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FOREST NEWS

TIGERPAPER is dependent upon your free and voluntary contributions in the form of articles, news items, and announcements in the field of wildlife and nature conservation in the region. In order to better serve the needs of our readers please write to us and send in the information you have or let us know if there is any information that you need. We appreciate receiving your letters and make all efforts to respond.

Front cover: King cobra (*Ophiophagus hannah*) (Photo: Manoj V. Nair)

DISTRIBUTION OF KING COBRA (Ophiophagus hannah) IN NORTHEASTERN INDIA WITH NEW ALTITUDINAL RECORD AND NOTES ON ITS HABITAT

by Abhijit Das, Manoj V. Nair, M. Firoz Ahmed and Pranjit K. Sharma

Introduction

King cobra (*Ophiophagus hannah*) is the largest venomous snake in the world, reaching to a length of up to 5.85 m (Aagaard, 1924). This monotypic genus of the family Elapidae is considered as a species complex (Das, 2002). Being a large and conspicuous reptile, King cobra has received scientific attention from various perspectives since its first description (see Das and Whitaker, 1996). However, in comparison to the availability of literature concerning its systematics, diet, general biology, husbandry, venom and envenomation, there is a dearth of information regarding its regional distributional locality records, which is a serious concern when planning out conservation strategies for the species.

Methods

The primary data used in the present study was collected between 2002 and 2007 during the course of our herpetological investigations at various places in northeast India. An extensive literature survey was done to extract the published distribution records available. Field records include direct sightings of live individuals, freshly killed specimens, skins, examination of museum specimens and distinct color photographs of the species taken from the region. A Garmin 12-channel GPS was used to get the geo-coordinates of the localities. Based on these data, a distribution map was prepared and an attempt was made to compile and analyze the King cobra distribution in northeast India, based on the literature records as well as field records.

Results of the literature survey

Globally, the species is distributed in India, Bangladesh, Bhutan, Myanmar, Nepal, South China, Macao, Laos, Thailand, Malaysia, Indonesia, Hong Kong, Brunei Darussalam, Cambodia, the Philippines, Singapore and Vietnam, (David and Vogel, 1996; Selich and Kestle, 2002). In India, the distribution range of the species is recorded as Western Ghats, Uttar Pradesh (Terai), Bihar, Orissa, West Bengal, northeast India and also the Andaman Islands (Whittaker and Captain, 2004).

It is regarded as widespread, but uncommon (David and Vogel, 1996). In its distributional range, the species is recorded from various habitat types such as lowland wet tropical forest, coastal rainforest, tropical and subtropical wet montane forest, dry forest, swamps and marshes, mesic open scrubland, plantation and cultivated areas, alluvial and terai grassland, mangrove swamps, open country and disturbed areas, and near human habitations (David and Vogel, 1996; Selich and Këstle, 2002; Leviton *et al*., 2003; Narayan and Rosalind, 1989).

Due to the paucity of herpetological surveys carried out in northeast India, exact distributional information on even conspicuous herpetofaunal species is lacking. However, King cobra has sporadically been listed from different states of northeast India.

In Assam, the species has been reported from Dibrugarh, Tezpur, Margherita and North Cachar Hill district (Wall, 1909), Garbhanga Reserved Forest (RF) and the Kulsi River side of Kamrup District (Sengupta *et al*., 2000; Mathew, 1983), Bansbari, Kasimdaha and the kuribeel grassland of Manas National Park (Narayan and Rosalind, 1989).

The literature record of the species from Arunachal Pradesh includes one example from Chessa and

two examples from around Itanagar (Borang *et al*., 2005). Athreya (2005) listed the species from Eagle Nest Wildlife Sanctuary and Pakke Tiger Reserve. Pawar and Birand (2001) confirmed the species in the primary forests of Nengpui National Park of Mizoram.

In Meghalaya, Wall (1908) reported the species from Ghat road below Shillong at 909 m (3, 000 ft) and one killed in Shillong bazaar. From the same state, Mathew (1983) reported the occurrence of the species from Umthan and Shillong woodland compound – both in the East Khasi hills.

Results of the present study

During the course of our herpetological field work (2002-2006) in different parts of northeast India, we came across new distributional localities of King cobra.

In Assam, the species was sighted in the Holalpath camp area of Kaziranga National Park (KNP); one was killed and one rescued from Panbari village adjacent to Panbari RF; another was rescued from a fishery tank at Lakhojan Tea Estate. One freshly killed male individual was recorded from Diring Chariali. All reports were from the fringe areas of KNP in Golaghat district of Assam.

Other locality records in Assam include one road-kill specimen on National Highway 37 passing through the semi-evergreen forest of Nambor Wildlife Sanctuary, one rescued from Guijan village at the periphery of Dibru Saikhowa National Park, one sighting record from the evergreen forest edge of Kakojan RF (Duarmara side) adjoining a tea garden, and one photographic record from Potasali camp of Nameri Tiger Reserve. Similarly, two rescued individuals of the species were seen in Bihara village of Cachar district, Assam.

In Arunachal Pradesh, we encountered the species crossing a trail in evergreen forest in Pangsu Pass RF and one dead juvenile of the species was found near Rusa-Chopsa village RF, both in Tirap District. In the lower Dibang Valley districts, one of study team encountered the species while it was crossing the Roing-Myodhia road. The vegetation on both sides of the motor road is secondary evergreen forest in different stages of degradation. In the same district we examined the skin of one specimen from Koronu village, which had reportedly been killed inside a bamboo forest beside Mehao Nullah (stream) at the periphery of Mehao Wildlife Sanctuary.

One individual was encountered while basking on a rocky outcrop near a stream in Rottung, West Siang district of Arunachal Pradesh.

Before the present study there were no locality records for King cobra from Nagaland state (see Ao *et al*., 2005). In November 2006, local villagers showed us the skin of a freshly killed specimen from the outskirts of Khonoma village. This constitutes the first scientific report of the species from Nagaland; however, the species is well known among local villagers who call it Nüga (Snake eater).

In Manipur, we came across a preserved specimen at Manipur Museum located at Imphal Zoological Park. The individual was collected from Moreh, situated at the India-Myanmar border.

Discussion

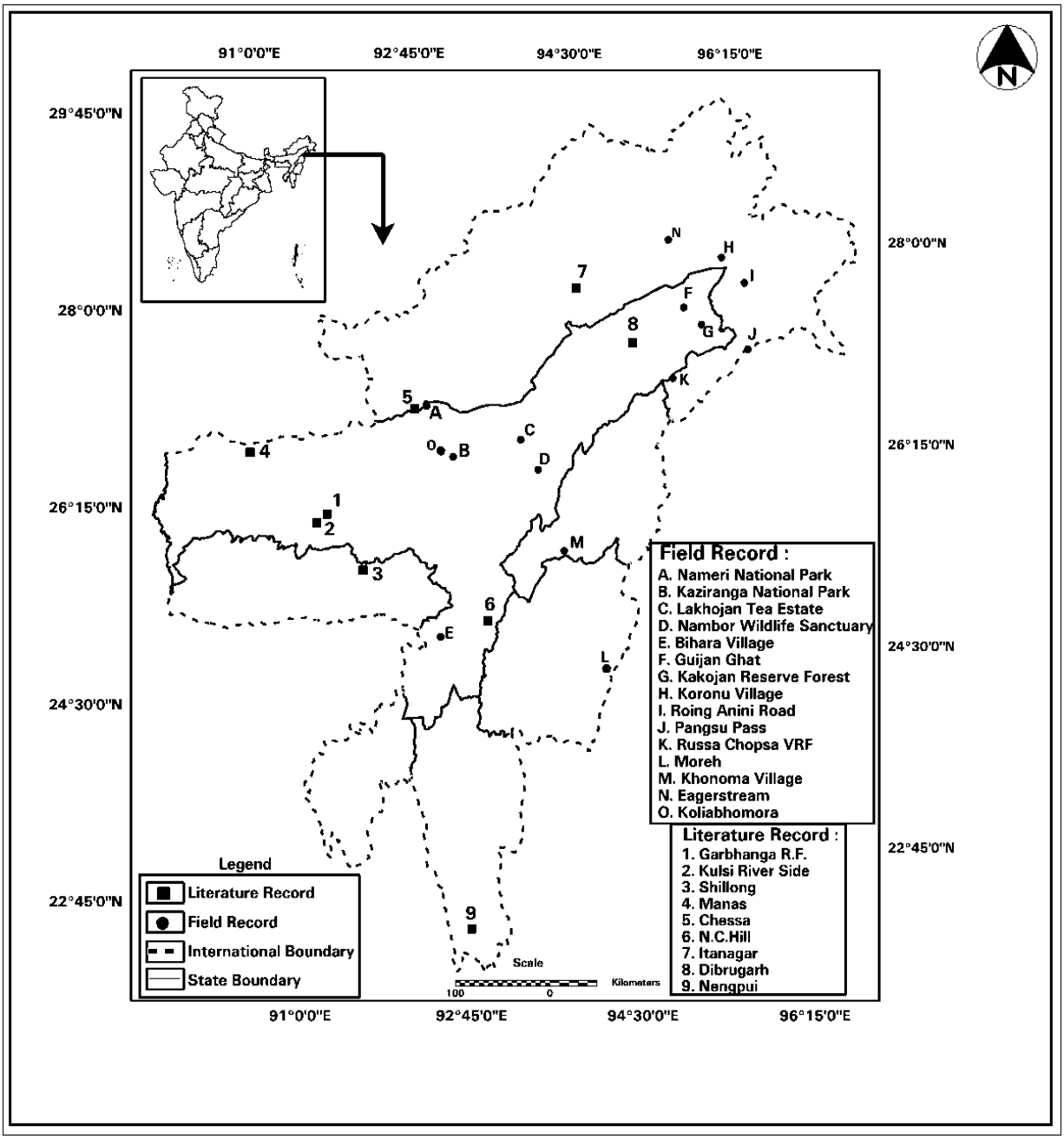
Habitat preferences

In Northeast India, King cobra was found to occupy a wide variety of habitats. Out of a total of 17 direct sightings, 6 were from primary wet evergreen and semi-evergreen forests, 3 from secondary evergreen forests, 2 from tall alluvial grasslands, 6 from in and around human habitations, and 1 from mid-elevation broad-leaved forests. Thus, although it seems that the species is a generalist with a wide ecological amplitude, a more incisive analysis of the records indicate that the majority (76%) of the sightings have been either inside or adjoining protected areas with large, intact undisturbed forests and not from small, degraded, fragmented forests. It thus follows that conservation of the species requires large contiguous tracts of forests with minimal biotic disturbance.

Altitudinal distribution

Regarding altitudinal distribution, an analysis of the records indicates that the species occupies a

Fig. 1 Map showing distribution localities of King cobra from Northeast India



wide range of altitudinal zones, ranging from sea-level to high mountains. It has been recorded from 150 m to 1,530 m in Nepal, and from sea level to 1,800 m in Sumatra (Selich and Kestle; 2002; David and Vogel, 1996). Waltner (1972) mentioned a specimen which he obtained from a site located at an altitude of 2,181 m at Mussoorie in 1967. During the present study, the lowest altitude reported for King cobra was at 40 m above sea level at Bihara village of Cachar, Assam. Forty-one percent (N=7) of the recorded sightings were at altitudes between 55-100 m, followed by 35% (N=6) between 100-500 m, and 11% (N=2) between 500-1,000 m (mid-elevation hills). It is worth mentioning that the highest altitude with recorded sightings during this study was 1,700 m above sea level at Khonoma, Nagaland, which is the highest known altitudinal record within northeast Indian limits.

Threats to the species and conservation status

During the course of study, the following threats were identified:

- habitat destruction and fragmentation from loss of forest cover due to swidden cultivation and logging;
- hunting, as King cobra meat is eaten in many parts of Arunachal Pradesh and Nagaland;
- deaths by autos, especially on the national highways passing through or along large forest patches; and
- wanton killings by humans when sighted near habitations – especially when the serpents venture out of degraded forests in the search of better habitats.

Although the exact status of the species in northeastern India is not known, it is certain that its numbers are dwindling rapidly due to large scale destruction of its habitat. The existing protected area network no doubt holds the key to maintaining safe and viable populations. But given the substantial areas of forested land under the direct control of local communities, any effective long-term conservation strategy has to focus on intensive awareness campaigns and sensitization of local people towards the requirements of this magnificent reptile.

Acknowledgements

The authors are grateful to the Departments of Forests and Environment of the Governments of Assam and Arunachal Pradesh for permission to conduct the study. Thanks also to the Animal Ecology and Wildlife Biology Lab, Department of Zoology, Gauhati University, Primate Research Center, Deshabandhu Club, Assam, and the Khonoma Village Council, Nagaland, for financial and logistical support respectively.

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Table I: Primary data locality records with details

No.	Date	Locality	District & State	Co-ordinates	Altitude (m)	Habitat type	Remarks
1	10/01/03	Roing-Mayodia Rd	Roing, Arunachal Pradesh	28° 13'N, 95° 50E	750	Secondary evergreen forest	Landscape dotted with jhum patches; very low human density.
2	20/04/05	Koronu Village	Lower Dibang Valley, Arunachal Pradesh	28° 03.933'N, 95° 56.493" E	357	Secondary bamboo growth near stream	Killed and eaten.
3	02/11/05	Pangsu Pass	Tirap, Arunachal Pradesh	27° 14'50" N, 96°08'21" E	630	Wet evergreen forest	Encountered basking on an evergreen forest trail
4	13/07/05	Russa-Chopsa VRF	Tirap, Arunachal Pradesh	27°04.280N, 95°18.17 E,	230	Selectively logged evergreen forest	Juvenile killed
5	24/05/02	Eagerstream, Rottung	West Siang, Arunachal Pradesh	28°08.376'N, 95° 08.876' E,	310	Rocky evergreen forest stream	Seen basking on a rocky outcrop
6	13/11/06	Nameri NP	Tezpur, Assam	27° 00' N, 92°40' -93° 00' E	110	Grassy patch near rocky river bed	Record from photograph by authority of Nameri eco camp.
7	12/03/04	Kaziranga NP	Nowgaon, Golaghat, Assam	26° 33'- 46'N, 92°55'- 93°40' E	55	Alluvial grassland with cane brakes	Encountered on a forest trail. It retreated inside the cane brake with a raised hood.
8	27/05/04	Panbari village	Golaghat, Assam	26° 37.334'N, 93° 32.395'	80	Village at the fringe of Semi evergreen forest	One individual rescued from a thatched roof and one killed by villagers.
9	01/06/04	Diring Chariali	Golaghat, Assam	26° 37'N; 93° 23'E	70	Paddy field near human habitation	Local villagers killed male individual
10	31/08/02	Lakhojan tea estate	Golaghat District, Assam	26° 38' 13.3"N 93°37' 43.9"	77	Near tea garden in fishery tank	Rescued from a fishery tank.
11	23/04/03	Nambor WS	Golaghat, Assam	26° 20'-25' N, 93°48' -54'	90	Semi evergreen forest	Road kill on NH 37 passing through Sanctuary

12		Kakojan RF	Tinsukia, Assam	27° 30'N, 95°40 E	137	Semi evergreen forest	Sighted on forest-tea garden edge
13	25/04/03	Guijan Ghat	Tinsukia, Assam	27° 38'N 95° 21'E	98	Human habitation	Rescued
14	23/01/07	Bihara Village	Cachar, Assam	24° 57.283 'N 92° 39.263' E	40	Human habitation	One rescued from brick pile near house; another from old temple.
15	09/12/03	Koliabhomora	Nowgaon, Assam	26° 33'N, 92° 56" E	56	Human habitation	Rescued in molting condition
16	?	Moreh	Chandel, Manipur	24° 15'N, 94° 18'E	181	Evergreen forest patch	One preserved specimen seen at Imphal Natural History Museum
17	10/11/06	Khonoma Village	Kohima, Nagaland	25° 37.923 N, 94° 01.433 E,	1,700	Subtropical forest	Killed and eaten

STUDY ON THE STATUS AND VARIOUS USES OF INVASIVE ALIEN PLANT SPECIES IN AND AROUND SATCHARI NATIONAL PARK, SYLHET, BANGLADESH

by Sharif Ahmed Mukul, Mohammad Belal Uddin and Mashiur Rahman Tito

Introduction

During past two decades "invasive alien species" (IAS) have gained wider recognition by scientists for their severe ecological and economic impacts worldwide, and have been identified as one of the greatest threats to native ecosystems, habitats and species. In fact, such species are introduced for their rapid growth, efficient dispersal capabilities, large reproductive output and tolerance to a broad range of environmental conditions (Campbell, 2005). Although it is has been widely believed that such characteristics of IAS frequently threaten the native biodiversity, still there are some contradictions in the definition and the use of the term IAS, and not all of these species are harmful (Wittenberg and Cock, 2001). Recently, Dr. Parvez Harris, a Bangladeshi scientist, observed that the powder obtained from the dried root of water hyacinth, one of the major IAS of Bangladesh and other countries of the tropics, can considerably reduce the arsenic contaminants from water and render it unobjectionable for human drinking. Bangladesh is thought to have more than 300 alien species, some with invasive natures which grow either wildly or are widely cultivated throughout the country (Hossain and Pasha, 2001). Among them, most of the herbs and shrubs were introduced during the British colonial period for their aesthetic value and most of the timber species were introduced in the country from the late 1880s to early 1890s to meet the country's rapidly growing demand for timber. A number of studies have been conducted on the ecological and economic impacts of IAS at both national and regional levels, but very few studies have focused on their use and role to local livelihoods. Our study attempts to demonstrate the status and various uses of these so-called invasive alien plant species in and around Satchari National Park, located in the northeastern hilly regions of Bangladesh.

The study area

Satchari National Park is one of the newest among the eighteen protected areas of Bangladesh. The area of the park is about 243 ha and is comprised

of the Raghunandan Hills Reserve Forests (RF) within the Satchari Range. The park is situated nearly 130 km northeast of Dhaka and is located in Chunarughat Upazila (administrative unit) of Habigonj District.

The southern part of the park is bordered by India; other adjacent areas are covered by tea estates, rubber, agar plantations and paddy fields. Although this forest classically belongs to the evergreen type, the large-scale conversion of the indigenous forest cover to plantations has changed its forest type entity (Choudhury *et al*., 2004). Now only 200 ha have natural forest; the rest is secondary-raised forest. It is also one of the last habitats of Hoolock gibbons (*Bunopithecus hoolock*) and the rare bird species Hooded Pitta (*Pitta sordida*), in the country.

The topography of the Satchari area is undulating, with slopes and hillocks ranging from 10 to 50 m in elevation. The climate is tropical in general. The total annual average rainfall is 4,162 mm. A number of small, sandy-bedded streams drain the forest during the rainy season. The maximum and minimum temperature of the area is 32ºC and 12ºC respectively. The relative humidity fluctuates from 74% to 90%.

Methodology

The data for this paper was collected during a course of intensive field visits undertaken to Satchari during February to June, 2006. During the course of the field visits the authors surveyed a number of sample plots in and around the national park boundary to identify the IAS plants available in the locality. Specimens and photographs of unfamiliar species were also collected. Some group discussions were also arranged with the local inhabitants to learn the various uses of the identified species in the Satchari area.

Several authors (e.g. Barua *et al*., 2003; Islam *et al.*, 2003; and Hossain and Pasha, 2001) have studied various aspects of IAS in Bangladesh; to classify a plant species as an invasive alien species the authors have followed the available literature.

Results and discussion

Invasive alien plant species of Satchari

During our intensive field survey we recorded a total of 19 alien species belonging to 12 different families; 15 of them were found to have been reported as IAS from various literature. Species were mostly found to belong to the Family Fabaceae (26%), followed by the Family Asteraceae (11%), Meliaceae (11%) and Verbenaceae (11%). Most of the recorded species were trees (47%), followed by some herbs, shrubs and others. Most of the species were found growing in natural forest (i.e. in the national park and adjacent reserved forest), while rest were found along roadsides, in waste and fallow lands, tea gardens and agricultural fields.

People's use and perception of various IAPS

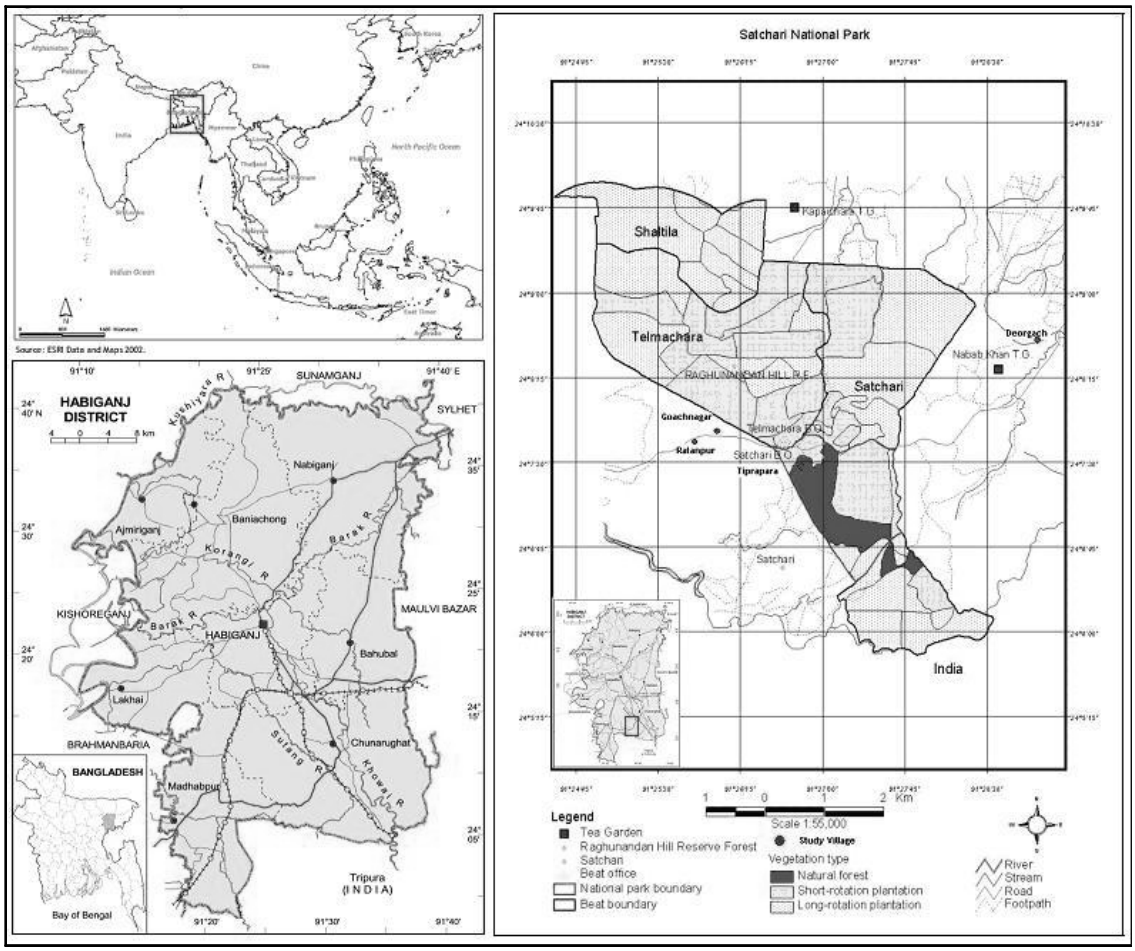
We have documented twelve diverse uses of the identified species in and around Satchari National Park. However, most of the species were found to be of multipurpose use. For example, water hyacinth is considered as one of the 100 worst IAS of the world (Lowe *et al*., 2000), but is used by the local people for 3 different purposes. The majority of identified species were found to be used for fuel, followed by timber production, medicinal or curative uses, fodder, and many others.

Our study also revealed that the majority of the identified tree species in the locality were introduced to meet the increasing demand for timber. Most of the weeds, both aquatic and terrestrial, and shrubs are reported to have been in the locality for a long period of time. Although the people of the Satchari area not conversant with the term IAS, they prefer such species of timber for their fast-growing nature. However, during our survey they reported 5 species as being very harmful to the local ecosystem, another 6 species that were moderately harmful, and 4 species that were less or least harmful.

Conclusions and recommendations

It is true that the so-called invasive alien species have some negative impacts on local ecosystems, but not all of them are harmful or useless. Besides, of the many alien species in the country, their uses

Figure 1. Location map of the study area



and impact on local ecosystems have yet to be identified. Therefore, a national programme must be initiated to distinguish the harmful from the harmless species and to identify the use and impacts of the former and latter. The Government should be cautious in introducing alien species in plantation programs and should establish clear and effective quarantine regulations for alien (invasive) species. In addition, a standard and comprehensible procedure for the introduction and monitoring of alien species is necessary.

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The authors would like to thank Mr. Joydip Roy for his support during our field visits. Field assistance of Nobel and Pranto are also acknowledged. The literature support from Global Invasive Species Programme (GISP), Invasive Species Specialist Group (ISSG), The World Conservation Union (IUCN) and Secretariat of the Convention on Biological Diversity (SCBD) is thankfully acknowledged. Finally, we are grateful for the cooperation of the residents of Satchari area during the time of our field data collection.

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Figure 2. Some common IA plant species of Satchari (clockwise: lantana; oil palm; siam weed and water hyacinth)

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MAN-WILDLIFE INTERACTION: UNDERSTANDING THE CONCEPT OF CONSERVATION ETHICS IN PAPUA

by Freddy Pattiselanno

Introduction

Hunting is one of the mortality factors that play a role in maintaining wildlife populations in the wild. In population dynamics, hunting (sport) is legally accepted for applying toward the sustainable harvest of wildlife as a part of wildlife management.

Culturally, hunting has been one of the traditional ways of life for the local tribes in West Papua from the time of their ancestors. Hunting activities are conducted for the purpose of obtaining food and for gathering material for the traditional attire and for customary rituals.

Some studies (McKinnon, 1984; Petocz, 1994) have indicated that the hunting activities by local communities in West Papua are important for catching animals for food and to obtain material for ceremonies. People often use traditional weapons and traps to catch animals for subsistence hunting (Wibowo and Suyatno, 1998). According to Beehler (1985), some birds were hunted not only for food, but also for their plumes that were used as accessories in their traditional costume.

To some extent, there are several differences between sport hunting and traditional hunting such as the purpose of hunting, time frame, regulations and the number of target animals hunted. However, other studies show that among the local community (traditional tribes) the common traditional concepts derived from their ancestors are still widely in practice, and could be considered as the law enforcement among local communities (hunters) in West Papua.

This paper reviews the available information gathered during field surveys in West Papua relating to the conservation ethics universally applied by local communities as an approach to wildlife management. In particular, this paper would like to emphasize the relevance of conservation principles trusted from the past up to now, and still extensively practiced by local communities in West Papua, that have a role in the management of hunting practices.

Purpose of hunting

Based on their daily activities, the local inhabitants who live in coastal areas, or in areas commonly related to wetlands including lakes, rivers and swamps, derived most of their income from traditional forms of fishing. They also occasionally hunt when they are unable to fish due to unfavorable weather. Whatever is caught is usually used for food and shared with the neighborhood in the village. In this circumstance, it seems that the purpose of hunting is mainly for animal protein sources (Pattiselanno, 2004a). Petocz (1994) stated that people trap and hunt mammals and birds everywhere in West Papua to complete their menu.

In contrast, people living far from the coast in remote areas predominantly engage in traditional agriculture and hunting. This way of life is inherited from their ancestors, who had a semi-nomadic lifestyle. They practice rotational agriculture of root crops – mainly taro and sweet potatoes. Those people who occupy the swamp areas utilize sago for their food. Anything caught by hunting is mainly used as food source, although it is also acknowledged that some bush meat (wild boar and deer) is sold to generate income (Pattiselanno, 2004b).

Hunting methods

People in West Papua often use traditional weapons and traps to catch animals (Wibowo and Suyatno, 1998). Paijmans (1976) stated that hand

nets and longer nets are used to catch pigs, birds and bats and that simple hand-operated snares made from rope and rattan and baited with wild fruits, sago or bananas are commonly used throughout New Guinea. Spring-snares are usually made from bamboo or flexible wilties of *Syzigium* sp., *Aglaia sapindina* and *Dodonea viscosa*.

Instead of using traditional weapons, some tribes also hunt animals using dogs. The number of dogs varies, but is usually more than one. Local communities of Lorentz National Park (Dani's tribe hunters) work with their dogs during their hunting activities (Flannery, 1995).

In Kebar and Wasur, the traditional way of hunting combining fire, dogs and blades is usually practiced in the dry season. In Wasur, hunting was first practiced to catch wild boar, but in the last few years, deer and wallaby are hunted as well. Groups of more than 10 people are involved in this traditional method of hunting.

Concept of conservation

Our findings indicate that different communities have different conservation concepts, e.g., people in Teminabuan believe that they will lose their skills in war (passed on from their ancestors), if they catch and kill cockatoo birds. Villagers in Cenderawasih Bay and the Northern Tamrau highland believe that there are some sacred places in the forest and they are not allowed to hunt there.

Pattiselanno *et al*. (1999) indicated that villagers in Cenderawasih Bay still practice "sasi", in which hunting ceases for a period of time in specified areas. However, in Wasur, it is practiced in relation to the death of a clan member. Local inhabitants in Jandurau village (Kebar highland) prohibit eating some of the catch killed by hunting dogs.

Local communities in all places are applying the common traditions passed on by their ancestors. The practices of traditional hunting are still widely followed such as using traditional weapons for hunting. Hunting in the forest is mainly influenced by ownership of the land (hunting is usually restricted to areas belonging the clan). In this case, outsiders have to ask permission from landowners and share the catch with the landowners of the forest. Wanggai and Kilmaskossu (1999) stated that traditional rights usually belong to the clan/ tribe in the forest in the territory where local communities hunt in the remote areas of West Papua.

Constraints

Due to the development of the province, local communities are increasingly exposed to migrants with different attitudes toward resources use. One consequence of social interactions between local inhabitants and migrants has been changing attitudes towards hunting practices by local people. For example, the exploitation of some valuable birds (e.g., Bird of Paradise and Crowned Pigeon), crocodiles and turtles by local people to supply the smuggling trader is increasing. A study conducted by Bodmer (1995) in Reserve Communal Tamshiyacu Tahuayo (Peru) indicated that the preferences of hunters were correlated with the economic value of species (combining both market and subsistence value).

In some areas, improved access to markets has led to a shift in hunting activities from subsistence to commercial purposes. In addition, this makes the practice of using guns more popular, even though it is prohibited. The Environment Study Center of Cenderawasih University (2000) reports that in Wasur, modern hunting practices using guns and motorcycles is widespread.

In fact, there is no law assigned by the local communities restricting hunters to killing adult male animals (bucks) only. Due to some restrictions such as the lack of knowledge about the breeding season, animals are trapped randomly. More information and planning is needing regarding the management aspect.

Conclusion

Unlike sport hunting, traditional hunting by local people is not subject to legal requirements such as licenses or hunting season. Target animals are randomly killed (using trap and traditional weapons) and the number of animals taken is not limited. Subsistence needs are the main purpose of hunting,

and it is difficult to identify the times when there is a harvestable surplus.

However, it is obvious that, to certain extent, the local communities in West Papua are already applying a form of wildlife management specifically to manage hunters. Their traditional rules that include utilizing traditional weapons, prohibiting hunting in some sacred areas, restricting hunting to areas belonging to certain clans, forbidding the capture or killing of certain animals in some areas, should all be considered as parts of wildlife management.

In the future, considering the limitations in traditional hunting regulations and the development of the province, it will be important to develop a wildlife management program for conservation purposes. The relevant information can be obtained through the education and research.

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CROP RAIDING PATTERN BY MIGRATORY ELEPHANTS IN VAST AREAS OF SOUTH WEST BENGAL

by A.K. Santra, A.K. Samanta and S. Pan

Introduction

Crop damage by elephants is reported to be very severe in south, east and northeast India. Elephants may encounter cultivable fields in the course of their natural seasonal movements. Since many cultivated crops such as cereals, millets, vegetables, sugarcane, oil palm, and coconut are analogous to their wild counterparts, elephants consume these crops as any other wild plants. Raiding of highly palatable agricultural crops by these animals is common over most of their range and therefore it has become a serious problem. At present, farmers across Asia and Africa lose millions of rupees worth of crops each year due to elephants' depredations.

A group of elephants has been migrating from Dalma Wildlife Sanctuary, Jharkhand to vast areas of South Bengal forests during August-September since 1987, where they remain for 6-7 months. During their stay, elephants become a subject of great concern in terms of economic loss and loss of human lives. Although elephants have started crop raiding intensively since 1987, old records indicated that in 1790, wild elephants destroyed agricultural fields in South Bengal (Anon., 1954). No explanation is yet available for the sudden spurt in crop raiding since 1987. Crop availability and raiding patterns were studied in order to comprehend their selection of a particular crop to be consumed with the seasonal conflict pattern.

Materials and methods

The study area is located in the three administrative districts of West Midnapur, Bankura and Purulia between latitudes 22°25' to 23°15' North and longitudes 86°30' to 87°49' East. The geographical area covers about 11,000 km^2, with forests spread over 1,850 km^2, and is bounded by Burdwan district in the north and Jharkhand and Orissa in the west. Dalma forest, home of migratory elephants, is located at the west of the study area within Jharkhand state.

The depredation pattern on different agricultural crops viz. paddy, sugarcane, potato, cabbage and wheat by elephants was monitored by direct observation. The data on different types of crops damaged, parts consumed, stages of crops, etc. were recorded by visual appraisal and damage area measurement (Manakadan and Rahmani, 1998). A total of 400 paddy fields in the vegetative stage, 200 paddy fields in the ripening stage, 40 sugarcane fields, 20 potato fields and 80 cabbage fields that suffered depredations by elephants were assessed for damage. A total of 300 hills of paddy and 300 standing sugarcane samples were assessed for parts consumed by elephants. Measurements of the damaged areas within the sampled plot were recorded to obtain the mean percentage damage in the sampled area.

Results and discussion

Elephant herds used the forest for daytime shelter and raided crop fields from dusk to dawn, depending on the local situation. They moved nearer to the forest boundary in the evening – usually between 18.00 hr and 19.00 hr. However, one breakaway group of seven elephants was observed entering between 15.00 hr and 16.00 hr at Lalgarh forest areas. There were instances of elephant herds entering into the fields located in Nayagram range between 20.30 hr and 21.30 hr. In one instance the elephants were delayed in coming out of the forest as their movement paths were blocked by highly enthusiastic villagers. Finally, the herd led by the tusker became belligerent and aggressive towards intruders and entered into the crop field at 21.15 hr.

In 2001, a herd was stationed at Mararchaiti forest of Patrasayer for more than a week and visited the Golsi area in search of highly palatable food such as potato and sugarcane. The herd left Mararchaiti forest at about 21.00 hr for Golsi and returned the next day at 9.00 hr to the same forest. Elephants invariably raided the agricultural fields bordering the forests. For a few consecutive days they would repeatedly raid a cluster of fields located near the forest where they took shelter in the daytime. This practice continued until the elephants turned their attention to other locations or they were driven away by the determined efforts of the driving parties. Migratory elephants do have a higher preference for agricultural crops, obviously due to their better taste. They usually devour crops in a typical attacking style and the pattern is termed "raiding".

The crop raiding pattern of migratory elephants in South Bengal during 1982-2003 revealed that elephants were almost totally dependent on paddy up to December. During this period (August-December) elephants moved into vast areas of paddy fields spreading over different forest divisions viz. East Midnapur, Rupnarayan Planning and Survey, Panchet Soil and Conservation and Bankura (north and south). However, during late February the elephants moved into Nayagram, Chandabilla and other ranges of West Midnapur forest division where rabi crops are cultivated on the bank of the river Subarnrekha. It was observed that six cultivated crops viz. paddy (*Oryza sativa*), sugarcane (*Saccharum officinarum*), potato (*Solanum tuberosum*), cabbge (*Brassica oleracea var.capitaria*), wheat (*Triticum aestivum*) and gourd (*Cucumbita maxima*) were the major dietary items of elephants, with paddy being the most important. Initially, they were dependent on the vegetative and booting stages of this crop, and later on switched over to the flowering stage, followed by fully ripe grain.

It was observed that out of the total number of paddy fields (vegetative stage) studied, 60% of the fields suffered up to 25% damage. However, only 2.5% of the fields were damaged by more than 75%. In the case of ripening paddy, 45% of the fields were damaged between 51%-75%. Quite naturally, fields located in the vicinities closer to the forests were more prone to depredations by elephants, irrespective of the stage of maturity of the crop. The mega-herbivores always made the best effort to consume the maximum amount of biomass in the minimum time. This was obviously to cut short the exposure time, an innate behavior among wild species. However, on many occasions elephants covered long distances in search of more palatable paddy fields with better vegetative growth or ripe grains.

Sugarcane was the second most preferred crop of elephant after paddy. The major part of their dietary requirement comes from sugarcane during the final part of their stay in South Bengal. They usually consumed 0.98 ft of the upper most part of the stem just below the leaves. Elephants avoided the lower part of the stem, perhaps due to the higher fiber content. Surprisingly, leaves were also discarded. It was observed that 92.5% of the fields suffered damages up to 25%. Interestingly not a single field was damaged beyond 75%. Together with sugarcane, potatoes were also an attractive food item for migratory elephants. Visual estimates revealed that they inflicted more than 75% damage to the raided fields. Interestingly, elephants avoided wet potato fields with immature crops. Cabbage was also chosen by elephants as a food item and they inflicted heavy damage to the crop due to threshing. Mature cabbage fields were more attractive to the elephants. In the present investigation, 40% of the fields were damaged beyond 75%. Wheat plants at different stages of growth were also attractive to elephants. Wheat fields with milky exudates grain were the most favored.

Depredations of gourd, brinjal, pea and cashew fields were also noted during the study period but were not very commonly except for gourd. However, it is difficult to conclude whether elephants had any special affinity for these crops or whether they accidentally they came into contact with these crops during their movement.

It appears from the study that the crop raiding pattern by migratory elephants was largely determined by the availability of different crops. On entering into South Bengal during last week of August or first week of September, they have to rely on the vegetative stage of paddy. They occasionally searched for an early variety of paddy

sown in June which would be bearing grains by that time. Though paddy in the vegetative stage supplied bulk biomass to the pachyderms, they made constant efforts to avoid the same, possibly because of the progressively higher fiber and silica contents.

Elephants were attracted to highly palatable and nutritious crops by virtue of their keen sense of smell in selecting food plants (Sukumar, 1985). The feeding pattern in South Bengal clearly indicates that the crop raiding strategy definitely benefited the elephants by providing more nutritious food than foraging on wild plants. Ripe grain, for example, provided more energy and the sucrose in sugarcane appealed to the elephant's sweet palate (Sukumar, 1985). Moreover, agricultural crops are either low or practically devoid of toxic compounds viz. tannins and other alkaloids. The optimal foraging theory which predicts that animals will maximize the quality of their nutrient intake whenever possible (Begon *et at*, 1986) offers the most plausible explanation for the unpredictable nature of elephant raids (Osborn, 1988; Hoare, 1999)

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PONG LAKE - AN INTERNATIONAL RAMSAR SITE IN NEED OF MANAGEMENT INTERVENTIONS

by D.S. Dhadwal

Introduction

Himachal Pradesh is nature's paradise, replete with beautiful landscapes, river catchments and forest wealth. A hill state, part of the Hindu kush Himalayas, it abounds in natural herbal wealth, has a large population of wildlife and varied climatic zones and topography. The hilly and semi-hilly areas are capable of sustaining a very large number of animal species and globally threatened birds.

Pong wetland, situated in Kangra District of Himachal Pradesh, was formed by the construction of Pong Dam in 1974 across the Beas River, and is one of the largest man-made wetlands of northern India. It is the first major wetland to potentially offer a transitory resting reserve for the migratory

birds coming from the trans-Himalayan zone in the winter season when the wetlands in Europe and North and Central Asia become frozen with the onset of winter. Every year flocks of waterfowl that breed in these areas in the summer migrate to Pong to spend the winter in more congenial climatic conditions during the winter season from October to March. The Government of Himachal Pradesh declared this wetland a wildlife (Birds) sanctuary in 1983. In 1994, it was declared a "Wetland of National Importance" by the Ministry of Environment and Forests, Government of India.

Pong Wetland Sanctuary

Pong wetland earned the distinction of being selected as an international RAMSAR site in 2002. This is first wetland of the state to have been given the global arm of protection.

The Pong dam reservoir extends between latitudes 31°49' to 32°14' North and longitudes 75°53' to 76°17' East. The total catchment area of 12,562 km^2 extends over Kangra, Mandi and Kullu Districts. The reservoir is 42 km long and 19 km wide and has live storage capacity of 7,290 million m3. The area of the water body varies from 125 km^2 at minimum water level of 1,265-1,280 ft in summer to about 225 km^2 at the maximum water level of 1,370-1,390 ft in the rainy season. When full, the reservoir has the appearance of an inland sea with waves traveling to the shoreline.

The environs of Pong wetland support more than 325 bird species belonging to more than 60 families. A large number of major and minor tributaries – some perennial and some seasonal, viz Dehar, Bhul, Gaj, Baner, Nekar, etc. from the Dhauladhar ranges – directly drain into Pong Dam.

The Pong reservoir has four major islands, viz Rancer, Karu, Kajal-ka-tapu and Jattaan da Kual. There is also a vast, flat fringe area on the right bank of the lake. BBMB Authority, being the owner of the land, has signed Memorandas of Understanding with three states, viz: Punjab, Rajasthan and Himachal to provide water for irrigation purposes.

Below Pong dam, a barrage was constructed in 1985-86 at Sathana. Sahanahar canal originates from this barrage. This barrage constitutes a shallow water body enclosing an area of about 3 km^2 and is a haven for a variety of migratory birds specific to marshy conditions. The total distance from Pong to the barrage is about 4 km.

Climate

The climate of the region is sub-tropical. The summer season extends from mid-March to mid-July and the monsoon season is from early July to mid-September. Winters are mild, starting in early December and lasting till mid-March. The temperatures range from a maximum 47°C in summer to a low of 3.5°C in winter. The rainfall is generally heavy and continuous from July to September. The average annual rainfall during the last five years was 1,207 mm.

Fauna

The main animal species found in the wetland are leopard, nilgai, sambhar, barking deer, goral, wild boar, monkeys, langurs, clawless otter and mongoose. Among the reptiles, monitor lizard and snakes such as cobra, python and krait have been recorded.

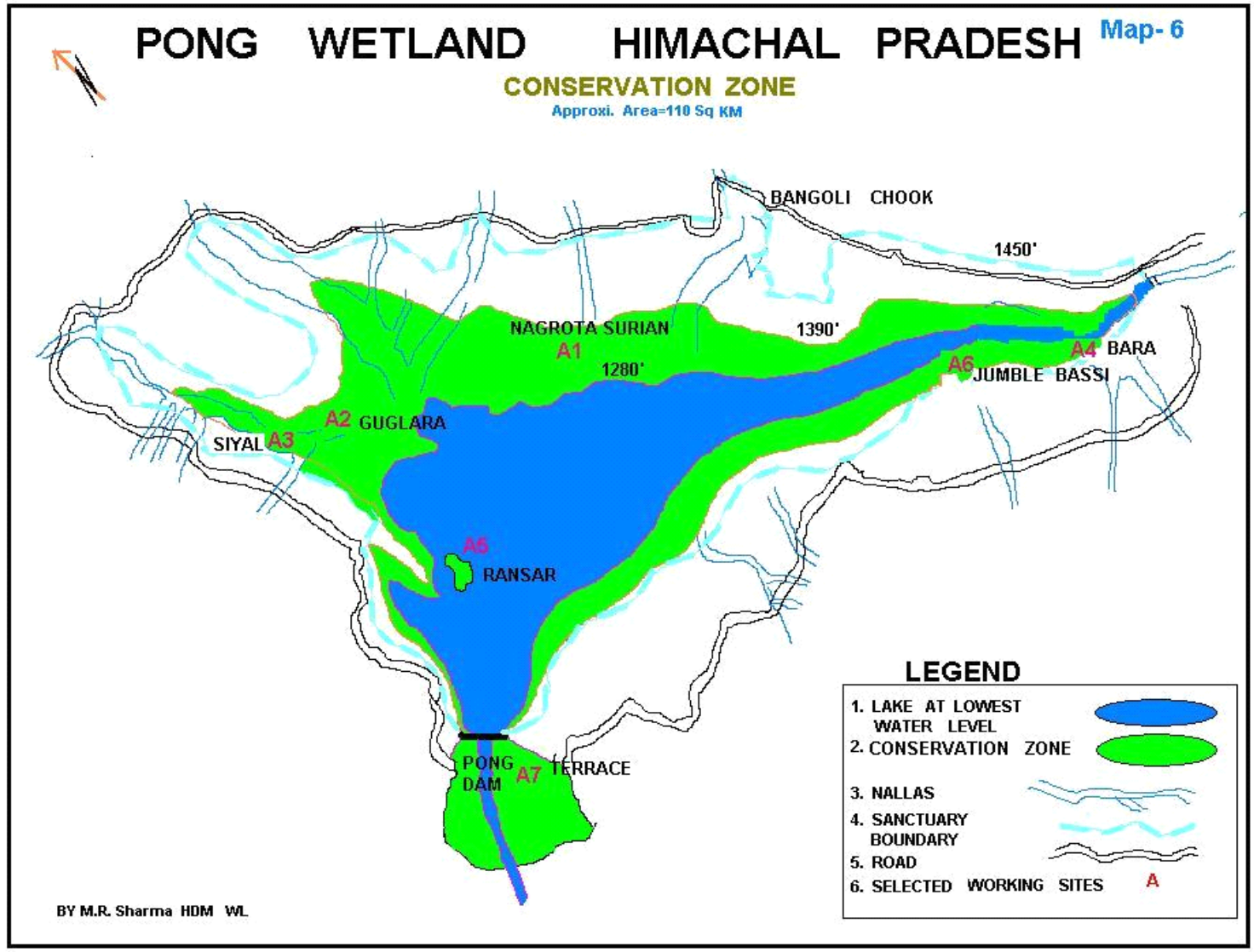
Fish diversity

The major attraction for the increasing number of migratory birds visiting Pong is the rich bounty of fish there. Fish species such as mahasheer, katla, carp, mirgal, rahoo, singhara, etc. are found in Pong Dam Lake and its tributaries. A total of 27 fish species belonging to five families have been recorded. Mahasheer (Tor putitora) is highly precious and the most sought after fish of Pong reservoir.

Commercial fishing in the wetland commenced soon after the formation of Pong reservoir, and provides direct employment to about 1,500 fishermen

Forests in and around Pong

The right bank of Beas has small pockets of meager forests, whereas on the left bank from Dehra to


PONG WETLAND HIMACHAL PRADESH
Map- 6
CONSERVATION ZONE
Approxi. Area=110 Sq KM
BANGOLI CHOOK
1450'
NAGROTA SURIAN
A1
1390'
A4 BARA
A6 JUMBLE BASSI
1280'
A2 GUGLARA
SIYAL A3
A5
RANSAR
PONG DAM
A7 TERRACE
LEGEND
1. LAKE AT LOWEST WATER LEVEL
2. CONSERVATION ZONE
3. NALLAS
4. SANCTUARY BOUNDARY
5. ROAD
6. SELECTED WORKING SITES A
BY M.R. Sharma HDM WL

Terrace are linear strips of scrub forests. There are several tree species that produce edible fruits for birds. There is also some submerged aquatic vegetation in the wetland that provides suitable habitat for rare birds such as moorhen, jacana, etc. The main tree species in the area are *Acacia, Jamun, Sisoo, Mango, Mulbery, Ficus, Kachnar, Amla, Prunus*, etc. There is also a variety of shrubs viz *Adatoda vesica, Indigofera, Dodonea, Woodfordia, Ziziphus, Maurraya, Euphorbia*,etc. and grasses of *Saccharum* sp, *Cymbopogan* sp., *Eulopsis* sp., etc. Several sub-tropical climbers are also found in these forests.

Water birds

Pong Wetland is regularly visited by a large number of migratory waterfowl. During 2004-05, about 1.42 lakh (lakh=100,000) migratory birds visited the Pong wetland.

The Pong wetland has an immense potential for bird watching, ecotourism, adventure tourism, water sports, angling, etc. Bar-headed goose, ruddy shelduck, coot, cormorants, pochard, mallard, grebe and moorhen are some of the important water birds that visit Pong every year. The number of bar-headed geese visiting Pong constitutes more than 45% of the world population. Large congregations of bar-headed geese in close association with ruddy shelduck can be easily located feeding on wheat and gram in the nearby fringe areas.

Wetland habitats

The man-made water body has created the following five main types of habitats in the wetland:

1. Mud flats and mud splits: Mud flats and mud splits are formed along the receding shoreline from during October to March. Such areas are highly preferred by sandlarks, pipits, shovellers, pintails, ducks, geese, wagtails, etc. Bar-headed geese and ruddy shelducks spend most of their time feeding on the sprouted grains/grass in the areas which are cultivated by local people during winter.
2. Open deep water: Such sites are dominated by grebes, cormorants, gulls, etc.
3. Waterside vegetation and swamps: Such swampy conditions are an ideal sites for moorhens, coots, Gadwall, Spotbill duck, jacanas, etc.
4. Shallow water at the reservoir margins: Such areas are important feeding areas for large numbers of dabbling ducks and some long-necked waders.
5. Dry sand banks with little or no vegetation: The banks strewn with boulders near the reservoir margins are used by stone curlew, pratnicoles, etc.

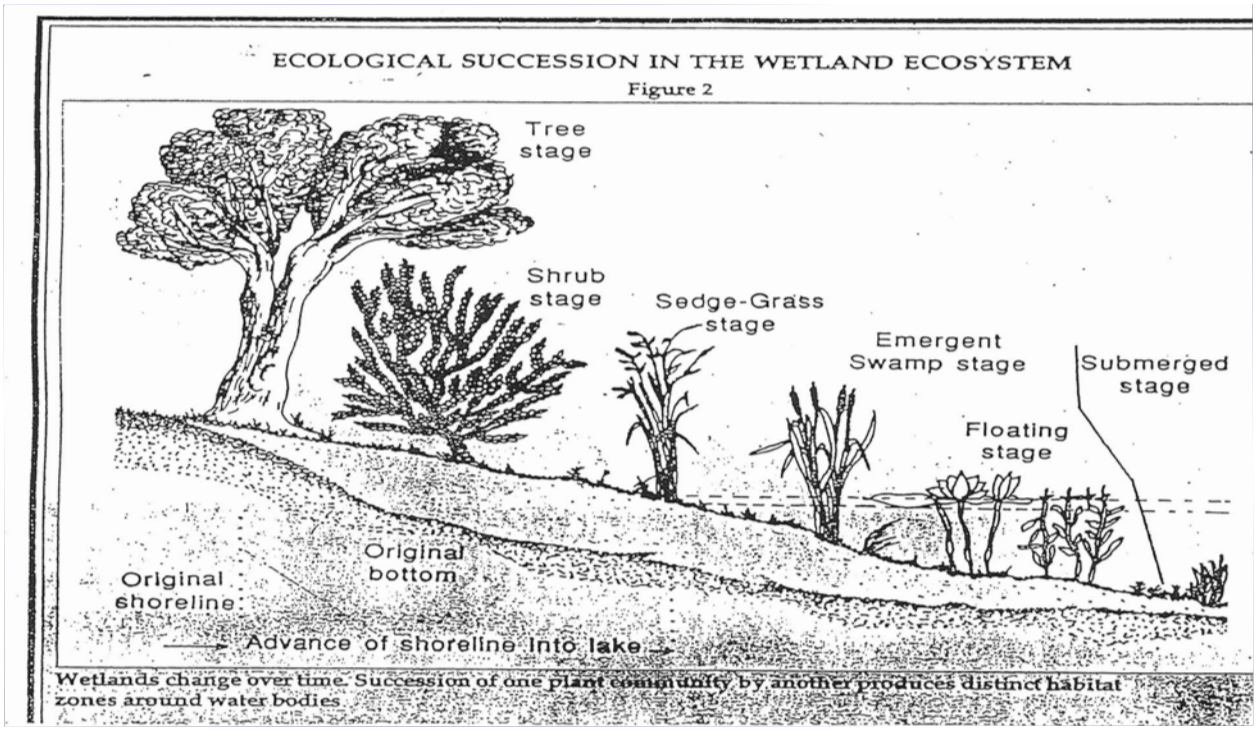
Management interventions in Pong Lake

Management plans in protected areas need to be institutionalized and should be formulated by a team of experts; sub-plans for each separate zone should be prepared with more emphasis on research and monitoring.

Water dynamics

The water level generally fluctuates from a maximum level of 1,390 feet mean sea level (msl) to a minimum 1,280 feet from October to June every year. Therefore, the flora and fauna in general, and the total numbers and species of migratory birds in particular, are significantly affected because of these uncontrolled/ unregulated fluctuations in the water level. It affects the waterfowl diversity and their arrival during the winter season and the breeding habitat of waterfowl during the summer season. Therefore, it is crucial to maintain the critical minimum level of water, so that the food, habitat and other requirements of flora and fauna can be maintained. It is very important that the water should be allowed to recede immediately when the birds begin their migration during October-November as the migratory birds, especially geese, need open areas to roost and graze on the new shoots of various grasses. If the area below 1,390 ft is not exposed at the start of the migration, there is the chance of fewer migratory fowls coming to Pong Lake due to the following factors:

- Less exposed area for roosting and grazing and subsequently, the birds will migrate to other nearby wetlands after hovering for some days in Pong lake.



- Non-availability of newly sprouted shoots of local grasses below 1,390 feet, which need time to sprout after the area is exposed after the water recedes.
- Biotic interference when the locals are rushing to sow the newly exposed area. Their movements and mechanical ploughing create lot of disturbance to the migrating birds during October-November every year.
- Non-static water level during the breeding period (April-July) is a deterrent as many waterfowls need to build their nests near the water body for successful hatching. As the water level keeps decreasing the nests end up quite far away from the water line and therefore the breeding success decreases. Sometimes the water level drops below 1,295 ft and even Ranser island is connected with the mainland, thus increasing the chances of predators and habitat destruction to the breeding ground .
- Decreased fish production and diversity due to the fluctuation of water levels from year to year. This affects the arrival of large cormorants, darters and other fish eaters.
- Non-availability of aquatic plants in the lake except near the perennial nallas and khuds. As the water level fluctuate, the strip of aquatic plants inside the shallow water keeps on shifting after short intervals of time and do not have sufficient time to create conditions for the plants to grow inside the water. These conditions restrict the aquatic plant growth in Pong Lake, which is essential for any wetland.
- More exposed area during the summer season leads to more biotic interference by the local people, by the cattle of the nomadic gujjars and by stray animals, therefore increasing the chances of trampling on the eggs of many water fowls species such as tern, lapwing, skimmers, pratincole, black-winged stilt, sarus crane, etc. which lay their eggs on the ground.

Recommendations

In order to maintain favorable conditions to support migratory birds, the following recommendations are proposed:

- The public should restrict their tilling/sowing activities to areas at least 500 m away from the maximum water line at any time, so that at least a 500 m untilled and undisturbed linear strip can be maintained at all times for the roosting and feeding of these migratory birds.
- The sowing of rabi (winter) crops in Pong lake continues up to the second week of January

every year along with the receding of the water (sometimes up to 1,300 ft msl) and therefore birds are always disturbed because of this unregulated way of cropping. The water level has to be maintained up to 1,340-1,350 ft until Lohri (harvest festival held on 13 January) to discourage the public from sowing more and more of the exposed area. Traditionally, people do not to carry out any sowing after Lohri.

- Water has to be released immediately after Lohri to expose more area for the birds. There is no harm in releasing the water immediately up to 1,300 ft; Ranser island will remain cut off from the mainland and be a breeding ground for water fowls during the summer season.
- Nagrota Surian fringe area (from 1,390-1,320 feet msl level) has to be converted into shallow ponds with mounds along the contours to retain the moisture throughout the year. A few deep fish ponds may be created to provide an alternate livelihood to the local public. Creating marshy land will also stop the public from ploughing the area, which would be otherwise difficult to stop. This fringe area in Nagrota-Surian measures 30 km^2, which is sufficient to create mini-Bharatpur conditions to attract birds. At the moment there is no need to supply water artificially to the ponds to be created but merely to let the water fill these ponds during the monsoon. The water will recede slowly on its own from one pond to other and with the passage of time water will start to remain in these ponds.

Nagrota Surian fringe area

Nagrota Surian fringe area is near the confluence of Gaj Khad and Minu Khad. Thousands of migratory birds, especially bar-headed goose, Brahminy duck and greylag goose can be sighted grazing in the nearby drawdown areas. It is also a good habitat for coots, pintails and cormorants.

The activities that will be undertaken in the area include:

- Terraced contour bundings all along the contours: Swamp conditions in the area will be created by erecting bundings along the contours. This will help to improve/expand the existing habitat of the waterfowls. This activity will be taken in conjunction with the construction of water ponds, fishing ponds and mounds. In addition to retaining the receding water it will improve the existing habitat of the birds during winter and also help extend the duration of swamp conditions during lean periods as well. An area of 30 km^2 between 1,390-1,320feet msl will be developed under terraced swamps in different locations at this site. The swamps may be developed in the first five years. The design of the terraces and the swamps will be such that top of the bunds can be utilized as walking/cycling trails for bird watchers, researchers and nature enthusiasts. The terraced slopes will be pitched with stones and planted with grass to create conditions suitable for bird activities. Food resources will be augmented by sowing grasses or grains.
- It is very important to identify the microhabitats in Greater Pong such as perennial sources of water, riverine forests, bamboo forests, etc., which are ultimately providing food/fresh water to the birds in Pong Lake. It is important to maintain and protect small mounds surrounded by water which cannot be reached by cats, dogs, etc., and keep groups (more than 3) of unlopped broadleaved trees during the breeding season for waterfowl species.
- It is important to manage critical and endemic flora and fauna for habitat needs like roosting/ nesting sites, etc., instead of a general approach which lets nature run its course. Weed control is another area which needs immediate efforts in a phased manner. The importance of the micro habitat has to be prioritized.
- It is not wise to completely stop the grazing of various grasses in Pong Lake, as these grasses may turn into coarse grass and it will be difficult for the migratory birds and other wildlife to feed upon it. Around 5-10 stray animals may also be kept at Ranser Island to keep the grass under control. In case grazing has to be stopped, then controlled burning of grassland has to be carried out in the future to keep the grass under control in some of the areas which remain outside the maximum water level during the year.

- Plantations in Pong Lake should be avoided except in the area outside the 1,390 feet msl contour and the islands so as to ensure roosting and breeding habitats for the birds. Locally available fruit-bearing plant species should be planted as some birds like cormorants, egrets, heron, etc., breed on groups of unlopped broad leaved plants. Dense plantations in the wetland may lead to eutrophication, which must be avoided
- The use of fertilizers, pesticides and insecticides should be discouraged, not only in Pong lake but in Greater Pong too. As the Pong wetland is acting as a sink of Greater pong the public has to be make aware about the importance of using vermi/organic compost for the health of Pong Lake and also mankind.

Environmental concerns

The analysis of oxygen demand may not be too unfavorable at the moment, but if unplanned/ unregulated habitat extension and habitat improvement works are carried out then the dissolved oxygen content may decrease. The aquatic plants in the main wetland have already decreased, which may not be helpful in increasing the dissolved oxygen content in the future. The temperature of the lake sometimes rises up to 47°C during the summer season and that may also reduce the oxygen concentration in the water body. The movement of boats in the lake might to some extent be helping to increasing the dissolved oxygen content. Chemical analysis of lake water has to be carried out yearly to determine the pollutant load and water quality, otherwise all the management interventions carried out in Pong lake may turn out to be futile.

As this wetland is glacier-fed, the impact of global warming on the wetland has to be considered and the effects of construction of new dams above streams, diversion of water for drinking, irrigation and hydropower, etc., has to be analyzed.

Local cattle and the cattle of gujjars in the Pong must be immunized and registered with local authorities to prevent outbreaks of various diseases.

Socio-economics

Fish population and fish diversity is one area that needs improvement in Pong Lake, as is preserving the breeding grounds of various fish in the Greater Pong since the fish generally breed upstream outside of the main Pong wetland. All fishing should cease during the bird migration season (December to March) and the fishermen may be compensated.

It is very important to determine the dependency level of the 26,000 people living in the sanctuary and the 11,500 domestic cattle in order to develop a prevention mechanism through protection and enhancing awareness about the importance of this fragile ecosystem.

Catchment area action

It is better to refer to "the Greater Pong" instead of Pong Dam to conserve and maintain the biodiversity in perpetuity. The Greater Pong may include Pong Sanctuary, the watershed in general and the buffer zone in particular, and the various stakeholders around Pong Lake. Management of Greater Pong is very much needed, otherwise Pong Wetland will act as a sink of Greater Pong.

Extension and stakeholder participation

A Pong society consisting of all stakeholders should be created and a surcharge collected from various user agencies such as hydro-powers, irrigation schemes, dams, etc., in the watershed area to carry out various conservation/welfare activities in Pong Lake.

Other concerns

Other areas which need attention include:

- treatment of nallahs/khads in buffer zone;
- soil types silt load;
- erosion;
- study of pressure, temperature and wind direction;
- biotic interference;
- quarrying outside the protected area;
- rain gauge to measure the precipitation;
- strengthening the infrastructure and communication facilities;

Table 1: Water bird count in the Pong Wetland from 1999-2008

SN	Year	Total number of water-birds counted
1	1999-00	70,555
2	2000-01	81,848
3	2001-02	114,082
4	2002-03	115,201
5	2003-04	136,000
6	2004-05	142,292
7	2005-06	130,490
8	2006-07	111,721
9	2007-08	105,000

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A PRELIMINARY SURVEY ON THE HERPETOFAUNA IN THE ANAWILUNDAWA WETLAND SANCTUARY: THE SECOND RAMSAR SITE OF SRI LANKA

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Editor's note:

This article appeared in Tigerpaper Vol.35:No.3 July-September 2008. We regret the omission of the authors' names under the title.

STUDY OF SOME MEDICINAL PLANTS FOUND IN DUDHWA NATIONAL PARK

by Kaleem Ahmed and Saima Bhat

Introduction

Plants are the basis of life on earth and are central to people's livelihoods. Tribal people are closely linked to their ecosystem and live in harmony with nature. The Indian subcontinent is inhabited by over 53.8 million tribal people in 5,000 forest-dominated tribal village communities, comprising 15% of the total geographical area of India's landmass. They represent one of the greatest emporia of ethno-botanical wealth (Sajem and Gosai, 2006).

Medicinal plants constitute a high value, remunerative crop that earns foreign exchange. The plants are the raw material used for treating various ailments, as flavoring agents, and in the pharmaceuticals, perfume and cosmetic industries of the world. Dudhwa National Park, where the present study was conducted, is situated on the Indo-Nepal border (28°18' and 28°42' N and 80°28' and 80°27'E) in Nigahsan subdivision of Lakhimpur-Kheri district in the northern Indian state of Uttar Pradesh. The area falls under the Terai-Bhabar biogeographic subdivision of the Upper Gangetic Plain (7A) bio-geographic classification of Rodgers & Panwar (1988). The Himalayan foothills lie about 30 km to the north of the park. The topography is flat, with a maximum elevation of 182 m above msl. In 1977, the area was declared a national park with a core zone of 490 km^2 and a buffer zone of 124 km^2. The buffer zone in Dudhwa National Park (DNP) is located to the north of the core zone and includes villages inhabited by *Tharu* tribes. These people are partly dependent on the forest for thatch, fodder and fuelwood, thus creating an important management issue (Javed 1996).

During the study period (2005-2006) the temperatures in the park varied from 9°C in January (minimum) to 45°C in May (maximum). Many of the different types of plants present in the park are used to treat various ailments. Various workers have studied the plants from a taxonomic point of view as well as regarding folk knowledge of medicinal plants (Dam & Hajra, 1997; Hajra & Baishya, 1997; Sharma, 2003; Datta & Datta, 2005; Khumbongmayum & Tripathi, 2005). Although studies have documented the uses of various medicinal plants from different parts of India, information on the traditional and cultural practices of tribes is unavailable. Therefore, it was necessary to gather in-depth information on the plant species used by the Tharu and elders of Dudhwa and document their traditional knowledge and cultural practices which may soon be lost due to the influence of modernization.

Materials and methods

The present study was conducted over a period of two years in 2005 and 2006. The information about plants were collected during formal and informal meetings with old forest staff, Mahawats (elephant keepers) Tharu guides and elderly Tharu men, who have in-depth knowledge of these medicinal plants. The information of these plants came in the form of local names and we compared these names with the forest management plan of Dudhwa (De, 2001). In addition, a herbarium of plants was also collected which included species not identified in the management plan, but which were later identified by the Botany Department of Aligarh Muslim University. The study was carried out according to the method suggested by Sinha (1996).

Results and discussion

The medico-botanical survey of the area revealed that the people of the area possess a good knowledge of herbal drugs, but as the people of the societies are progressively exposed to modernization, their knowledge of traditional uses of plants may be lost in due course. Therefore it is important to study and record the uses of plants by different tribes and sub-tribes for futures study. Such studies may also provide some information to phytochemists and pharmacologists in the screening of individual species and in rapid assessing of phytoconstituents for the treatment of various diseases.

Following are some locally available plant species and their medicinal importance:

1. **Botanical name: *Acorus calamus* L.**
   Family: Araceae
   English name: Sweet flag
   Hindi name: Bach, Gorbacc
   Parts used: Rhizome
   Medicinal uses: Stomatopathy, hoarseness, mental and skin diseases
2. **Botanical name: *Azadirachta indica* A.Juss.**
   Family: Meliaceae
   English name: Neem tree
   Hindi name: Nim
   Parts used: Bark, leaves, flowers, seeds
   Medicinal uses: Leprosy, tumour, bronchitis, diabetes, syphilis, cough and fatigue
3. **Botanical name: *Asparagus adscendens* Roxb.**
   Family: Liliaceae
   English name:
   Hindi name: Satavar
   Parts used: Tuberous roots
   Medicinal uses: Dysentery, diarrhea and leprosy
4. **Botanical name: *Argemone mexicana* L.**
   Family: Papaveraceae
   English name: Mexican Poppy
   Hindi name: Satyanasi
   Parts used: Whole plant
   Medicinal uses: Jaundice, rheumatism and all types of poisoning.
5. **Botanical name: *Aegle marmelos* L. Corr.**
   Family: Rutaceae
   English name: Holy fruit
   Hindi name: Bel
   Parts used: Roots, leaves, fruits
   Medicinal uses: Uropathy, intermittent fever, swellings and dyspepsia
6. **Botanical name: *Calotropis procera* (L.) R.Br.**
   Family: Asclepiadaceae
   English name: Gigantic swallow wort.
   Hindi name: Madar
   Parts used: Whole plant
   Medicinal uses: Cutaneous diseases, paralysis, fever
7. **Botanical name: *Cordia dichotoma* Forst.**
   Family: Boraginaceae

English name: Sebesten plum
Hindi name: Lasora
Parts used: Bark, leaves and fruits
Medicinal uses: Helminthiasis, gonorhoea and opthalmodynia, chronic fever and dry cough.

8. Botanical name: *Dalbergia sissoo* Roxb.
Family: Fabaceae
English name: Sissoo
Hindi name: Sisam
Parts used: Roots, leaves, bark and heartwood
Medicinal uses: Diarrhoea, dysentery, and infections

9. Botanical name: *Emblica officinalis* Gaertn.
Family: Euphorbiaceae
English name: Indian gosseberry
Hindi name: Amla
Parts used: Fruit, leaves and seeds
Medicinal uses: Anaemia, leucorrhoea, discharge of blood from the uterus.

10. Botanical name: *Eclipta prostrate* L.
Family: Asteraceae
English name: Eclipta
Hindi name: Bhangra, Babri, Mochkand
Parts used: Whole plant
Medicinal uses: Antidote for snake venom, antihepatotoxic, anti- inflammatory.

11. Botanical name: *Ficus benghalensis* L.
Family: Moraceae
English name: Banyan
Hindi name: Bargad
Parts used: Aerial root, bark, leaves, buds, fruits
Medicinal uses: Vomiting, leucorrhoea, ulcers, diabetes and rheumatism

12. Botanical name: *Ficus racemosa* L.
Family: Moraceae
English name:
Hindi name: Gular
Parts used: Bark, Fruit, root
Medicinal uses: Skin inflammation, diarrhoea, dysentery, leucoderma.

13. Botanical name: *Leonurus sibiricus* L.
Family: Lamiaceae
English name: Motherwort
Hindi name: Guma
Parts used: Whole plant
Medicinal uses: Malaria, amenorrhoea

14. Botanical name: *Mangifera indica* L.
Family: Anacardiaceae
English name: Mango tree
Hindi name: Am
Parts used: Roots, bark, leaves, flowers, fruits and seed kernel
Medicinal uses: Uteritis, dysentery, wounds, ulcers and rheumatism

15. Botanical name: *Mimosa pudica*
Family: Mimosacae
English name: Sensitive plant
Hindi name: Lajwanti, chuimui
Parts used: Whole plant

Medicinal uses: Urinary infections, leprosy, syphilis, nervousness, veneral disease and piles.

16. Botanical name: *Ocimum sanctum* L.

Family: Lamiaceae
English name: Holy basil
Hindi: Tulsi
Parts used: Whole plant
Medicinal uses: Cough, haemopathy, leucoderma, fever and gastropathy in children.

17. Botanical name: *Piper longum* L.

Family: Piperaceae
English name: Idnian long pepper
Hindi name: Pipli
Parts used: Fruits and roots
Medicinal uses: Diarrhea, indigestion, jaundice, abdominal disorders, hoarseness of voice, asthma, chest conjestion, throat infections

18. Botanical name: *Santalum album* L.

Family: Santalaceae
English name: Sandal tree
Hindi name: Safedcandan
Parts used: Heart wood
Medicinal uses: Skin diseases, gastric troubles, cystitis

19. Botanical name: *Shorea robusta* Gaertn. f.

Family: Dipterocarpaceae
English name: Sal.
Hindi name: Sal
Parts used: Bark, leaves, fruits and resin
Medicinal uses: Tubercular ulcers, dermatopathy.

20. Botanical name: *Solanum nigrum* L.

Family: Solanaceae
English name: Black night-shade
Hindi name: Makoy
Parts used: Whole plant
Medicinal uses: Swellings, bronchitis, fever, skin diseases, cough and asthma.

21. Botanical name: *Syzygium cumini* L. skeel

Family: Myrtaceae
English name: Black plum
Hindi name: Jamun
Parts used: Bark, leaves and fruits
Medicinal uses: Diabetes, diarrhoea, splenopathy

22. Botanical name: *Terminalia arjuna* Roxb. ex DC

Family: Combretaceae
English name: Arjun
Hindi name: Arjun
Parts used: Bark
Medicinal uses: Cardiopathy, tumours, hypertension

Conclusion

Dudhwa National Park is famous for its endangered fauna such as tiger (*Panthera tigris*) and barasingha (*Cervus duvauceli duvauceli*), but it is also rich in medicinal plants. However, their use by local communities has remained unknown to the scientific community. In very remote areas where modern health care systems are unavailable, local communities, especially the tribals, heavily depend on medicinal plants for their day-to-day use. They use these medicinal plants for curing diseases, healing wounds, etc. Documentation of these medicinal plants and their use is important for their conservation and management. The present study was aimed to generate first hand information on various medicinal plants and their use by local communities in DNP. It will also provide research input for their use in modern medicine.

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Nesting activities of Spoonbill (Photo submitted by G.Y. Dayananda)

NEST AND NIDIFICATION ACTIVITIES OF THE SPOONBILL (Platalea leucorodia) IN WESTERN GHAT REGION OF SHIMOGA, KARNATAKA

by G.Y. Dayananda and B.B. Hosetti

Introduction

The spoonbill (*Platalea leucorodia*) is spread throughout India. It is a colonial breeder, nesting on moderate to tall-sized trees and shrubs such as *Vitex leucoxylon* and *Kirganelia reticulate*, which stand amidst or near water bodies (Ali and Ripley, 1983; Hancock, 1992; Gadhvi and Soni, 2002). According to Ali and Ripley (1983), the breeding season of the spoonbill in South India begins during second week of July and extends up to November, depending on the monsoon conditions. These birds are characterized by having a long neck, long legs, snow white marshy plumage, black and yellow spoon-shaped bill and pale yellowish brown patch on the fore neck with a full nuchal crest in the breeding season. These are gregarious birds; they share nesting places with ibises, cormorants, herons and egrets. The nesting site selection is an important factor in the breeding success of bird species (Trevor Price and Nitin Jamdar, 1991; Li and Martin, 1991; Ramachandran and Vijayan, 1994). The nesting activity is an important component of breeding behavior in birds. Though it is difficult to determine the exact factors that govern the selection of sites on particular trees for nesting, there exists some evidence that preference was shown by certain water birds. About 25 spoonbills breed every year in Gudavi Bird Sanctuary (GBS).

Lack of detailed information on the species poses problems for its conservation. Comprehensive research to explain the apparent difference between the known numbers of wintering and breeding individuals is not available yet, and the spoonbills breeding biology itself is not known (Chang Jong Ryol, 2000). In this study the authors tried to fill the lacunae on breeding behavior of spoonbills in the GBS from courtship to nidification activities.

Study area

The Gudavi Bird Sanctuary was notified in 1989 and is one of the well known bird sanctuaries of Karnataka. It is located 13 km from Sorab City and 0.5 km from Gudavi village. This sanctuary occupies a waterspread area of 33 ha in the rainy season, out of the total 73.68 ha area. The remaining area is moist deciduous forest comprising various tree species. The sanctuary is located between latitude 14°25' 59" to 14°26' 41" and longitude 75° 6'43" to 75° 25'28".

Vegetation

The entire area was formerly covered with dense, moist deciduous forest and due to intensive protection efforts by the Forest Department the area still has some greenery. Gudavi Sanctuary embodies a diversified vegetation that attracts migratory birds to take shelter and provides sufficient space for them to construct their nests for breeding. The vegetation of GBS is comprised of marshy plants and hydrophytes. The trees and shrubs are partially submerged and provide suitable nesting grounds for wetland birds. These nesting sites also provide the highest security from predators.

Material and methods

The present study was carried out over three breeding seasons (2003, 2004 and 2005) from July to December. Observations were made both morning and evening, before sunrise to sunset (spoonbill stays). The study was conducted with the aid of 5 X 50 binoculars and available field guides. The breeding behavior of active pairs of spoonbills was studied by monitoring the nest sites from early morning to late evening for consecutive days. Nidification activities, such as the number of hours of labor for nest construction, the type and amount of nesting material collected during the busy hours of nidification, average time spent in gathering sticks for nest building, average time to carry the nesting material from its source to the nest, nest inspection and re-arrangement activities by nest occupants were recorded to determine the roles of both sexes in nesting activities.

Results and discussion

Nesting season

Observations were made during the breeding season (i.e., July to November) on the nesting of spoonbill. However, in the study years (2003, 2004 and 2005) observations of early nesting and late nesting were not made because the area received rain during the period of spoonbill breeding. These birds start their nesting activity in July in Gudavi Bird Sanctuary. According to Lark (1968), the breeding season is characteristic of the geographical area rather than species specific; accordingly, the breeding season of the spoonbill varied over different geographical areas. In general, nesting took place after the rains and varied according to the monsoon. Ali (1996) described the nesting season of spoonbill as variable between July and November in South India. The present observations were recorded to determine the breeding season of spoonbill from late July to the second week of December. Improvement of breeding conditions through good rains enhanced the reproductive vigor (Chovda, 1997). The copulation process was more intensive during nidification.

The male initiated courtship by preening the female's cheek, head and neck. His mate responded by rubbing the males' head and neck. This continued for 4-5 minutes, after which the male raised his head plumage, grasped the females bill about the mid point and initiated copulation for 8-10 seconds. This process continued until the day before the final egg was laid. Extra pair copulation was not observed. The nest repairs continued until breeding was over or until fledging took place.

Nesting site selection

The nesting activities occurred in the Gudavi area during the 3rd week of July. The nesting site selection was part of the courtship behavior. Upon arrival at the area each pair searched and inspected the vegetation and potential nesting spots in the territory. The pair began to fly over the entire nesting area and then selected a suitable place for nesting. This process took almost 4-5 days and involved both the partners. Once a nesting site on a tree was selected, the pair immediately began to construct the nest. During the three breeding seasons studied, the birds were found to change their nesting sites. The selected nest sites were characterized by a significantly high richness of the canopy and provided an ideal nesting platform. Birds returned every year to breed regularly at these places, which became traditional nesting sites. This may be due to the availability of plentiful food sources in the surrounding area and safety for nest and nestlings (Parasharya and Naik, 1990; Carioscal *et al*., 1993; Gadhavi and Soni, 2002; Yahya, 2001). In Gudavi Sanctuary there were 15 –16 nesting pairs, almost all of which breed in this sanctuary every year.

Nesting habits

In Gudavi Bird Sanctuary, 12 species of plants were used for nesting. These included three tree species and four species of shrubs; all were found within the waterspread area. The spoonbill mainly utilized two species for nesting and the remaining species were present in and around the sanctuary. The spoonbills preferred *Kirganelia reticulata* and *Vitex leucoxylon* for nesting, because it was easy to construct nests on them and they provided dense canopy and an ideal nesting platform for these birds.

The spoonbills usually built nests at the top level of trees that are standing in or around the water bodies. However, nests were also observed on top of partially submerged shrubs (Ali and Ripley, 1983). Sometimes the thick canopy also prevented the chicks from falling directly into the water or on the ground. In the case of GBS, the canopy cover of *Kirgenelia reticulata* also provided protection by minimizing the direct heat from the open sun. The well-shaded nest does not require wing shading by the parents for their chicks, which benefits the parents in conserving the energy (Gadhvi and Soni, 2002).

Nesting materials

The nesting material varied from nest to nest and was dependent on the nesting site. The birds seldom brought materials to the nest, but instead utilized whatever materials were available around the nest location. The spoonbill collected nesting sticks from *Acacia nilotica, Kirganelia reticulata, Bombax aroundinaceae, Phylanthus polyphyllus, Lantana india, Vitex leucoxylon* and *Eupotorium odoratum*. The nesting material was available nearby the sanctuary. Other materials like feathers, grasses and leaves were also seen in the nests. The bulk of the nest material was twigs of trees and shrubs. The parents collected different sized twigs from different trees. In nest construction, the large twigs were used in the basal part for a firm platform support or as a basement; medium-sized twigs were then placed just above this. The small and thin twigs were placed in and around the nest cup. The other materials like feather, grasses and leaves were used inside the nest cup to provide a soft bed for the eggs and chicks and sometimes used for patching work.

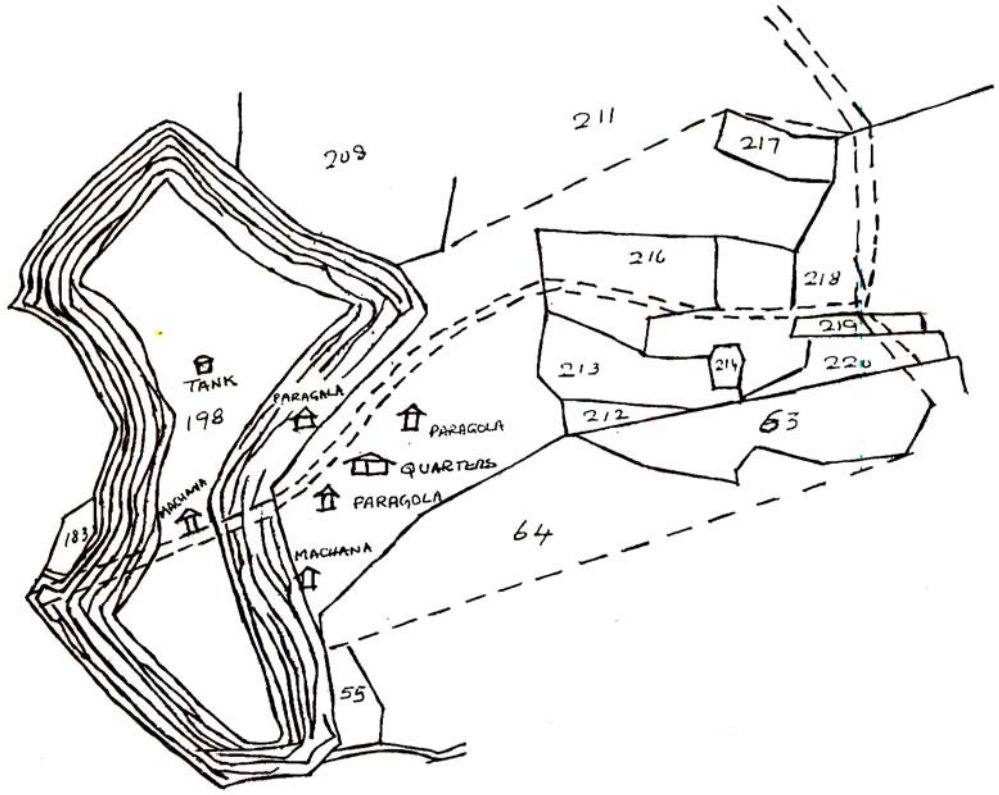
Nest size

The nest size varied from species to species and was dependent on the size of the birds. Among spoonbills the weight of the nest ranged from 1,750 gms to 3,050 gms (X=2480, SD=480.20, n=5); the length of the nest was 59 to 90 cm (X=74, SD=10.52); and the diameter of the nest rim was 48 to 56 cm (X=51.2, SD=2.71). The diameter of the nest cup was 23 to 31 cm (X=27.4, SD=3.00) and the depth of the nest cup was 2.5 to 4 cm (X=3.06, SD=0.55). Based on the study it was revealed that this area is very suitable for spoonbills with a very rich canopy and sufficient amount raw materials for nesting.

Nidification

Sometime breeding pairs have helpers to construct the nest, but in the present case there were no helpers assisting the spoonbills. Nests were built

Figure 1: Gudavi Bird Sanctuary



on well-branched trees and shrubs of *Vitex leucoxylon* and *Kirganelia reticulata*. The spoonbills were observed to construct the nest by placing 15-20 twigs as the basement substrate before egg laying commenced and they continued to add more twigs during incubation. The spoonbill in GBS started the nest building process just after sunrise and work continued until the pair left to forage at around 10:30 to 11:00 am. It was observed that the male brought twigs to the nest and passed them to the female, who arranged them in order in the nest with the help of her bill. The addition of twigs was carried out in such a way to insure that the chicks do not fall out as the nests deteriorate during the progress of the nesting period. These birds collected about 22-24 twigs every day from the nesting trees and shrubs.

Summary

The Gudavi Bird Sanctuary provides nesting sites for about 35 of spoonbills every year. The nesting site selection is the part of courtship behavior and nesting activity is an important component of breeding behavior. These birds return to their breeding home regularly, making them traditional nesting sites for them. The availability of suitable food resources in the surrounding area and safe nesting sites attracted these birds to the same site. The nesting materials varied from nest to nest and were influenced by the nesting site or canopy. Nest size also varied from species to species and was dependent on the size of the birds. The nest and nesting site selection is a most important factor for breeding success.

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Nesting activities of Spoonbill (Photo submitted by G.Y. Dayananda)

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Meeting the challenge of timber legality verification

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Worldwide, interest in timber legality is growing. The hand-wringing that has sometimes characterized debate on illegal logging is giving way to practical measures designed to increase the proportion of timber that is harvested and traded according to the law. Arguably, the verification of timber legality can not only ensure access to markets that might otherwise be restricted, it can also encourage good forest governance.

The FAO/VERIFOR International Workshop on Legality of Traded Timber: the Development Challenges took place at FAO Headquarters in Rome, 24-26 November 2008. The meeting gathered about 100 forest governance practitioners from 32 countries and several international organizations to discuss issues surrounding legality verification, including multi-stakeholder dialogue processes and their management; the economics of legality assurance of traded timber; the role of new technologies in forest governance reform; mechanisms and structures for independent forest monitoring; legality standards and their definition; and the convergence of policy processes at national and international levels.

The workshop marked the end of four years of research under the VERIFOR project, an applied research collaboration headed by the Overseas Development Institute (ODI) and involving partners in Africa, Latin America and Asia (www.VERIFOR.org). It also provided a launching platform for a new EC-funded project by which FAO will provide support for FLEGT-related issues to countries of Africa, the Caribbean and the Pacific (ACP countries) (www.FAO.org/forestry).

The outcomes of the workshop are summarized here in the form of key messages based on the lessons learned from country efforts and from the research by the VERIFOR project.

Timber legality verification can be an effective policy option for improving forest governance and market access, provided national ownership conditions are met

The verification of timber legality will help reassure consumers that by buying tropical timber they are not supporting illegal logging while, at the same time, also providing producers with access to markets that might otherwise close altogether. Initiatives to provide timber legality verification typically combine support for governance reform and improved forest law enforcement with the leverage that can be provided by market demand for verified timber.

Some analysts suggest that timber legality verification can be a stepping stone to the wider uptake of certification because it focuses attention on global wood product tracking and labelling and primes the markets. Others argue that timber legality verification could make certification redundant as long as it guarantees market access. However, European public procurement schemes will soon require sustainable as well as legal timber, so the two movements are likely to converge, at least for markets such as these.

Multi-stakeholder processes are an essential component of effective forest governance reform

Recent experience has shown the value of multi-stakeholder processes (MSPs) in building the trust that is needed for public confidence in official decisions and better policy outcomes. MSPs are not simply about getting stakeholders to sit at the same table; they are also about improving transparency and accountability, raising awareness, and increasing knowledge.

By bringing a greater range of views and experiences – including those of previously marginalized groups – to the table, MSPs are also likely to lead to more efficient and effective policies. MSPs can be expensive and time-consuming. In the long run, however, policies developed through an effective MSP are likely to be more cost-effective than "top-down" policies that ultimately fail to resolve conflicts.

For MSPs to be successful, there needs to be clarity as to who is participating and why, and who is being excluded. They work best when they have a clear mandate, defined rules of engagement, accountability and a commitment to implementation. MSPs are not a substitute for good government, but can lead to better governance.

Forest illegality is not just a matter of morality but also of economics

If all interest groups value the forest equally, an effective forest policy would ensure that each pays an equal share of the costs associated with managing the forest. In reality, however, many stakeholders do not pay their share of the cost, which then fall disproportionately on the forest owners or traditional users. In forests that are undervalued in this way, illegal logging and deforestation inevitably become prevalent.

In some places, more than half the economic rent of a forest can be wasted through processing inefficiency. Nevertheless, even in efficient operations the rent obtained from timber alone is still often insufficient for profitability. Laws might be required to ensure that other forest stakeholders, including the public at large, pays their share of the forest management costs.

Unnecessary barriers are often put in the way of operators, particularly those that are small-scale or marginalized. Legality verification mechanisms need to be implemented in ways that enable such stakeholders to both act within the law and make a profit. The regulations with which they must comply should be kept simple, and the costs of the verification mechanism must be as low as possible. Governments could also establish facilities to assist small operators to do their business legally.

Forest law enforcement should aim to reduce harm and ensure the optimal payment of forest rent

Most laws operate on the principle of deterrence – the inhibition of criminal behaviour by fear of sanctions or penalties. The level of deterrence is a function of the probability of detection and the severity of the sanction. High sanctions with low detection rates would be inefficient. Thus, legal systems should aim to set "reasonable" penalties that are proportionate to the level of harm and to adjust enforcement accordingly.

Forest-related tax evasion and corruption are intimately linked to the structure of the forest licensing and revenue system and to other fiscal policies. Reducing tax evasion requires increased monitoring and a system of fines. Since monitoring can be costly, lawmakers should aim for a system in which the increased revenue produced by monitoring is at least greater than the cost of monitoring.

In countries where the legal system is functioning well, the perceived probability of detection is higher than the actual risk. Increasing information about efforts being made to enforce forest laws can therefore help to increase compliance.

In the development of legality standards, simplicity should be the aim

A timber legality verification system requires standards against which legality can be assessed. Important considerations for the development of such standards are which legislation should be

included in the standard and which actors should be held accountable.

An illustrative example is the Indonesian standard for legal verification which comprises origin of timber and traceability. Timber must be harvested by the rightful party in the designated forest areas, with due regard for traditional forest users; timber companies must comply with all laws and regulations pertaining to environmental and social safeguards; and harvesting activities must comply with all legal felling systems and procedures, including – but not limited to – the payment of all fees. Moreover, all timber must be traceable to its legal source. The government and an independent third party will work together in managing the verification process.

Similar processes have also been under way in other countries. A guiding principle in most has been to make the legislation that sets out legality standards as simple as possible and to reduce the cost of compliance.

The independence of timber legality monitoring must be guaranteed by the state

A paradox of timber legality verification is the need to ensure both its independence and its compatibility with national sovereignty. Independence has three dimensions: autonomy in decision-making; impartiality; and neutrality.

Most timber verification models involve independent forest monitoring (IFM), which can be defined as activities undertaken by third parties (non-governmental or private sector) on behalf of the state to monitor official processes of resource utilization and assessment. It is designed to give credibility to the legality verification system and to provide data for improving the system over time. True independence is difficult to achieve, but a system of checks and balances – such as the use of external observers – will help reduce the risk of undue political interference. Ultimately, independence cannot be assumed; it must be conferred by the state through contract, agreement or law.

New technologies are helping forest law enforcement, transparency and better governance. Institutional support, however, is essential for their effective deployment

Technological tools available today include: remote sensing; digital photography and videography; radar; lidar; geotracking; geodatabanks; communication technologies such as the internet and mobile phones; and software that enables the integration and analysis of large quantities of data. Well used, they can facilitate transparency, improve response times against transgressors, decrease the costs of monitoring, and democratise access to information.

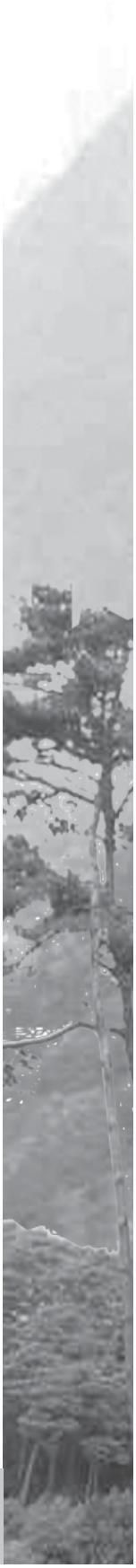
Technology is useless, however, unless applied within a framework that guarantees: 1) the capacity to analyze the data generated by the technology; 2) political commitment to law enforcement; and 3) a management system that leads to action on the ground.

Technology tools need to be organized into systems. Systems to detect deforestation and forest degradation, for example, can be integrated with systems to track logs. When combined with systems for the authorization of forest operations and species identification they can be used to alert authorities to illegal activities and to verify timber legality.

There is significant potential for convergence between timber legality verification and the likely demands of REDD in post-2012 arrangements on climate change

There is a high probability that reducing emissions from deforestation and forest degradation (REDD) will be included in post-2012 arrangements on climate change. Many of the drivers of forest loss and forest degradation are illegal, to varying degrees, so there is a clear overlap between REDD and timber legality verification.

Under most concepts of REDD, payments will be made to help reduce deforestation and probably also forest degradation, although it is unclear if this will be through a market-based or fund-based mechanism (or both). Some of the drivers of deforestation and forest degradation can be addressed by payments. It is difficult, however, to directly address illegal activities through payments,



so where such activities are prevalent there will be a need to address underlying causes, including poor forest governance.

Many of those involved in negotiations over climate change know little about forests and the forest law enforcement issues that need to be addressed. The forest sector needs to build links with such people and to promote better understanding among them.

Illegal logging in the Philippines (Photo: Patrick B. Durst)

Harmonizing reporting on forests and forestry

Masahiro Otsuka[1], Mette Loyche Wilkie[2], Monica Garzuglia[3], Masakazu Kashio[4]

A dizzying array of international conventions and organizations request national governments to regularly provide up-to-date data on the status of their forests and on activities related to the respective conventions and action programs. There's no doubt that such reporting is important, but many countries face considerable difficulties in reporting to various processes because of limited technical and financial capacities and because of the divergence of forest-related terms, definitions and reporting methods used by the various conventions and processes. In addition, since distinct national agencies are often responsible for reporting under different mechanisms – using differing methodologies, definitions and procedures – inconsistencies and confusion are common within the data being reported by individual countries.

FAO is actively working with countries and other forest-related organizations to enhance capacity in forest monitoring, assessment and reporting. Key objectives are to harmonize forest-related terms and definitions and to strengthen consultation, communication and collaboration among agencies responsible for reporting forest-related information and data.

As part of this effort, a regional workshop on "Strengthening of Harmonization of National Reporting to the Global Forest Resources Assessment (FRA) 2010 and Other International Processes on Forests in Asia" was held in Kuala Lumpur, Malaysia, 13-16 October 2008, in collaboration with the Forestry Department of Malaysia. Sixty-two persons participated in the workshop, representing 24 Asian countries and 5 international organizations. The workshop aimed to facilitate harmonization and streamlining of national reporting to international processes and to provide technical assistance to the National Correspondents to the FRA 2010.

Presentations were made and discussions held on various international reporting processes related to forests, efforts to harmonize national reporting, initiatives to harmonize and streamline thematic indicators for reporting processes, and future steps for harmonizing forest-related reporting.

Participants discussed challenges in overcoming inconsistent terminology and definitions among international processes, limited reporting capacities for specific thematic aspects, dispersion of data among various agencies and lack of communication and coordination. They also identified problems related to major indicators in thematic reporting (e.g., forest extent/health, biodiversity, soil and water protection, forest production, biomass/carbon, socio-economic and institutional aspects), including: (i) inconsistent assessment of forest areas and other variables and their changes over time; (ii) lack of effective tools and methodologies; (iii) inconsistent terms, definitions and classifications; (iv) deficiencies in data collection; and (v) insufficient coordination among national agencies.

Coordination among different agencies is critically important to ensure effective reporting by each country. Workshop participants emphasized the need to keep forest terms, definitions and classifications as simple and flexible as possible, to allow them to easily be adapted to national conditions and needs. The value of sharing

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experiences and lessons learned and building national capacity through various projects and thematic assessment initiatives (e.g., biomass, carbon, biodiversity, etc.) was also recognized. Workshop participants also noted the importance of linking action-oriented reporting and outcome-based reporting (situations and trends). National governments were urged to adopt consistent terminologies, developed through technical consultations with the various international processes.

Workshop participants acknowledged on-going efforts of international and regional organizations for streamlining and harmonizing international reporting. At the global level, FAO is spearheading such harmonization together with many of the members of the Collaborative Partnership on Forests. For example, FRA 2010 will encompass the reporting requirements on quantitative indicators for the MDG, CBD and UNFF. It will also help countries report on carbon stocks in forests for the UNFCCC and incorporate many of the ITTO criteria and indicators. For these aspects, definitions have already been harmonized. At the regional level, FRA 2010 also incorporates many of the indicators established by the ASEAN C&I process.

In Asia and the Pacific, the Japan-funded FAO project "Strengthening Monitoring, Assessment, and Reporting (MAR) on Sustainable Forest Management (SFM) in Asia" (GCP/INT/988/JPN) was established to facilitate harmonization and broadening of national forest monitoring, assessment and reporting to enhance sustainable forest management.

The workshop encouraged international organizations to continue efforts to further harmonize terms, definitions, classifications, and indicators for coherent reporting by countries and the development of joint reporting guidelines. Participants expressed the need for technical and financial assistance from international organizations in clarifying methodologies, collecting field data, and interpreting updated remote sensing imagery. Coordination should also be strengthened among national agencies and other stakeholders to promote national- and regional-level harmonization of forest-related reporting. Regional cooperation among countries is expected to improve national capacities for forest-related reporting by sharing information and expertise. Participants welcomed the initiative by ASEAN to establish a common regional data base on forest-related information.

New project to support enterprise development in Philippines forest communities

The Government of New Zealand will provide $302,399 to FAO to support the implementation of the Department of Environment and Natural Resources (DENR) project "Enhancing Natural Resources Management through Enterprise Development in the Philippines."

The project, backed by the New Zealand Agency for International Development (NZAID), will run for three years and will aim to enhance environmental management and development of livelihood opportunities for forest dwellers through improved forest use. Six sites will be piloted by the project.

DENR Secretary Jose Atienza Jr. said that forest cover is a special concern in the Philippines – estimated at only 7.17 million hectares. At the same time, poverty occurs in upland areas on a large scale due to the lack of economic opportunities, unemployment, poor infrastructure and lack of basic services.

The DENR also acknowledged that the Philippines is among countries in the tropics with the fastest rate of forest cover loss due to unsustainable harvesting and logging activities and the conversion of forestland to non-forest use.

Findings and recommendations from the "Enhancing sustainable forest harvesting in Asia" project

Contributed by Patrick Dugan, Project Coordinator (patdugan@mozcom.com) and Patrick Durst, Senior Forestry Officer, FAO/RAP (Patrick.Durst@fao.org)

Project background

Harvesting is a major element of forest management. Efficient and environmentally-sound harvesting methods are crucial to achieving sustainable forest management. In this context, more than 10 years ago, FAO lent its support to a decision by the Asia-Pacific Forestry Commission (APFC) to develop a *Code of Practice for Forest Harvesting in Asia-Pacific*. Published in 1999, the *Code* provided a model for the preparation of national codes across the region.

The "Enhancing sustainable forest harvesting in Asia" Project (GCP/RAS/192/JPN) was approved for implementation in May 2003. Grant funding was provided by the Forest Agency of Japan. FAO was designated as executing agency at the regional level, working in collaboration with counterpart agencies at country levels (i.e., in Lao PDR, Myanmar and Vietnam). The project became operational in June 2003 and was completed on 30 June 2008.

Objectives of the project

The overall objective of the project was to strengthen national capacities for developing and implementing national codes of practice for forest harvesting to achieve sustainable forest management.

Specific objectives were to:

- raise awareness of the need and opportunities for sustainable forest management and better forest harvesting;
- facilitate improved forest harvesting; and
- strengthen national and local capacities for improved forest harvesting.

Results and conclusions

Framework established for participation of stakeholders in planning and implementation

Sustainable forest management partnership committees (SFMPCs) were organized in each country. These committees met regularly throughout project implementation. They provided venues for concerned sectors to discuss and help shape policy, while also serving as oversight bodies to keep track of project progress. SFMPC membership included government, private business, media and non-governmental organization (NGO) representatives. Organization of SFMPCs has created a framework upon which additional participatory initiatives can build in the future.

Discussions at SFMPC meetings increased awareness of the benefits that can be derived from sustainable forest management (SFM) and the realization that SFM is an achievable goal. Insights along these lines were particularly relevant for SFMPC members who lacked exposure to real-world conditions prevailing in the forests and had minimal or no appreciation of the forest dynamics that bring about natural regeneration and restoration.

Increased awareness of the need and opportunities for sustainable forest management and better forest harvesting, existing experiences reviewed and relevant information produced

National experts and international consultants collaborated on targeted studies that: (i) examined the status of forest harvesting practices in each country; (ii) assessed training needs; and (iii) formulated recommendations for improvement in both of these areas.

Local and national workshops and seminars were organized to review and discuss results of the studies conducted to highlight successful examples of SFM and reduced impact logging (RIL), while also identifying problems that needed to be addressed.

Appropriate national codes for forest harvesting prepared, approved and disseminated

Prior to project implementation, Lao PDR and Myanmar had already produced draft harvesting codes. However, neither of these drafts had been formally approved for implementation. The project assisted further refinement and approval of the earlier drafts in Lao PDR and Myanmar. Project assistance enabled Vietnam to also develop a code. Application of code provisions has commenced in all three countries, but additional years of effort are required before nationwide implementation is achieved.

Appropriate RIL guidelines prepared and disseminated

Simple illustrated handbooks (i.e. guidelines) were produced to explain RIL in graphic, easily-understood terms. In this regard, the project benefited from collaboration with an ITTO initiative in Indonesia that provided a model for adaptation to conditions in the project countries.

Suitable project areas and demonstration established for operational activities and research

Demonstration-cum-training sites were identified in each country, and plans were formulated for operational activities and research. "Hands-on" training was the principal activity conducted at these sites with participants applying what they learned from lectures and training manuals. The sites also provided visitors and media with opportunities to observe forest harvesting operations and become aware that SFM is a realistic objective.

Capacity strengthened through training

The project provided RIL training for 1,877 government forestry officers, private sector supervisors and forest workers (i.e., Lao PDR: 435 trainees, Myanmar: 735 trainees, Vietnam: 707 trainees). Training agendas included all phases of harvesting operations, beginning with the preparation of harvesting plans, and moving onward to identification and marking of buffers and "no-cut" zones, tree marking, road and skid trail layout and construction, directional felling, proper bucking, skidding and transport to logdecks. Each phase of the training emphasized how best to reduce impact on the forest and thereby contribute to successful regeneration for future harvests. Training on preparation of harvesting plans and road/skid trail layout and construction highlighted the potential to reduce costs by avoiding mistakes. The objective was to help dispel the mistaken notion that RIL merely increases costs but does not provide financial benefits.

Two special training topics were conducted in classrooms (i.e., application of the RILSIM software and utilization of protocols to monitor and audit compliance with provisions of harvesting codes). Additionally, in respect of training, forest harvesting codes and guidelines were successfully integrated into the curricula of forestry education institutions in the three project countries.

Overall conclusions

With support from the project, national codes are now in place in the three project countries, Sustainable Forest Management Partnership Committees (SFMPCs) are operating, and almost 2,000 individuals have received RIL training. Each country now has a core of persons equipped with the knowledge required to train others. Media coverage, workshops, seminars and SFMPC meetings have helped increase awareness of the benefits of RIL and SFM.

Recommendations

The initiatives listed below are recommended to sustain and build on the progress achieved during implementation of Project GCP/RAS/192/JPN:

Country level

- Ensure conscientious implementation of monitoring and audit procedures that assess the extent to which code provisions are applied.

- From among persons trained by the project, identify individuals who express interest in training others, and have the capability to impart knowledge and skills effectively. Selection of trainers should not be confined to persons from government agencies and the academe. It will be important to identify trainers with extensive "hands-on" skills such as experienced chainsaw operators.
- Preparation of harvesting plans should be given extra emphasis in training, particularly for private sector entities.
- Reduce impediments to animal-powered/labor-intensive harvesting.
- Review and revise scaling regulations and procedures to facilitate increased application of animal-powered skidding.
- Clarify and simplify the ground rules for active community participation in (and benefit from) RIL and SFM.
- Countries should continue to plan and implement field trips for key decision makers to help increase awareness, understanding and appreciation of forest management issues, as well as benefits from RIL and SFM.
- Develop and put in place incentives for private sector implementation of RIL.

Regional/international level

- Provide financial assistance and resource persons for workshops that combine training and/or development of tools with the exchange of lessons learned.
- Working in collaboration with NGOs, hire local experts as full-time, in-country coordinators to promote RIL and code implementation.
- Seek to include presentations on lessons learned and experiences in implementing codes of practice in international meetings to enhance awareness and understanding of issues and opportunities.

Training in tree felling is important to ensure greater safety and to minimize damage to the log and residual forest (Photo: Graham Wilkinson)

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Forest recovery in abandoned grassland with Assisted Natural Regeneration (ANR) in the Philippines

By Kikang Bae[1], Patrick B. Durst[2], and Ernesto A. Cadaweng[3]

Introduction

In the Philippines, the conversion of primary forests into grasslands has increased dramatically in the last 30 years. For example, degraded areas in the Philippines are largely covered with cogon (*Imperata cylindrica*) grass and the total area is about 5 million hectares (Gerrits *et al*., 1997). Once these lands are abandoned it is unclear if they will revert to forests or if they will become permanent grasslands, but it is known that grassland areas will naturally revert to secondary forests through the process of plant succession if fires are prevented (Friday *et al*., 1999). However, in recent times this may not be a regular process due to the high population density in upland areas and many grassland areas being used for farming or grazing (Rebugio *et al*., 2005). For this reason, many rehabilitation strategies, such as agroforestry, tree plantations, and assisted natural regeneration (ANR), have been carried out to restore degraded forest lands in the Philippines.

More recently, the Philippine government has tried a novel approach through assisted natural regeneration (ANR). ANR is a compromise method in that it better protects biodiversity than conventional plantations and requires less investment. Therefore, ANR aims to strike a balance between high-cost efforts to restore biodiversity to small areas and the establishment of commercial plantations over large areas focused on productivity (Shono *et al*., 2007).

This study focused on: 1) the processes of forest destruction and rehabilitation or restoration, from forests to grassland and vice versa; 2) impacts of ANR application in the Philippines; and 3) the potential for expanding ANR implementation in the Philippines.

Process of forest destruction – forest to grassland

The Philippines was originally covered mostly with primary forests. Through human intervention, the forests have become "logged-over" or degraded, and new vegetation – second growth forest – has emerged because of the opening of the canopy. Moreover, through continuous human interventions made in the second-growth forest, the bigger trees left over from logging operations have been steadily removed. Areas gradually become reduced to a young forest and require a longer time to recover if left alone. The need for agricultural lands further destroys these young forests as they are cleared for slash-and-burn farming. These areas, if left alone, will also ultimately recover, but it will take a much longer time if trees and root stock are removed and the area is continuously farmed. The time period of forest destruction largely depends on the influx of people into the forest areas. Inevitably, however, the time period for the return of the forest will be much longer.

Process of rehabilitation or restoration – grassland to forest

Grasslands are normally burned every dry season, either accidentally or purposefully. They are burned for grazing purposes, and sometimes because of hunting, as young grasses are very palatable to grazing animals and hunted animals such as deer

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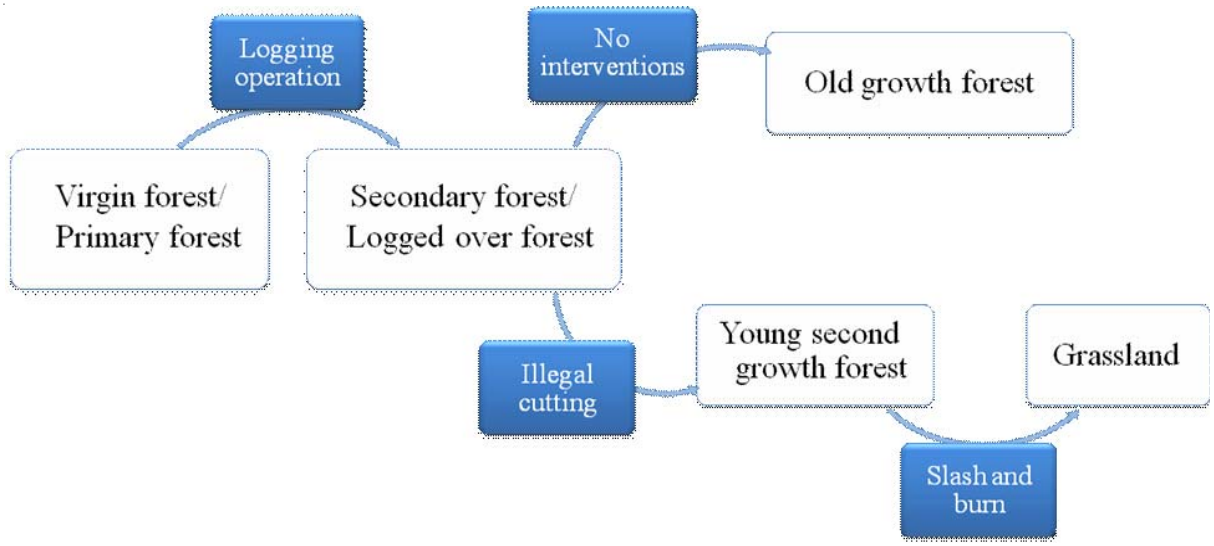

(Figure 1. Framwork of process of forest destruction, forest to grassland)

and wild pigs. After burning, the grasses grow more vigorously, and in the case of cogon more tillers emerge from the ground after burning. Accidental fires also occur through untended campfires or lighted cigarettes thrown into dry grasses.

If these grasses are not disturbed for some time, the growth of bigger grasses like talahib (*Saccharum spontaneum*), bamboos or brush species will start to appear in the area. At the same time that these species appear, some vines will also come in. Through time, if these areas are not disturbed, pioneer tree species such as *Macaranga* sp. will come in and then hardier pioneers such as anabiong (*Trema orientalis*) follow. The entry of climax species or permanent forest cover will evolve later – the rate of which will be dependent on the availability of mother trees as well as seed dispersants such as birds and animals.

Definition and history of ANR

Assisted natural regeneration (ANR) is a strategy for rehabilitating degraded forests by taking advantage of existing wildlings, including pioneer species and residual climax trees. The main principle being followed in the implementation of ANR is vegetative succession. ANR has been used in many countries (sometimes under various other names) to restore degraded forest areas. The Philippines is often cited as advanced in terms of institutionalizing ANR as an official forestland rehabilitation approach (Dugan Jr., 2007). In 1989, DENR (Department of Environment and Natural Resources) issued Memorandum Circular No. 17 that specifically encourages the use of ANR for forest rehabilitation.

Environmental and socio-economical impacts from ANR

In response to the forest rehabilitation needs, over the past decade, considerable efforts were made by governments, the private sector and non-governmental organizations in the Philippines (Rebugio *et al*., 2007). One of the most common approaches has been tree plantation establishment by national governments. This conventional approach is often carried out on a large scale – usually using a small number of fast-growing exotic species – and the value of the plantation is usually sufficient to justify the cost of excluding disturbances (Lamb, 2003). However, the success of such reforestation is questioned by environmentalists because of poor species-site matching, low species diversity, and inadequate maintenance. ANR is considered an attractive

alternative because it relies on natural processes that are influenced by the prevailing conditions in the area, relies mainly on native species, and promotes species diversity.

There are several socio-economical benefits from ANR. In comparison with conventional reforestation methods the cost of ANR is significantly lower because it requires far fewer seeds/seedlings and less site preparation. In its most basic form, ANR does not involve planting, which means ANR may cost from 60-90 percent less than conventional forest regeneration and rehabilitation practices. For this reason, more reforestation can be implemented and serve several environmental services such as biodiversity, soil health, carbon sequestration, and improvement of air/water quality (FORRU, 2005). ANR can also improve the quality of life of the local people. ANR has been successfully implemented in village projects on national lands and individual farms, and it is reported that on-site restoration activities created jobs and generated revenues in many early ANR sites (FORRU, 2005).

Conclusions and recommendation

The implementation of ANR has had positive environmental and socio-economical impacts, as currently assessed. However, documentation of ANR areas and follow-up support is limited. Research in ANR is also very minimal, and records related to the application or implementation of ANR have not been standardized.

To promote more successful implementation and continuity of ANR, the following are recommended: 1) Base line information on environmental and socio-economical parameters is critical for monitoring ANR in the future; 2) ANR training and follow-up activities are necessary to manage ANR areas sustainably; and 3) Studies on income-generating opportunities in community forests for local development are needed.

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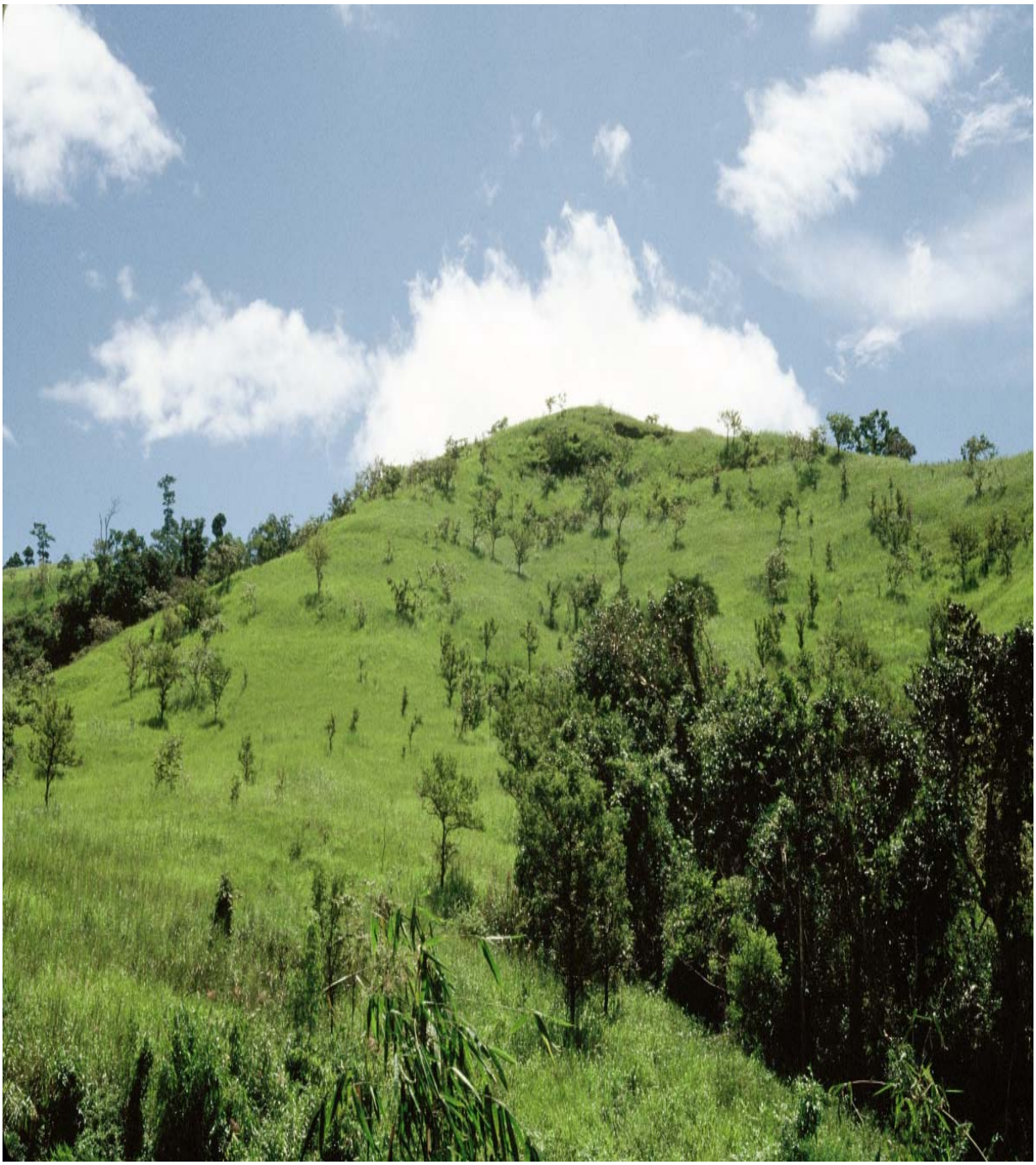


Assisted natural regeneration (ANR) in the Philippines. Grass pressing and protection against fire to suppress Imperata grass to allow tree seedlings to establish and eventually to shade out the grass. (Photo: Patrick Durst)

RAP forestry staff movement

Beau Damen, a national of Australia, joined the RAP forestry group in July 2008 as a Bioenergy Officer under the Australian Youth Ambassadors for Development (AYAD) Programme. He has been charged with supporting RAPO's various bioenergy related activities over the coming year, including a regional project on renewable energy for rural development in the Greater Mekong sub-region, the FAO Bioenergy and Food Security Project in Thailand, and a number of thematic workshops on bioenergy and climate change.

Prior to joining forestry group, Mr. Damen was a senior officer within the Australian Government's Department of Resources, Energy and Tourism alternative fuels team, specializing in biofuels. He has also worked for the Australian Government on major resources and energy projects, natural resource management issues and regional trade agreements.

Sverre Tvinnereim, a national of Norway, joined the RAP forestry group in October 2008 as an Associate Professional Officer with special focus on bioenergy. Among his duties will be to help coordinate the Bioenergy and Food Security (BEFS) project with FAO Headquarters in Rome, organize workshops related to bioenergy, prepare a thematic paper on the outlook for bioenergy in the Asia-Pacific region for the next decade and assist in the organization of APFC events, including the second Asia-Pacific Forestry Week to be held in China in 2010.

Mr. Tvinnereim holds a Candidatus Magisterli from the University of Bergen, Norway, and a Candidatus Mercatorius in Business Administration from the Norwegian School of Economics and Business Administration, Norway. Before coming to RAP, he worked as an international adviser at the University of Tromsø in Norway and as a trainee on economic/political analysis at the Royal Norwegian Embassy in Athens, Greece.

Tattanakorn Moekchantuk, a national of Thailand, joined the RAP forestry group in December 2008 as a Coordination Consultant for the Bioenergy and Food Security Project (BEFS). Her main duties include coordinating with involved organizations and organizing meetings/workshops related to the project.

Ms. Moekchantuk was formerly a consultant for FAO's Integrated Pest Management (IPM) project and provided backstopping on Non Formal Education to the Department of Agricultural Extension, Thailand and FAO IPM, Lao PDR. Before joining FAO/RAP, she worked as an IPM trainer at the Thai Education Foundation, was a Thai language teacher at the Thai-Chinese International School, a Language and Cross-Culture trainer with the US Peace Corps/Thailand, and a teacher at a refugee camp.

ASIA-PACIFIC FORESTRY CHIPS AND CLIPS

INDONESIAN FORESTS SUFFER FROM LACK OF SUPPORT

An official from the Indonesian Forestry Ministry has indicated that community forest programs in the provinces of West Nusa Tenggara, Yogyakarta and Lampung are unlikely to meet their targeted goal of 400,000 hectares of community-managed forest by 2009. The official alleged that only 8,600 hectares of forest have been dedicated to the program since its launch in December 2007. Inadequate support from local administrations was cited as the reason for slow progress.

– The Jakarta Post –

BIODIVERSITY BANK ESTABLISHED

A biodiversity bank has been established to raise funds to protect and conserve the biodiversity-rich 34,000 hectare Malua Forest Reserves on the east coast of Sabah, Malaysia. The Malua Wildlife Habitat Conservation Bank, or Malua BioBank, will be jointly managed by New Forests, an international environmental investment management and advisory services firm, and the Sabah state government. The bank is believed to be the first of its kind in Asia.

– The New Straits Times –

RM25 MILLION BOOST FOR FOREST RESTORATION IN SABAH, MALAYSIA

Plantation giant Sime Darby committed RM25 million for conservation work in Sabah, Malaysia. The project encompasses the rehabilitation of the forests in one of the largest orangutan conservation areas in the world. The contribution will be spread over the next 10 years.

– The Star –

CRUNCH TIME FOR INDIA'S TIGERS

India has lost more than half of its tiger population in the past five years, a new government tiger census showed. The National Tiger Conservation Authority estimates the population around 1,160 tigers, down from 3,642 tigers in 2002. Experts warn that tigers will be lost altogether from India if attention is not paid to their conservation.

– Environment News Service –

INTERNATIONAL DAY AGAINST MONOCULTURE PLANTATIONS

A number of environmental and social organizations declared 21 September 2008 as "International Day against Monoculture Tree Plantations." The organizations hoped to draw attention to the potential for industrial tree plantations to cause social upheaval and environmental degradation.

– Monganbay.com –

ALMOST HALF OF AUSTRALIA UNTOUCHED BY HUMANS

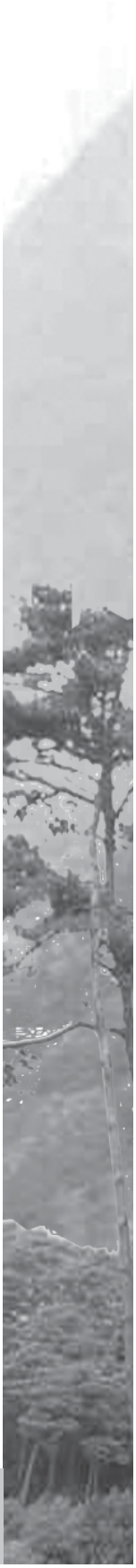
A study has found that more than 40 percent of Australia, an area the size of India, remains untouched by humans. The study purported that Australia's three million square kilometers of untouched wilderness makes the country as critical to the world's environment as the Amazon rainforests.

– Reuters –

MAPPING MYANMAR FORESTS FOR WILDLIFE

Researchers have built up a bank of valuable data on Myanmar's tiger population and other smaller, lesser-known carnivores. The researchers, from the Wildlife Conservation Society's Myanmar programme, used camera traps to survey the 3,250 square kilometer core area of the Hukaung tiger reserve for evidence of the big cats. Other surveys also confirmed the continued existence of 18 smaller carnivores in a variety of habitats across Myanmar.

– The Economic Times –



FAO ASIA-PACIFIC FORESTRY CALENDAR

4-6 January 2009. Bangalore, India. ***Invasive Plants in the Tropics: Ecology, Management and Livelihoods - An International Conference.*** Contact: ATREE, info@atree.org

March 2009 (dates tba). Kuala Lumpur, Malaysia. ***Regional training on ASEAN Criteria & Indicators.*** Contact: Masahiro Otsuka, Forestry Officer, FAO Regional Office for Asia and the Pacific, 39 Phra Atit Road, Bangkok 10200, Thailand; Tel.(662)697-4130; Fax:(662)697-4445; E-mail: Masahiro.Otsuka@fao.org

16-20 March 2009. Rome, Italy. ***Committee on Forestry (COFO) - 19th Session and World Forest Week***. Contact: Douglas Kneeland, Chief FOEL and Secretary COFO, FAO Forestry Department, Via della Terme di Caracalla, 00100, Rome, Italy; E-mail: Douglas.Kneeland@fao.org

6-8 April 2009. ***APFSOS Scientific Committee Meeting.*** Chiang Mai, Thailand. Contact: Patrick Durst, Senior Forestry Officer, FAO Regional Office for Asia and the Pacific, 39 Phra Atit Road, Bangkok 10200, Thailand; Tel.(662) 697-4139; Fax: (662) 697-4445; E-mail. Patrick.Durst@fao.org

26 May 2009. Rome, Italy. ***Advisory Committee on Paper and Wood Products – 50th Session***. Contact: Joachim Lorbach, FOIP, FAO Forestry Department, Via della Terme di Caracalla, 00100, Rome, Italy; E-mail: Joachim.Lorbach@fao.org

18-25 October 2009. Buenos Aires, Argentina. ***XIII World Forestry Congress***. Contact: Olman Serrano, Associate Secretary General; E-mail: WFC-XIII@fao.org

23-28 August 2010. Seoul, Korea. ***XXIII IUFRO World Congress***. Contact: Secretariat, IUFRO Headquarters;, Mariabrunn (BFW), Haupstrasse 7, A-1140, Vienna, Austria; E-mail: office@iufro.org

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Forest and clouds formation in East Kalimantan. (Photo contest entry by Christoforus Terry)

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

- APFC - The unwelcome guests: Proceedings of the Asia-Pacific Forest Invasive Species Conference (RAP Publication 2005/18)
- Helping forests take cover (RAP Publication 2005/13)
- Elephant care manual for mahouts and camp managers (RAP Publication 2005/10)
- Forest certification in China: latest developments and future strategies (RAP Publication 2005/08)
- Waves of hope – report of the regional coordination workshop on rehabilitation of tsunami-affected forest ecosystems: strategies and new directions (RAP Publication 2005/07)
- Forests and floods – drowning in fiction or thriving on facts? (RAP Publication 2005/03)
- In search of excellence: exemplary forest management in Asia and the Pacific (RAP Publication 2005/02)
- What does it take? The role of incentives in forest plantation development in Asia and the Pacific. Executive summary (RAP Publication 2004/28)
- What does it take? The role of incentives in forest plantation development in Asia and the Pacific (RAP Publication 2004/27)
- Forests for poverty reduction: opportunities for Clean Development Mechanism, environmental services and biodiversity (RAP Publication 2004/22)
- Forests for poverty reduction: can community forestry make money? (RAP Publication: 2004/04)
- Advancing assisted natural regeneration (ANR) in Asia and the Pacific (RAP Publication 2003/19) - 2nd edition
- Bringing back the forests: policies and practices for degraded lands and forests (RAP Publication 2003/14) **out of print**
- Community forestry – current innovations and experiences (CD-ROM included)
- Community-based fire management: case studies from China, The Gambia, Honduras, India, the Lao People's Democratic Republic and Turkey (RAP Publication: 2003/08)
- Practical guidelines for the assessment, monitoring and reporting on national level criteria and indicators for sustainable forest management in dry forests in Asia (RAP Publication: 2003/05)
- Giants on our hands: proceedings of the international workshop on the domesticated Asian elephant (RAP Publication: 2002/30)
- Communities in flames: proceedings of an international conference on community involvement in fire management (RAP Publication: 2002/25)
- Applying reduced impact logging to advance sustainable forest management (RAP Publication: 2002/14)
- Monograph on benzoin (Balsamic resin from *Styrax* species) (RAP Publication: 2001/21)
- Proceedings of the International Conference on Timber Plantation Development, 7-9 November 2000, Manila, Philippines
- Trash or treasure? Logging and mill residues in Asia-Pacific (RAP Publication: 2001/16)
- Regional training strategy: supporting the implementation of the Code of Practice for forest harvesting in Asia-Pacific (RAP Publication: 2001/15)
- Forest out of bounds: impacts and effectiveness of logging bans in natural forests in Asia-Pacific: executive summary (RAP Publication: 2001/10)
- Forest out of bounds: impacts and effectiveness of logging bans in natural forests in Asia-Pacific (RAP Publication: 2001/08)
- Regional strategy for implementing the Code of Practice for forest harvesting in Asia-Pacific (July 2000)
- Development of national-level criteria and indicators for the sustainable management of dry forests of Asia: background papers (RAP Publication: 2000/08)
- Development of national-level criteria and indicators for the sustainable management of dry forests of Asia: workshop report (RAP Publication: 2000/07)
- Asia-Pacific Forestry Commission: the first fifty years (RAP Publication: 2000/02)
- Decentralization and devolution of forest management in Asia and the Pacific (RAP Publication: 2000/01)
- Asia-Pacific Forestry Towards 2010 - report of the Asia-Pacific Forestry Sector Outlook Study
- Trees commonly cultivated in Southeast Asia: an illustrated field guide - 2nd edition (RAP Publication: 1999/13)
- Code of Practice for forest harvesting in Asia-Pacific (RAP Publication: 1999/12)

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