caterpillar affecting conifer forests.

India

- Appointment of a National Forest Commission to examine restructuring and strengthening of forest policy, legislative and institutional frameworks.
- Launching of a National Afforestation Programme to rehabilitate degraded forests through people's participation.
- Passage of the National Biodiversity Act 2002 and formulation of a National Biodiversity Action Plan.
- Convening of the COP-8 meeting in New Delhi, expected to influence new strategies and policies for reducing greenhouse gas emissions through forestry initiatives.
- Supreme Court orders to remove all forest dwellers who have encroached on forest lands since the enactment of the Forest Conservation Act 1980.
- Continued expansion of Joint Forest Management, with latest data indicating a total of 63,000 committees managing more than 16 million hectares of forests in 27 States.

Indonesia

- Increased regional autonomy and decentralization of forest management authorities, triggering widespread unsustainable forestry practices at local levels.
- Accelerated pace of illegal logging, often sponsored by powerful interests.

- Agreements forged with U.K. and China for combating illegal forest activities.
- Ban imposed on exports of unprocessed logs (June 2002).
- Listing of ramin (*Gonystylus bancanus*) in CITES Appendix III, effectively banning the trade of all un-exempted ramin products.
- Central government cancellation of a pioneer district regulation giving communities management rights for state forestlands in Java.
- Establishment of a process to downsize industrial timber processing capacity, using access to legal wood supplies as a basis for rationalization.

Japan

- Reduction in overseas development aid budgets.
- Convening of preliminary meeting for the Third World Water Forum (scheduled for March 2003).

Rep. Korea

- Worst-ever recorded typhoon damage in Korea inflicted by Typhoon Rusa, including major damage to a number of forests.
- Observance of the International Year of Mountains 2002. Leading to increased awareness of the importance of forests and announcement of the Forest Charter.
- Passage of the Forest Land Management Act designed to minimize forest exploitation.

Lao PDR

- Formulation of a Forestry Strategy to the year 2020.
- Preparation of a Sustainable Forestry and Rural Development Project, which recognizes the potential of villagers as forest managers and as partners of local government forestry staff.
- Issuance of Prime Ministerial Decree 59/2002 on sustainable management of production forests and the related drafting of implementing regulations.
- Progress in negotiations between the Government and potential donors, expected to lead to increased support in 2003.

Malaysia

- Formalization of the Malaysian Timber Certification Standards and C&I for sustainable forest management.
- Initiatives by European NGOs to ban the use of borax in the treatment of wood (boric acid is used to treat rubberwood to avoid blue stain; if banned, around 2,400 companies engaged in rubberwood processing will be affected).
- Plans to audit forestry activities in eight States in Peninsular Malaysia for potential certification, resulting in significant changes in forest management practices and attitudes.
- Convening of the international conference on Bringing Back the Forests: Policies and Practices for Degraded Forests, in Kuala Lumpur in October.
- Formation of the *Sarawak Forestry Corporation*, which will take the place of the State government's forestry department.
- Abandonment of major planned pulp and paper initiatives in Sabah and Sarawak after extensive initial logging of merchantable timber from natural forests (with minimal rehabilitation), leaving large areas of degraded forests.
- Termination of the *Treelink* project in October.

Mongolia

- Establishment of the Forestry, Water and Natural Resources Agency, which will oversee forestry issues in Mongolia and eliminate fragmentation in dealing with forestry development.
- Increased recognition of the economic value of forests by the Ministry of Nature and the Environment.
- Infestation of extensive areas of Mongolian forests by insect pests such as *Dendrolimus sibiricus, Ocherrie dispar* and *Orgyia antiqua*.
- Convening of the 19th session of the Asia-Pacific Forestry Commission in Ulaanbaatar.

Nepal

- Sharp drop in donor-assisted forestry projects and Government forestry development activities as a result of Maoist insurgency.

New Zealand

- Emerging evidence of rotten timber framing in new buildings due to water leakage attributable to design changes, building code changes allowing use of untreated timber, and construction practices.
- Growing public uncertainty over new investments in plantation forestry as a result of a failed attempt to restructure a large public company.
- Strengthened border quarantine surveillance at seaports and airports to prevent entry of potentially damaging pests and diseases.
- Increased public and private funding for conservation management of forest parks and national parks, and for management of threatened species.

Philippines

- Successful negotiations between the governments of the Philippines and the United States leading to establishment of two tropical forest and debt reduction agreements, allowing interest payments on loans to be diverted into a tropical forest conservation fund.
- Issuance of a policy facilitating the harvesting and transportation of trees grown under plantation programs, thereby enhancing profitability of plantations and encouraging investment in tree-planting.
- Launching of the Philippines Biodiversity Conservation Programme.
- Promotion of good "eco-governance" through formulation of a Code of Conduct for Good Environmental Governance and implementation of a joint DENR/USAID Eco-governance Project.
- Approval of operational permits to logging corporations, which suggests Community-Based Forest Management (CBFM) may be marginalized in the future.
- Initiation of a UNDP/FAO-supported project to review and update the Philippines Masterplan for Forestry Development.
- Delayed confirmation of the appointment of DENR Secretary Alvarez, followed by the appointment of a new Secretary (Gozun) in December 2002 (hindering the implementation of forest policies for much of the year).
- Establishment of a range of attractive incentives (stable land tenure, waiver of royalties and forest charges, financial "pump priming") to encourage private sector participation in plantation establishment on government forestlands.

Solomon Islands

- Government reorganization, establishing the Ministry of Forests, Environment and Conservation.

Sri Lanka

- Initiation of an island-wide tree-planting program of "jak" (*Artocarpus* spp.) involving Government and private sector collaboration.

Thailand

- Major Government restructuring, including establishment of the Ministry of Natural Resources and Environment to undertake policy and planning for national parks, watershed management, wildlife conservation, coastal zone management, community forestry and forest fire control.
- Continued non-passage of the Community Forestry Bill.
- Completion of a mid-term review of the Thai Forestry Sector Master Plan.
- Collapse of negotiations for a proposed US-Thai debt swap that would have established a forest conservation fund.

Vanuatu

- Passage of a new Forestry Act.

Viet Nam

- Elaboration and expansion of a partnership agreement to implement the Forest Sector Support Program, including development of an implementation mechanism and a monitoring system.
- Shift in focus of the National Working Group from community forestry to a broader range of sustainable management approaches, including exploration of certification schemes.
- Destruction of thousands of hectares of primeval forests in Southern Kien Giang and Ca Mau provinces as a result of one of the worst forest fires in Vietnamese history.

UPDATE ON THE SEARCH FOR EXCELLENCE IN FOREST MANAGEMENT IN ASIA-PACIFIC

Nothing average ever stood as a monument to progress. When progress is looking for a partner it doesn't turn to those who believe they are only average. It turns instead to those who are forever searching and striving to become the best they possibly can. If we seek the average level we cannot hope to achieve a high level of success. Our only hope is to avoid being a failure. **A. Lou Vikery** (Business author)

The In Search of Excellence initiative got underway in November 2001. The initiative called for nominations of forests in the Asia-Pacific region that demonstrate exemplary management. In Search of Excellence aimed to identify:

- a broad cross-section of exemplary forest management in Asia-Pacific;
- examples of forest management that show promise for the future;
- examples across a broad range of forest eco-types from many countries in the region, exemplifying management for a variety of objectives and under different ownership structures; and
- examples of both large and small forest areas.

The nominating process closed on 1 May 2002, with more than 170 nominations received from 20 countries. These required a huge amount of work to sift through the information received. Many nominees provided a great deal of supplementary information sometimes more easily measured in kilos rather than the numbers of pages!

This mass of information necessitated the hiring of a consultant to undertake preliminary screening of the nominations. The consultant followed a clearly defined process requiring the identification and utilization of specific selection criteria to narrow the overall list of nominated forests down to a list of 40 recommendations for future consideration.

The consultant's work was reviewed by a panel of Rome-based FAO staff, and then by the In Search of Excellence Technical Working Group in early January 2003. The Working Group comprised 10 people with diverse forestry backgrounds, from throughout the region. These two groups worked to identify additional nominations that should be considered in the final review process, and developed appropriate criteria for selecting the final set of forests for case studies. The Working Group placed a premium on identifying a variety of instructive and innovative management experiences characterizing a full range of management objectives, and representative of a broad range of countries in the region.

We want to clearly and definitely emphasize one key point. The initiative was NOT and is NOT meant to be a competition, and the choice of case study forests does not imply that the Technical Working Group believes that one nominated forest is necessarily better managed than another. Nor does it mean that FAO, RECOFTC or the Technical Working Group necessarily endorse the management practices of the selected forests. What it does mean is that we believe, in the context of the other forests selected, that each nominee demonstrates an aspect (or aspects) of management that tells a compelling story of innovation in meeting challenges and should be of interest to those concerned with forests and forestry in the region.

The 30 forests selected for case studies are:

Australia
Timbercorp Blue Gum Tree Farm Estate
Southern Forests of Tasmania
South west forests of Western Australia

China
Lin'an Model Forest

Huoshan County Community Forestry

Cambodia
Bos Thom Community Forest and Kompong Phluk Flood Forest

Fiji
Nakavu Forest

India
Dugli-Jawarra Sal Forest
Sulia Reserve Forest
Periyar Tiger Reserve

Indonesia
Pesisir Forest Area
Bagan Siapiapa
Komodo National Park

Japan
Imabari-Tamagawa-Asakura Watershed Forest

Republic of Korea
Anmyeon Recreation Forest

Kyrgyz Republic
Kyrgyz Ata Juniper Forest

Lao PDR
Dong Phousoi Production Forest and Dong Sithouane Production Forest

Malaysia
FMU19(a) Deramakot Forest Reserve

Mongolia
Pine forests of Khodood

Nepal
Banayak Pimidanda Community Forest
Chapani, Racchma, Dharapani & Fagar Khola Community Forests

New Zealand
Woodside Forest
Forever Beech
Lake Taupo Forest

Philippines
Mt. Makiling Forest Reserve
Kalahan Reserve
Ifugao Muyong
Buswang Mangrove Plantations

Sri Lanka
Knuckles (Dumbara)

Vanuatu
Fasak Eco-Forestry Project

Viet Nam
Can Gio Mangrove Biosphere Reserve

At present it is expected that case studies will be drafted by the middle of 2003, with a final publication due out before the end of the year.

We would like to take this opportunity to thank all those people who participated in the initial phases of the process contributing a great deal of effort in submitting very informative and high-quality nominations. It is a credit to forestry in the Asia-Pacific region that so many people, from so many countries and backgrounds, took the time and dedication to compile substantive nominations.

If you have further inquiries, please contact:

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SEEKING NEW HIGHS FOR MOUNTAIN AREA DEVELOPMENT

The Bishkek Global Mountain Summit was held from 29 October to 1 November 2002 in the Republic of Kyrgyzstan. The summit was the culminating event of the International Year of Mountains (IYM). More than 600 delegates joined the summit, including a delegation from FAO, headed by Hosny El-Lakany, Assistant Director-General for Forestry.

The summit included plenary sessions and numerous thematic working group sessions, roundtable meetings and satellite symposia. Dozens of organizations, including FAO, participated in the "Mountain Marketplace," which featured exhibits, publications, information and mountain products. Several pre- and post-summit excursions were also organized to expose participants to the beauty, culture and development issues in the mountain regions of Kyrgyzstan.

The key outputs of the summit included the following:

- Bishkek Mountain Platform: a framework for action for sustainable development in mountain areas;
- affirmation of the International Partnership for Sustainable Development of Mountain Regions, first launched at the World Summit on Sustainable Development in Johannesburg;
- elaboration of ideas for establishing a network of Mountain Developing States (MODS); and
- the signing of the Central Asian Mountain Charter.

It is also anticipated that a draft resolution for consideration by the UN General Assembly will be formulated on the basis of the discussions and outcome of the summit.

The Bishkek Mountain Platform includes a framework for future action, recommending follow up at international, regional, national and local levels. Of particular importance to FAO, the declaration welcomes the offer made by FAO to host the secretariat of the International Partnership for Sustainable Development of Mountain Regions.

For more information, visit the following website: http://www.mountains2002.org/

ADAPTIVE COLLABORATIVE MANAGEMENT OF COMMUNITY FORESTS: AN OPTION FOR ASIA?

Thirty-nine experts in community-based forest management met for a workshop on adaptive collaborative management (ACM) of community forests was held at the FAO Regional Office in Bangkok from 26-27 September 2002, sponsored by the Asian Development Bank (ADB), FAO and the Center for International Forestry Research (CIFOR).

ACM is defined as a process whereby the people or groups who use, control or in some other way have "interests" in a forest, agree, on the basis of shared information on their "interests", to act together when they draw up plans for these forests.

It has generally been recognized that ACM has considerable potential to ensure sustainable

natural resources management through the participation of local stakeholders.

The workshop marked the conclusion of a three-year research project led by CIFOR, with financial support from ADB, entitled "Planning for sustainability of forests through adaptive co-management". The research focused on community forestry sites in Indonesia, Nepal and the Philippines over the period April 1999 to September 2002.

Case studies from these countries were presented to investigate whether changes to forms of collaboration, communication, monitoring and planning would result in significant improvements to the overall management system, livelihoods and the condition of forests at those sites. Discernible improvements were indeed registered, especially in the process of management through making learning a deliberate and conscious element of this process. Collaboration was also enhanced, resulting in better understanding of diverse interests and sharing of information. However, the case studies failed to illustrate definitively the exact linkages necessary to be established within the institutional framework. Without adequate reforms of the policy and regulatory framework, it is unlikely that these positive experiences demonstrated at the research sites will be replicated at a larger scale.

STAFF MOVEMENT

Suparmo Darmo retired on 31 December 2002 after 13 years of service with FAO.

Mr. Suparmo joined the staff of FAO's Regional Office for Asia and the Pacific in early October 1995, as the National Forestry Action Plan (NFAP) Adviser. He was transferred from the Forestry Department, FAO Headquarters, in line with FAO's decentralization policy. He started his career with FAO in February 1990 at FAO Headquarters in Rome, Italy, as the Tropical Forest Action Plan (TFAP) Adviser for Asia-Pacific. In line with new initiatives dealing with the forestry sector and UNCED, the title of the post was changed to National Forestry Action Plan (NFAP) Adviser, and later to National Forest Programmes (NFP) Adviser.

Prior to joining FAO, Mr. Suparmo worked for the Ministry of Forestry, Indonesia, for more than 20 years in the areas of forestry planning, marketing and trade, transportation, harvesting and foreign cooperation. He was the focal point for the preparation of Indonesia's NFAP and involved in its sectoral studies. He was also the editor of the Ministry of Forestry's magazine and the bulletin of the Indonesian Forestry Professional Association, and was involved with forestry activities within the Association of South East Asian Nations (ASEAN).

Throughout his career, Mr. Suparmo was famous for conducting his work with an air of perpetual cheerfulness, humor, and kindness. His many friends and colleagues around the region will miss his jokes, free-flowing laughter, and sincere efforts to provide support toward better forest management.

Mr. Suparmo and his wife have retired to their home in Jakarta. They look forward to visits and continued contact with friends and former associates.

WHAT'S THE ROLE OF FORESTS IN SUSTAINABLE WATER MANAGEMENT?

Freshwater is the single most precious element for life on earth. In recognition of the central importance of water resources, the United Nations General Assembly proclaimed 2003 as the International Year of Freshwater. This provides the world community an opportunity to raise awareness, promote good practice, motivate people and mobilize resources in order to meet basic human needs and manage water in more sustainable ways. What are the implications for stakeholders in the forestry sector? And what is the role forests can play in ensuring sustainable supplies of this valuable resource? The Third World Water Forum, which will be held from 16 to 23 March 2003 in Kyoto, Osaka and Shiga, Japan, will provide a good opportunity to address these issues. (For more information, please see: http://www.worldwaterforum.org).

To contribute to the discussions and outcomes of the Third World Water Forum, 100 forest and watershed management experts from 18 countries and 16 international organizations met in Shiga, Japan from 12 to 16 November 2002. The purpose of the meeting was to deliberate on the relationships between forests and water and the importance of watershed management. The meeting considered the role of sustainable forest management in water resources management, including mitigation of floods and droughts and water quality maintenance. In this regard, it considered different policy instruments and cost/benefit arrangements for providing hydrological services. The output of the meeting consisted of a declaration that is to contribute to the deliberations at the Third World Water Forum and the Sixteenth Session of the FAO Committee on Forestry.

The meeting was successful for two main reasons. First, while forests and watershed management have long been viewed as only providing benefits related to water quantity and quality, several participants noted that the services that forests provide have often been exaggerated. The scientific evidence is generally too weak to support claims that forests can increase water yields or reduce floods. Even with regard to the effects of forests on water quality it was noted that the impacts can be negative when forests filter pollutants out of the air. A number of participants observed that the direction of impacts is often location specific. For example, the effect of tree plantations on water tables is positive in situations where high water tables cause soil salinization. In other locations, the high evapotranspiration rate can lower water tables and reduce water availability for agricultural crops. It was also noted that the careless extrapolation of research results derived from small-scale experiments has sometimes led to generalizations that have been the basis for policies and projects with negative socio-economic effects. To increase the knowledge of the hydrological effects of forests, participants called for better long-term eco-hydrological monitoring that would provide improved understanding of large-scale interactions, and the influence of forests on dry-season flows, flood mitigation and groundwater recharge.

A second positive outcome of the meeting was enhanced recognition of the importance of the cultural and socio-economic impacts of various forest and water policy instruments and management practices. It was noted that a significant volume of valuable information exists, but it is often not disseminated widely or is distributed in ineffective formats.

The major outcome of the expert meeting was the "Shiga Declaration on Water and Forests." The declaration stresses the importance of effective forest and watershed management and calls on

governments and stakeholders to develop policies and implement programs that promote holistic, multi-disciplinary and multi-stakeholder approaches that link forests, water, watersheds, the environment and people. The following five key issues were identified during the expert meeting:

1. Promoting the development and wider adoption of holistic approaches to forest and water management that integrate the needs of people and the environment.
2. Improving understanding of the bio-physical interaction between forests and water.
3. Improving understanding of the cultural and socio-economic impacts of different forest and water policies and management practices.
4. Developing better mechanisms for managing upstream/downstream linkages and interactions.
5. Enhancing knowledge and information sharing.

The declaration's five recommendations are as follows:

1. Move from a sectoral to an integrated and cross-sectoral approach to economic, social and environmental planning at local, national and international levels. This approach would build on and develop the necessary bio-physical and socio-economic understanding of forest and water interactions to identify key forest and water issues in the context of the location concerned.
2. Establish the total economic value (capturing all products and services) of forest and water resources, and the economic implications of different policies and management practices. The distribution and the importance of benefits to particular stakeholders should also be established.
3. Put in place appropriate incentives to support the sustainable management of forest and water services to ensure that those who use resources pay the full cost of their exploitation and those who bear the costs of conservation are equitably compensated. In particular, consideration should be given to the provision of secure resource rights, the reform of water pricing policies, the development of market-based or other mechanisms of payments for environmental services, and the removal of undesirable (perverse) subsidies to the agricultural and forestry sectors.
4. Promote effective and equitable collaborative arrangements and partnerships among governments, local communities, research institutions, civil society, the private sector, forest and water managers and other stakeholders. These will facilitate knowledge sharing and capacity building, leading to sound science-based policy development and tangible improvements in forest and water management.
5. Address forest and water interactions in forest resources assessments, and request that the international community provide sufficient resources to accomplish this important task.

More opportunities to discuss forests and water at COFO-03!!

Access to, and availability of, freshwater is increasingly a concern in many areas of the world. Delegates to the upcoming 16th session of FAO's Committee on Forestry (COFO), to be convened 10-14 March 2003, in Rome, will be invited to discuss the contributions that forests and forestry can make in securing freshwater resources. Presenters from major independent institutions dealing with the links between forests and water will introduce key issues. The roles and specific contributions expected of international agencies and organizations will also be discussed and highlighted.

NEW RAP FORESTRY PUBLICATIONS

COMMUNITIES IN FLAMES: PROCEEDINGS OF AN INTERNATIONAL CONFERENCE ON COMMUNITY INVOLVEMENT IN FIRE MANAGEMENT
RAP Publication 2002/25

Recent large-scale fires throughout the world have demonstrated the high social, economic and ecological costs of catastrophic forest fires. In the past, government responses to forest fires have tended to focus on suppression and costly technological solutions to fight fires. Contrary to alleviating the problems, these solutions have sometimes increased the scale and magnitude of forest fires. Furthermore, they have largely ignored the human dimensions of fires and the positive social and ecological benefits of prescribed and managed fires. As the number of forest fires is increasing, conventional suppression measures are increasingly questioned.

Since the widespread fires of the late 1990s, numerous agencies and organizations have supported various fire prevention, suppression and management initiatives. These efforts have indicated that in many countries, local communities can play significant positive roles in forest fire management, particularly when working in close collaboration with formal forest and fire management authorities.

Information on involving communities in fire management is still scarce, widely scattered and only slowly emerging. To advance the understanding and enhance awareness of the potential for community involvement in fire management, FAO, Project FireFight South East Asia and the Regional Community Forestry Training Center organized in 2001 the Communities in Flames Conference. The conference proceedings provides long-awaited and first-hand insights into community-based forest fire management. The strength of the publication lies in the diversity of the contributions and the recognition that the role that communities can play is not overstated. Other stakeholders, including the government and the private sector, must also play a substantial role in forest fire management.

GIANTS ON OUR HANDS
RAP Publication 2002/30

The Asian elephant has played an important role in the cultural, economic and social life of Asia for millenia. However, it has been increasingly marginalized in the region and, apart from Myanmar, there is now little demand for the traditional work done by elephants. Combined with the dwindling habitat, the continued existence of elephants is threatened.

FAO and the Japan Wildlife Research Center jointly commissioned a series of studies on domesticated Asian elephants in the 11 domesticated elephant range countries in 2000. On the basis of these studies, an International Workshop on the Domesticated Asian Elephant was organized from 5-10 February 2001. This publication constitutes the proceedings of the workshop.

It is hoped that this publication will help increase awareness of the conservation and management of nature in general, and serve as a useful source of information and good reference guide for elephant managers, specialists, NGO groups and donors seeking opportunities to improve the management and utilization of Asian elephants in particular.

ASSESSMENT OF TREE RESOURCES IN THE HOME GARDENS OF SRI LANKA
EC-FAO Partnership Programme - November 2002

Sri Lanka imposed harvesting restrictions in its natural forests more than ten years ago. Prior to the logging ban, Sri Lanka was self-sufficient in timber and wood products imports were modest. Of the 575,300 cubic meters of sawnwood produced in the country, 515,000 cubic meters are produced domestically. Where does it come from if not from the forests? Forest plantations cover only about 93,000 hectares. Together with rubber and coconut plantations, they contribute about 30 percent to the total sawlog supply. More than 40 percent originate from Sri Lanka's home gardens.

This publication provides an island-wide assessment of Sri Lanka's home gardens. It provides insights into species distribution by district. The author estimates that home gardens are capable of producing over 1.3 million cubic meters of industrial timber and fuelwood per year. This represents about 41 percent of the domestic demand for timber and 26 percent for biofuels.

OVERVIEW OF FOREST PRODUCTS STATISTICS IN SOUTH AND SOUTHEAST ASIA
EC-FAO Partnership Programme - December 2002

Forestry statistics are inadequate to support appropriate and timely decision making. As a result, many decisions are based on inaccurate, incomplete or outdated information. Strengthening statistics on forest products is crucial for improving forest policy formulation and planning at the national and sub-national levels.

This report reviews the current status of data collection, data processing and dissemination of information in the context of implementing sustainable forest management in the Asia-Pacific region. It provides insights into forest products statistics in 12 countries of tropical Asia. The document consists of two main parts: (1) a regional synthesis on forest products statistics; and (2) country profiles that describe the current situation at national levels.

The country profiles review the existing data related to forest products and trade (roundwood, wood charcoal, wood chips, particles and residues, sawnwood, wood-based panels, pulp and recovered paper, paper and paperboard); identify main weaknesses and constraints in current statistical systems; and propose practical measures for improving data collection, data processing and regular dissemination of information on forest products.

It is hoped that this publication will contribute not only to improving forest products statistics in Asia, but more importantly to better decision-making in forest management.

COMMUNITY-BASED FOREST RESOURCE CONFLICT MANAGEMENT: A TRAINING PACKAGE

FAO's Forestry Policy and Planning Division and the Bangkok-based Regional Community Forestry Training Center (RECOFTC) have developed a comprehensive training package that examines conflict within forest resource use and community-based forest management and offersstrategies for managing it.

The training package can be ordered from RECOFTC (Attn: Mr. Vitoon) at the following e-mail address: info@recoftc.org or from FAO (Attn: Gloria Loriente) at fonp-documents @fao.org.

ASIA-PACIFIC FORESTRY CHIPS AND CLIPS

WORLD BANK APPROVES NEW FOREST POLICY

The World Bank recently approved a new forest policy and strategy that is expected to improve the livelihoods of millions of the rural poor, while safeguarding environmental values of forests, and integrating forests in sustainable economic development. The Bank says it will finance commercial harvesting only in areas where strict environmental assessments or authoritative scientific surveys have demonstrated that the areas in question do not contain critical natural habitats. The new policy reflects a vision of responsible growth, and is a marked departure from a previous strategy of disengagement from the forestry sector. The previous policy failed to slow deforestation or deter the expansion of illegal logging. The new policy contains provisions for a partnership with WWF aiming to bring at least 200 million hectares of production forests under sustainable forest management through third party certification.
– Society of American Foresters –

CO-MANAGEMENT IN THAI FOREST

A mountain area in northeastern Thailand will be declared a co-management forest. Khao Phaeng Maa, in Nakon Ratchasima province will be Thailand's first forest to be "co-managed" through a partnership between the National Parks and Wildlife Department and local communities. The co-management scheme originates from efforts by villagers and the Wildlife Fund Thailand, which helped replant 800 hectares of degraded forest land. The law requires that forests that undergo this type of private rehabilitation be declared part of a nearby national park. The co-management concept is designed to allow local people to retain responsibility for the area.
– Bangkok Post –

NATIONAL FOREST COMMISSION FOR INDIA

India has announced the formation of a National Forest Commission to examine institutional strengthening, restructuring and reform of the country's forestry sector. The Commission will also review and assess the existing policy and legal framework and its impact on ecological, economic, scientific, social and cultural aspects of Indian forestry. The commission will produce a report in two years, indicating specific policy options for achieving sustainable forest and wildlife management, biodiversity conservation and ecological security.
– The Hindu –

FOREST HARVESTING QUOTA FOR CHINA

China's Tenth Five-Year Plan has set a harvesting limit of 223 million cubic meters per annum for the period up to 2005. This is a decline of around 68 million cubic meters on limits set by the Ninth Five-Year Plan. Under the new plan, commercial timber felling will decline by about 42 million cubic meters.
– ITTO Market Information Service –

BANGLADESH BANS TREE-FELLING IN SUNDARBANS

Bangladesh has banned all tree-felling in its Sundarban mangrove forest. The ban includes felling of timber for firewood. Bangladesh's Forest and Environment Minister said the only commercial production activity permitted in the forest would be the collection of wild honey. Bangladesh and India are working together on a UN-sponsored project to protect the Sundarban's ecosystem and biodiversity.
– RECOFTC E-letter –

FORESTRY RESTRUCTURING

Thailand's government forestry institutions have been restructured, with more than 7,000 Royal Forest Department staff transferred to the Natural Resources and Environment Ministry, mainly to form a National Parks Flora and Fauna Department. The Bureaucratic Restructuring Act 2002 has left 1,100 staff in the Forestry Department, which retains the role of promoting forestry to boost national revenues. The downsized Forest Department also retains responsibility for enforcing the Forestry Act, the Forest Reserve Act, the Forest Plantations Act and the measures in the Community Forestry Bill, when it is eventually enacted.
– Bangkok Post –

ADB ENVIRONMENTAL POLICY

The Asian Development Bank (ADB) has approved a new Environment Policy based on recognition that environmental stability is a prerequisite for pro-poor economic growth and efforts to reduce poverty. The Environment Policy has five thrusts to meet major challenges:

- interventions to reduce poverty;
- mainstreaming environmental considerations in economic growth;
- maintaining global and regional life-support systems;
- working in partnerships; and
- full integration in ADB operations.

– ADB news release –

NEW MEDICINAL PLANTS CENTRE

A new centre for research and conservation of medicinal plants has been established in Kerala, India. The Centre for Medicinal Plants Research in Satabdi Nagar has a broad research mandate extending across plant taxonomy, pharmacology, tissue culture and establishment of seed gene banks.

ITTO FOCUS ON ILLEGAL LOGGING

The ITTO Trade Advisory Group has called on importing countries to cooperate in halting trade in illegally logged timber. The advisory group praised ITTO efforts to combat illegal logging and noted that legitimate traders were willing to cooperate in every way possible to halt illegal trade. ITTO recently launched several initiatives to address illegal logging and illegal trade. For example, a group of thirteen ITTO member countries is collaborating in a project to reconcile national timber trade statistics to assess the extent of undocumented, and possibly illegal, trade.
– ITTO Market Information Service –

TIMBER IMPORTS BOOM IN CHINA

China imported more than 12 million cubic meters of logs in the first six months of 2002, an increase of 52.5 percent over the previous year. Imported sawnwood volumes for the same period totaled 2.5 million cubic meters, a 39.3 percent increase. Russia was the source of 62 percent of log imports, with other major suppliers being Malaysia, New Zealand, Gabon and Papua New Guinea. Indonesia was the largest supplier of sawn timber, with the US, Russia, Thailand and Malaysia also exporting more than 250,000 cubic meters of sawn timber each.
– ITTO Market Information Service –

INDONESIA-CHINA MOU

Indonesia and China have signed a Memorandum of Understanding to cooperate in curbing rampant illegal logging and trade in illegal logs. The agreement is expected to help curb the smuggling of illegal logs out of Indonesia. The Indonesian government has also signed a similar agreement with the United Kingdom and the European Union to boost efforts to protect forests and curb illegal logging activities.
– Jakarta Post –

FAO ASIA-PACIFIC FORESTRY CALENDAR

10-14 March 2003. ***16th Session of the Committee on Forestry (COFO).*** Rome, Italy. Contact: Michael Martin, Secretary of COFO, FAO Forestry Department, Via delle Terme di Caracalla, 00100 Rome, Italy; Tel: (3906) 57053302; Fax: (3906) 57052151; E-mail: Michael.Martin@fao.org

24-26 March 2003. ***Forests for Poverty Reduction: The Changing Role for Development, Research and Training Institutions.*** New Delhi, India. Contact: S. Appanah, Senior Programme Adviser, Forestry Research Support Programme for Asia and the Pacific, FAO Regional Office for Asia and the Pacific, Maliwan Mansion, Bangkok 10200, Thailand; Tel: (66-2) 697-4136; Fax: (66-2) 697-4411; E-mail: Simmathiri.Appanah@fao.org

14-15 April 2003. ***Assisted Natural Regeneration of Tropical Forests of Southeast Asia.*** Kuala Lumpur, Malaysia. Contact: S. Appanah, Senior Programme Adviser, Forestry Research Support Programme for Asia and the Pacific, FAO Regional Office for Asia and the Pacific, Maliwan Mansion, Bangkok 10200, Thailand; Tel: (66-2) 697-4136; Fax: (66-2) 697-4411; E-mail: Simmathiri.Appanah@fao.org

21-23 April 2003. ***Rehabilitation of Degraded Forests and Lands.*** Kuala Lumpur, Malaysia. Contact: S. Appanah, Senior Programme Adviser, Forestry Research Support Programme for Asia and the Pacific, FAO Regional Office for Asia and the Pacific, Maliwan Mansion, Bangkok 10200, Thailand; Tel: (66-2) 697-4136; Fax: (66-2) 697-4411; E-mail: Simmathiri.Appanah@fao.org

28-30 April 2003. ***Non-Timber Forest Products Management.*** Bangalore, India. Contact: S. Appanah, Senior Programme Adviser, Forestry Research Support Programme for Asia and the Pacific, FAO Regional Office for Asia and the Pacific, Maliwan Mansion, Bangkok 10200, Thailand; Tel: (66-2) 697-4136; Fax: (66-2) 697-4411; E-mail: Simmathiri.Appanah@fao.org

May 2003. ***Forests for Poverty Reduction: Can Community Forestry Make Money?*** Bejing, China. Contact: S. Appanah, Senior Programme Adviser, Forestry Research Support Programme for Asia and the Pacific, FAO Regional Office for Asia and the Pacific, Maliwan Mansion, Bangkok 10200, Thailand; Tel: (66-2) 697-4136; Fax: (66-2) 697-4411; E-mail: Simmathiri.Appanah@fao.org

5-7 May 2003. ***Forests for Poverty Reduction: What Potential with Ecological Services and Carbon Trade?*** Kuala Lumpur, Malaysia. Contact: S. Appanah, Senior Programme Adviser, Forestry Research Support Programme for Asia and the Pacific, FAO Regional Office for Asia and the Pacific, Maliwan Mansion, Bangkok 10200, Thailand; Tel: (66-2) 697-4136; Fax: (66-2) 697-4411; E-mail: Simmathiri.Appanah@fao.org

26 May - 3 June 2003. ***Third United Nations Forum on Forests (UNFF).*** Geneva, Switzerland.Contact: Secretariat of the United Nations Forum on Forests, DC2-2286, 2 UN Plaza, New York, NY 10017, USA; Tel: +1-212-963-3160/3401; Fax: +1-917-367-3186; E-mail: unff@un.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

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FORESTRY PUBLICATIONS: FAO REGIONAL OFFICE FOR ASIA AND THE PACIFIC (RAP)

Readers who are interested in obtaining any of the following publications can order up to three titles. For copies, please write to: *Forestry Section, FAO Regional Office for Asia and the Pacific, Maliwan Mansion, Phra Atit Road, Bangkok 10200, Thailand*

1. Leucaena Psyllid in the Asia Pacific Region: Implications for its Management in Africa (RAPA Publication 1994/13)
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)
6. Non-Wood Forest Products in Bhutan (RAP Publication 1996/6)
7. Asia-Pacific Agroforestry Profiles: Second Edition (APAN Field Doc. No.4/RAP Publication 1996/20)
8. The Khao Kho Story: Reclaiming the Barren Hills of Thailand's Central Highlands (RAP Publication 1996/27)
9. Reports Submitted to the Regional Expert Consultation on Eucalyptus - Vol.II (RAP Publication 1996/44)
10. Forests and Forest Management in Mongolia (RAP Publication 1997/4)
11. Non-wood Forest Products: Tropical Palms (RAP Publication 1997/10)
12. Gone Astray: The Care and Management of the Asian Elephant in Domesticity (RAP Publication 1997/16)
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)
15. Labor-Intensive Harvesting of Tree Plantations in the Southern Philippines (RAP Publication 1997/41)
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17. Leasing Degraded Forest Land: An Innovative Way to Integrate Forest and Livestock Development in Nepal (RAP Publication 1998/4)
18. Carbon Dioxide Offset Investmentin the Asia-Pacific Forestry Sector: Opportunities and Constraints (RAP Publication 1998/9)

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19. Asia-Pacific Forestry Towards 2010 - Executive Summary: The Asia-Pacific Forestry Sector Outlook Study (RAP Publication 1998/22)
20. Asia-Pacific Forestry Towards 2010 - Report of the Asia-Pacific Forestry Sector Outlook Study
21. Regional Strategy for Implementing the Code of Practice for Forest Harvesting in Asia-Pacific
22. Trees Commonly Cultivated in Southeast Asia - An Illustrated Field Guide 2nd Edition. (RAP Publication 1999/13)
23. Decentralization and Devolution of Forest Management in Asia and the Pacific (RAP Publication 2000/1 - RECOFTC Report No.18)
24. Asia-Pacific Forestry Commission Fifty Years (RAP Publication 2000/2
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)
26. Forests Out of Bounds: Impacts and Effectiveness of Logging Bans in Natural Forests in Asia-Pacific (RAP Publication 2001/08); Executive Summary (RAP Publication 2001/10)
27. 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)
29. Proceedings of the International Conference on Timber Plantation Development
30. Information and Analysis for Trees Outside Forests in India (Working Paper No.1. EC-FAO Partnership Programme)
31. Monograph on benzoin (Balsamic resin from *Styrax* species) (RAP Publication: 2001/21)
32. Applying Reduced Impact Logging to Advance Sustainable Forest Management (RAP Publication: 2002/14
33. Non-Wood Forest Products in 15 Countries of Tropical Asia - An Overview (EC-FAO Partnership Programme)
34. In Support of Forestry Statistics (Workshop Proceedings No.3. EC-FAO Partnership Programme)
35. Report of the Asia-Pacific Forestry Commission 19th Session (RAP Publication: 2002/21 FO/APFC/2002/REP

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