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

October-December 2012

TIGERPAPER

Regional Quarterly Bulletin on Wildlife and National Parks Management

Vol. XXXIX: No. 4

Featuring

FOREST NEWS

Vol. XXVI: No. 4

TIGERPAPER

REGIONAL OFFICE FOR ASIA AND THE PACIFIC

TIGERPAPER is a quarterly news bulletin dedicated to the exchange of information relating to wildlife and national parks management for the Asia-Pacific Region.
ISSN 1014 - 2789

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FOREST NEWS

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Front cover: *Mugger or Marsh crocodile (Crocodylus palustris) (Photo: Courtesy of Raju V. Vyas)*

THE BEST EXAMPLE OF CO-EXISTENCE OF MAN AND MUGGER AT VADODARA CITY, GUJARAT STATE: IN SEARCH OF A POSITIVE SOLUTION

by Raju V. Vyas

Introduction

Today there are over twenty-three crocodilian species found in temperate regions of the earth. All the crocodilian species are large carnivores and excellent predators, some growing very large, over seven to eight meters long (e.g., Estuarine or saltwater crocodile: *Crocodylus porosus*) and some being dwarf species (e.g., Dwarf crocodile: *Osteolaemus tetraspis*), barely reaching two meters. But all crocodilian species are outstanding predators, and when they grow too large and are found in the vicinity of human habitations, a crisis for human life is created.

There are a few well known examples of large crocodilian species found around human habitations. The best extraordinary examples of "croc and man co-existence" are Cancun lagoon of Mexico and the state of Florida in the USA. These sites are the best evidences of human culture interwoven with the crocodiles and an example of people having great reverence towards the crocodilian species, thus believing in the goal of crocodile conservation.

The same kinds of situations and examples are also found in Asian countries, where crocodiles are coexisting with man. The Mugger or Marsh crocodile (*Crocodylus palustris*) is often found in human vicinities. Some people believe crocodiles to be sacred beings and divine animals and so they worship them. The best examples are Magha Pir (Karachi, Pakistan) and Saint Khan Jahan Ali Mazar (Bangladesh).

Mugger crocodile

The Mugger or Marsh Crocodile (*C. palustris*) is one of the most widely distributed crocodilian species in the world. It is a threatened reptile in India and legally protected under Schedule-I animals, under the Indian Wildlife (Protection) Act. In the late 1960s, the species was depleted from its entire distribution range due to illegal hunting, fishing and habitat loss, bringing muggers to the edge of extinction. But now the mugger population is flourishing due to the legal protection afforded to it and the success of *ex situ* programs, especially the grow and release practice. The mugger is the most adaptable crocodile species and is found in various types of habitats ranging from rivers to large lakes, small puddles, village tanks and also roadside ditches.

Vishwamitri River

The Vishwamitri River (Vishvamitri or Dhadhar-Vishwamitri) is a seasonal river that flows from east to west between two large perennial rivers (i.e., the Mahi and the Narmada) in Gujarat State. The Vishwamitri River originates from the Pavagadh hills (830m altitude) and other small hills (part of Jambughoda Wildlife Sanctuary) of Panchmahals District, flowing westwards through Vadodara district and Bharuch district and finally merging into the Gulf of Khambhat near Khanpur village, Bharuch District. A 25-km-long stretch of the river passes through Vadodara city on a curvilinear path. However, in the recent past, most of these curvatures of the river were cut and the river flow has been diverted into a straight, fast flow as a flood-control measure, so this 25-km-long river stretch has been minimized into a 16-km-long stretch in which the remaining river curvatures create various types of water pockets in the middle of the city. This entire riparian ecology shelters many species of plants and animals.

Biodiversity & the river valley

Presently, this river valley is home to numerous wildlife including various species of mammals, birds, reptiles, amphibians and fishes. Also, the small, non-perennial Vishwamitri River shelters a small population of Mugger or Marsh Crocodiles. Survey results indicated that 120 species of vertebrates

belonging to 103 genera from five different classes were recorded in this riparian habitat within the city area (Vyas, 2010), including nine species of mammals, 76 species of birds, 19 species of reptiles, 6 species of amphibians and 10 species of fishes. These figures of vertebrates indicate the richness, diversity and significance of the habitat.

Earlier published records (Oza, 1975) indicate that during the 1970s there were about fifty mugger crocodiles inhabiting the reservoir situated at the upper site of Vishwamitri River, known as Sayaji Sarovar or Ajwa Lake. But hunting and illegal fishing activities depleted the mugger population and finally the crocs disappeared from the water body within a decade. It is believed that due to hunting and fishing activities some mugger populations might have migrated to downstream areas of the Vishwamitri River and might have settled there (Vyas & Vyas, 2002; Vyas, 2010).

In January 2010, 155 mugger crocodiles were counted (77 juveniles and sub-adults, 58 adults and 20 large) in the river stretch between two villages (Vemali to Vadsar) lying within the city area. This survey was carried out by the State Forest Department with the help of various local non-governmental organizations (NGOs). As per the survey result, over 50% of the mugger populations consist of large to very large-sized mugger crocs. The mugger population of Vishwamitri River is growing well according to the published and unpublished literature and a recent census of muggers.

Recent data of Vyas (2010) indicated that an average of 27 animals per year were rescued from the urban areas of Vadodara city during the last decades. During 1995 to 2009, a total of 19 incidents of mugger attacks were noted in the entire river system, wherein seven attacks were recorded within the city itself. An average of 2.8 mugger attacks was recorded per year in the last five years. On the other hand, within the last two decades, 17 animals were found killed, burnt and badly injured in the city area.

The situation shows that man and mugger co-existence is precarious; the situation is threatening for both sides. Particularly when crocodile conflicts/ attacks occur, most people are not in the favor of crocodiles and are ready to exterminate them or prefer to relocate the crocs somewhere else. There is an urgent need to find a positive solution to avoid such 'do or die' situations and achieve a state where both men and muggers safely co-exist in accord with each other.

When large numbers of big crocs are found in the vicinity of humans, the probability of conflicts increases. Attempts to mitigate the mugger/man conflict by rehabilitating the culprit somewhere away from the human vicinity or kept in captive condition would result in saturation of the mugger population at the release site, thus creating a further problem.

A better prospect would be to relocate the crocs to a habitat where they can freely roam and live without the interference of the urban landscape. A very large natural habitat, within the existing habitat of the species at hand would be suitable. The large crocodiles would have to be deterred from entering human settlement areas, and unauthorized locals or civilians should not be allowed into the refuge. It has been reported that in some foreign countries troublesome large crocodiles are slaughtered, but it is not acceptable in the Indian scenario.

The first option is not a good solution, as it only shifts the problem from one place to another and is thus only a temporary solution. The second option to design a refuge center for large muggers is more rational and constructive as per the author's knowledge and experiences. Execution of the second solution requires a detailed study to find the best possible habitat for muggers within the present existing habitat in the core of the city. It also requires the cooperation of the authorities and the citizens involved in the process.

Acknowledgements

Grateful thanks to the staff of the Vishwamitry River Project, Sayaji Baug Zoo, Fire brigade and Gujarat State Forest Department for their assistance in various aspects of this study. Thanks also to the volunteers of Gujarat Society for the Prevention of Cruelty to the Animals (GSPCA) and the Crocodile Group of

Vadodara for providing information about rescued animals. Thanks also to the Conservator of Forest, Vadodara, for suggestions. Special thanks to S. Bhatt, R. Bhavsar, Manoj Thakar and Kartik Upadhayay for providing information and photographs for this article and accompanying the author during the field work. Final thanks to Khushboo Vyas and to the anonymous reviewer for reviewing my manuscript.

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Table 1: List of mammals, birds, reptiles, amphibians and fishes recorded at the Vishwamitri River Stretch, Vadodara, Gujarat, India

No	Common Name of Species (Scientific Name)
	MAMMALS
	Family: Cercopithecidae
1	Hanuman Langur (*Semnopithecus entellus*)
	Family : Sciuridae
2	Northern Palm Squirrel (*Funambulus pennantii*)
	Family: Felidae
3	Jungle Cat (*Felis chaus*)
	Family: Viverridae
4	Asian Palm Civet (*Paradoxurus hermaphroditus*)
5	Small Indian Civet (*Viverricula indica*)
	Family: Herpestidae
6	Grey mongoose (*Herpestes edwardsii*)
7	Small Indian mongoose (*Herpestes auropunctatus*)
	Family Canidae
8	Jackal (*Canis aureus*)
	Family: Bovidae
9	Nilgai (*Boselaphus tragocamelus*)
	Family: Felidae
10	Leopard (*Panthera pardus*)
	BIRDS
1	Little Cormorant (*Phalacrocorax niger*)
	Family: Arediae
2	Grey Heron (*Ardea cinerea*)
3	Indian Pond Heron (*Ardeola grayii*)
4	Cattle Egret (*Bubulcus ibis*)
5	Large Egret (*Casmerodius albus*)
6	Median Egret (*Mesophoyx intermedia*)
7	Little Egret (*Egretta garzetta*)
8	Night Heron (*Nycticorax nycticorax*)

	Family: Ciconiidae
9	Painted Stork (*Mycteria leucocephala*)
10	Asian Openbill Stork (*Anastomus oscitans*)
11	White necked Stork (*Ciconia episcopus*)
	Family: Threskiornithidae
12	White Ibis (*Threskiornis melanocephalus*)
13	Black Ibis (*Pseudibis papillosa*)
	Family: Accipitridae
17	Black-shoulder Kite (*Elanus caeruleus*)
18	Pariah Kite (*Milvus migrans*)
20	Shikra (*Accipiter badius*)
	Family: Phasianidae
21	Grey Francolin (*Francolinus pondicerianus*)
22	Indian Peafowl (*Pavo cristatus*)
	Family: Rallidae
24	White-breasted Waterhen (*Amauronis phoenicurus*)
	Family: Charadriidae
25	Red-wattled Lapwing (*Vanellus indicus*)
	Family: Laridae
26	Gull-billed Tern (*Gelochelidon nilotica*)
27	River Tern (*Sterna aurantia*)
	Family: Columbidae
28	Yellow-legged Green Pigeon (*Treron phoenicoptera*)
29	Blue Rock Pigeon (*Columba livia*)
30	Collared Dove (*Streptopelia* sp.)
31	Little Brown Dove (*Streptopelia senegalensis*)
	Family: Psittacidae
32	Alexandrine Parakeet (*Psittacula eupatria*)
33	Rose-ringed Parakeet (*Psittacula krameri*)
34	Plum-headed Parakeet (*Psittacula cyanocephala*)
	Family: Cuculidae
35	Pied Crested Cuckoo (*Clamator jacobinus*)
36	Brain-fever Bird (*Hierococcyx varius*)
37	Asian Koel (*Eudynamys scolopacea*)
38	Greater Coucal (*Centropus sinensis*)
	Family: Tytonidae
39	Barn Owl (*Tyto alba*)
	Family: Strigidae
41	Spotted Owlet (*Athene brama*)
	Family: Alcedinidae
42	Common Kingfisher (*Alcedo atthis*)
43	White-breasted Kingfisher (*Halcyon smyrnensis*)
44	Pied Kingfisher (*Ceryle rudis*)
	Family: Meropidae
45	Green Bee-eater (*Merops orientalis*)
	Family: Coraciidae
47	Indian Roller (*Coracias benghalensis*)
	Family: Upupidae
48	Common Hoopoe (*Upupa epops*)
	Family: Capitonidae

49	Coppersmith Barbet (*Megalaima haemacephala*)
	Family: Picidae
50	Lesser Golden-backed Woodpecker (*Dinopium benghalensis*)
51	Yellow-fronted Pied Woodpecker (*Dendrocopos mahrattensis*)
	Family: Alaudidae
52	Lark (*Mirafra* sp.)
	Family: Hirundinidae
53	Wire-tailed Swallow (*Hirundo smithii*)
54	Red-rumped Swallow (*Hirundo daurica*)
	Family: Laniidae
55	Shrike (*Lanius* sp.)
	Family: Oriolidae
56	Eurasian Golden Oriole (*Oriolus oriolus*)
	Family: Dicruridae
57	Black Drongo (*Dicrurus macrocercus*)
	Family: Sturnidae
58	Brahminy Starling (*Sturnus pagodarum*)
59	Common Myna (*Sturnus tristis*)
60	Bank Myna (*Acridotheres ginginianus*)
	Family: Corvidae
61	Indian Tree-pie (*Dendrocitta vagabunda*)
62	House Crow (*Corvus splendens*)
63	Jungle Crow (*Corvus macrorhynchos*)
	Family: Pycnonotidae
65	Red-vented Bulbul (*Pycnonotus cafer*)
	Family: Timaliinae
66	Common Babbler (*Turdoides caudatus*)
67	Large Grey Babbler (*Turdoides malcolmi*)
68	Jungle Babbler (*Turdoides striatus*)
	Family: Sylviinae
69	Common Tailorbird (*Orthotomus sutorius*)
	Family: Turdinae
70	Indian Robin (*Luscinia brunnea*)
71	Oriental Magpie Robin (*Copsychus saularis*)
	Family: Nectariniidae
72	Purple Sunbird (*Nectarinia asiatica*)
	Family: Passerinae
73	House Sparrow (*Passer domesticus*)
74	Yellow-throated Sparrow (Petronia xanthocollis)
	Family: Ploceinae
75	Baya Weaver (*Ploceus philippinus*)
	Family: Estrildidiae
76	White-throated Munia (*Lonchura malabarica*)
	REPTILES
	Family: Crocodildae
1	Mugger (*Crocodylus palustris*)
	Family: Bataguridae
2	Indian roofed turtle (*Pangshura tecta*)
	Family: Trinychidae
3	Indian soft-shell turtle (*Nilssonia gangeticus*)

4	Indian flap-shell turtle (*Lissemys punctata*)
	Family: Gekkonidae
5	Brook's house gecko (*Hemidactylus brookii*)
6	Yellow-green house gecko (*H. flaviviridis*)
	Family: Scincidae
7	Spotted supple skink (*Lygosoma punctatus*)
8	Common keeled grass skink (*Eutropis carinata*)
9	Eastern bronze skink (*Eutropis macularia*)
	Family: Agamidae
10	Garden lizard (*Calotes versicolor*)
11	Fan-throated lizard (*Sitana ponticeriana*)
	Family: Varanidae
12	Bengal monitor (*Varanus bengalensis*)
	Family: Boidae
13	Common sand boa (*Gongylophis conica*)
	Family: Colubridae
14	Indian rat snake (*Ptyas mucosus*)
15	Ch. Keelback snake (*Xenochrophis piscator*)
	Family: Elapidae
16	Common Indian krait (*Bungarus caeruleus*)
17	Spectacled cobra (*Naja naja*)
	Family: Viperidae
18	Indian saw-scaled viper (*Echis carinata*)
19	Russell's viper (*Daboia russelii russelii*)
	AMPHIBIANS
	Family: Bufonidae
1	Co. Asian toad (*Duttaphrynus melanostictus*)
	Family: Ranidae
2	Indian skipping frog (*Euphlyctis cyanophlyctis*)
3	Indian bull frog (*Hoplobatrachus tigerinus*)
4	Cricket frog (*Fejervarya limnocharis*)
5	Short-headed burrowing frog (*Sphaerotheca breviceps*)
	Family: Microhyldae
6	Marbled Balloon Frog (*Uperodon systoma*)
	FISHES
	Family: Cypriniformes
1	*Salmostoma boopis*
2	*Parluciosoma daniconius*
3	Indian Carp (*Labeo rohieta*)
4	*Puntius* sp.
5	Katla fish (*Catla* sp.)
	Family: Poecilidae
6	*Gambusia affinis*
	Family: Channidae
7	Snake-headed fish (*Ohiocephalus punctatus*)
	Family: Cichlidae
8	Tilapia (*Oreochormis mossambica*)
	Family: Silupidae
9	Cat fish (*Wallego* sp.)
	Family: Cobitidae
10	Loach fish

TRANS-BOUNDARY HUMAN-ELEPHANT CONFLICT IN THE INDO-NEPAL TERAI LANDSCAPE

by Jayanta Kumar Mallick

Introduction

In northern West Bengal (India), the habitat of the endangered Indian elephant (*Elephas maximus indicus* Cuvier, 1798) lies in Darjeeling (terai) and Jalpaiguri (duars) districts spread over 1,828.35 km^2 of forests (Elephant Census, 2010) and divided by major rivers into three zones: 1) Terai (Mechi-Teesta) - 339.96 km^2; 2) Western duars (Teesta-Torsa) - 482.54 km^2; and 3) Eastern duars (Torsa-Sankosh) - 1,005.85 km^2.

The east-west ecological range of the terai elephant population extends from the Teesta char (Baikunthapur Division) through Mahananda Wildlife Sanctuary (MWLS) under Wildlife Division-I and southern forests of Kurseong Division, up to Bahundangi Village Development Council, Jhapa district, Nepal, on the western border. In recent years, this landscape, interspersed with human habitations, has become an extensive human-elephant conflict (HEC) zone in terms of human mortality, crop depredations and loss of properties.

Study area

The study area, lying between the Teesta catchment area and Bahundangi across the Mechi, is the westernmost elephant habitat and impact zone. The only protected area (PA) in this zone is MWLS (Latitude 26°23’33" - 26°47’54" North; Longitude 88°23’36" - 88°23’31" East) covering 158.04 km^2, with National Highway 31A (Siliguri-Gangtok) on the east, National Highway 55 (Siliguri-Darjeeling) on the west, the plains of Laltong to the south and Latpanchar of Kurseong hills to the north at elevations of 150–1,150 m above sea level.

The forest types are riverain Khair-Sisoo-Simul, Eastern Bhabar Sal, Eastern Terai Sal, Lower Hill Sal and Pure Sal, intervened by Dry Mixed, Wet Mixed, Lower Hill Dry Mixed, Lower Hill Wet Mixed and Middle Hill forests. These forests are dotted with many forest/revenue villages, military cantonments and tea garden (TG) colonies. A 12 km segment of the broad-gauge railway track (Siliguri– Alipurduar) cuts through MWLS (Gulma-Sevoke). Across the Nepal border, the 54 km^2 area of densely populated Bahundangi (Latitude 26°74´ North; Longitude 88°16´ East) is situated at an altitudinal range of 125–381 m above sea level. The forest is thin and fragmented without any carrying capacity to contain a large elephant herd.

Justification of the study

North Bengal is an age-old HEC area (O’Malley, 1907; Fawcus, 1943; Lahiri-Choudhury, 1975; Bist, 1977; Lahiri-Choudhury and Bardhan Roy, 1983; Santiapillai and Jackson, 1990; Dey, 1991; Barua, 1995; Barua and Bist, 1995; Bist, 1996; Singhal, 1996; Chowdhury *et al*., 1997; Bist, 1998; Datta Roy, 2003; Sukumar *et al*., 2003; Mangave, 2004; Venkataraman *et al.*, 2005; Roy *et al.*, 2009). A few literatures also highlight the HEC in Bahundangi, Jhapa (Velde, 1997; Yadav, 2002; Bhandari, 2004; Shrestha, 2007). But no exclusive account is available for the whole of the Indo-Nepal terai region, which is considered a ‘high conflict zone’ during recent years.

One of the important problems identified by the Elephant Task Force (Ministry of Environment and Forests, India) in the conservation of elephants is the lack of sufficient research on conflict–related issues that can inform action on the ground (Shahabuddin, 2010). Hence, a one-year study on the status of HEC was conducted in the terai during 2010 with the assistance of the local forest department staff to bridge this knowledge-gap.

Methods

Information was obtained from published literature, newspaper reports and records available from the Forest Department. Primary data were collected through field surveys, interviews with the local villagers and departmental staff.

Results and discussion

The home range of the terai elephant population is about 500 km^2. Two (eastern and western) important elephant corridors have been identified within this range (Tiwari, 2005):

(1) Apalchand–Teesta char–Mahananda (Lat 26°47´–26°49´ N, Long 88°31´–88°35´ E). Length: 10–11 km; width: 3 km; settlements: Naya basti (200 houses), labour lines of TGs, Laltong (18 houses), Shaugaon (200 houses) and Dhumsigara village. Used by bulls and large herds of 40–80 elephants during July–November (Route: Apalchand RF–river Gish (near Gazaldoba)–Sonali TG–river Lish–Kolagaiti TG–river Teesta–Laltong RF).

(2) Mahananda–Kolabari (Lat 26°46´–26°48´ N, long 88°11´–88°19´ E). Length: 1.2-13 km; width: 1–1.5 km; settlements: Mahananda-Mechi Terai (225–230 families), Nepunia basti (500–600 families), Owaldangi (70 families), Tukra basti (35 families), Chenga basti, Srasath Seema Bal (SSB) army camp and labour colonies of tea gardens. Used by bulls and herds during maize (May to July) and paddy (October to February) seasons (Route: Mahananda–Lamagumba RF (near Sukiakhola)–Rohini TG–Bamanpokhri RF–Garidhura TG–Balason extension forests–river Balason [near Hatidhura]–Tartari RF–Barachenga–Belgachia– Nipania–Ashapur TGs–Kolabari RF–river Mechi–Nepal or Tukriajhar RF via Bengdubi–Naxalbari–Uttam Chander Chat forests].

HEC in the Darjeeling terai has a century-old history. O'Malley (1907) first recorded the movement of a herd of at least 30 elephants into Nepal by crossing rivers Teesta, Mahananda, Balason and Mechi. "… south of the district is infested by wild elephants, sweeping through it in large herds or roaming singly (which) are a veritable scourge to the people; and for the last few years, the Tarai has had a melancholy record of persons killed, crops destroyed and villages ruined by them. Indeed, the depredations of these animals in this part of the district have become so serious a menace to life and property that there is a danger of much of the land being thrown out of cultivation and relapsing into jungle."

Fawcus (1943) reported that the large herds of the region had become smaller and less numerous due to encroachment for tea cultivation and agriculture. He, however, made no reference to herds operating west of the Teesta and the migration of elephants into Nepal. It may be inferred that at that time either this migration had ceased to occur or the amount of depredations was minimal.

In north Bengal, the pocketed elephants used to change their locations (ranges) with the passage of time to adapt themselves to the changing environment, by moving on to new areas and adopting new routes (Barua and Bist, 1995). During the mid-twentieth century, elephants were reportedly sighted in Kurseong Division only during the summer months. The Annual Report of the Wildlife Preservation (1955-56) recorded the presence of only ten elephants in Sukna and Sevoke ranges of Mahananda (Game) Sanctuary. There was no report of any residential elephant population in this PA during 1957-1967. Guhathakurta (1966) recorded elephant–encounters in Mahananda, but did not mention the population status. The elephants were, however, more common in the eastern part of the river Teesta, where the habitat was extended up to Bhutan through Kalimpong (Guhathakurta, 1964).

There were no records of big herds of elephants west of the river Teesta until the early 1970s (Dey, 1991). Lahiri-Choudhury (1975) quoted Prakritish Chandra Barua (Lalji)'s report about occasional movement of a small herd numbering about 12 elephants between Kurseong and Nepal. During 1971-81, 117 elephants, forming over 40% of their population, were captured in north Bengal (Bist, 1998). But instead of mitigation, the problem worsened in 1980s (Dey, 1991). It was observed that factors such as habitat loss and biotic interferences rather than the overpopulation were

responsible for the depredations (Barua, 1995). Hence, such capture was stopped.

Since the mela shikar (elephant capture) was confined mostly to the terrain east to the river Teesta, the elephant herds from this zone started moving towards the west. They became isolated in MWLS and were frequently found in Kurseong Division, leading to frequent depredations in the civil areas. Tukriajhar Reserve Forest (RF) along with Uttam Chandar Chant RF (southernmost habitat in Darjeeling district) and Jhapa comprise a seasonal elephant movement zone. This has led to serious HEC from 1974-75 onwards.

In 1977-78, a herd of 60 elephants migrated to Nepal through Panighata by crossing the river Mechi, but soon returned to India due to military intervention (Bahuguna and Mallick, 2010). Since July 1978, as many as 5 elephants were captured and 4 killed as rogues in Kurseong Division; 13 human beings were killed by elephants. Once again, in November 1980, elephant depredations became a serous issue in Naxalbari, where for two months a herd of around 60 elephants would take shelter during the day in the isolated forest patch of around 22 ha (Uttam Chandar Chant) and used to raid crops at night in the surrounding villages (Lahiri Choudhury and Bardhan Roy, 1983).

Trained elephants (kunkis) were successfully deployed in November 1980 and August 1981 to chase away the marauding elephant herds pocketed in Kurseong Division to MWLS - about 20 km away - after which no serious depredations took place in the terai during the twentieth century.

Since the 1980s, the practice of converting the natural forests into monoculture plantations of commercially valuable species was stopped and habitat improvement works like plantations of fodder (bamboo and grasses like *Saccharam* sp.) were taken up in MWLS. The sanctuary was also extended by 30.82 km^2 in 1996 by including parts of Laltong block of Baikunthapur Division. As a result, elephant herds again started frequenting the terai landscape and one small herd became resident in MWLS.

Santiapillai and Jackson (1990) identified the elephant population west of the river Torsa as being the most seriously threatened, but did not record any observations on the terai population. In fact, the elephant population of MWLS and surrounding Kurseong forests appears to be fluctuating because of their inherent trend to migrate seasonally from one forest to another. An estimation during November 1990 recorded a congregation of herds of 102 elephants on the Teesta char (Chamukhdanga/Laltong), but recorded only 8 elephants in MWLS and 5 solitaries in Bagdogra Range of Kurseong Division (Dey, 1991). The elephant census figure for 1993 increased to 50 in MWLS. In April 2000, its population was reduced to 37 (5 loners– two tuskers, one left tusker, two maknas (tuskless males)– and two herds with 27 and 5 elephants respectively) in MWLS. Yadav (2002) assessed the trans-boundary elephant population as 50-75, including 15 tuskers and 7 calves. On 25th April 2005, 55 elephants were counted in the terai. The 2007 census recorded only about a dozen elephants in MWLS, indicating dispersal of most of the elephants to the adjacent habitats. However, the census in November 2010 estimated the terai elephant population as 83, distributed in Baikunthapur (123.96 km^2), Wildlife–I (Mahananda 152.96 km^2) and Kurseong (63.04 km^2) Divisions. There were 17 elephants (11 adult males, 3 adult females, 1 of unknown sex and 2 calves in Kurseong Division.

In December 2005, it was reported in the 3rd Steering Committee meeting of the CITES MIKE South Asia Programme that around 70 elephants, originating from Mahananda, caused extensive depredations in surrounding areas and also in bordering villages in Nepal. About 50,000 people were reportedly affected by these incursions and 30-50 people were killed by the elephants. Crop and property loss due to elephant depredations was valued at $50,000. The HEC is still continuing in the study area and the impact was assessed during the present study.

In all, 49 elephant mortalities were recorded in the study area up to 2010 due to collisions with trains (16), poaching (1), bullet injuries (16), electrocution (10), poisoning (5) and elimination of rogues (1). It appears that during the twentieth century, except

for one case, all other mortalities were due to collision with the trains passing through Mahananda.

The number of human beings killed by the elephants in and around Wildlife-I and Kurseong Divisions was 84 during 2003-2010. Up to 2010, 26 people were also reportedly killed in Bahundangi by elephants (Kuldip Giri, Secretary, Bahundangi Village Development Committee, pers. comm.). Besides, many more elephants and human beingswere injured, a huge number of huts were damaged and a large quantum of standing crops destroyed. Compensation was paid by Wildlife-I and Kurseong Divisions. The amounts disbursed during 2008–2009 and 2009–2010 (Table 1) show increased (60.27%) payment in Kurseong Division, but reduced payments (20.56%) in Wildlife Division-I.

Items	**Wildlife Division-I**		**Kurseong Forest Division**	
	2008-09	2009-10	2008-09	2009-10
Persons killed	-	1	1	14
Persons injured	-	3	7	18
Compensation paid for human death and injury	-	110,570.00	225,000.00	4,91,447.00
Livestock killed	1	4	-	9
Compensation paid for livestock killed	700.00	2,500	-	6,300.00
Hut damage	29	54	774	195
Compensation paid for hut damage	2,18,250.00	58,400.00	386,900.00	553,200.00
Crop damage (ha)	10.000	90.000	122.025	95.500
Compensation paid for crop damage	99,500.00	81,500.00	488,100.00	712,053.00
Total compensation	318,450.00	252,970.00	1,100,000.00	1,763,000.00

Human-elephant conflicts have been going on for generations in the study area, but there were no reports of any retaliatory killing of the elephants in the twentieth century; however, such incidences have increased during the last few years. To curb the elephant depredations, the local people in Jhapa, Nepal have started killing the marauding elephants by poisoning, electrocution and shooting (Bahuguna & Mallick, 2010). Regular attacks and firing on these migratory elephants have made the animals hostile, increasing the risk of conflict in the border areas in both the countries. Some have been hit by 'sophisticated bullets' by the army/ police personnel of Nepal and the rest with crude bullets, arrows and spears by the villagers.

The villagers have also taken up other measures to cope with the HEC like chasing the elephants with fire torches, setting off firecrackers, erecting machans to keep regular watch and ward to guard their crop fields, etc. Unfortunately, these measures do not appear to be very effective.

The negative attitude of the affected people in Darjeeling has been comparatively reduced because the economic loss is compensated by Wildlife-I and Kurseong Divisions, but no such compensation is paid for depredations in Jhapa, Nepal. Consequently, retaliatory killing of the crop-raiders to reduce the number of problem elephants is on the rise along the eastern boundary of Jhapa district. It was observed that the villagers in Nepal have been trying to prevent incursions of elephants by using electrified wires, leading to the mortality of some elephants. Elephants are also killed by the Nepal police or BSF personnel at the insistence of the harrassed villagers. The lack of participatory conservation and development activities in this vulnerable zone has led to such intolerant and negative attitudes of the villagers.

Extensive efforts are also being made to keep the elephants away from the river Mechi and confined within the Indian territories by means of energized fences, mobile squads, and driving the elephants by the FPC members, forest staff and departmental elephants (kunkis). A team of mahuts, kunkis and experienced staff from Jaldapara Wildlife Sanctuary was also sent to help the local staff of Kurseong Division. A hulla party (experts in elephant-driving) comprising 15 persons was also brought from Bankura (south Bengal) to expedite the driving operation. Herds were often prevented from entering Nepal through intensive patrolling along the river Mechi in November-December, when farmers harvest their second crop. But, due to heavy rains during the monsoon, when the entire terrain becomes inaccessible to vehicles, it is difficult to control their movement. In addition, there were frequent political disturbances in the region during the last few years.

The Nepal police were approached for help and cooperation through the SSB. Some informal contacts were made during 2007 with the villagers on the Nepal side with the help of some NGOs (WWF-Nepal) and FPCs to sensitise them towards protecting elephants. Some search lights and firecrackers were given to the villagers to help them keep elephants away from their croplands. But this arrangement did not appear to work. As far as conservation initiatives in Jhapa are concerned, some activities were undertaken by the District Forest Office, District Development Committee, Village Development Committee and District Administrative office. The local people have also formed an organization called 'Hatti Niyantran Committee' in order to tackle the HEC. However, more effective integrated conservation activities are lacking in the study area.

Conclusions

For managing elephant populations moving across the Indo-Nepal border, preparation and implementation of a joint action plan by the forest departments of West Bengal and Nepal is essential. There is also need for better coordination among the forest officers of West Bengal (DFOs/ Wildlife Division I and Kurseong Division) and DFO/Jhapa in Nepal to share information about movement of elephant herds, existence of problem elephants and activities of elephant poachers.

Trans-boundary meetings between Nepal and India at the local level with respect to HEC should be carried out regularly, at least every month during the crop season. Radio-telemetry should be used on a few elephants moving across the border for giving advance warning to the forest staff and villagers. A special elephant squad, along with a

trained and efficient hulla-party, may be stationed permanently at a convenient location nearer to the problem area for driving the elephant herds back to the designated area. Help of the SSB posted in the locality (e.g., Tarabari camp), may also be sought for this purpose. Army authorities should also be approached for extending help and cooperation at the time of exigency.

Awareness programmes among the local farmers should be arranged by the forest departments of both Nepal and West Bengal. Local NGOs may volunteer to tackle HEC by actively participating in such efforts of community participation as well as monitoring and mitigation initiatives. Each local village guarding group and the farmers should be trained how to control and drive elephants from their crop fields. The police and forest department personnel should also be included in such groups. Devices to frighten the elephants and night vision binoculars should be provided to the driving teams. Suitable infrastructure should be constructed for controlling the crop raiders like watch towers, electrified barriers, solar fencing and dyke construction along the bank of river Mechi. Permanent barriers (mechanical/elephant-proof trenches) should be used in the vulnerable areas for containing elephants within the designated areas.

Moreover, the farmers may be encouraged to grow alternate cash crops not liked by the elephants such as tea, lemon, chilly, etc., instead of the agricultural crops, particularly along the river bank, and cultivation of staple foods (elephants fodder species). The modalities for payment of compensation for crop depredations, property damage, human casualties and injuries in Jhapa, Nepal, must be worked out. The transboundary nature of elephant movements can only be controlled through effective HEC management and a collaborative transboundary approach at micro, meso and macro levels, integrated through appropriate policy and implementation frameworks.

Acknowledgements

The author gratefully acknowledges all the local forest department staff and villagers who extended help and cooperation during the study.

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STATUS OF HUMAN-WILD DOG (Cuon alpinus) CONFLICT IN SAGALEE REGION OF ARUNACHAL PRADESH, NORTHEAST INDIA

by Surendra Varma and Sunil Subba Kyarong

Introduction

Mithuns (*Bos gaurus frontalis* Gayal) are semi-domesticated cattle that form an integral part of the life and culture of the Nishi tribes of Arunachal Pradesh in northeast India. Mithuns are found only in the northeastern states of the country. Arunachal Pradesh has the highest mithun population in the world with 124,194 animals, Nagaland has 33,345, Manipur has 16,660 and Mizoram has 2,594 animals (Shukla, 1965; Singh, 1995; Solanki, 2002). The animal is a crossbreed between gaur (*Bos gaurus gaurus* Smith) and domestic cattle (*Bos indicus* Linnaeus) and is the living wealth of the Nishis and a few other tribal communities of Arunachal Pradesh (Solanki, 2002; Anon, 2000; Anon, 2001b). In these communities, particularly among the Nishis, the status of an individual depends on the number of mithuns a person owns. Mithuns are sacrificed during customary rights, special occasions, functions, elections and also during the 'Nyokum' festival. It is also believed that a sick person in the family will be cured if a mithun is sacrificed. At times, even the monetary needs of the tribe are satisfied by the sale of the animal. In general, the animal is used to pay dowries, medical bills, education fees for children, fines and has been vital not only as a custom or tradition, but also in meeting the economic requirements of the people (Singh, 1995; Solanki ,2002).

Mithuns are free-ranging animals that the owners let into the forests. The females are brought back to the houses when they are pregnant to prevent the calves from being killed by predators. When a calf is born, in order to help the animal to recognize its human owners, it is fed salt. After a week or two, the calf and the mother are let out and as the calf grows it often visits its house for salt. This approach of letting the animals out to graze saves the tribes a lot of time and effort, which would otherwise be spent in collecting fodder and feeding mithuns – a huge task. The animal is never kept and reared, or ever used as a milching animal (Shukla, 1965; Solanki, 2002). As mithuns are let into the forest, they are often preyed upon by predators, particularly by wild dogs (*Cuon alpinus* Pallas) and to some extent by leopards (*Panthera pardus* Mayer). The reported killing of mithuns by predators has resulted in severe human-animal conflicts and the problem has become serious over the last 5-6 years.

The objective of the survey was to look at the status of the conflict; specifically to:

- assess the status and reasons for conflict and the effect of the conflict on the socioeconomic status of the villagers; and
- evaluate the villagers' understanding and overall perspective towards the problem, as this may suggest or help to review how to integrate conservation plans to mitigate the problem.

Survey methods

Study area

The study site and the survey villages fall in Papum Pare District, the capital district of Arunachal Pradesh. The site is located between latitudes 26°55'N and 28°40'N and between longitudes 92°40'E and 94°21'E. Itanagar Wildlife Sanctuary, established in 1978, is located in the vicinity of the villages and covers an area of 140 km^2 (Anon, 2000). It is also one of the richest biodiversity hotspots. The region comes under the Sagalee Territorial Forest Division and is contiguous with the forest complex of Itanagar Wildlife Sanctuary. The forest has a substantial area under secondary growth (Kaul and Haridasan, 1987) due to the practice of shifting cultivation (Ramakrishnan, 1992).

Methods

Initially, the forest officials, including the Deputy Chief Wildlife Warden, Deputy Conservator of Forests and the Range Forest Officer, were interviewed for specific information on the status of forests, status and nature of the conflict and other aspects related to the cultural and economic importance of mithun. The main survey was done through visiting villages and obtaining information through interviews and direct observations. The survey focused on the information about the number of mithuns owned by the village as a whole, and also with regard to the villagers, its influence on the socio-economic status of the village and villagers, and other relevant aspects of rearing a mithun. The socio-economic data included agricultural patterns, annual and alternate sources of income, crop yields and crop damage. The interviews were done with the help of trackers who translated the questions and answers.

Results

Socio-economic status

The survey region has three main villages, namely Pech, Laptop and Belapo, with a combined population of about 600 people belonging to the Nishi tribe. Seventy-five percent of the population live in Pech and Belapo with the remaining 25% in Laptop. All the villages were found to be surrounded by secondary forests with mainly banana and bamboo forests.

The major crops cultivated in these villages were paddy (*Oryza sativa* Linnaeus), maize (*Zea mays* Linnaeus), banana (*Musa* spp) and orange (*Citrus aurantium* Linnaeus). A family owns on an average three acres of land with the major source of income coming from shifting cultivation or jhumming, making 80% of the population dependent on this practice. Wildlife such as barking deer (*Muntiacus muntjak* Zimmermann), Asiatic black bear (*Ursus thibetanus* Cuvier), wild dogs (*Cuon alpinus* Pallas), tiger (*Panthera tigris* Linnaeus), elephant (*Elephas maximus* Linnaeus) and others are hunted and consumed by the villagers.

Status of mithun

Mithun is an integral part of the villager's daily life. Approximately 1,000 to 2,000 mithuns are reported to be found in Sagalee division with an average of 20 to 25 mithuns/family. A total of 380 mithuns was estimated for all three survey villages: 53% belonging to Pech village, 23% from Laptop and 21% from Belapo. The ratio of mithun to people for Pech village was found to be 0.66:1, for Laptop it was 0.5:1 and for Belapo it was 0.26:1. The number of mithuns owned by a single owner depended on the economic status of the individual. As a free-ranging animal, occasionally the mithuns visit villages for salt and other food given by the villagers; at other times they restricted themselves to the forested areas.

Status of conflict

The mithun is one of the main sources of income (directly or indirectly) and the animal is also culturally important to the villagers. Predators, particularly wild dogs and to some extent leopards, are known to attack mithuns. Mithuns of all age groups and sizes are attacked by the dogs and it is reported that the dogs will go after a new mithun even before they consume the mithun that's already been hunted. This partial consumption could also indicate that mithuns are not the preferred prey species of the wild dogs. In order to prevent mithuns from being killed, the villagers regularly kill the predators.

The reported killing of mithuns by predators has resulted in severe human–animal conflict and the problem has escalated over the last 5 to 6 years. About 15 to 17 wild dogs are killed by the villagers each year and a single person was found to have killed 44 wild dogs over a period of five years. During the survey period a villager even shot a panther when it was found eating a mithun.

Proximate and ultimate causes for the conflict

Many reasons were speculated for the human-wildlife conflict. It was observed that the shifting cultivation practice of the villagers had transformed the primary evergreen forests into secondary forests, attracting a number of large and small herbivorous mammals and also predators

such as wild dogs, panthers and tigers into this region. Some of the wildlife species are part of the villagers' food resource and over-hunting of these wildlife species could have depleted the prey base of the predators. The subsequent increase in the domestic animal population in the villages has resulted in the shifting of food resources of the predators from wild prey species to domestic animals. The forested hills surrounding the villages are subjected to shifting cultivation and the hills are very steep on both sides, reducing hunting grounds for the wild dogs.

According to the villagers and other sources of information, it appears that the wild dogs were more numerous in Itanagar Wildlife Sanctuary and the adjoining forested regions several years ago. The developmental activities in the capital complex in recent times have driven the wild dog population to Sagalee and the adjoining areas. The increase or arrival of wild dogs in new regions could also be a cause for the conflict.

People's perception about the conflict

There were different opinions about the status of the conflict, the number of wild dogs and their involvement in the conflict. Some villagers thought that about 1,000 mithuns were present in the village and adjoining areas and around 300 were killed each year by the predators. The villagers also were of the opinion that about 3,000 to 4,000 wild dogs existed in the whole Sagalee forest division. However, it was interesting to note that none of the interviewed villagers had seen a single wild dog at any time. According to them, more than 20 wild dogs were killed each year by the villagers.

Some other villagers (from the same village) felt that about 200 mithuns were owned by the Pech villagers, of which more than 20 were killed each year by wild dogs and other predators. About 20 wild dogs were also seen by one individual. The varying opinions among the villagers appeared to suggest that the local people were not very knowledgeable about the actual status of conflict or possibly that the extent of the conflict has been exaggerated.

Suggested recommendations

In order to mitigate the conflict the following suggested measures were discussed by the village administration:

- Construction of an enclosure of 20 to 30 acres to hold the female mithuns during the gestation period in the affected villages.
- Erecting wire fences to block the trails of mithuns to reduce interaction between mithuns and wild dogs and other predators.
- Appointing 12 temporary watchers from the villages (4 persons each from 3 villages) to monitor the movements of wild dogs and other predators and patrol the affected area.

The suggestion of erecting a fence to prevent mithun-predator interactions was not accepted by many of the villagers and they collectively felt that killing all the wild dogs would be the only solution to the problem. This suggestion was favored by the majority as the killing of wild dogs would save the mithuns and the meat of the wild dogs could also be consumed.

The villagers did not have any faith in the compensation procedures for the predator attacks on mithun. In fact, they felt that providing compensation would not solve the problem as a compensation of only Rs. 2,000 for each mithun that costs about Rs. 15,000 to 20,000 is not reasonable and acceptable.

However, according to some villagers, erecting fences near the grazing area may restrict mithun movement making them less vulnerable to any attack. Also, keeping all the females and the young ones in an enclosure during the gestation period could help minimize the conflict.

Some villagers have already identified areas to be fenced and the other aspects (including budget) related to keeping pregnant females and calves. The proposed site is called Peg Namci, which is a 5 km walk from Pech Village. The place is an old abandoned shifting cultivation site, which has an area of about 12.40 ha. It has been estimated that about 100 persons working for 2 months would be needed to fence this area and it is expected to cost about 0.432 million Indian Rupees (1 US $ = ~43.75 Indian Rupees); this

(continued on p.17)

(continued from p.16)

includes the cost of hiring 100 persons for 60 days at Rs. 70 Indian Rupees/day/person. The proposed fenced area is expected to take care of mithuns from the three villages located in the region.

Villagers also felt that proper patrolling and monitoring of mithuns by the volunteers may reduce the frequency of attacks on mithuns by the predators.

Role of NGOs in conflict mitigation

NGOs could play a crucial role in mitigating the conflict. They should develop and implement specific Rapid Action Programs (RAP) which should be monitored to ensure the expected results and collect more field-based data. The field data should focus on:

- Information on villages affected by the problem;
- Total number of mithuns found in these villages;
- Protected areas surrounded by the villages.;
- Prey species within the protected areas;
- Prey species found within the village limits;
- Predators seen or believed to have been seen in and around villages;
- Number of mithuns killed over a period of time;
- Number of wild dogs and other predators killed over a period of time;
- Area under shifting cultivation and its role in creating secondary forests;
- List and number of wildlife species hunted by the villagers;
- Status of wildlife in the earlier periods;
- Expected recommendations of the villagers; and
- Photographic evidences of the forest villages, jhum cultivation areas, secondary forest, mithun and skins of wild dogs (other predators) and other related documents.

Conclusions

It is not very clear as to how the suggested recommendations and people's perception of the status of conflict will solve the problem. However, if these recommendations are accepted, it would ensure the villagers' support and the killing of wild dogs could be stopped. The time gained by this process may help to understand the problem more clearly so that a long-term solution could be developed.

Another important aspect to be considered is that the villages where the mithuns are reared are in tough, hilly terrains, so the hunting of wild dogs and other animals would take a lot of time and effort. The fact that the current generation of villagers are not trained shooters, and the availability and the efforts involved in buying and making guns (cost of a SBBL gun is Rs. 18,000) act as deterrents that have favored the wild dogs and other animals and hence some wildlife is still left in these areas. This leaves some scope for the predators, but a long-term effective understanding of the conflict and mitigation measures have to be seriously considered.

Acknowledgements

The authors would like to thank Mr. C. Loma, Deputy Chief Wildlife Warden, and other forest officials and the staff of Arunachal Pradesh Forest Department for all their support. Our sincere thanks are due to every Nishi family for their support and hospitality during the household visits. Thanks also to Sujata Srinivas Iiyengar, Nimmy Varkey and Kannan for reviewing the manuscript and providing valuable inputs.

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MORPHOLOGICAL AND ANATOMICAL DIFFERENCES IN HAIRS OF SOME WILD MAMMALS OF DISTRICT JAMMU (J&K)

by Rahul Kait, Sanjeev Kumar and D.N. Sahi

Introduction

Hair is a characteristic feature of mammals; only mammals in the vertebrate group have hair, so the presence of hair somewhere directly makes us think of mammals and these hairs can be utilized for distinguishing different mammalian species depending upon the differences in their structure, size and colour. Mammalian hair identification helps us in studying the food habits of carnivores such as tigers, lions, panthers and large canids, where the food habits cannot be known by just following the animals and noticing what they eat, but the analysis of fecal matter containing hair will give the identity of the animal preyed upon. The knowledge of food habits of the organisms is very important from a management point of view.

Identification of hair helps us in identification of predators in cases of predation, or identification of the animal inhabiting a particular habitat.

Identification of hair remains may also serve as evidence in convicting a game law violator.

Two basic functions of hair are that they may be either sensory or protective. Sensory hairs are not useful in identification of mammals because their structure is same in all the species.

Methods

Sources of hair specimens

The hair specimens were collected either from captured animals in the wild or animals found dead. Hair specimens were also collected from museum specimens in the Department of Zoology, University of Jammu, and from animals in the zoo (Manda).

Mounting of hair

Procedure: cleaning and treatment of hair for full mounting.

Cleanliness is extremely important at all stages of work. Initially, all hair specimens are carefully washed with hot water and then placed in a clean container and dried thoroughly. When the specimen is dry it is successively passed through the following solutions in the order indicated below:

1.	50% alcohol		½ hour
2.	75% alcohol		½ hour
3.	80% alcohol		½ hour
4.	100% alcohol		½ hour
5.	Alcohol: xylol	75:25	½ hour
6.	Alcohol: xylol	50:50	½ hour
7.	Alcohol: xylol	25:75	½ hour
8.	Pure: xylol	100%	2 hours

Then the material again is air dried and cooled in xylene for 24 hrs.

Mounting on slide

The slide is immersed in a solution of laboratory detergent; it is then removed, washed in running water and submerged in alcohol and dried with muslin cloth, and smeared with Canada balsam or transparent nail polish.

Observations

Features helpful in diagnostic of hair are: hair size, colour, type of medulla and cuticle.

Though hair size does not give us the authenticity of a particular species, it gives us an idea about the great variations that are found in the hair size of the same individual. Color gives us some sort of confirmation as to whether the hair is monocolored, bicolored or banded.

Hair specimens collected from identified sources form the basic standard reference material for further microscopic and macroscopic observation based on following regions:

Structural region: Proximal, Medial and Distal
Diagnostic features: Cuticular patterns, medulla arrangement, color pattern.

Hair type and their morphological characteristics: For identification of hair, only cuticle and medulla are important. There are differences in the scale pattern and medulla pattern of different species and no two species have the same medulla and cuticle arrangements.

Name of species: Rhesus macaque
Zoological name: *Macaca mulatta* (Zimmermann)
Place of collection: Manda hill top, Jhajjar Kotli, Nagrota.
Diagnostic features:
Color: The hair color is orange-red.
Appearance: Proximal and median portion are cylindrical and distal part gradually tapers.
Microscopic appearance:
Medulla pattern: In the proximal portion the medulla is absent and in the distal portion the medulla pattern is fragmental, i.e., the medulla is divided into uneven segments which are elongated (Fig. 1a).
Scale pattern: The scales are imbricate, i.e., they are overlapping. They are flattened throughout the whole length of hair. The scales have flat and untoothed margins (Fig. 1b).

Name of species: Bush rat
Zoological name: *Gollunda ellioti*
Place of collection: Environmental park on Sidhra bypass road.
Diagnostic features:
Color: Hair colour is brownish to dark grey.
Appearance: Proximal portion is slightly thinner than the medial portion and the distal portion tapers towards the point.
Microscopic appearance:
Medulla pattern: It is "discontinuous" throughout the whole length of the hair, i.e., the medulla is divided into discoidal segments (Fig. 2a).
Scale pattern: The scale are imbricate; they are elongate in proximal portion (Fig. 2b) and crenate with toothed margins (Fig. 2c).

Name of species: Common mongoose
Zoological name: *Herpestes edwardsi*
Place of collection: Roopnagar, Near Girls Hostel (JU)
Diagnostic features:
Color: Light in proximal part, followed by dark grey and light grey bands. Distal tip is blackish.
Appearance: Proximal portion has uniform thickness, medial portion is slightly thicker and distal portion tapers to the point.
Microscopic appearance:
Medulla pattern: In the proximal portion the medulla is uniform and unbroken, i.e., it is "continuous" (Fig. 3a) and in the distal portion the medulla is absent (Fig. 3b).
Scale pattern: Scales are imbricate, with crenate type in median (Fig. 3c) and flattened in distal region.

Name of species: Northern five-striped palm squirrel
Zoological Name: *Funambulus pennanti*
Place of collection: University campus, Bikram Chowk.
Diagnostic features:

Color: The color of hair ranges from pale, whitish and blackish; some hairs are banded having white and black bands.
Microscopic appearance:
Medulla pattern: Medulla pattern is discoidal or discontinuous (Fig. 4a). This arrangement of medulla is found throughout the length of hair, i.e., proximal portion to distal portion.
Scale pattern: The scales are imbricate. They are flattened throughout the length (Fig. 4b).

Name of species: Indian crested porcupine
Zoological name: *Hysterix indica*
Place of collection: Environmental Park, on the way to Manda Hill top, Near High Court.
Diagnostic features:
Color and appearance: The porcupine has two types of hair. The hairs which are thick and pointed form the armor of the body. They are thicker in the middle and taper towards the end. The distal end being more pointed. These quills have transverse alternating bands of white and black color.
The hair which are not quills are black to dark brown in color and even they are thicker than hair of other mammals.
Microscopic appearance
Medulla pattern: Medulla in the proximal portion is absent as it is not visible with a microscope (Fig. 5a). But in the distal part of hair the medulla is continuous and uniform (Fig. 5b).
Scale pattern: Scales are imbricate with edges flattened in proximal and median segments or portion (Fig. 5c) and crenate (toothed margins) in distal portion (Fig. 5d).

Name of species: Small Indian civet
Zoological name: *Viverricula indica*
Place of collection: Sidhra, Narwal.
Diagnostic features:
Color and appearance: Some hairs are blackish, some are white and some have bands of both black and white colors. They are cylindrical in proximal and medial portions but taper in the distal region.
Microscopic appearance:
Medulla pattern: (Fig. 6a) Medulla as seen under microscope is discontinuous, i.e., the medulla is arranged in the form of discoidal plates and the arrangement is uniform throughout the length of hair.
Scale pattern: The scales are imbricate. They are acuminate in the proximal portion and flattened in the medial and distal parts.

Name of species: Fruit bat
Zoological name: *Pteropus gigantus*
Place of collection: Surinsar, Botanical Garden,(University Campus)
Diagnostic features
Color and appearance: The hairs are short, and soft; color varies from light brown to dark brown.
Microscopic appearance:
Medulla pattern: (Fig. 7a) Medulla is absent and hair seems to be transparent when seen under a microscope. Medulla is absent throughout the whole length.
Scale pattern: The scales are imbricate and flattened, i.e., they have flat and untoothed margins throughout the length (Fig. 7b).

Name of species: Rufous-tailed hare
Zoological name: *Lepus nigricollis ruficaudatus* (Geoffery)
Place of collection: Nagrota, Akhnoor, Musum.
Diagnostic features
Colour and appearance: Hair is soft; color varies from black, brown on dorsal side to white on the ventral parts (rufous)
Microscopic appearance
Medulla pattern: Medulla is discontinuous, i.e., the medulla is in the form of discs arranged in a regular pattern and are seen throughout the whole length of the hair.
Scale pattern: The scales are imbricate, i.e., overlapping and flattened throughout the whole length of hair.

Name of species: Mole rat
Zoological name: *Bandicota bengalensis*
Place of collection: University campus, Gandhi Nagar Police Line, Railway Station, Janipur.
Diagnostic features
Color and appearance: Grayish to smoky white. The hairs have uniform thickness in the proximal part, are thicker in middle portion and tapering in distal portion
Microscopic appearance:
Medulla pattern: Medulla is latticed, i.e., the medulla is continuous and cellular (Fig. 8a). This

pattern is seen throughout the whole length of the hair.
Scale pattern: The scales are imbricate and acuminate throughout the length of the hair (Fig. 8b).

Name of species: Jackal
Zoological name: *Canis aureus*
Place of collection: Bajalta on Sidhra, Surinsar Road.
Diagnostic characters
Color: Color of hair is generally light brownish, but a few hairs have blackish and white bands on same hair; length of hair ranges from 1.5 cm to 7 cm.
Microscopic appearance:
Medulla pattern: It is fragmental throughout the whole length, i.e., proximal, medial and distal portion.
Scale pattern: The scales are imbricate; they are crenate in distal.

Discussion

The present study on hair was conducted by following the methods given by Hausman (1924), Hausman (1930), Koppikar and Sabnis (1976). According to Sabnis (1980), there are many factors which influence hair characteristics, such as location on the body, geographical location of the animal (which influences the scale pattern), length and color, so these observations should not be considered absolute.

During the present study, the hair structure of 10 species was studied and the results are given below.

In Rhesus monkey, the hair is orange colored, medulla is absent in proximal portion but in distal portion it is fragmental. The scales are imbricate throughout the length.

In the case of Bush rat, the hair is brownish, medulla is "discontinuous" throughout the length and scales are imbricate, they are elongate in proximal portion and crenate in distal part. Northern five-striped palm squirrel has pale whitish and blackish colored hair; some hairs are banded having white and black transverse bands. Medulla pattern is discoidal and is found throughout the length; Scales are imbricate and flattened throughout the length.

Porcupines have two types of hair: quills form the armor of body; are pointed at proximal and distal end and have transverse black and white bands, the distal end being more pointed. The other hairs are black to dark brown in color, and are thicker than the hairs of other mammals. The medulla in the proximal portion has continuous medulla. Scales are imbricate, they are flattened in proximal and median segments, and crenate in distal parts.

Mole rat has grayish to smoky white hair. The medulla is latticed throughout the length. The scales are imbricate and acuminate throughout the length.

Indian jackal has light brownish hair; a few hairs are blackish; The medulla is fragmental, scales are imbricate, crenate in distal and medial regions where as these are flattened in proximal part.

Some hairs in the Small Indian civet are black, some are white and some have transverse bands of black and white color. The medulla is discontinuous throughout in all colors. Scales are imbricate; they are acuminate in proximal portions.

Common mongoose has light gray banded hair. The medulla is "continuous" in the proximal part and is absent in distal part. Scales are imbricate; they are crenate in medial part and flattened in distal portion.

The hair of Fruit bat is soft, short and light brown to dark brown in color. The medulla is absent and hairs are seen as transparent under a microscope throughout the length. Scales are imbricate; they are flattened throughout the length.

In the Rufous-tailed hare, the hair is soft; color varies from blackish brown to white. The medulla is discontinuous throughout and scales are imbricate and flattened through out the length of hair.

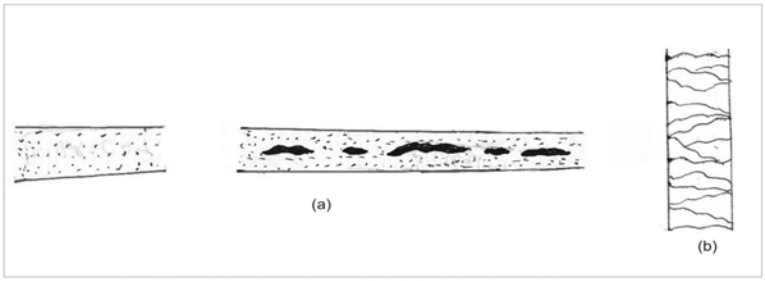

Fig. 1

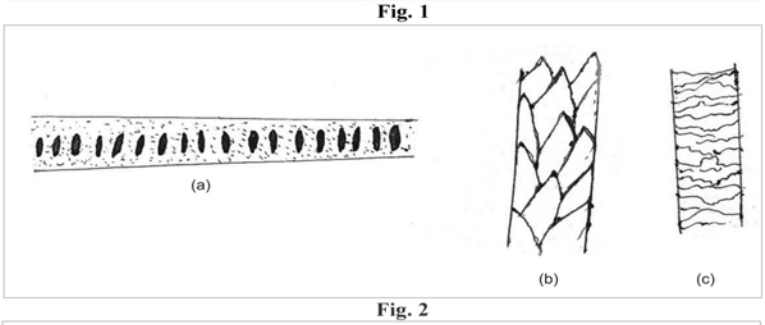

Fig. 2

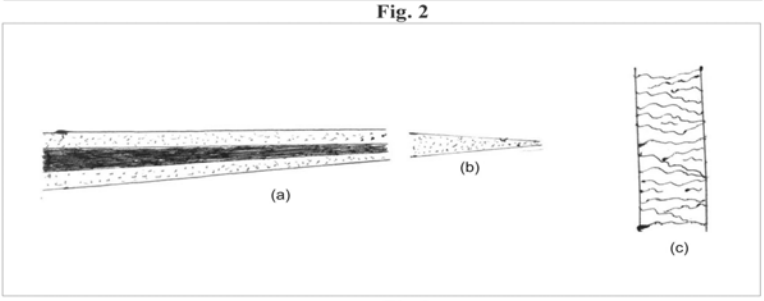

Fig.3

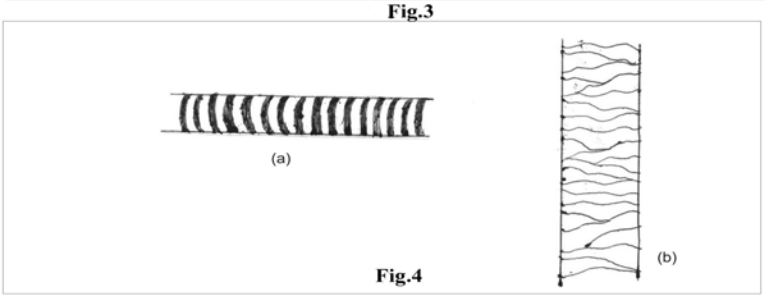

Fig.4

Plate I

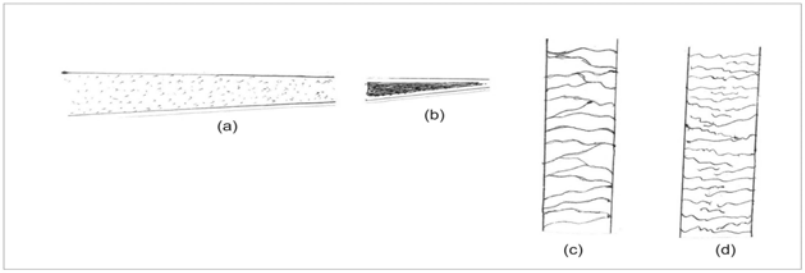

Fig. 37

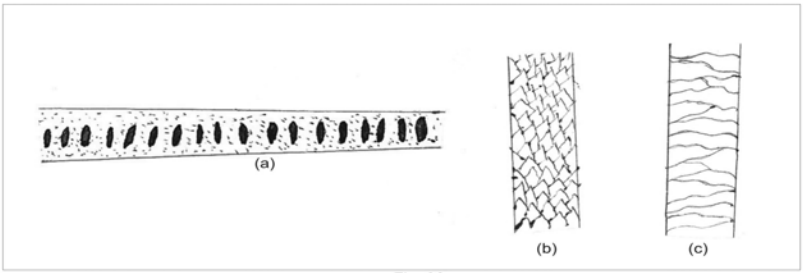

Fig. 38

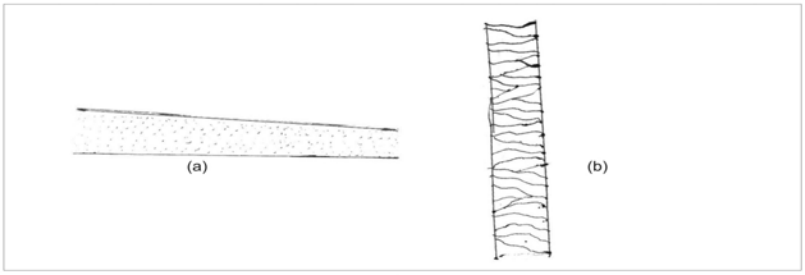

Fig. 39

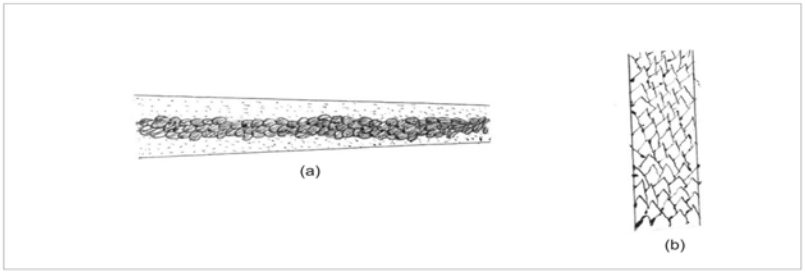

Fig. 40

Plate II

Acknowledgements

The authors are thankful to UGC for the financial assistance to carry out the present work and H.O.D Zoology for providing lab and a departmental vehicle.

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OBSERVATION OF FLOWERS OF GASTRODIA ZEYLANICA: AN ENDEMIC, CRITICALLY ENDANGERED SAPROPHYTIC ORCHID SPECIES IN KANNELIYA RAINFOREST, SRI LANKA

by Anuradha Ediriweera, Charith Senanayake and Piyal Wijerathne

Introduction

Sri Lanka is an island in the Indian Ocean lying on the southern tip of the Indian Peninsula between 5°55' - 9°51' North latitudes and 79°41' - 81°54' East longitudes. The island has three peneplains (Figure 1).The first is from sea level to 900 m. This comprises the dry zone and the wet zone. The dry zone, which is the largest part of the island, in the north, north-east to the south-east is a large flat lowland that receives low rainfall (<2000 mm per year) from the northeast monsoon. The vegetation principally comprises dry mixed evergreen forests and some parts belong to the arid floristic zone. Lower numbers of orchid diversity are observed in this area (Fernando and Ormerod, 2008).

The south-western part of the peneplain receives more rainfall throughout the year from the southwest monsoonal activity. This area represents the wet zone of Sri Lanka and three major floristic zones of the northern wet lowlands, south of Rathnapura- northern Sinharaja and southern Sinharaja – Hiniduma- Kanneliya, can be seen (Ashton *et al.*,1997). Lowland wet rainforest occurs in these areas while orchid diversity is also very high (Fernando and Ormerod, 2008).

The second peneplain is from 900 to 1,100 m, which is called a submontane zone, located between the lowland wet zone and the montane zone. Floristic zones of the northern intermediate lowlands and eastern intermediate lowlands apply in these areas (Ashton *et al*., 1997). These areas harbor the richest orchid diversity because of the lush conditions for perennial orchids (Fernando and Ormerod, 2008).

The third peneplain belongs to the highest mountains with montane forests and montane grasslands, which are in the central peaks of the island.

Figure 1: Map of major bioclimatic zones of Sri Lanka and locality of Kanneliya rainforest

The Kanneliya Forest Reserve is situated in the Kanneliya-Dediyagala-Nakiyadeniya (KDN) forest complexes in the lowland wet zone of southern Sri Lanka. The total extent of the KDN forest complex is 12,196 ha (Jayasuriya & Abayawardana, 2008). The Kanneliya Forest is the largest among these, about 6,114 ha in extent, with an average annual rainfall of about 4,445 mm, mainly during the southwest monsoon season (Jayasuri-ya & Abayawardana, 2008). The mean monthly temperature is around 27°C. The entire area of the Kanneliya Forest Reserve has been declared a Man and Biosphere Reserve due to being one of the most floristically rich areas in South Asia (Bandaratilaka, 2003).

Orchids are perennial herbs of the Family Orchidaceae. They belong to the monocotyledonae, one of the largest flowering plant families, and are greatly concentrated in the tropical areas (Fernando *et al*., 2003). There are 188 species of 78 genera belonging to five sub-families recorded according to the recent studies on Family Orchidaceae (Fernando and Ormerod, 2008).

Gastrodia zeylanica is a very rare species which is endemic to Sri Lanka, with distribution in tropical wet evergreen forests below 610m altitude (Jayaweera, 1981; Fernando and Ormerod, 2008; Dassanayake and Fosberg in Jayaweera, 1981.

Fernando and Ormerod (2008) mentioned that "the figure in Jayaweera (1981) and two drawings deposited at the Peradeniya Herbarium (PDA) are not *G. zeylanica* but a *Didymoplexis* sp." Thus, it is important to identify the actual species for conservation purposes. However, because of its conservation status being Critically Endangered according to the IUCN Redlist (2007), only photographs were taken without harming the plant (Figure 2). Confirmations were made by orchid experts and the National Botanical Gardens at Peradeniya, Sri Lanka

The orchids were recorded at Kanneliya Rainforest, Southern Province, Sri Lanka, found growing under the shade of trees in decaying plant litter. The soil was moist and enriched with decaying and fallen plant leaves. Flowers were seen in March-April.

A full detailed taxonomic description will be completed after receiving proper authorization to ensure its distribution within the rainforest.

G. zeylanica was previously recorded at Hiniduma Kande, which is a mountain located 8 km from the Kanneliya Rainforest (KRF); however, in the past 60 years it has been isolated from other rainforest fragments as it is surrounded by tea monoculture. The identification of this critically endangered species adds to the floristic diversity value of KRF and provides conservationists and biologists an opportunity to address the status of this rare species and engage in urgent conservation action.

Figure 2: A-Flower from front, B- Inflorescence and side view of a flower.

Acknowledgements

The authors are grateful to Dr. Siril Wijesundara, Director-General of the National Herbarium of Peradeniya, Sri Lanka, for his help in verifying the orchid species.

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EEL FISHERY AT THE WATERLOGGED AREA OF NOAKHALI DISTRICT, BANGLADESH

by M. Mizanur Rahman, M. Ziaur Rahman and Subrata Sarker

Introduction

Although eels are available in Bangladesh, they not considered as a food item in the local diets. However, eels are a high demand food item in Europe and some other Asian countries. Eel culture is not established in Bangladesh and traditionally fish are harvested from wild sources, generally when attaining a marketable size. Little research has been done on fresh water eels in Bangladesh, but it was reported that recently young eels are being captured and sold before they attain marketable size.

Eels are elongated fish, ranging in length from 5 centimeters in the one-jawed eel (*Monognathus ahlstromi*) to 4 meters in the slender giant moray (berlinonline). Adults range in weight from 30 grams to well over 25 kilograms. They possess no pelvic fins, and many species also lack pectoral fins. The dorsal and anal fins are fused with the caudal or tail fin, forming a single ribbon running along much of the length of the animal (expertensprechen). Most eels live in the shallow waters of the ocean and burrow into sand, mud, among rocks, or in cracks found in coral reefs. A majority of eel species are nocturnal, and thus are rarely seen. Sometimes, they are seen living together in holes, or "eel pits." Some species of eels also live in deeper water on the continental shelves and over slopes as deep as 4,000 meters. Only members of the Anguillidae family regularly inhabit fresh water, but they still return to the sea to breed (wno).

Freshwater eels are commonly used in Japanese cuisine. Eels are also very popular in Chinese cuisine, and are prepared in many different ways. Hong Kong eel prices have often reached 1,000 HKD per kilogram, and once exceeded 5,000 HKD per kilogram. Eel is also popular in Korean cuisine and is seen as a source of stamina for men. The European eel and other freshwater eels are eaten in Europe, the United States, and other places. New Zealand longfin eel is a traditional Mâori food in New Zealand. In Italian cuisine eels from the Comacchio area are specially prized, along with freshwater eels of Bolsena Lake. In northern Germany, The Netherlands, the Czech republic, Poland, Denmark and Sweden, smoked eel is considered a delicacy (Wikipedia, 2011). Eelskin leather is highly prized. It is very smooth and exceptionally strong and comes from the Pacific Hagfish, a jawless fish which is also known as the slime eel (Snopes; Barss, 1993).

In 2010, Greenpeace International added the European eel, Japanese eel and American eel to its seafood Red List, which is a list of fish that are commonly sold in supermarkets around the world, and which have a very high risk of being sourced from unsustainable fisheries (Greenpeace International). The human demand for protein as a consumable has been rising the world over, consistent with the growth of human populations. In this context, eel culture can serve as a sustainable protein source for the world's growing population. Furthermore, eel culture has come to be treated as a potential input to compensate for the declining fish production from capture sources and as a main alternative for the management of sustainable fish production output.

Bangladesh is endowed with vast water resources in the form of ponds, dighis, lakes, streams, and rivers, natural depressions in coastal areas and estuaries, covering an area of 4.56 million ha (DoF, Bangladesh 2005), from all of which eel can be produced profitably. Fisheries are diverse in Bangladesh with fish and prawns occurring in its freshwater resources and fish and shrimp in its marine waters in addition to crabs, etc. Fish is a major component in human nutrition and fisheries provide employment and contribute to the nation's foreign exchange earnings. About

12 million people are associated with the fisheries sector of Bangladesh. The development of eel culture has generated considerable employment opportunities in Bangladesh by the production and marketing of eel and the associated activities. Around 400,000 ha of freshwater ponds/ditches and more than 900,000 households are involved in aquaculture (ADB, 2005). The present study aims to identify the life cycle of fresh water eels at the water-logged area of Noakhali district and examine the indigenous catching techniques and their economics and marketing.

Materials and methods

Materials used in the study included a digital camera and a tape recorder. Methods included semi-structured interviews, personal interviews and field visits. During the data collection a group of four persons who capture eels in the study area were interviewed separately and as a group. Visits were made to the capture area to observe the location, capture technique, storing technique and capture rate of each person.

Result and discussion

Generally eels are a catadromous species, meaning that they spend their juvenile life in fresh water and migrate to the ocean to spawn. Adult eels move from rivers to the ocean in the autumn. After spawning, the adults die and the eel larvae travel on ocean currents back toward the mainland, feeding and growing along the way. The eel larvae undergo three stages, ending with the elver stage. The elvers are migratory, reaching stream mouths in the spring and then traveling up rivers.

The European eel (*Anguilla anguilla*) was the one most familiar to Western scientists, beginning with Aristotle, who did the first known research on eels. He stated that they are born of "earth worms", which emerged from the mud with no fertilization needed — they grew from the "guts of wet soil". For a long time, nobody could prove Aristotle wrong. In 1777, Carlo Mondini found the creature's gonads and proved that eels are fish.

Until 1893, larval eels — transparent, leaflike, five cm long creatures of the open ocean — were considered a separate species *Leptocephalus brevirostris* (from the Greek *leptocephalus* meaning "thin- or flat-head"). In 1886, French zoologist Yves Delage kept leptocephali alive in a laboratory tank in Roscoff until they matured into eels, and in 1896 Italian zoologist Giovanni Battista Grassi observed the transformation of a Leptocephalus into a round glass eel in the Mediterranean Sea, and recognized the importance of salt water to the process. Despite this discovery, the name *leptocephalus* is still used for larval eels .

However, the fresh water eels of Noakhali district show a different life cycle pattern. Their whole life cycle is completed in fresh water and no salt water is needed. The life cycle is completed within 4 months

Catching eels

Catching freshwater eel depends to some extent on equipment, timing and to some degree, luck. The eel collectors first prepare cases and bamboo sticks and then select a waterlogged area and carry 40-60 cases per person to the selected area. They then collect some shrubs from the roadside area. The shrubs are sunk into the water in drums or containers until the water color changes. After completing the mixing the water is discharged into the roadside area or where earthworms are available. The worms come out from the soil within 4-5 minutes and then the collectors gather the earthworms with sticks or by hand into a bag and carry it to the cases. The earthworms are impaled on sticks and put into the cases. The collectors carry the cases by boat to the capture location. This is carried out in the late evening. All the cases are set out in bushy areas and covered by some bushy substance for the whole night. Eels will enter into the case to eat the earthworms and after eating they cannot get back out; sometimes snakes enter into case. When the sun is completely up the collectors go to collect the cases and bring them back to the land area. The eels are collected from each case and put into plastic bags and stored at the collectors' residences until they have caught enough eels to take to the nearest sale center.

Economics and marketing

Since 2001, the United States has exported frozen American eels, primarily to South Korea and Belgium. In 2010, South Korea purchased eels valued at $3.0 million, while Belgium purchased eels valued at $1.7 million. Hong Kong, now the third largest importer of American eels, purchased $1.2 million worth of eels that year. Total U.S. exports of American eels in 2010 were 2,202 metric tons valued at $7.4 million. (U.S. Trade Internet System). Eels in Bangladesh have a high economic value in foreign currency.

Conclusion

Eels are probably not in demand as a local food item due to their "snake-like" structure and a lack of consumers with a taste for them. But it has a high demand in foreign markets so it is high time to take the necessary steps to conserve the eel fishery.

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STUDY ON FEEDING HABIT OF ELEPHANT IN KARANJIA DIVISION, ORISSA, INDIA

by Sandeep Ranjan Mishra, Anup Kumar Nayak and Debiprasad Sahoo

Introduction

Every animal has specific biological features and ecological requirements for survival. At birth, an elephant already weighs around 90 kilograms and stands about 1m tall. The height at the shoulder of an adult is 2.2 to 3m.Adults weigh between 2,041 to 4,990 kg. An elephant needs to consume large quantities of food every day. They are not specialist feeders and browse and graze on a variety of plants. More than 75 species have already been identified which serve as elephant fodder. An ideal elephant habitat should therefore have a variety of natural food species. The proportion of different plant types in their diet will vary depending upon the habitat and season. Elephants may spend up to 14-19 hrs a day

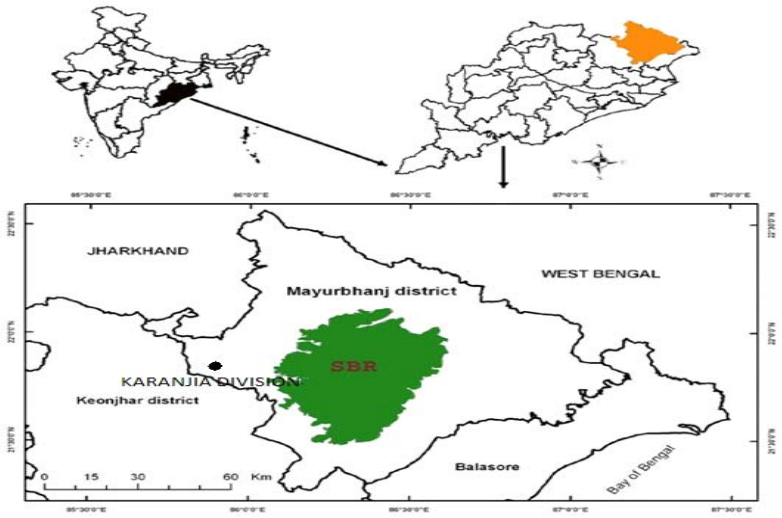
feeding, during which they may consume up to 150 kg of food.

Numerous studies on the food plants of African and Asian elephants have shown that the proportions of various plant species in the diet vary widely from one region to another (Barnes, 1982; Douglas-Hamilton, 1972; Field, 1971; Field and Ross, 1976; Guy, 1976; Laws *et al.*, 1975; McKay, 1990; Olivier, 1978a; Sukumar, 1989; Swain and Rath, 1998; Vancuylenberg, 1977). The present study aims to document food plants of elephant in Karanjia Division, which is a major migration place for elephants of Keonjhar Division.

Study area

Karanjia Division is located in Mayurbhanj district of Orissa.

Fig.1: Location map of the study area



Methodology

Two methods were employed for documenting the food plants of elephant within the study area. The first was direct observation. After observing the feeding of animals (using binoculars) and noting the feeding signs, on-site inspections of food plants were made to identify plant species. The second method was interviews with forest dwellers who have sighted elephants many times and were able to observe them while feeding.

The parts of plants consumed such as leaf, fruit, etc. were recorded in the both the above methods. The plant species were photographed and identified with the help of taxonomists.

Results

The food plants of elephants were traced through a number of trekking excursions to the elephants' habitats. Various devices were employed to look for signs of the preferences of elephants towards plants of the forests, through either direct sighting or through evidence available from the plant parts used by the elephants. A variety of plant species and plant parts were found to be consumed by

Table 1: Elephant food plants

Species	Plant parts consumed by elephants
Shorea robusta	bark
Bombax ceiba	leaves and small stems
Kydia calycina	leaves
Sterculia urens	stem and bark
Artocarpus heterophyllus	leaves, bark and fruits
Ficus benghalensis	leaves and bark
Ficus glomerata	leaves and fruits
Limonia acidissima	bark and fruits
Mangifera indica	fruits
Schleichera oleosa	leaves
Zizyphus maurutiana	leaves
Zizyphus oenoplia	leaves
Tamarindus indica	leaves and fruits
Terminalia chebula	leaves
Terminalia belerica	leaves
Syzygium cumini	leaves
Careya arborea	leaves and fruits
Madhuca indica	flowers
Diospyros melanoxylon	root of young plant leaves
Cyperus sp	vegetative parts
Cynodon dactylon	vegetative parts
Dendrocalamus strictus	leaves branches and shoots
Imperata cylindrical	leaves and base
Smilax zeylanica	leaves
Cassia fistula	leaves and small stem
Oryza sativa	vegetative parts, inflorescence and grains
Saccharum officinarum	vegetative parts

elephant. A list of plants and their parts eaten by elephants are given in Table 1.

Discussion

Karanjia Division is one of the major migration areas for elephants of Keonjhar Division. Elephants frequently migrate from Joda and Badbil of Keonjhar Division to Karanjia Division for several reasons such as developmental activities going on in Joda and Badbil, mining, habitat destruction, and scarcity of food and water, which is easily available in Karanjia Division. Elephants prefer a variety of food plants in their diet. It was found that elephants also consume bark and small stems of a number of plants. At the end of winter there is leaf shedding and the grasses and sedges dry out, making the forest floor a perfect stage for catching fire. Fire burns out many of the elephant's food plants. At this time elephants depend on bark and small stems. During the rainy season and prior to winter, grasses and sedges constitute the bulk of elephant diet. Important species grazed by elephants are *Cyperus* sp.; *Eragrostis* sp., *Digitaria* sp., *Ischaemum* sp., *Themeda* sp., *Panicum repens*, *Cynodon dactylus* and *Brachiaria* sp. Elephants also like to eat the bark of Sal (*Shorea robusta*).

The plant species which serve as the staple food of elephants are *Kydia calycina* (leaves), *Grewia tiliaefolia* (leaves and small stems), *Helicteres isora* (leaves and branches), *Mallotus philippinensis* (leaves and branches), *Cassia fistula* (leaves and small stems), *Madhuca indicia*, *Dioscorea* sp (tubers). It was found that elephants sometimes feed on local cultivations such as paddy plants, vegetables, sugar canes and banana plantations due to the presence of human settlements in nearby areas.

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FOREST NEWS

Vol. XXVI: No. 4 2012

REVISING THE CODE OF LOGGING PRACTICE FOR PAPUA NEW GUINEA

Prepared by Roger Steinhardt, FAO Consultant

PNG has a unique forest ecosystem.

Introduction

The forests of Papua New Guinea (PNG) are a unique natural resource asset that contribute to the monetary, environmental and social sectors of the economy. Most of PNG's population are dependent on forest resources as a source of nutrition, medicine, livelihoods and a number of critical services, namely, air and water quality and carbon storage. Over recent decades, the sustainable capacity of much of PNG's forests to support these products, services, biodiversity and ecological integrity has come under threat from the degradation occurring due to forest harvesting activities.

The Logging Code of Practice (LCOP), circa 1996, is now seen as outdated when considering the application of climate change systems and biodiversity management in the sustainable management of forests. The project seeks to strengthen the capacity of the national forest agency by strengthening the LCOP and provide training to Papua New Guinea Forest Authority (PNGFA) personnel and forest industry operators on improved forest practice guidelines, monitoring and enforcement.

The lead agency is the Papua New Guinea Forest Authority (PNGFA), who enters into Forest Management Agreements (FMA) with

incorporated land groups (ILGs) for harvesting rights and then issues timber permits to forest concessionaires. The ILG are the customary owners of the land and the government must follow a systematic process containing 34 steps from forest survey, through community consultation to eventual development of the FMA.

The Forest Management Agreement (FMA) entered into between the forest concessionaire and the PNG Forest Authority requires that in addition to the normal harvesting and re-planting activities, the company will invest in a range of infrastructure development deliverable over a 20-35 year period. This infrastructure includes schools, teachers' housing, dormitories, health centers, churches, sports facilities, a Police Station, jetties, roads, bridges and crossings. It also requires the company to actively assist in the socio-economic development of the landowners within the Forest Management Area concession.

Teacher accomodation built as part of FMA, Cloudy Bay, PNG

Within the FMA, the forest concessionaire actively works on regenerating the forest and maintaining productive capacity while protecting and maintaining long-term forest and soil productivity, water resources, high conservation value forest sites and sacred and cultural sites.

The PNGFA is the pivotal point for all negotiations relating to village development and royalty payment systems for the ILGs and approval and monitoring of all actions under the timber permit. The PNGFA's role is to provide a buffer between the ILGs, customary owners who live in and around the FMAs, and forest concessionaires. However, in reality, there is no buffer as the forest concessionaire lives and works with local ILG members, whether through direct employment or through socially beneficial development activities such as building schools, churches or building roads.

In Papua New Guinea, forest resource ownership is unique, unlike many other parts of the world. This is closely associated with the land tenure system where land is owned and managed by customary landowners (tribal clan groups). It is estimated that 95 percent of the total land area of the country is customary-owned, while the remaining 5 percent is owned either by the State, private companies, individuals or religious groups such as the Roman Catholic, Lutheran and United Missions.

The role of FAO

The "Promoting sustainable forest management by developing effective systems of forest planning, monitoring and control in Papua New Guinea" project is managed by FAO on behalf of the Australian Department of Agriculture, Fisheries and Forestry, who funds the project as part of

the Australian Government's Asia-Pacific Forestry Skills and Capacity Building Program. FAO's Regional Office for Asia and the Pacific has had extensive experience in the area of forest practices and reduced impact logging over the last decade, which are highly relevant to the project activities.

Stakeholder meeting programs

Workshops and field visits with various stakeholders have provided opportunities for all stakeholders and partners to actively participate in discussions relating to the project consultation process, establishing site selection criteria, planning for activities, defining roles and responsibilities and allowing the interaction with practitioners in forest operations, research activities and training institutions.

Key messages, conclusions and recommendations from the stakeholder meeting are as follows:

- It was noted that the new LCOP requires greater emphasis on environmental management of the forest and maintenance of flora and fauna biodiversity, including high conservation values forest (HCVF), silvicultural prescriptions, improved road design, sustainable yield, forest regeneration and social concerns.
- The revised LCOP must contain elements of sustainable forest management (SFM) practices that provide a balance between economic and environmental concerns. The revised LCOP will promote the sustainable harvesting of forests, while protecting biodiversity and environmental values. Biodiversity and conservation values are not emphasized in the current LCOP.
- The top priorities for successful development and implementation of the revised LCOP are the consultation process and training components related to the "training the trainer" courses and the code implementation system (CIS) development and monitoring and enforcement protocols.

Log dump management and safety issues

- Stakeholders want the revised LCOP document to be of a high technical standard, but easily applicable in the field, including the monitoring and enforcement protocols.
- Field guides need to be developed for specific tasks related to the LCOP, including those for tree cutters, machinery operators, road builders and silvicultural managers. These guides need to be tailored for specific regions such as lowlands, highlands and areas of volcanic soils that require modified prescriptions for soil and water management.
- PNGFA staff indicated that plantation harvesting operations should be considered when revising the LCOP for it is predicted that in coming years native forest harvesting will decrease and plantation development and plantation harvesting operations will increase.
- There is a need to promote education of landowners through meetings and involvement in the set up planning. Landowners need a greater understanding of the non-monetary value of their forests and the role of the LCOP in protecting these values, such as healthy streams and biodiversity.
- The capacity of PNGFA staff must be increased to undertake planning, control and monitoring activities. This includes more transportation be made available and increased financial support and numbers of staff in the field.
- Forest certification through various international schemes is helping to improve management structures and regimes, but it is not known whether certification will lead to higher sale prices.

Field marking before harvest operations commence

Silvicultural prescription discussions at Cloudy Bay, PNG

REDD+ AND THE FUNDAMENTALS OF FOREST MANAGEMENT SCIENCE: IS SUSTAINABILITY EVER POSSIBLE?

REDD+ and the fundamentals of forest management science: Is sustainability ever possible?

Sustainability: a word that entered into the popular lexicon after the 1992 Rio Earth Summit, has been dissected, examined and redefined like few other words before or since. With regard to all natural, renewable resources, sustainable use is the goal of every good manager. However, Barbara Zimmerman and Cyril Kormos question whether, in the field of timber extraction from tropical forests, sustainability is even possible. If the answer is 'no', then the implications for REDD+, and for the forestry profession, are dire.

If you're a regular reader of Go-REDD+, then the key points of this debate may be familiar. How can timber extraction ever be sustainable, compared to the pre-harvest condition? Can forests ever recover completely to their natural state? Can commercial forestry ever be profitable with stringent environmental standards? Zimmerman and Kormos revisit these arguments and conclude that 'industrial scale' Sustainable Forest Management (SFM) is unsuitable as an element of national REDD+ strategies. However, they also conclude that SFM at the 'local-community scale' is indeed possible.

In a critical response to the original article, Plinio Sist and colleagues point out some flaws in these conclusions. Firstly, the categories of 'industrial scale' and 'community scale' are not well-defined, and overlap to a certain extent. Secondly, in terms of both carbon stock and biodiversity, logged forests can indeed recover, with appropriate post-harvest management. And thirdly, to write off the entire tropical timber industry as a lost cause, rather than incentivizing improved practice, is likely to undermine, rather than reinforce, conservation efforts.

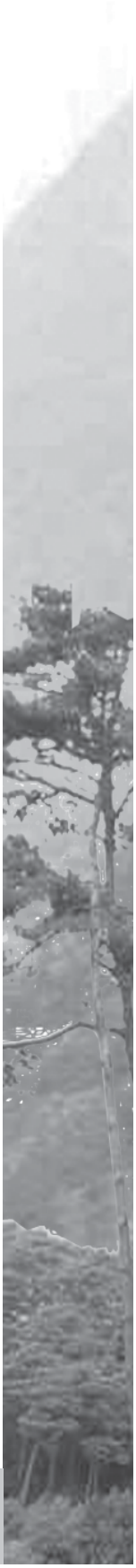
For forest managers, the principles of SFM embody best practice[1]. The means of implementation vary considerably depending on forest type and management objectives. However, misuse of the term by some tropical forest managers has led to association of 'SFM' with poor practice, in the view of some commentators. In response to Sist, Zimmerman pointed out that logging in tropical forests under 'presently mandated protocols' does indeed lead to resource depletion. The salient point here, however, is that these protocols or codes of practice are not followed, in the vast majority of cases. In fact, most operators are not even aware of them.

REDD+ has reopened old fault lines in the debate over SFM. By introducing the term 'Sustainable Management of Forests' (SMF), REDD+ negotiators had hoped to bypass the controversy. Instead, confusion reigns.

Efforts towards sustainability in forest management practices should surely be encouraged, whatever terminology we use. Research into Reduced Impact Logging (RIL) measures, and their impacts on carbon stocks, biodiversity and harvesting costs indicates that REDD+ *could* potentially incentivize such efforts.

But on whether it *should*, opinion is divided.

From: Go-REDD+ Special Issue #5 February 2013



[1] The most recent definition of SFM, from the United Nations Forum on Forests (UNFF) in 2007: "Sustainable forest management as a dynamic and evolving concept aims to maintain and enhance the economic, social and environmental value of all types of forests, for the benefit of present and future generations."

THE IMPORTANCE OF TENURE: RESULTS OF AN INTERNATIONAL CONFERENCE

Prepared by Ma Qiang, Forestry Officer, Forest Economics, Policy and Products Division, FAO

Securing tenure for the world's rural and forest people is essential for alleviating poverty and achieving broader social and economic goals. Among the countries that have undertaken forest tenure reforms in recent decades, China's tenure reforms are especially significant, as it is clearly the largest, when measured by the number of people directly affected. As the world's most populous and second largest economy, what China does with its forests and forest tenure has dramatic implications for not only itself, but for the rest of the world. The fate of China's forests and its own use of wood products have major implications for its economic development, food security, carbon emissions and sustainable resource management. China has become the world's largest processor of timber and non-timber forest products and its policies have thus become central to the development of forest governance mechanisms such as REDD and FLEGT.

During the past three years, the State Forest Administration (SFA), with support from FAO, has been implementing a project to strengthen the collective forest tenure reform in six southern provinces of China. The experiences generated on forest farmer cooperatives, forest trade centers and participatory approaches to forest management by communities and forest producer organizations will provide valuable inputs to the development of new policies to enhance forest governance and participatory forest management.

The international conference of forest tenure reform: Status and review of forest tenure reforms in China and a global perspective on the way forward was held 21-23 November 2012 in Hangzhou, China. Some 170 participants, including about 30 international participants, attended the conference. Lessons and experiences from China and around the globe on the development and implementation of forest tenure policies, laws and regulations were shared through presentations and discussions in seven sections of the conference covering the areas of review, assessment and experiences of forest tenure reforms; legal dimensions of collective and household property rights; economic and livelihoods dimensions of forest tenure reform; the role of credit, insurance and subsidies; and the role of local cooperatives and associations in deepening forest tenure reform.

The conference was hosted by China's State Forestry Administration, FAO, the European Union, the Rights and Resources Initiative and Peking University, and was the last largest event of the China forest tenure project. The key outcomes of the project, including the main findings of the assessments on forest farmer cooperatives and forest tenure trade centers, were presented and discussed in addition to some other presentations and discussions at the conference. It was expressed by the participants that the outcomes of the project have provided important inputs to the ongoing forest tenure reform process and to the future deepening reforms in China, as well as provided lessons that could be shared by other countries. Overall, the conference was acknowledged by participants as a great success, particularly in regard to presentations and discussions, and the organization of the conference.

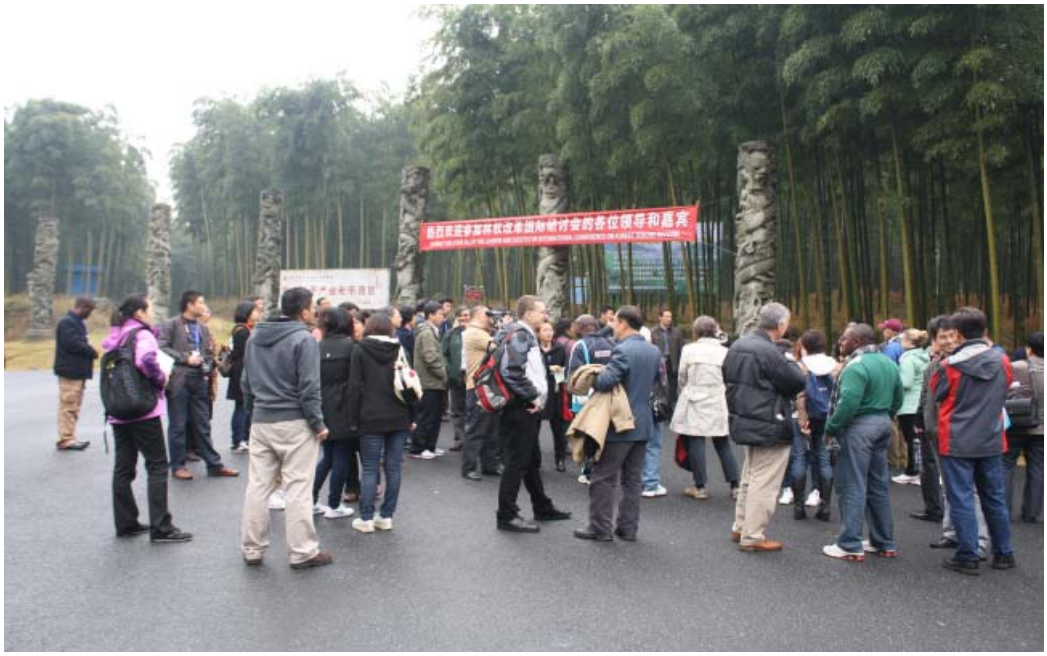
At the opening section chaired by Mr. Liu Yongfan (Director-General of the Forestry Policy and Legislation Department, SFA), Opening Speeches were given by Mr. Zhang Jianlong (Vice Minister of SFA), Mr. Johan Cauwenbergh (Minister Counselor of the Delegation of the EC, EU) representing EU, Mr. Percy Misika (FAO Representative in China) and Ms. Eva Muller (Director of Forest Economics, Policy and Products Division of FAO) representing FAO. The Voluntary Guidelines on the Responsible Governance of Tenure were presented by Ms.

Eva Muller as a framework for the way forward and the importance of their implementation was highlighted by participants. Ms. Ma Qiang (Forestry Officer Forest Economics, Policy and Products Division of FAO) gave a presentation on good practices and the key to success of forest producer organizations. The importance of an enabling environment in developing forest producer organizations was highlighted by participants. Mme. Zhang Lei (Director-General of the Department of Rural Forest Reform and Development, SFA) delivered a key presentation on opportunities and challenges for deepening collective forest tenure reform. Lessons and experiences of China's forest tenure reform shared were appreciated by the participants.

The first day of the conference consisted of a field trip to the Tianlin bamboo shoot professional cooperative and to the Hengshanwu village community. In order to increase income for their members, both have developed ecotourism. The former one has realized the economics of scale by unified management and marketing. The latter one has developed the production of Yellow Pear.

A major outcome of the conference was the conclusion that tenure reform in China has been a major success in many ways. It has recognized the land rights and unleashed the aspirations and entrepreneurial energies of hundreds of millions of Chinese farmers. The broad indicators of the success have been that the increases in incomes from tree planting and harvesting. Other major outcomes were that the recognition of rights is considered the first generation of tenure reforms, which also includes the need for government assistance on forest credit, insurance, cooperatives and extension of services; The second generation of the reforms is about the government respecting the rights that forest owners and communities now have and making sure that all citizens have equal access to those rights. It is beginning to make efforts to address with the second step - establishing the mechanisms to make sure that the government itself and other powerful parties actually respect those rights, and also to ensure that those rights are fully extended to women, ethnic minorities and other disenfranchised groups. For example, the persistence of the forest harvesting quota, the taking of rights under the Natural Forest Protection Program and the public benefit ecosystem forest program are old policies that preceded the tenure reforms and should be addressed in the next generation of reforms in China. Finally, it has found that the shared experiences and lessons of the China forest tenure reform have been very useful to the reform processes of other countries, and vice versa.

Further information on the conference can be obtained at the following url link of the Project website: http://www.fao.org/forestry/tenure/china-reform/80838/en/.



ROLE OF FORESTS IN NATURAL DISASTERS

Coastal protection forests initially serve three key functions and can cause one major problem in tsunami events: on the one hand forests can reduce wave energy, stabilize dunes or other elevated barriers along the coast and capture drifting objects, thus reducing the destructive power of tsunamis. On the other hand, they can also cause secondary damage by drifting trunks.

Several countries in the Asia-Pacific region have been haunted by natural disasters more frequently and intensively in recent years, and climate change is expected to further stimulate this tendency. In particular, the Great East Japan Earthquake, which triggered powerful tsunami waves that hit the Pacific coast in northern Japan on 11 March 2011, raised many new and old questions about the role of forests in natural disasters.

In need of information after the repercussions of this powerful earthquake, an international seminar "The Role of Forests in Natural Disasters and Revival of Forests and Forestry" was held in Sendai, Japan, 5–6 February 2012. Subsequent to a keynote presentation on sustainable forest management and its usage in the context of the seminar, three sessions and a panel discussion took place, designed to meet the objectives of developing an understanding of a forest ecosystem-based approach to natural disaster risk reduction based on experiences in Japan and around the world, as well how forests and forestry can contribute to the reconstruction of high-hazard areas. It also aimed to demonstrate Japan's efforts and progress made for reconstruction after the earthquake through on-site direct observation.

Functions and limitations of protection forests against different disasters

Tsunamis

- Wide belts of moderately dense mixed forest (over 100m in width) with undergrowth and no gaps can mitigate destructive tsunami impacts.
- Sparse trees without branches (e.g. coconut plantations) and isolated patches of mangroves offer little protection.

Floods

- Forests can reduce flooding in small and medium catchments by drying soil, increasing water infiltration, intercepting rainfall and slowing run-off.
- Forests have little effect on extreme, basin-wide events where volumes of water far exceed the holding capacity of forests and forest soils.

Landslides

- Landslide incidence is much greater after forest removal and road construction, etc.
- Forests can help prevent shallow landslides by drying and stabilizing soil.
- Forests can also block rockfalls and reduce landslide run-out.
- The effect of forests in reducing deep-seated landslides is marginal in most instances.

During the keynote presentation Ohta Takehiko, Professor Emeritus at the University of Tokyo, shared his knowledge and views starting from an historical perspective and briefing that Japan has been planting coastal forests for protection since the 17th century. He pointed out that the tsunami

demonstrated the functions and limitations of forests in mitigating disasters- a major limitation was that forests had no effect where wave height was greatest. Numerous coastal forests were destroyed, causing Japan to reconsider its approach to disaster risk management.

The finding that coastal protection forests can play a role in mitigating tsunami destruction was the primary cause leading to the rehabilitation of 3,600 hectares of forest. A key consideration for rehabilitation in general was to have a coastal forest belt with a width of over 200 meters, which can reduce the force of a 10-meter-high tsunami by one-third. Concerning the forest structure, a mixed forest is recommended, having different tree-bands parallel to the coastline. Artificial embankments can also significantly improve disaster mitigation.

In rehabilitation, 8,000 temporary *itakura* shelters were built by local carpenters with domestic wood, following the Great East Japan Earthquake, demonstrating the function of forests as a safety net. Experiences following natural disasters in China, Indonesia and Myanmar were also shared in the workshop.

During the seminar participants had the opportunity to see tsunami-affected sites and they developed a deeper understanding of the issues. An important and well discussed outcome of the seminar was the shift to disaster mitigation, which is gaining more importance compared to disaster prevention.

ENHANCING REGIONAL COOPERATION FOR MANGROVES

Globally, mangroves are in decline by 1 percent per year, but exceptions from this serious decline can be found in India, Pakistan and few other countries that have success stories to share. Nearly half the global population lives in coastal areas and about 70 percent in East Asia depend on coastal resources for their livelihoods.

The Mangroves for the Future (MFF) initiative has the vision for a healthier, more prosperous and secure future for all coastal communities and therewith a broader focus than only mangroves. It wants to build coastal community resilience in the face of escalating pressures for human development. There are eight MFF member countries, namely India, Indonesia, Maldives, Pakistan, Seychelles, Sri Lanka, Thailand, and Vietnam.

The 9th Regional Steering Committee of the Mangroves for the Future Initiative was held in Karachi, Pakistan, 18-22 November 2012. Representatives of the eight MFF member countries convened to discuss and present the progress in coastal management efforts in their respective countries. They were joined by MFF outreach countries Bangladesh (welcomed by the Committee as the ninth member country), Cambodia and Myanmar. FAO, UNEP, Wetlands International, and other partners of the MFF Initiative, were represented. The theme for the RSC-9 learning event was: "Coastal resilience in the wake of climate change through private sector engagements." This led to discussions which focused on the ways economies are dependent on biodiversity and ecosystem services. Participants acknowledged that many far-sighted businesses are recognizing opportunities in the greening of preferences.

A 12-point "Call for Action" was launched, based on an earlier meeting in August 2012 in India. The document underpins an urgent call for better and effective regional cooperation for mangroves protection and serves as a guide for better government decision making.

COMMUNITY-BASED FOREST HARVESTING FOR POVERTY REDUCTION IN VIETNAM

Prepared by Lara Mia Herrmann, FAO intern (Asia and the Pacific)

A new 2-year project, supported by FAO's Technical Cooperation Programme (TCP) was recently launched in Vietnam. The main objective is the preparation of formal and practical guidelines for forest harvesting that may facilitate the implementation of Sustainable Forest Management (SFM) in Community Forest Management (CFM) sites.

The land designated for forestry in Vietnam currently accounts for approximately 14.7 million hectares and will be expanded to 16.2. million hectares by 2020. Over 70 percent of Vietnam's population live in rural areas and around 25 million are heavily dependent on forests. Many of them depend on forests for cropping or collection of non-wood forest products (NWFPs), or have developed ways to manage forests in a small-scale, labour-intensive way. Some engage in forest management collectively, but informally, without official tenure instruments (so-called "redbooks") but there are more than 64 communities in 10 provinces practicing formal CFM.

The government of Vietnam is committed to promoting sustainable development programs and activities. In terms of forestry, most operations until now have focused on large-scale and commercial interests. The TCP project aims to strengthen small-scale, community-based forestry by addressing legal procedures and guidelines for forest timber harvesting which are appropriate in scale and capacity for CFM.

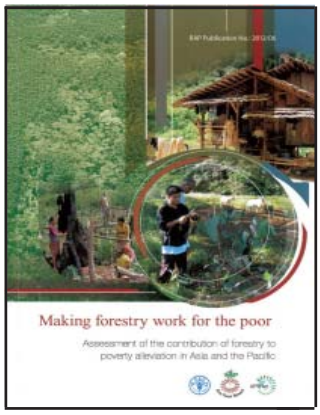
The objectives of the project are to:

- to address poverty in rural and forested areas;
- to help find a national consensus on how best to achieve SFM for poverty reduction;
- to improve the market chain process to benefit small-scale forest enterprises;
- to adequately document innovative and successful forestry practices in Vietnam and to scale them up;
- to identify sustainable methods such as Reduced Impact Logging (RIL) to reduce emissions from deforestation and forest degradation (REDD); and
- to provide technical guidelines for the role of communities in forest harvesting and guidelines for natural forest management planning.

The project aims to document successful cases of community-based (including households) forest harvesting, models for "best practices" and to produce and disseminate simple guidelines for replication of those "best practices" for extension and training.

A systematic review of best practices in Vietnamese timber harvesting will be undertaken through an inventory of community organizations, focusing on their small-scale forest harvesting activities, community-to-community exchanges and communication on community-based forest harvesting.

NEW FAO FORESTRY PUBLICATIONS

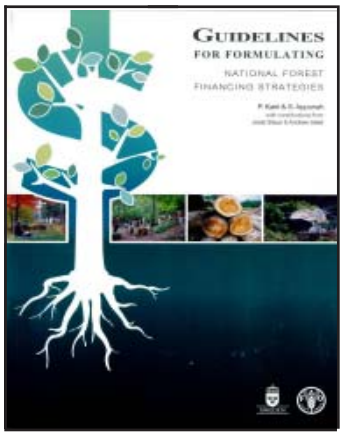


MAKING FORESTRY WORK FOR THE POOR

Assessment of the contribution of forestry to poverty alleviation in Asia and the Pacific
RAP Publication 2012/06

With the 2015 target for achieving the Millenium Development Goals – including halving poverty – just around the corner, FAO, with support from the Asia-Pacific Network for Sustainable Forest Management and Forest Rehabilitation (APFNet), embarked upon a project entitled: "Making forestry work for the poor: Adapting forest policies to poverty alleviation strategies in Asia and the Pacific." The project aimed to assess the extent to which poverty has been reduced through forestry activities in the region and to strengthen policies and capacities to tackle poverty within the sector.

This publication represents a key output of the project and includes eleven reports respectively outlining the contribution of forestry to poverty alleviation in Bhutan, Cambodia, Clina, India, Indonesia, the Lao Peoples' Democaratic Republic, Nepal, Papua New Guinea, the Philippines, Thailand and Vietnam. The reports provide an analysis of key policies and plans relevant to poverty alleviation at the national level and within the forestry sector in each economy and draw attention to the need for concrete measures to support livelihood development at the local level.



GUIDELINES FOR FORMULATING NATIONAL FOREST FINANCING STRATEGIES

RAP Publication 2013/01

Forests are intricately intertwined with life on earth: they maintain life support systems, provide the ecological balance, are rich reservoirs for terrestrial biodiversity, and millions of people are closely dependent for their livelihoods on this ecosystem. But forests are facing a crisis with deforestation and forest degradation continuing at an unabated pace. For decades we have been seeking ways to manage forests on a sustainable basis, but the cost is very high.

The issue on the provision of adequate resources for investment in sustainable forest management of forest resources in developing countries has been receiving increasing attention. A joint initiative by FAO-SIDA on financing sustainable forest management in Asia-Pacific was launched. Under this initiative four specific studies were carried out to delineate: i) the role and concerns of governments and other public institutions; ii) the interests of communities owning or controlling forests; iii) the critical role that payment of ecological services could play in making investment in forestry an attractive proposition; and iv) the interest of private investors. These studies provided a set of recommendations which were collated and edited to form the overall guidelines for financing sustainable forestry.

EU FAO FLEGT PROGRAMME - ACCEPTING CALLS FOR PROJECT PROPOSALS TO TACKLE FOREST ILLEGALITY

Contributed by Giulia Muir, Forest Economics, Policy and Products Division, FAO

Despite a marked increase in forest area reported in Asia and the Pacific, deforestation is still rampant in many countries, particularly in Southeast Asia, which experienced the largest decline in forest area in the region over the last decade (FAO, 2011). Intensive agricultural activity and a high demand for cheap timber have played key roles in this forest loss. Yet *forest illegality* – which includes illegal logging and the harvest, processing, transport, purchase or sale of forest products in violation of national or international laws – has arguably had an equally significant impact on forest loss. Corruption, poor governance, inconsistent and unrealistic forest laws and weak institutional capacity to enforce them, moreover, perpetuate forest illegality. In addition to destroying vital wildlife habitats and exacerbating poverty, forest illegality costs governments more than US$10 billion per year in lost revenue (World Bank, 2002).

During the last decade, major timber consumers such as the European Union (EU) have taken steps towards countering these trends and promoting better forest governance; the EU Action Plan on Forest Law Enforcement, Governance and Trade (FLEGT), adopted in 2003, is one example. The Action Plan tackles forest illegality while encouraging sustainable forest management. Elements of the Action Plan include supporting:

- initiatives that work to improve transparency and wood traceability systems and other capacity-building measures;
- the negotiation and conclusion of legally-binding voluntary partnership agreements (VPAs) between the EU and individual timber-producing countries, which aim to eliminate illegally-produced timber from international and domestic trade and prevent illegal timber from entering the EU market;
- public procurement policies that address more than just forest legality; and
- private sector initiatives; measures to avoid investment in activities which encourage illegal logging and conflict timber.

To complement activities under the Action Plan, the EU adopted the EU Timber Regulation (EUTR) (Regulation (EU) No 995/2010 of 20 October 2010). The EUTR is legally binding on all 27 EU member states and prohibits placing illegal timber on the EU market from 3 March 2013.

Since 2008, FAO has been supporting the FLEGT Action Plan through a demand-driven programme designed to support local stakeholders — government institutions, civil society and private-sector organizations — in addressing forest governance and illegality in their countries, called the Africa, Caribbean and Pacific (ACP) FLEGT Support Programme. The four-year initiative has supported over 100 pilot initiatives in 32 countries thus far, testing new methodologies and approaches for improving forest governance and tackling forest illegality. Although it is difficult to quantify the direct impacts of the Programme's work, studies show that responses to illegal logging are working. Globally, illegal timber production has declined by 22 percent since 2002 (Lawson and MacFaul, 2010). Moreover, *it has been estimated that if illegal logging were to be slowly curbed and end within the next ten years, between 2 and 22 billion tonnes of CO_2 emissions might be avoided* (Lawson and MacFaul, 2010).

Despite this progress, the FLEGT Action Plan continues to face a daunting global trade in illegal timber. In light of the challenges ahead, the EU and FAO are scaling up. On 1 May 2012, FAO,

with continued funding from the EU, embarked on the **EU FAO FLEGT Programme**, a follow-on programme to the ACP-FLEGT Support Programme spanning to 30 April 2016. This Programme supports countries engaged in the negotiations or the implementation of a VPA with the EU, known as *VPA countries*, but also wood-producing developing countries and/or those who are major players in wood products trade that are eligible, but not currently engaged in negotiations, or *non-VPA countries*. The Programme has two main objectives: 1) providing assistance to local stakeholder groups in developing countries to put the FLEGT Action Plan into practice; and 2) increasing the availability of FLEGT-related information, knowledge and experiences among local stakeholder groups by supporting actions to improve understanding of the Action Plan and the FLEGT process more generally. The Eu FAO FLEGT Programme is now accepting proposals from government agencies, civil society and private sector organizations in VPA countries until 31 May 2013. Government institutions can also make direct assistance requests at any time. (For more information, please see: www.fao.org/forestry/eu-flegt).

For more information on the EU FAO FLEGT Programme, please contact:

EU FAO FLEGT Programme
Food and Agriculture Organization of the United Nations
Viale delle Terme di Caracalla
00153, Rome, Italy
E-mail: EU-FLEGT-Info@fao.org

References

Lawson, S. & L.MacFaul. 2010. **Illegal Logging and Related Trade Indicators of the Global Response**. London, Chatham House.

Nellemann, C. & INTERPOL Environmental Crime Programme, eds. 2012. **Green Carbon, Black Trade: Illegal Logging, Tax Fraud and Laundering in the World's Tropical Forests**. France and Nairobi, INTERPOL and UNEP.

FAO. 2010. **The State of Forest Resources: 2011**. Rome. (also available at www.fao.org/docrep/013/i2000e/i2000e01.pdf).

World Bank. 2002. **Revised forest strategy**. Washington, DC, USA.

Applying for EU FAO FLEGT Programme Assistance

The EU FAO FLEGT Programme provides assistance by issuing periodic calls for proposals open to government agencies, civil society and private sector organizations and responding to direct assistance requests from government institutions, which can be submitted at any time and are evaluated on a rolling basis. *Stakeholders in both VPA and non-VPA countries are eligible to apply:*

- In **VPA countries**, the Programme supports proposals that advance the VPA process and harness the participation of local stakeholders; funding is limited to €100 000. Direct assistance requests by government institutions should target activities that complement the national VPA strategy and the broader FLEGT process; funding is limited to €50 000.
- In non-VPA countries, the Programme supports proposals that aim to improve forest governance as defined in the country's national programme, advance the FLEGT process or address an element of the FLEGT Action Plan; requests are limited to €100 000. Direct assistance requests — of up to €25 000 — are also available to respond to urgent needs that address an element of the FLEGT Action Plan.

For more information on how to apply, please see:
www.fao.org/forestry/eu-flegt/78026/en/

ASIA-PACIFIC FORESTRY CHIPS AND CLIPS

CHANGE IN FOREST ACT BRINGS HUGE BENEFITS TO FOREST COMMUNITIES

With the introduction of a Forest Rights Act and through efforts of the Tribal Affaires Ministry, the Environment Minister, Ms.Jayanthi Natarajan, succeeded in correcting the definition of bamboo from that of a tree, as defined in the Indian Forest Act of 1927, to its technical classification as a grass. This small but obviously necessary change will have a significant impact on the livelihood of rural communities.

Because of the change in definition the management, harvesting and sale of bamboo will no longer be the responsibility of the Forest Department but will fall under the Tribal Affairs Ministry. Bamboo is a major raw material for the paper and pulp industry and is thought to be worth around Rs.100 billion annually.

Because of this change in definition the benefits from bamboo production and sales, rather than going to government revenue, will now be enjoyed by the rural communities where the bamboo is grown.

– *ITTO Tropical Timber Market (TTM) Report Vol.17:No.4* –

PAPER PRODUCER TO STOP CLEARING OF INDONESIAN FORESTS

Just months before a two-year moratorium on new forest concessions mandated by the Indonesian government ends, Asia Pulp and Paper, third-largest pulp and paper company in the world, said that it had stopped clearing natural forests across its supply chains in Indonesia, accelerating an earlier commitment to do so by 2015. This is a sign that public pressure was having an effect and Asia Pulp and Paper could act as a role model for other companies.

– *The New York Times* –

FORESTS IN INDONESIA, MALAYSIA THREATENED BY GROWING PALM OIL DEMAND

India is the fourth largest oilseed producing country and the world's largest importer of palm oil and nearly 73 per cent of India's demand for palm oil is supplied by Indonesia. A study released by WWF India says that growing demand for palm oil in India is threatening wildlife in Indonesia and Malaysia where this has resulted in almost a third of forest loss in the last 10 years due to the expansion of oil palm. 2011-12 India is the world's largest consumer of palm oil with 23 per cent of the global consumption, still, the current per capita consumption levels are lower than global averages.

– *The Hindu Business Line* –

EUROPEAN TIMBER REGULATION NOW IN FORCE

The Timber Trade Federation has welcomed the introduction into law of the European Timber Regulation (EUTR) which came into effect Sunday March 3rd and covers the whole of the EU, including the UK. For the first time ever, it will be a criminal offence to place timber and timber products onto the European market that are derived from illegally harvested logs and companies caught doing so can face stock seizures, fines and criminal prosecution.

To minimize the risk of products from illegally harvested sources entering the supply chain, the EUTR requires all companies placing timber products onto the European market to have a comprehensive and robust due diligence system in place. Through this system, first placers of timber or timber products must now, by law, collect information about the products and supply chains that they come through, assess the risk of illegally harvested timber being present and take appropriate mitigating actions if any risks are identified.

Members of the Timber Trade Federation have been required to implement these levels of due

diligence since 2010 as a compulsory condition of membership. The TTF provides all members with a free due diligence framework as well as a toolkit to help members assess and mitigate identified risks– the Responsible Purchasing Policy (RPP). Companies failing to provide satisfactory evidence of having robust due diligence in place will be expelled from membership.

– Timber Trade Federation News Release –

INDONESIA APPROVES LANDMARK FOREST PROTECTION PROJECT

Indonesia has approved a rainforest conservation project that sets aside an area roughly the size of Singapore and rewards investors with tradable carbon credits in the first of its kind to win formal backing in the country. Four years in the making, the Rimba Raya Biodiversity Reserve will protect nearly 80,000 hectares (200,000 acres), much of it carbon-rich peat swamp forest at risk of being felled for palm oil plantations. Russian energy giant Gazprom and German insurance firm Allianz are backers of the project, the world's first on deep peat.

Indonesia has the world's third-largest expanse of tropical forests but these are disappearing quickly in the rush to grow more food and exploit timber and mineral wealth. Forest clearance is a major source of greenhouse gases. By saving the forest and locking away planet-warming carbon, investors such as Gazprom will receive carbon credits they can sell for profit or use to cut their own emissions. Money from credit sales will also fund local livelihood projects.

The project area, in Central Kalimantan province on Borneo island, is brimming with rare animal species and adjoins a national park. It is designed to be a sanctuary for endangered orangutans. Rimba Raya is part of a UN-led scheme called reducing emissions from deforestation and degradation (REDD). The aim is to show forests can pay for themselves and compete with powerful palm oil, mining and timber interests. Over Rimba Raya's 30-year life, the project will generate about 104 million credits, each representing a ton of carbon. In total, that equates to 300 million to 500 million euros ($390 million to $650 million) based on current market rates for REDD carbon offsets.

– Reuters –

MYANMAR TO SUSPEND WOOD LOG EXPORTS IN 2014

Myanmar will suspend its wood log exports in 2014 in a bid to eradicate wood log smuggling and conserve forests. The suspension will be effective from April 2014 according to an announcement by the Ministry of Environment and Forestry.

Myanmar exported teak mostly to neighboring India and China at a rate of 1.6 million tons annually, earning US$522 million, the London-based Environment Investigation Agency was cited as saying. According to the agency, Myanmar exported 18 million cubic meters of wood log from 2000 to 2010, gaining 5.7 billion dollars.

There are over 16.32 million hectares of forest reserve area, of which teak plantations cover 24,300 hectares, while hardwood areas cover 324,000 hectares, according to statistics. The forest area accounts for nearly half the country's total area of 67.6 million hectares.

A major exporter of teak in the world, Myanmar takes up 75 percent of the world market. Myanmar exports teak most to India, followed by China, Bangladesh, Thailand and Malaysia. Meanwhile, Myanmar is able to produce nearly 283,000 cubic

– NZweek –

WORLD'S HIGHEST NATIONAL PARK OPENS IN TIBET

With the opening of Qomolangma National Park, Tibet is now home to the world highest national park, reports Xinhua. The park is named for Mt. Everest, which is known locally as Qomolangma or Chomollungma.

Within its boundaries are five mountains that reach more than 8,000 meters, the highest being Everest at 8,848 meters. Covering 78,000 square kilometers the park is spread through six districts of Tibet's Shigatse region and shares a border with Nepal, reports Nepali news site Republica.

– Huffington Post –

FAO ASIA-PACIFIC FORESTRY CALENDAR

25-30 March 2013. ***World Teak Conference***. Bangkok, Thailand. Contact: info@worldteak2013.org

1-3 April 2013. ***Workshop on Forest Products Statistics in China.*** Haikou City, China. Organized jointly by FAO and ITTO. Contact: Adrian Whiteman, FAO Forestry Department, Via della Terme di Caracalla, 00100, Rome, Italy. E-mail: Adrian.Whiteman@fao.org

8-19 April 2013. ***10th Session of the UN Forum on Forests***. Istanbul, Turkey. Contact: www.fao.org/forestry

6-10 May 2013. ***Technical Meeting of the National Correspondents to the Global Forest Resources Assessment 2015***. Chiang Mai, Thailand. Contact: Emma Foti, FAO Forestry Department, Via della Terme di Caracalla, 00100, Rome, Italy. E-mail: emma.foti@fao.org

9-10 May 2013. ***FLEGT Asia: Regional experiences to address governance and trade challenges in the forest sector.*** Bangkok, Thailand. Contact: Robert Simpson, FAO Forestry Department, Via della Terme di Caracalla, 00100, Rome, Italy. E-mail: Robert.Simpson@fao.org

13-15 May 2013. ***International Conference on Forests for Food Security and Nutrition***. Rome, Italy. Contact: Eva Muller, FAO Forestry Department, Via della Terme di Caracalla, 00100, Rome, Italy. E-mail: Eva.Muller@fao.org

27 May - 6 June 2013. ***Forest Policies in the post-Rio+20 World: Executive Forest Policy Course 2013***. Thimphu, Bhutan. Contact: Patrick Durst, FAO Regional Office for Asia and the Pacific, 39 Phra Atit Road, Bangkok 10200, Thailand; E-mail: Patrick.Durst@fao.org

4-8 November 2013. ***Twenty-fifth Session of the Asia-Pacific Forestry Commission***. Rotorua, New Zealand. Contact: Patrick Durst, FAO Regional Office for Asia and the Pacific, 39 Phra Atit Road, Bangkok 10200, Thailand; E-mail: Patrick.Durst@fao.org

FOREST NEWS is issued by the FAO Regional Office for Asia and the Pacific as part of TIGERPAPER. This issue of FOREST NEWS was compiled by Patrick B. Durst, Senior Forestry Officer, FAO/RAP.

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

- East Asian forests and forestry to 2020 (RAP Publication 2010/15)
- Forests beneath the grass: Proceedings of the regional workshop on advancing the application of assisted natural regeneration for effective low-cost forest restoration (RAP Publication 2010/11)
- Forest policies, legislation and institutions in Asia and the Pacific: Trends and emerging needs for 2020 (RAP Publication 2010/10)
- Report of the Asia-Pacific Forestry Commission Twenty-third session (RAP Publication 2010/09)
- Asia-Pacific forests and forestry to 2020. Asia-Pacific Forestry Sector Outlook Study II (RAP Publication 2010/06)
- Forest law enforcement and governance: Progress in Asia and the Pacific (RAP Publication 2010/05)
- Forest insects as food: humans bite back. Proceedings of a workshop on Asia-Pacific resosurces and their potential for development (RAP Publication 2010/02)
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- A cut for the poor: Proceedings of the International Conference on Managing Forests for Poverty Reduction Capturing Opportunities in Forest Harvesting and Wood Processing for the Benefit of the Poor (RAP Publication 2007/09)
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- Trees commonly cultivated in Southeast Asia: an illustrated field guide - 2nd edition (RAP Publication: 1999/13)

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