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Featuring

SPOTLIGHT ON APFC SILVER ANNIVERSARY IN ROTORUA

FOREST NEWS

Vol. XXVII: No. 4

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Front cover: Adult male *Batagur baska* in captivity at Sajnekhali of Sundarban Tiger Reserve Photo: PK Pandit

Back cover: *Batagur baska* hatchlings basking in captivity at Sajnekhali Photo: PK Pandit

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CAPTIVE BREEDING OF *Batagur baska* - A CRITICALLY ENDANGERED SPECIES IN SUNDARBAN TIGER RESERVE, WEST BENGAL, INDIA

by Prasanta Kumar Pandit



Northern River Terrapin (*Batagur baska*) both Male and Female
Photo: P.K. Pandit

Adult male and female *Batagur baska* in captivity at Sajnekhali (Photo: PK Pandit)

Introduction

Batagur baska (Gray, 1830) – variously known as northern river terrapin, batagur, common batagur, four-toed terrapin, river terrapin, giant river turtle, giant river terrapin, mangrove terrapin and Asian river terrapin - belongs to the family Geoemydidae, and order Testudines. Once it was distributed in India, Bangladesh, Myanmar, Thailand, Cambodia, Indonesia, Malaysia and Singapore. But presently it is found in India and Bangladesh (generally only in mangrove rivers and creeks). It is extinct in the wild in Thailand, Myanmar and Vietnam. It is listed as a critically endangered in the IUCN Red List, 2006, and also in the “Top Twenty-Five Turtles in Trouble” published by Turtle Conservation Coalition in 2011. It is also listed in the Appendix-I of CITES and commercial international trade in specimens of the species is prohibited. In India it is found in the Sundarbans and Bhitarkanika Wildlife Sanctuary of West Bengal State and Orissa State, respectively, in eastern India.

Batagur baska is one of the largest and long-lived of the terrapins, having shell length of 60 cm, and is easily distinguished from other terrapins by the presence of only four instead of five claws on the forelimb. The carapace is domed and heavily buttressed with a vertical keel in the young, which disappears in the adult. The plastron is large, strongly angulate laterally in the young, but convex in the adult, truncate interiorly, angularly notched posteriorly. The head is small with an upturned snout; the forehead is covered with small scales. The upper surface of shell and soft parts are an olive-grey or brown color and the lower surface is yellowish. The head is similarly coloured but lighter on the sides. The jaws have a denticulated edge and the limbs are transversely enlarged with band-like scales. Females and juveniles are olive-grey in colour with grey or brown eyes. Males are darker and turn completely jet black during the breeding season with yellow or white eyes (Moll, 1980). The sizes of adult males are generally smaller than females.

It occurs in aquatic, coastal mangrove estuaries and creeks which are under tidal influences. Sometimes it ventures far up rivers during the breeding season.

The nesting season varies from December to January and nesting sites are on sandbars in the Sundarbans. *Batagur baska* is omnivorous; it consumes waterside plants, molluscs, crustaceans and small fishes. Fruits of *Sonneratia* are a highly favoured food item of this species.

Hunting, harvesting of eggs, loss of mangrove habitat and other food sources, incidental capture in fishing nets and traps, accidental death by collision with motor-boats, watercrafts, loss of nesting beaches, pollution, destructive fishing practices, unseasonal floods, siltation and sedimentation by several activities, habitat alteration and destruction are the key threats to the survival of the species.

Study area

India's globally renowned conservation scheme 'Project Tiger' was launched on 23 December 1973 in the Sundarbans. It thus has the distinction of being one of the first nine Tiger Reserves to be declared in the India, which today number 39. Sundarban Tiger Reserve (STR) is situated in the coastal districts of West Bengal, i.e., 24-Parganas (South) and 24-Parganas (North). It lies at the southern-most extremity of the lower Gangetic delta, bordering the Bay of Bengal. The entire Sundarban can be described as a maze of estuaries, river channels and creeks encompassing a number of islands (105) of various shapes and sizes. The Tiger Reserve has an area of 2,585 km² and along with the Bangladesh Sundarban forms the largest contiguous tract of mangrove forest anywhere in the world. It is the only mangrove forest throughout the world (besides Bangladesh) to harbour significant tiger populations. Apart from the tiger, the Sundarban Tiger Reserve also has a rich array of biodiversity values, both floral and faunal.

The Indian Sundarban has a forest area of 4,263 km², of which 2,585 km² was designated as Sundarban Tiger Reserve (STR) in 1973. Within this Tiger Reserve 1,699.6 km² was designated

as Critical Tiger Habitat (CTH) in 2007. Within this CTH, lies the Sundarban National Park, having an area of 1,330.12 km². The area outside the CTH is known as the Buffer Zone. Within the buffer area is located Sajnekhali Wildlife Sanctuary, covering an area of 362.42 km². The rest of the area is the multiple use zone, which is used by the local population to fulfil their bonafide needs. The importance of this area was recognized by UNESCO and accorded the status of a World Heritage Site in 1987.

The Sundarban mangrove ecosystem is considered unique because of its species richness due to the diverse mangrove flora, which constitutes the mangrove-associated flora, back mangrove species and several endemic typical mangrove associated fauna of different groups. In addition to its floral richness, the Sundarban harbours many rare and endangered animal species in addition to the Royal Bengal Tiger. These include the estuarine crocodile (*Crocodylus porosus*), water monitor lizard (*Varanus salvator*), the globally critically endangered river terrapin (*Batagur baska*), sea turtles viz. Olive Ridley (*Lepidochelys olivacea*), Green sea turtle (*Chelonyx mydas*) and Hawksbill turtle (*Eretmochelys imbricata*), fishing cats (*Felis viverrina*), smooth-coated otters (*Lutra perspicillata*), Gangetic dolphin (*Platanista gangetica*) and Irrawady dolphin (*Orcaella brevirostris*) and the Goliath Heron (*Ardea goliath*), a rare African visitor; these are some of the important species among 53 rare and endangered animals found in the Sundarban. In addition, 20 identified species of prawns have been recorded and 44 species of crabs, including two edible ones. The mangrove forest acts as a nursery for the finfish and shellfish and sustains the fisheries all along the eastern coast of India. It also shelters the metropolis of Kolkata from cyclonic storms and tidal surges

Captive breeding

Morphological criteria and dichromatic characters (Moll *et al.*, 1981) provides elaborate information about differentiating the sex of adult individuals.

The first successful captive breeding of *Batagur baska* at the Bronx Zoo was reported by Blanco

et al. (1991). It was recorded that a total of 82 animals were found in six collections worldwide (Anon, 1998a). Under captive conditions, based on body size and observed colour changes, reproductive maturity was attained after approximately 10 years (Blanco *et al.*, 1991). They also reported that one female laid 33 eggs in February 1990 with the application of oxytocin. Out of the total, only six hatchlings (3 abnormal) were produced after 87 days of incubation in a temperature range of 26–30°C.

A few years back, 11 *Batagur baska* (8 males & 3 females) were recovered from local fishermen of the Sundarban area and kept in pond at Sajnekhali of Sundarban Tiger Reserve. On 15.08.2012 one female *Batagur baska* came out from the large pond where all the others were kept. This female was then kept in small pond. In the meantime, scientists of Madras Crocodile Bank Trust (MCBT) came to examine the *Batagur baska* and on close observation said that she was in the immediate egg-laying stage. The other two females were also examined and all of them were kept separately in the turtle hatchery unit. But the area was too small and they did not have sufficient space, so the egg-laying female was then shifted very carefully to a medium pond which was

prepared for egg-laying, *i.e.* filling of sand in one side, free movement from water to sand bed. The pond was covered with double fencing like agro net inside and nylon-net fencing on outside. On the top it was covered with agro net (50:50) to protect the turtle from predators. The other two females were carefully returned to their original big pond. Nothing was known about *Batagur baska* courtship and mating at Sajnekhali. On 5th April, 2012, the first 5 eggs were found, out of which 2 were broken and remaining three were found to be damaged. After that, the female laid a few more eggs, which were kept under sand cover 1½ feet below ground level. Scientists of MCBT, along with staff of Sajnekhali were constantly monitoring the situation very closely. After the completion of egg-laying, the mother batagur was shifted to its original habitat, *i.e.* larger pond. The eggs were then monitored and adequate measures were taken for their protection by covering a distance of 3 feet from the parapet level with thin corrugated sheet on all sides of the pond. The first hatchling was seen in the pond on 12th June. Thirty-two eggs were then removed. The scientists of MCBT were informed and according to their advice, supply of food, protection, care, etc. was duly taken. Initially, a fresh paste of 250 gm of *Basella rubra* for each hatchling was given as





Batagur baska rearing pond at Sajnekhali (Photo: PK Pandit)

food. Then shrimps, small fish, water cabbage, twigs of *Ipomoea asiatica*, etc. were gradually added to the diet. But it was found they did not seem to favour fish or shrimp. A few wooden planks were floated on the pond water for the hatchlings to bask on. From time to time, the water was drained from the pools and replaced with fresh river water. It was noted that the hatchlings were more fond of water cabbage than other items in their diet. No abnormalities or deformities were noticed. On 25th August, 75 days after hatching, the weight of 14 hatchlings were taken and recorded; their weight varied from 96 gm to 138 gm. The carapace size of the hatchlings was 5 cm x 4 cm. In the meantime, water cabbage and shrimp was provided as a food to the hatchlings.

All the hatchlings were looking healthy and basked regularly. On 19th September, 2012, all the hatchlings were taken out from pond and counted; interestingly, the total number of hatchlings was at least 32. Ten hatchlings were weighed and their weight varied between 139 gm to 146 gm. At the same time, all the adult *Batagur baska* were taken out from the larger pond. There were 3 females

and 7 males. One adult could not be removed from the pond. The weight of males varies from 10-12 kg. and females were 20-22 kg. The total number of *Batagur baska* in captivity in the world is less than 100. (Per. comm. Shailendra Singh, MCBT). 12 June 2012 is an auspicious day in the history of captive breeding of the critically endangered turtle species *Batagur baska*. No vitamins or mineral additives were offered to hatchlings. No courtship or intromission was witnessed. No hormone was given to the female to induce egg-laying.

According to Moll (1980), the number of clutches laid annually per female is usually two to three per nesting season. Clutches average 26 eggs in nests in the Perek River (Malaysia). The average egg size is 6.6 x 4.0 cm, and 64 gm in weight. The incubation period varies from 66-88 days. Growth rates of *Batagur baska* living under natural conditions have never been studied adequately.

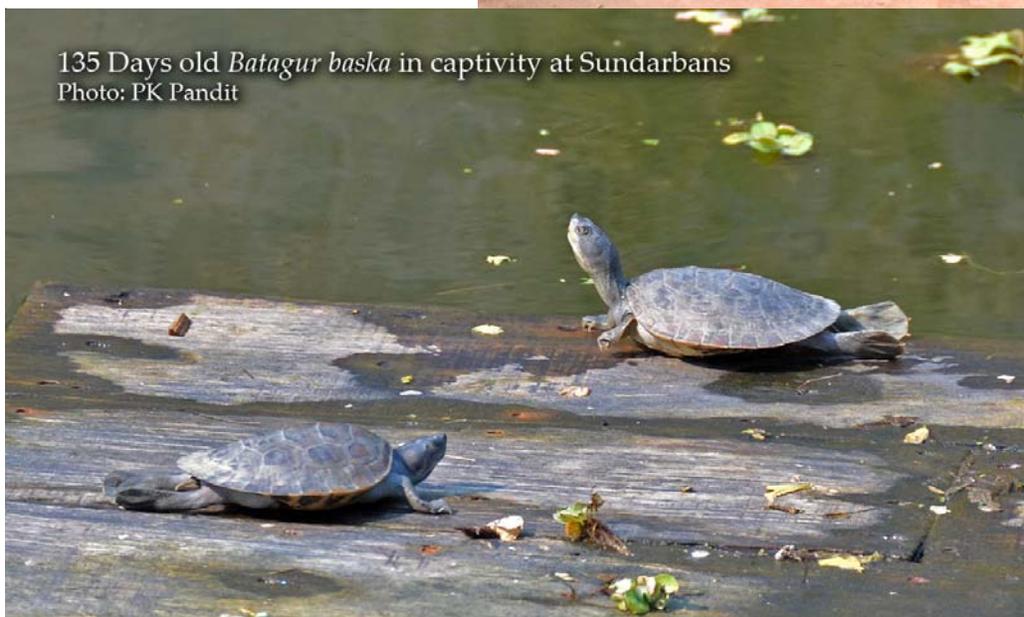
Juveniles of *Batagur baska* are reported to be omnivorous. They ingest more animal food such as molluscs and small fishes to get more calcium. But upon maturity and in the adult stage, it appears



One day old hatchling of *Batagur baska*
Photo: PK Pandit



98 Days old hatchling of *Batagur baska*
Photo: PK Pandit



135 Days old *Batagur baska* in captivity at Sundarbans
Photo: PK Pandit

to be more herbivorous in the wild. Egg-laying took place in the artificial sandbed of the breeding pond. In three months, the carapace length gain was 28 mm and the average weight was almost nearly double the hatching weight (57.5 gm) with a carapace length of 62.2 mm (among 3 normal individuals) in captive hatchlings.

Threats

The major threats to the survival of *Batagur baska* in the Sundarbans are hunting, harvesting of eggs, loss of mangrove habitat and other food sources, incidental capture in fishing nets and traps, accidental death by collision with motor-boats, watercrafts, loss of nesting beaches, pollution, destructive fishing practices, unseasonal floods, siltation and sedimentation by several activities, habitat alteration and destruction.

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References

- Anon, 1998 a. **Census of rare animals in captivity 1996-97.** *Int. Zoo Yearbook.* Vol. 36, p – 560.
- Blanco, S., Behler, J.L. and F. Kostel. 1991. **Propagation of the Batagurine turtles *Batagur baska* and *Callagur borneoensis* at the Bronx Zoo.** *Proc. 1st Int. Symp. on Turtles & Tortoises; Conservation and Captive Husbandry.* pp 63 – 65.
- Daniel, J.C. 1983. **The book of Indian reptiles.** Bombay Natural History Society. Oxford University Press, Bombay, Delhi, Calcutta, Madras. pp – 26.
- Das, Indraneil. 2002. **A photographic guide to snakes and other reptiles of India.** New Holland Publishers (UK) Ltd. pp – 123.
- International Union for Conservation of Nature and Natural Resources. 1982. **The (IUCN) Amphibia – Reptilia Red Data Book, Part-I: Testudines, Crocodylia, Rhynchocephalia** (Compiled by B. Groombridge), IUCN, Gland, Switzerland, pp 21 – 25; 2729.
- Kostel, F. 1990. **Breeding behaviour and activity patterns of the Asian fresh water terrapins *Batagur baska* and *Callagur borneoensis*.** M.S. Thesis. Fordham University, Bronx, New York.
- Moll, E.O., Matson, K.E. and E.B. Krehbiel. 1981. **Sexual and seasonal dichromatism in the Asian river turtle *Callagur borneoensis*.** *Herpetologica* 37(4), pp 181 – 194.
- Moll, E.O. 1980. **Natural history of the river terrapin, *Batagur baska* (Gray) in Malaysia.** *Malaysian J. Sci.* 6(A): 23 – 62.

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One-day-old *Batagur baska* hatchlings (Photo: PK Pandit)

POPULATION STATUS, HABITAT UTILIZATION, DISTRIBUTION AND CONSERVATION THREATS OF HISPID HARE (*Caprolagus hispidus*, Pearson, 1839) IN BARDIA NATIONAL PARK OF WESTERN NEPAL

by Promod Tandan and Bhuwan Dhakal

Introduction

The hispid hare is a species with a monotypic genus and one of the world's rarest mammals. It was feared to be extinct in 1964. It is listed as "endangered" in the **IUCN Red Data Book** and in Appendix - I of the National Park and Wildlife Conservation Act, Nepal, 1973 and by CITES (Chapagain & Dhakal, 2001). Native to the foothills of the Himalayas, historically it has been recorded in tracts along the southern Himalayan foothills from Uttar Pradesh (India) through Nepal and southwards as far as Dhaka in Bangladesh (Blandford, 1888; Dawson, 1971). At present, it is restricted to few grassland patches of northern India and southern Nepal with a population of only a few hundred due to habitat degradation and illegal killing (Maheshwaran, 2002; Hoffman *et al.*, 2005).

With increasing human pressure on grassland, a very limited area is left as refuges for small mammals like the hispid hare and they are being pushed to the brink of extinction (Adhikari, 1999; Oliver, 1985). Chapman *et al.* (1990) suggested a captive breeding program for hispid hare, but Bell (1986) stated that the captive breeding program for the species didn't succeed and therefore it is rarely kept in captivity (Wilson, 1994). This raises a serious question for its long term survival outside the natural habitat. In Nepal, the species was believed to exist in Suklaphanta Wildlife Reserve, Chitwan National Park and Bardia National Park by Oliver in 1984, but its present status outside Suklaphanta WLR is not known, necessitating the need for the study outside the reserve for long term *in situ* conservation.

Materials and methodology

Study area

Bardia National Park (BNP) is the biggest national park (estd. 1976; 968 km²) of the western lowland terai of Nepal. There are 7 main vegetation types viz: sal forest, khair-sisoo forest, moist riverine forest, mixed hardwood forest, wooded grassland, phantas and flood plain grassland. They have provided suitable habitat for more than 38 species of mammals (9 endangered), 25 reptiles, 60 fishes and more than 400 species of birds. The total density and biomass of wild herbivores (excluding mega herbivores) in the mosaic of grassland and grassland-related habitats of BNP are among the highest recorded in Asia (more than 200 animals/km²) (Andersen & Naess, 1993; Moe & Weege, 1996).

The following objectives were undertaken for the study:

- To study the population, ecology, extent of movement and habitat utilization of hispid hare in Bardia National Park.
- To determine the distribution of hispid hare in Bardia National park, including an assessment of their conservation threats.
- To make recommendations to the park management to manage the habitat and the species more scientifically.

Methods

The study was performed during two seasons: winter/before burning (November — February of 2008); Summer/after burning (March- June of

2009) with data gathering through discussions with park staff, NTNC staff, local experts, concerned people and a literature search. All grassland patches, forests and edges between the grasslands and forests of Bardia National Park were surveyed for fresh and old pellet groups.

Status through pellet estimation

Making a direct count of rabbits is not a suitable method for determining their distribution (Burnham *et al.*, 1980; Buckland *et al.*, 1993) as the hispid hare is elusive and agile, plus the presence of tall grassland. Therefore, the pellet count method was followed for the research. Strip transects were systematically laid perpendicular to the Babai river in each grassland of the Babai Valley at the same places where the above-mentioned sampling works were done (the number of transects depended on the extent of pellets available) (Maheshwaran, 2000; Yadav, 2006). A main transect line of 50m was drawn with a strip transect of 20m length and 2m breadth on either side. The searching for pellets was done within the transect line to determine the pellet density.

Habitat, food ecology and distribution

For the habitat ecology, the layout of transects and plots were the same as in the vegetation study except for the plot shape and size. The sample plot size for plants used was as suggested by Schemnitz (1980), which is 10m x 10m (r=5.64m) for tree layer, and 4m x 4m (r= 2.6 m) for all woody undergrowth up to 3m in height. Circular sample plots (10m², r=1.78m) were used for grass species in each plot (Gyawali, 2003). Recordings were

Data analysis

$$\text{Pellet density/ha} = \frac{\text{Total pellets groups}}{\text{Transect area} \times \text{Transect number}} \times 10000$$

$$\text{Habitat Preference (Pokhrel, 1996).} = \frac{\text{Number of pellets in habitat}}{\text{Total pellets}} \times 10000$$

Importance Value Index (IVI) = Relative frequency+ Relative density+ Relative coverage

made of plant species with their number, species and coverage lying within the circle. The soil sample was taken from a depth of 10cm from the circular area to measure calcium (CA), magnesium (Mg), potassium (K), phosphorus (P) and sodium (Na). The analysis of the animal habitat noted the surrounding features such as cover, ground morphology (broken, unbroken, smooth, presence of boulders, rocks) grassland type, aspect and nearby water sources.

For the food ecology of the species, a microhistological analysis of hispid hare pellets was done to analyze its food preference (Baumgartner and Martin, 1939; Holechek *et al.*, 1982).

The animal distribution were observed and recorded with GPS on the basis of direct observation and pellet presence. Later those points were transformed into the digitized Topo-map of Bardia National Park, 1996 by using GIS software Arc View version 3.2 from WWF, Nepal.

Conservation threats and measures

To assess threats and conservation measures for this animal the park staff, key informants, wildlife experts, local people and other concerned authorities were interviewed with the help of a questionnaire. The field survey and questionnaire survey also assessed the effect of burning practices on the animal. The occupancy rates and detection probabilities of Hispid hare in Mulghat phanta were estimated as a test for site occupancy on the basis of the pellet groups (MacKenzie *et al.* (2002) cited in Donovan & Hines, 2007).

Whereas, the data related to microhistological analysis were analyzed using following formulas:

1) **Relative Importance value (RIV)** of each plant species observed in the plant sample=

$$RIV_x = D_x \cdot f_x$$

Where, RIV_x = Relative Importance Value for species x

D_x = Mean percent of species x in fecal sample

f_x = Frequency of species x in fecal sample

Following two Indices were computed to detect selection of plant eaten:

i) Diet selection value (DSV) = $RIV_x / PV_x \times 100$

Where, DSV_x = Diet selection value for species x

RIV_x = Relative importance value of species x in the diet

PV_x = Prominence value of species x in the habitat.

ii) Ivlev's electivity index (Ivlev, 1961 cited in Jnawali, 1995)

$$IEI_i = \frac{r_i - n_i}{r_i + n_i}$$

Where, IEI = Ivlev's electivity index for species i

r_i = Percentage of species I in the diet

Results and discussion

A total of 682 transects were made and consequently the study was performed on different grassland phantas within the Park, broadly categorized into 4 categories: 1) Around the park headquarters (169 transects); 2) Lamkohli and its adjacent areas (114 transects); 3) Lalmatti, Chisapani and Rambhapur (43 transects); and 4) Babai valley (356 transects). Out of these sites only 7 grassland patches in the Babai valley held populations of hispid hare. The pellet density of hispid hare was 4.07/ha in winter and 8.71/ha in summer, indicating that in the winter season pellets were distributed in only small areas and some of those areas did not lie in the transects during the study. The ecology of hispid hare has been analyzed in 2 parts: 1) food ecology; and 2) habitat ecology.

Food ecology

The diet of hispid hare consisted of 23 diverse species of food plants, but > 90% of the volume in the diet was contributed by less than 10 species.

Imperata cylindrica was the most preferred food species (25.65% winter & 45.68% summer). *Saccharum spontaneum*, *Imperata cylindrica*, *Desmostachya bipinata*, *Cynodon doctylon* and *Saccharum munja* were the 5 most preferred species and constituted more than 85% of the food plant species. Grass species were the most preferred plant species, which constituted 98.10% (winter) and 95.25% (Summer) of the diet of the hispid hare. 56.52% of the plant species were commonly preferred in both seasons, out of which 11 were grass species. The higher proportion of grasses in the diet of hispid hare in the post-burning season might be due to two reasons: 1) the nature of the grasses that were inhibited in growth by other plants, which were decreased after fire; and 2) less availability of food plants after the burning in the dry season leads the animals to consume a diverse variety of plants to fulfill their nutritional requirements. (Laurie, 1978). The general pattern of food plant selection was related to species abundance in the natural habitat. Mean RIV and PVs (adjusted to relative size of habitat) were positively correlated in both seasons ($r^2 = 0.861$, $p < 0.001$; $r^2 = 0.732$, $p < 0.001$). Ivlev's Electivity

Index (IEI) also showed the highest preference values were found for *Imperata cylindrica* (IEI=0.51 in winter and 0.71) in summer. It was followed by *Saccharum spontaneum* (0.69 & 0.45) and *Cynodon doctylon* (0.24 & 0.22) with least preference by browse species.

Habitat ecology

Most of the habitat (>80%) was low-lying without human disturbances, except in the case of prescribed burning by the park. Hispid hare distribution was found to range from 1-100m from the nearest road. Its distribution was found to be dependent on the distance to water sources that ranged from 34m to 200m in mean distance. The hare mostly preferred water sources within 0-50m (65.51%) in winter and 50-100m (30.65%) in summer. The habitat found to be utilized by hispid hare was classified into 7 categories:

- 1) Forest (dominated by trees of any species);
- 2) Edge of forest and grassland;
- 3) Tall grassland (containing grasses >1m. height);
- 4) Short grassland (grass height from 15cm to 1m in height);
- 5) Open grassland (grasses <15cm height);
- 6) Open –tall grassland (grasses that are present in patches in the habitat dominated by sand); and
- 7) River banks (dominated by boulders, sand near the rivers and streams).

Hispid hare did not utilize the forest and the edge between the forest and grassland. It mostly preferred river banks (48.27%) in the winter season, followed by open grassland (20.68%). In the summer season it mostly preferred the open grassland (35.48%) formed after burning practices, and open tall grassland (29.05%). Regarding the IVI, *Saccharum spontaneum* had the highest IVI (103.47) in winter followed by *Imperata cylindrical* (50.17) and *Cynodon doctylon* (39.19). In the summer season *Imperata cylindrical* had the highest IVI (104.47), followed by *Saccharum spontaneum* (49.87) and *Cynodon doctylon* (22.42). About 83% of the total plant species in winter season and 79% of the species in summer season had IVI values of less than 10.

Most of the pellets (>50%) were found with a decrease in grass cover (<25%) with preference for *Imperata cylindrical* and *Saccharum spontaneum*, which is almost similar to Masheshwaran's (2002) findings in India, implying that there are specific needs relating to the areas with less coverage and open patches within the tall grassland. According to the Occupancy model, hispid hare had a decreasing detection probability from survey 1 to survey 3. The probability of site occupancy by the species was 0.798, indicating that almost 80% of the Mulghat phanta were occupied by the hispid hare. However, a detailed scientific study regarding the site occupancy needs to be done regarding the species.

Soil Analysis

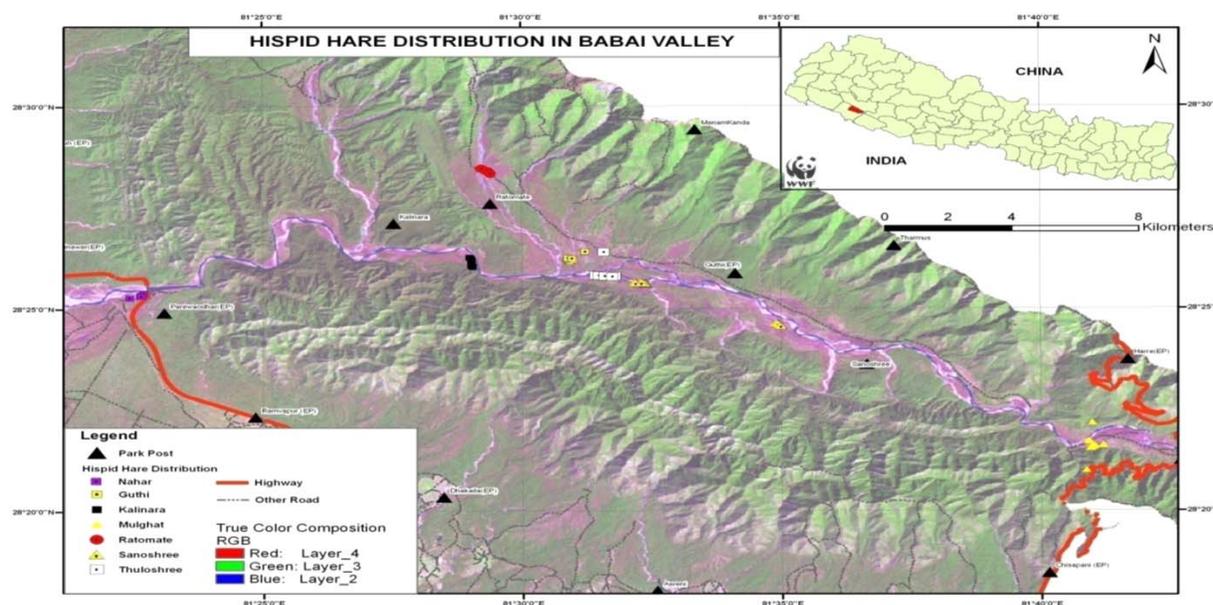
The majority (>80%) of soil colors of the phanta occupied by hispid hare was found to be brownish-white with a sandy, silty texture. The majority of the phantas had higher Ca and Mg values after burning than before burning; normal values: Ca (10-20 mg/100gm) and Mg (0.6- 1.8mg/100gm). This indicates that there was sufficient storage of Ca and Mg nutrients in the summer season from the rock minerals with the help of microorganisms and by the normal leaching process. These Ca and Mg values indicate that the status of phantas is suitable for grasses, inhibiting further encroachment by the woody species (Rai, 1977). The K value is also higher after burning (<1.5mg/100gm), illustrating the current security of grassland from woody invasion as K is essential for photosynthetic activity and increases resistance to diseases in plants.

Distribution

The distribution map shows that the species is highly dependent on being close to the water. Most of the populations are found along the riverside, whereas only a few were found to occupy areas that were far from the water. The distribution of the species in seven phantas is given in the map.

Status, conservation threats and suggestions

The major threats to the survival of hispid hare is killing and poaching by humans, weak park management and invasion of grassland by woody and invasive species, for which strict and proper



park management and detailed study of the species were suggested. The study revealed that there may be some direct effect at the time of burning, but it is not that great as the distribution of the hare was found to be much higher in the post-burning season than pre-burning due to availability of more open areas. In general, therefore, it appears that annual burning is good for the hispid hare, although frequent burning in a year must be avoided. The burning season (Feb- Apr) seems to be applicable in the Babai valley, because the grasses are fully mature at that time. During burning in the habitats preferred by hispid hare and other endangered species, care must be taken to leave suitable patches and the burning should be done under the direct supervision of the park staff.

The species-poor distribution as compared to other hare species in such restricted areas like Babai points to three causes: 1) their poor adaptive capability to the environment and sensitivity to environmental change; 2) their low reproductive capacity; and 3) flooding. During the study season, the species had isolated populations and did not prefer the adjacent jungle area of grassland, but during the monsoon season this is the only area that is not inundated, limiting large populations of different animals in the remaining constricted

habitats, which might have also played a role in its limited population in the area.

Conclusion

The study successfully proved the presence of hispid hare in Bardia National park, with pellet density of 4.07/ha in the winter and 8.71/ha in the summer season. The microhistological analysis of the pellets revealed that the hispid hare highly prefers grass species (98.10% in winter season) with *Imperata cylindrica* (25.65% in winter and 45.68% after burning), *Saccharum spontaneum* (19.48% & 14.68%), and *Cynodon doctylon* (13.64% & 11.89%) being the main food species. The study also revealed that the species preferred open areas rather than tall bushy grassland habitat. It mostly preferred the riverbank (48.21%) and open grassland (20.68%) in winter and open grassland (35.48%) and open tall grassland (29.05%) in the summer season. The major threats to the species were found to be the grassland invasion by woody invasive plant species, uncontrolled park burning, poor park management, predation and flooding. Strict and proper park management, research and awareness about the species, and efficient co-ordination was suggested as the solution to reducing these threats.

Recommendations

- Research should be initiated and carried out on hispid hare biology in its habitats throughout the country.
- Coordination among the conservation organizations working in Bardia is needed.
- Annual burning has been found to be done without actual guidelines. Therefore, the following points should be considered: i) Proper patch burning in the same phantas rather than widespread burning so that the species like the hispid hare will have shelter sites; ii) Burning must be carried out under close supervision of the park staff; iii) Burning schedule must avoid the breeding season of hispid hare and other endangered small mammals that reside in grassland; iv) Caution must be exercised while burning at or near the hispid hare habitats.
- Conservation awareness among the locals, park staffs themselves and army personnel is of vital importance.
- Adequate park staff must be allocated for Chepang, Guthi and Parewaodar post along with proper equipment and facilities.

Acknowledgements

Special gratitude to CEPF-WWF Nepal for providing the opportunity for the study on hispid hare. Particular thanks for the support from Dr. Sarala Khaling, Mr. Angphuri Sherpa, Dr. Dinesh Raj Bhujju and Dr. Pralhad B. Yonzon. Thanks also to the Department of National Parks and Wildlife Conservation Kathmandu, especially Mr. Shyam Bajimaya, Dr. Narendra Man Babu Pradhan, Shiva Raj Bhatta, Warden Mr. Tika Ram Adhikari, Asst. Warden Mr. Jhamak Bdr. Karki and Mr. Ramesh Thapa and all the staff from Bardia National Park who deserve special recognition for their kind permission for the research and continuous support, and lastly for the contributions from Mr. Chiranjivi Pokhrel, Mr. Naresh Subedi and Sitaram Adhikari.

References

Adhikari, T.R. 1999. **Grassland management impacts on small mammals**. In: *Grassland*

ecology and management in protected areas of Nepal Vol.2: 92-95. Department of National Park and Wildlife Conservation/ International Centre for Integrated Mountain Development/World wildlife fund, Nepal.

Bell, D.J. 1986. **A study of the Hispid hare *Caprolagus hispidus* in Royal Suklaphanta Wildlife Reserve, Western Nepal: 'A summary report'**. *Dodo, Journal of the Jersey Wildlife Preservation Trust*, 23, pp: 24-31.

Bhatta, S.R. 1999. **Status paper of Royal Bardia National Park. Vol.2**. Department of National Park and Wildlife Conservation/ International Centre for Integrated Mountain Development/World Wildlife Fund, Nepal.

Blandford, W.T. 1988. **The fauna of British India including Ceylon and Burma: Mammalia**. Taylor and Francis, London, UK.

Chapman J.A. *et al.* 1990. **Conservation action needed for rabbits, hares and pikas**.

CITES. 2000. **Amendment of Appendix I & II of CITES**. 11th Meeting of the Conference of Parties, Nairobi, Kenya.

Dawson, M.R. 1971. **Fossil mammal of Java 1. Notes on Quaternary (Mammalia Logomorpha) from Central Java**. *Proc.konickl Nederl.Akad. Weter schappen*, Amsterdam, 74:27-32pp.

Gyawali, N. 2003. **Status and habitat use of Barasingha *Cervus duvauceli duvauceli* population in Royal Suklaphanta Wildlife Reserve, Far Western Lowland, Nepal**. B.Sc.Forestry Thesis.T.U, Nepal.

Hoffmann, Robert S., Smith, Andrew T., Wilson, D. E., and D.M. Reeder (Eds). 2005. **Mammal species of the world** (3rd edition). Johns Hopkins University Press. pp. 194-195. ISBN 0-801-88221-4. <http://www.bucknell.edu/msw3>.

Holecheck, J.L., Vavra, M. and R.D. Pieper. 1982. **Botanical composition determination of range herbivores diets. A review**. *J. Range mgmt.* 35 (3): 309-315.

Jnawali, S.R. 1995. **Population ecology of greater one-horned rhinoceros (*Rhinoceros unicornis*) with particular emphasis on habitat preference, food ecology and ranging behavior of a reintroduced population in Royal Bardia National Park in Lowland Nepal**. PhD.

- Dissertation submitted in Agricultural university of Norway, Norway.
- Maheswaran, G. 2002. **Ecology and conservation of the endangered hispid hare *Caprolagus hispidus* in Jaldapara Wildlife Sanctuary, West Bengal, India.** *Journal of the Bombay Natural History Society*, 103 (2-3).
- Moe, S.R. and P. Wegge. 1996. **Spacing and habitat use of Axis Deer (*Axis axis*) in Lowland Nepal.** *Can.J.Zool.* 72:1735-1744 pp.
- Oliver, 1984. **The Distribution and Status of hispid hare: The summarized findings of 1984 Pigmy hog/Hispid hare field survey in northern Bangladesh, Southern Nepal and Northern India.** *Dodo, Journal of the Jersey Wildlife Preservation Trust*, 21:6-32pp.
- Rai, M.M. 1977. **Principles of soil science.** 3rd edition. Macmillan India Limited, India.
- Schemnitz, D.S. 1980. **Wildlife Management Technique Manual.** Published by Wildlife Society, Washington D.C., U.S.A.
- Tikadhar, B.K.1983. **Threatened animals of India.** Zoological Survey of India, India. 133-134.pp.
- Yadav, B.2006. **Status, distribution and conservation threats of Hispid hare (*Caprolagus hispidus*) in Royal Suklaphanta Wildlife Reserve, Nepal.** A thesis submitted to the Institute of Forestry, Pokhara, TU.
- www.greenexpander.com downloaded 16 the Feb. 2007
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SIGHTING OF PHEASANT-TAILED JACANA (*Hydrophasianus chirugus Scopoli, 1758*) FROM SOUTH ANDAMAN

by C. Sivaperuman, J. Dinesh and G. Gokulakrishnan

The Andaman and Nicobar archipelago comprises 572 islands and extends over 800 km, running north to south between 6°45'2" N and 13°30'2" N latitudes and 90°20' E and 93°56'2" E longitudes with an area of 8,249 km². The Andaman and Nicobar islands can be broadly divided into two groups, namely, the Andamans and the Nicobars. These two groups are separated by the Ten-degree Channel, which is about 150 km wide and 400 fathoms deep. Average annual temperature varies from 24° to 28° C and the rainfall is slightly higher in Nicobar with an annual average of 3,000 to 3,500 mm. The elevations range from 0 to 732 m at Saddle Peak in North Andaman and 642 m at Mount Thulier in Great Nicobar Island.

A study on the birds of Andaman and Nicobar Islands was initiated by Beavan (1867) who listed the avifauna of Andaman Islands, followed by Hume (1873, 1874 a,b, 1876) and Abulali (1964, 1965, 1967, 1971, 1979, 1981). More recently, a few researchers have contributed to the records

of avifauna of Andaman and Nicobar Islands (Tikader, 1984; Sankaran and Vijayan, 1993; Kailash and Rajan, 1994; Chandra and Kumar, 1994; Sankaran, 1995, 1998, 2001; Vijayan, 1996, 2007; Yoganand and Davidar, 2000; Sivakumar and Sankaran, 2002; Yahya and Zarri, 2003; Ezhilarsi and Vijayan, 2006; Sivakumar, 2007; Pande *et al.*, 2007 and Sivaperuman *et al.*, 2010)

The authors have been surveying the area frequently as a part of the major ecological studies on wetland birds in South Andaman initiated during 2012, sponsored by the Science Engineering Research Board (SERB), Department of Science and Technology, Government of India and INS-Utkrosh, Ministry of Defence, Government of India. During these surveys, four Pheasant-tailed jacanas were recorded in the tsunami-inundated wetlands at Sippighat, South Andaman (Lat.: 11° 36.298' N; Long.: 92° 41.464' E; Lat.: 11° 36.207' N; Long.: 92° 41.477) in April 2013, along with a flock of Little egrets *Egretta garzetta* (Linnaeus),



Pheasant-tailed Jacana *Hydrophasianus chirugus* (Scopoli)



Tsunami inundated wetlands, South Andaman

Median egret *Mesophoyx intermedia* (Wagler), Common moorhen *Gallinula chloropus* (Linnaeus), Purple moorhen *Porphyrio porphyrio* (Linnaeus), Lesser whistling-duck *Dendrocygna javanica* (Horsfield) and Cotton teal *Nettapus coromandelianus* (Gmelin). The Pheasant-tailed jacana was also sighted again on three other occasions in April 2013 in the same locality.

The Pheasant-tailed jacanas that were sighted during the survey are non-breeding adults, chiefly dull brown and white with a black “necklace” on upper breast without the long tail. The Pheasant-tailed jacana is resident and widely distributed throughout India. It breeds in India, Southeast Asia and Indonesia (Ali and Ripley, 1983; Kumar *et al.*, 2005). A review of literature revealed that Ali and Ripley (1983), Tikader (1984) and Kumar *et al.* (2005) have not reported this species from Andaman and Nicobar Islands. The present sighting is the first report of Pheasant-tailed Jacana from South Andaman Islands.

References

- Abdulali, H. 1964. **Four new races of birds from the Andaman and Nicobar Islands.** *J. Bombay Nat. Hist. Soc.* 61(2): 410-417.
- Abdulali, H. 1965. **The birds of the Andaman and Nicobar Islands.** *J. Bombay Nat. Hist. Soc.* 61(3): 483-571.
- Abdulali, H. 1967. **The birds of the Nicobar Islands, with notes on some Andaman birds.** *J. Bombay Nat. Hist. Soc.* 64 (2): 139-190.
- Abdulali, H. 1971. **Narcondam Island and notes on some birds from the Andaman Islands.** *J. Bombay Nat. Hist. Soc.* 68(2): 385-411.
- Abdulali, H. 1979. **The birds of Great and Car Nicobars with some notes on wildlife conservation in the Islands.** *J. Bombay Nat. Hist. Soc.* 75(3): 744-772 (1978).
- Abdulali, H. 1981. **Additional notes on Andaman birds.** *J. Bombay Nat. Hist. Soc.* 78 (1): 46-49.
- Ali, S. and S.D. Ripley. 1983. **Hand Book of the birds of India and Pakistan.** Oxford University Press, Oxford. 737 pp.
- Kumar, A., Sati, J.P., Tak, P.C. and J.R.B. Alfred. 2005. **Handbook on Indian wetland birds and their conservation.** Zoological Survey of India, Kolkata. 468 pp.
- Beavan, R.C. 1867. **The avifauna of the Andaman Islands.** *Ibis* 3 (3): 314-334.
- Chandra, K. and S. Kumar. 1994. **Observations on avifauna of Great Nicobar Islands, India.** *Indian Forester* 953-955.
- Ezhilarsi, N. and L. Vijayan. 2006. **Birds of Chidiyatapu Biological Park, South Andaman.** *Zoos' Print Journal* 21 (12): 2517-2518.
- Hume, A.O. 1873. **Notes on avifauna of the Islands of the Bay of Bengal.** *Stray Feathers* (5): 421-423.
- Hume, A.O. 1874a. **Additional notes on the avifauna of the Andaman Islands.** *Stray Feathers II* (6): 490-501.
- Hume, A.O. 1874b. **Contributions to the ornithology of India. The Islands of the Bay of Bengal.** *Stray Feathers II* (1,2&3): 29-324.
- Hume, A.O. 1876. **Additional notes on the avifauna of the Andaman Islands.** *Stray Feathers IV* (4,5&6): 279-294.
- Kailash, C. and P.T. Rajan. 1994. **Observation on avifauna of Mount Harriett National Park, South Andaman (A & N Islands).** *Indian Forester* 1996 (October): 965-968.
- Pande, S., Sant, N., Ranade, S., Pednekar, S., Mestry, P., Deshpande, P., Kharat, S. and V. Deshmukh. 2007. **Avifaunal survey of Andaman and Nicobar Islands, January 2007.** *Indian Birds* 3(5): 162-180.
- Sankaran, R. 1995. **The distribution, status and conservation of the Nicobar Megapode *Megapodius nicobariensis*.** *Biological Conservation* 72: 17-26.
- Sankaran, R. 1998. **An annotated list of the endemic avifauna of the Nicobar Islands.** *Forktail* 13 (February): 17-22.
- Sankaran, R. 2001. **The status and conservation of the Edible-nest swiftlet (*Collocalia fuciphaga*) in the Andaman & Nicobar Islands.** *Biological Conservation* 97: 283-294.
- Sankaran, R. and L. Vijayan. 1993. **The avifauna of the Andaman and Nicobar Islands: A review and the current scenario.** In: *Bird Conservation: Strategies for the Nineties and Beyond*. 255-271. Verghese, A., Sridhar,

(continued on p.17)

(continued from p.16)

- S. and Chakravarthy, A. K. (eds.). Bangalore: Ornithological Society of India.
- Sivakumar, K. and R. Sankaran. 2002. **New records of birds from the Andaman and Nicobar Islands.** *Forktail* 18: 149-150.
- Sivakumar, K. 2007. **The Nicobar megapode. Status, ecology and conservation: Aftermath tsunami.** Dehra Dun, Wildlife Institute of India: 1-45.
- Sivaperuman, C., Venkatraman, C. and C. Raghunathan. 2010. **Avifauna of Andaman and Nicobar Islands: An Overview.** In: *Recent trends in biodiversity of Andaman and Nicobar Islands.* pp. 399-412. Ramakrishna, Raghunathan, C and Sivaperuman, C. (Eds.). Zoological Survey of India, Kolkata.
- Tikader, B.K. 1984. **Birds of Andaman and Nicobar Islands.** Zoological Survey of India, Kolkata. 167 pp.
- Vijayan, L. 1996. **Status and conservation of the Andaman teal (*Anas gibberifrons albogularis*).** *Gibier Faune Sauvage* 13: 831-842.
- Vijayan, L. 2007. **Ecology and conservation of the Andaman teal.** *J. Bombay Nat. Hist. Soc.* 103 (2&3): 231-238.
- Yahya, H.S.A. and A.A. Zarri. 2003. **Status, ecology and behaviour of Narcondam hornbill, (*Aceros narcondami*) in Narcondam Island, Andaman and Nicobar Islands, India.** *J. Bombay Nat. Hist. Soc.* 99 (3): 434-445.
- Yoganand, K. and P. Davidar. 2000. **Habitat preferences and distributional status of some forest birds in Andaman Islands.** *J. Bombay Nat. Hist. Soc.* 97 (3): 375-380.

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INFLUENCE OF RAINFALL, ENVIROMENTAL TEMPERATURE AND ECOLOGICAL CHANGES ON MAMMAL ACTIVITY AT TWO HABITATS (SECONDARY FOREST AND PINUS PLANTATION), HANTHANA MOUNTAIN, PERADENIYA, SRI LANKA

by Niroshan Jayalath Bandara and Suyama Meegaskumbura

Introduction

Fundamental to studies involving the determination of the abundance of animals by census techniques is the assumption that their detectability remains constant through the time. However, environmental parameters may affect the behavior, and therefore the detectability of animals, and this changes between sample periods as the parameters vary (Goldingay, *et al.*, 1998 ; Golly *et al.*, 1975).

For example, terrestrial animals show increased activity on warm cloudy nights, with even greater activity when these conditions are accompanied

by rain (Golly, *et al.*, 1975). Unfortunately, only a few studies have examined the effects of such factors. (Brennan, 2006). In addition, weather affects the abundance and “trapability” of small mammals (Golly, *et al.*, 1975). Usually the effect of weather on small mammal activity is discussed in general terms or in respect to the most obvious weather variables. However, studies show that weather effects are difficult to isolate due to the correlation and interactions between variables such as rainfall, humidity, temperature, moonlight, barometric pressure, season, habitat and species (Taylor, 2004).

In this study we were mainly concerned about effects of three variables on small mammal activity: rainfall; air temperature; and occasional forest fires. Rainfall was a key factor to consider, as the study site was located in the central hills, where a very high amount of rainfall is observed throughout the year. However, responses to rain are well documented for several mammal species (Goldingay *et al.*, 1986). Although most studies observed an increase in mammal activity following the rain, so far it is little understood. The animals may be seeking areas of shelter in which to forage which could reflect an increase in activity (Knopf *et al.*, 1996). On the other hand, some recent studies showed rainfall to be significantly related to the trapability of the yellow-footed antechinus (Kavanagh *et al.*, 1998).

Air temperature has a direct impact on small mammals (Wright *et al.*, 1992). Changes in air temperature will cause changes in the type of habitat selected and influence the daily activity of mammals (Brown, 1974). As sudden climatic changes are very common in the study site, this is a very important factor to assess.

Understanding how fire influences the distribution of biota in fire-prone environments is essential for effective ecological and conservation management (Kelly, 2010). However, small mammal populations display variable responses to prescribed burning depending on species-specific habitat requirements (Brennan, 2006). Fire may affect small mammals directly or indirectly through changes in environmental conditions (Knopf *et al.*, 1996).

The objective of this study was to evaluate the effect of rainfall, environmental temperature and manmade forest fires on the distribution, abundance and activity of mammals in secondary forest habitat and *Pinus* plantations.

Materials and methods

The study was conducted in two habitat types located at the Hantana mountain area: *Pinus* plantation (06°26'N, 80°25'E, elevation 460 m) and natural secondary forest (06°26'N, 80°25'E, elevation 460 m). Mammals were detected by using hair tubes, which is an efficient and

advantageous method of mammal censusing compared to other methods (Entwistle *et al.*, 2000).

A total of 80 hair tubes, 40 in each habitat, were placed every month for five consecutive days from November 2011 to March 2012. Pieces of fried coconut were used as bait. Trap locations were selected and tagged. The daily mean rainfall data of the study site for each trial was obtained from the Meteorological Department of Sri Lanka. The environmental temperature was recorded 4 times a day and the daily mean temperature was calculated. Prominent ecological changes of the *Pinus* plantation were recorded throughout the study. Collected hair samples were identified according to the methods of Amerasinghe (1983).

Results

In both secondary forest and *Pinus* plantation five species of mammals were identified through collected hair samples, including *Mus musculus*, *Ratufa macroura*, *Bandicota indica*, *Rattus norvegicus* and *Rattus rattus*.

During the rainy periods, the number of trapped hair samples decreased in both the forest habitat (Figure 1), and the *Pinus* plantation (Figure 2). During these days almost no hair samples were collected. But during drier periods with a negligible amount or no rainfall a comparatively higher number of hair samples was detected. In forest habitat 53 hair samples were collected. From these, only 3 (5.66%) samples were collected during the rainy days. The other 50 (94.34 %) samples were collected when there was no or less rain. In *Pinus* habitat 38 samples were found. Out of 38, only 3 (7.89 %) samples were collected during the days with high rainfall. The remaining 35 (92.11 %) were collected during less or no rainfall days.

As the temperature increased the number of collected hair samples also increased in both secondary forest and *Pinus* plantation (Figure 1; Figure 2). The maximum number of hair samples were trapped when high environmental temperatures combined with low or no rainfall. (Figure 1; Figure 2). But when low environmental temperature combined with high rainfall, hardly

any hair samples were trapped (Figure 1; Figure 2).

Significant variations in the number of trapped hair samples due to ecological changes were mainly observed in *Pinus* plantations. Between 30 December and 1 January the shedding of leaves and corns of *Pinus* plants was observed (Table 1). During that period a higher number of hair

samples was trapped. But between January 31 and February 2, the *Pinus* plantation was subjected to a man-made forest fire. During this period only a few hair samples were trapped. Nevertheless, due to the rainfall between February 2 and March 2, re-growth of ground vegetation was observed (Table 1). At the same time the number of trapped hair samples also increased.

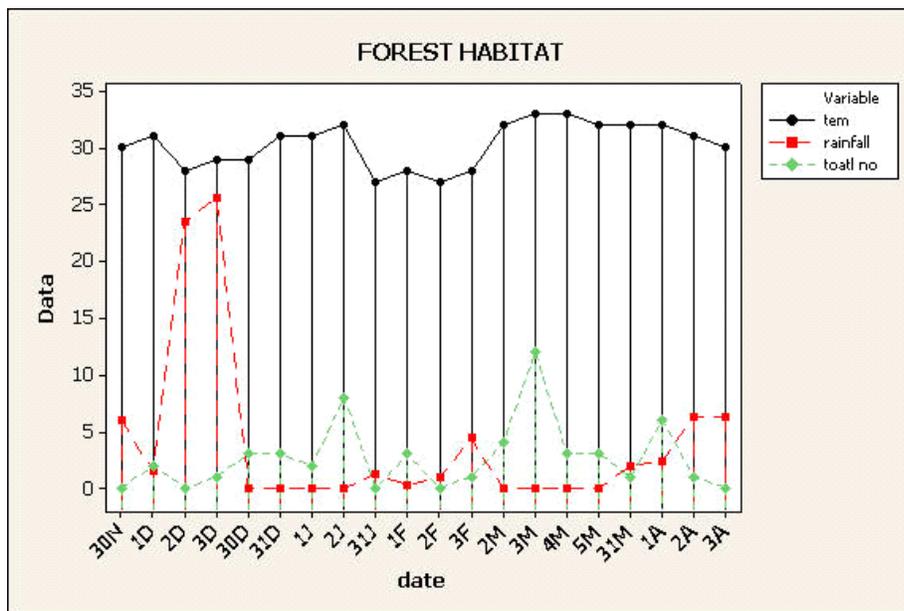


Figure 1: Variations of number of trapped hair samples with environmental temperature and rainfall in secondary forest habitat, Hanthana Mountain, Sri Lanka

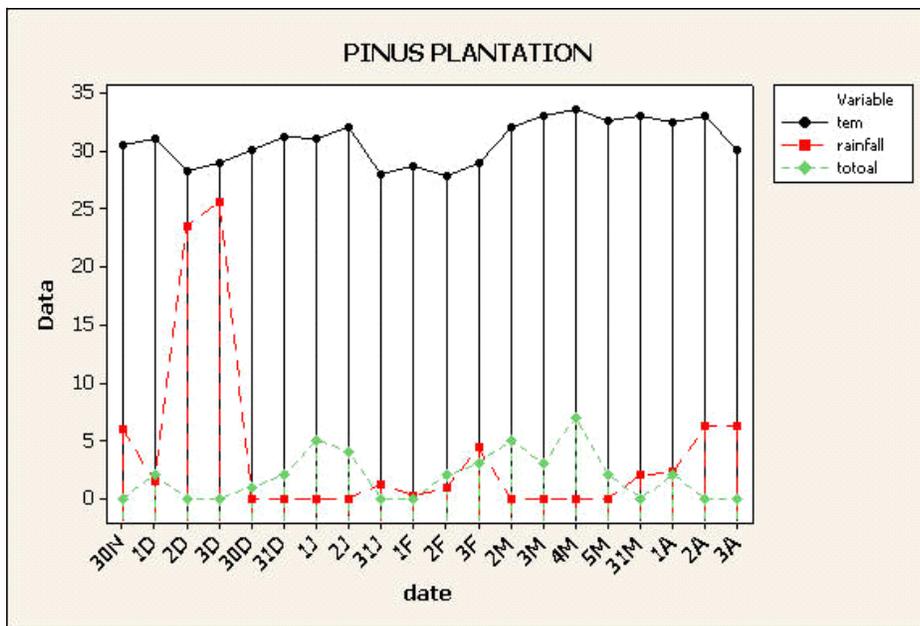


Figure 2: Variations of number of trapped hair samples with environmental temperature and rainfall in pinus plantation, Hanthana Mountain, Sri Lanka.

Table 1: Foremost ecological changes observed in *Pinus* plantation during each trial from November 2011 to April 2012.

Trial period	Major Ecological Change
Trial 1 (Nov-30, Dec-1, Dec-02, Dec-03)	High rainfall, Tree falling
Trial 2 (Dec-30, Dec-31, Jan-01, Jan-02)	<i>Pinus</i> cones and leaves falling
Trial 3 (Jan-31, Feb-1, Feb-2, Feb-3)	Man made fire, bare ground with no cover
Trial 4 (Mar-2, Mar-3, Mar-4, Mar-5)	Ground vegetation re-growth and ground covered by <i>pinus</i> leaves
Trial 5 (Mar-31, Apr-1, Apr-2, Apr-3)	No major changes observed

Discussion

Little is known about abundance-climate relationships for animals because few long term studies have addressed the issue (Golley *et al.*, 1975). The effects of climate on abundance can be mediated by many factors. Short term weather extremes lasting a few days can be ameliorated or exploited by altering behavior. This may be displayed by the increasing or decreasing activity of mammals. This study indicates a decrease of mammal activity during high rainfall and low temperature. But just after a rainfall, mammals show a sudden increase in their activity. This may probably mean that they lack food throughout the rainy period. Immediately after the rain ends, they swiftly move around the habitat foraging for food. But if rainfall is associated with low temperatures, it will reduce small mammal activity. They tend to remain in their burrows, where they are able to use stored food supplies.

Small mammals are very sensitive to ecological changes. In the *Pinus* plantation during the leaves and cone shedding period, a sudden increase of mammal activity can be observed. During this period a large number of *Pinus* cones and ground cover generated by *Pinus* leaves provide suitable habitats for small mammal food sources such as small insects and within a short period a large number of mammals are attracted to the *Pinus* plantation. But when the *Pinus* plantation experiences burning, mammal activities drop to a very low level. Then between February and March, due to high rainfall, the ground vegetation of the *Pinus* plantation begins to re-grow and the *Pinus* habitat again becomes hospitable to mammals. One month after the fire (March), mammals recolonize the *Pinus* habitat.

References

- Amerasinghe, F.P. 1983. **The structure and identification of the hairs of the mammals of Sri Lanka.** *Ceylon Journal of Science* 16: 76-124.
- Brennan, L.A. 2006. **Texas quails: ecology and management.** Texas A & M University Press p. 45-48.
- Goldingay, A. 1986. **Capture-related aspects of the ecology of *Antechinus flavipes*.** *Australian Mammalogy* 9:132-133
- Golly, F.B., Petrwshevski, G.K. and L. Rhszkowski. 1975. **Small mammals: their reproductivity and population dynamics.** Cambridge University Press p. 36-42
- Kelly, L.T. 2010. **The short term responses of small mammals to wildlife semi-arid scrublands, Australia.** *Wildlife Research* 37: 293-300
- Knopf, F.L. and Samson, F.B. 1996. **Ecology and conservation of great plain vertebrates.** Springer Pp.217
- Taylor, Z. 2004. **Barn owls: predator prey relationships and conservation.** Cambridge University Press p. 130-150
- Wright, H.C., Coffin, J.B.A. and N.E. Aseng. 1992. **The patterned peat lands of Minnesota.** University of Minnesota Press p. 92-97
- Zabel, C.J. and R.G. Anthony. 2003. **Mammal community dynamics: management and conservation in the coniferous forest.** University of Cambridge Press p. 125-143.

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STATUS AND CONSERVATION ISSUES OF HIMALAYAN BROWN BEAR (*Ursus arctos isabellinus*) IN BASHQAR GOL, DISTRICT CHITRAL, PAKISTAN

by Ajaz Ahmed, Shafiqullah Khan and Hamid Ahmad



Bashqar Gol (Photo: Courtesy of Ajaz Ahjmed)

Introduction

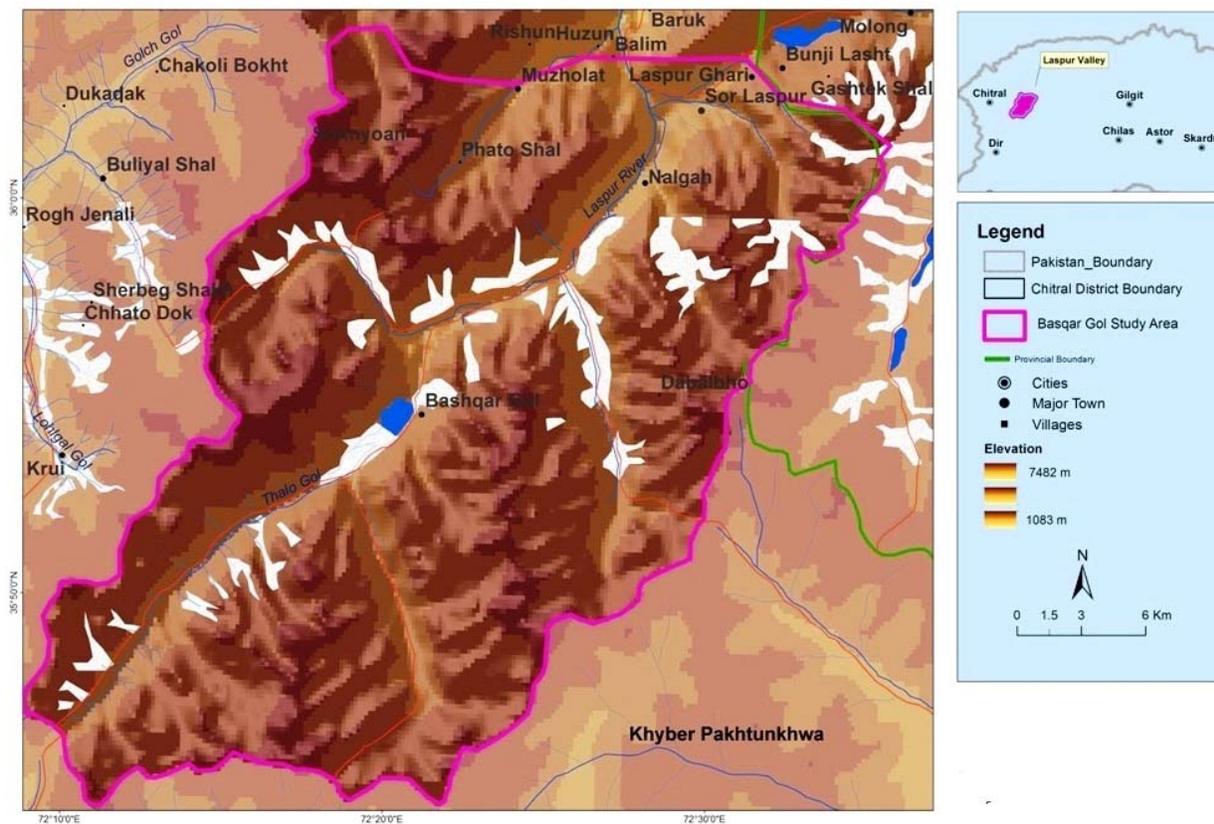
The Himalayan brown bear (*Ursus arctos isabellinus*) is restricted to the alpine meadows and sub-alpine scrub zone above the tree line between 3,900 m to 5,100 m elevation. Both black and brown bear are reported in Chitral district. The Himalayan brown bears occupy the Hindu Kush Range in the northern part of the Chitral District, the Kalam area in Swat Kohistan, Kaghan Valley, and Palas Valley in Indus Kohistan (Arshad, 2003). There are 3 populations (Kalam, Indus Kohistan, and Kaghan) and 2 subpopulations (Tirch Mir, Chitral) of the Hindu Kush range in Khyber Pakhtunkhwa. A population reported from SiranNalla in Hazara District, and the subpopulation in Chitral Gol National Park are extinct (Schaller, 1977, Mirza, 2003). A small subpopulation of Tirch Mir still persists at the headwaters of Yarkhun and along the Afghan border. Fulton (1903) reported that brown bears were common in the Turkho and Yarkhun valleys, and Schaller (1977) also observed some signs in that area. The Kalash people practiced bear hunting and it was considered as

sign of bravery, strength and courage. Bears were also hunted for their fats which was used in local medicines and to stimulate hair growth.

Study area

The present survey focused on the status and conservation issues of brown bear in Bashqar Gol, which is one of the socio-ecologically important watersheds of Laspur valley in Chitral district, Khyber Pakhtunkhwa Pakistan. The valley has borders with Swat, Gilgit-Baltistan and Golain Valley of Chitral. Bashqar Gol is famous for scenic views, wetlands and biological diversity. Bashqar Gol lies out of the monsoon rains and has arid, temperate and alpine zones. The precipitation in winter is in the form of snow, while in summer there is occasional rainfall. December and January are the coldest months during which the entire area get covered with snow and temperatures fall several degrees below freezing point. The study area comprises different types of habitats including sub-alpine scrub, alpine meadows and tundra. There are seasonal settlements and cultivated

Map of the Study Area.



areas around Garik (3,343 m). The stream bed of Bashqar Gol is characterized as sub-alpine scrub which supports vegetation like *Artemisia brevifolium*, *Salix tetrasperma*, *Bitula utilis*, *Populus ciliata*, *Juniperus communis*, *Hippophae rhamnoides* (Sea buckthorn), *Tamarix* spp and *Rosa webbiana*. The alpine zone of Bashqar Gol includes the area around Bashqar Gol Lake and the surrounding semi-hilly terrains support *Ephedraea gerardiana*, *Artemisia brevifolium*, *Artemisia maritime*, *Metricaria chamomile*, *Chenopodium album*, *Astragalus* spp, *Carexdivisia*, *Geranium* spp, *Euphorbia* spp, *Bunium persicum* and other wild berries.

Habitat type and quality are key factors for wildlife distribution. Bashqar Gol has several species of wildlife that are ecologically, economically and scientifically very important, including Snow leopard (*Uncia uncia*), Brown bear (*Ursus arctos*), Wolf (*Canis lupus*), Himalayan ibex (*Capra ibex*). Chinese birch mouse (*Sicista caudata*), Pika (*Ochotona* spp), Snow cock

(*Tetraogallus himalayensis*), Chakur partridge (*Alectoris chukar*), Bearded vulture (*Gypaetus barbatus*) and Golden eagle (*Aquila chrysaetos*). In Bashqar Gol, presently Himalayan ibex is the only herbivore comprising the prey base for carnivores, but according to the local people Musk deer also inhabited the area. The most prominent feature of Bashqar Gol is a biologically active soligenous lake (Bashqar Chaat) which is located at an elevation of 3,679 m above sea level. The lake covers about 200 ha has its inflow towards Laspur Valley.

Methodology

Questionnaires and observations to assess the occurrence and distribution of predators have been widely used in Europe and North America (Fuller *et al.*, 1992; Martizanis, 1994). Focused group interviews and semi-structured questionnaires were used as survey tools to obtain information on sightings, depredations and major threats to the brown bear in the survey area.

Counts of tracks or scats have been widely used to assess the relative abundance of wildlife ranging from Elephants to Bobcats (Jackson and Hunter, 1996). The survey was conducted between August 1, 2012 to August 7, 2012 in Bashqar Gol, one of the important watersheds of Laspur Valley, District Chitral. During the survey 20 transects were marked out at the selected potential sites of Brown bear, ranging from 300 m to 950 m depending upon the terrain and topography. Data was decoded as per the Snow Leopard Information Management System (SLIMS) standards (Jackson and Hunter, 1996), which was used as a survey protocol to estimate the relative density of Brown bear.

Results

The survey team directly observed Brown bear in Bashqar Gol and looked for other evidences such as feces, pugmarks and fur. During the

survey a total of 15 signs of Brown bear were recorded consisting of pugmarks (60%), feces (27%), and fur (13%). Sign density was 1.26 signs per kilometer, indicating low carnivore density in the study area. It was also observed that most of the signs were fresh (45%), followed by old (25%) and very old (30%) respectively. According to the local people's perception, about 80% of the respondents categorized Brown bear as common, 5% as rare and only 6% said it is absent in the valley. The local people displayed a positive attitude toward Brown bear and did not consider it a threat to their livestock. It was also confirmed by the locals that in the study area the population of Brown bear is declining at alarming rate due to habitat loss, fragmentation, human-induced mortality, commercial poaching for the sale of bears parts and retaliatory poisoning. Details of the SLIMS finding of the study area are given in Table 1.

Table 1: SLIMS findings of Bashqar Gol

	Sites	All signs	Pugmarks	Feces	Fur
Total	15	15	9	4	2
Average	0.75	0.75	0.45	0.2	0.1
Minimum	0	0	0	0	0
Maximum	4	4	3	2	1
Signs/km		1.26	0.76	0.33	0.17

Discussion

Brown bear was observed in Bashqar Gol in the evening in close proximity of juniper scrub forest at Garik. In the study area Brown bear also descends to the lower parts in birch and Salix forest in search of succulent plants. The bulk of their diet is made up of vegetable matter, including sedge leaves and succulent rhizomes. During the survey it was reported by the wildlife watchers of the area and the local people that they had seen Brown bear feed upon bulbs, roots and sometimes they turned over the stones and rocks in search of insects. They usually feed for one or two hours before sunrise and again in the afternoon. Brown bear can also develop the habit of killing domestic

livestock; The brown bear is under continuous threat to its survival in Pakistan in general and Chitral in particular. The Brown bear has been listed as Critically Endangered in Pakistan.

Some of the threats/conservation issues identified in the study are as follows.

1. Loss of habitat

A great threat to wildlife, including the Brown bear, in Bashqar Gol is the disappearance of habitat or the competition with domestic grazing animals. During the survey it was confirmed that the sub-alpine scrub of Bashqar Gol is shrinking at a high rate. Pressure on forests for fuelwood collection is degrading the natural alpine vegetation.

Encroachment for agriculture and excessive grazing by domestic animals is also a major threat to the habitat of the wildlife of Bashqar Gol

2. Retaliatory poisoning

According to the local community, in 2010-2011 a total of 82 depredation cases attributed to three carnivore species (Snow leopard, Wolf and Brown bear) were reported in the area affecting 28 households. For the damage to their agriculture fields the local communities made claims for compensation but in most cases the Wildlife Department was not in the position to compensate the affected community. As a result, the locals still keep their livestock in the Bashqar Gol and as such, grazing has not been stopped in area. The presence of livestock in the area attracts carnivore predators towards more easy prey like goats, sheep and yaks. When a Snow leopard, Wolf or Brown bear kills a grazing animal, the owner of the herd poisons the carcass to kill the predators. This leads to the death of not only the attacking predator but also many other carnivores and scavengers who are dependent on the left-over hunt. This situation has resulted in reducing the number of wildlife to an alarming level in Bashqar Gol.

3. Over-grazing

Heavy grazing in the different ecological zones of Bashqar Gol is also one of the major threats to the wildlife of the area. The huge number of domestic animals including sheep, goats and yaks consume all available forage of an area while moving to another place, thus leaving nothing for wild ungulates and posing tough competition for the wild animals.

4. Weak law enforcement

The rules and regulations that have been framed regarding the protection and conservation of natural resources have typically not been implemented properly due to weak law enforcement. Therefore illegal hunting and shooting still exist. Now the government has started to work with stakeholders and concerned communities for the protection, conservation and sustainable use of wildlife by providing some enforcement.

5. Limited resources

Chitral Wildlife Division through the Ranger Office Wildlife, Wildlife Range Booni is responsible for the conservation and protection of wildlife in the area. There is inadequate field staff and lack of proper training of existing staff, combined with limited funds, which means that they cannot perform their duties effectively.

Recommendations

- A long term awareness programme should be initiated to increase the level of awareness of students, teachers, and local communities, the government, non-governmental organizations and law enforcement agencies regarding the Brown bear population status, habitat conservation needs and their role in the ecosystem.
- The northern part of District Chitral provides a good habitat for Brown bear and other associated wildlife species. The existing protected areas are insufficient both in numbers and sizes to provide adequate refuge and food to Brown bear. The only protected area in this part of Chitral is Broghil National Park which was established in 2009, but the Wildlife Department has insufficient capacity to properly manage this national park. There is a need for the establishment of protected areas like national parks, and game sanctuaries especially focusing on Brown bear, and a need to improve the capacity of the Wildlife Department to manage the existing protected areas and create new ones.
- The existing rules are not properly implemented because of certain loopholes and weaknesses. It is noteworthy that the total area of district Chitral is 14,850 km² and there are only 52 wildlife field staffs for the whole district, which means a single wildlife staff is covering an area of 286 km². The Wildlife Department should strengthen both the financial and human resources. Community participation in wildlife conservation, especially of Brown bear, should be ensured.
- The conservation of Brown bear is difficult to handle through isolated efforts; joint actions would be required on the part of major stakeholders. The government institutions, being the custodians, have a crucial role, while

others have important roles too. However, such roles can only be effectively realized if there is proper co-ordination between all these institutions. This is possible only if a strategic direction is determined with an agreed action plan, determined through general consensus to guide all interventions related to Brown bear conservation in its natural habitats.

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References

- Ahmad, A. 1994. **Protection of Snow leopards through grazier communities - some examples from WWF-Pakistan's projects in the Northern areas.** J.L. Fox and Du Jizeng (eds.) *Proceedings of the Seventh International Snow Leopard Symposium.* ISLT, Seattle, pp. 265-272.
- Ajaz, A. 2013. **Feasibility study for Bashqar Gol Game Reserve.** KP Wildlife Department Chitral.
- Himalayan Wildlife Foundation. 1999. **Deosai brown bear project, 1998.** Final Report. Himalayan Wildlife Foundation, Islamabad, Pakistan.
- Ajaz, A, Khan, Shafiqullah and Hameed Ahmad. 2011. **Ecological Assessment of Bashqar Gol, Brown Bear Project.** WWF Pakistan Chitral.
- Fox, J.L. 1994. **Snow leopard conservation in the wild - a comprehensive perspective on a low density and highly fragmented population.** Pages 3-15 in: J.L., Fox and Du Jizeng (editors). *Proceedings of the Seventh International Snow Leopard Symposium* (Xining, Qinghai, China, July 25-30, 1992). International Snow Leopard Trust, Seattle, Washington
- Fuller, K.T., Berg, W.E., Radde, G.L., Lenarz, M.S., and G.B. Joselyn. 1992. **A history and current estimate of wolf distribution and numbers in Minnesota.** *Wildlife Society Bulletin*, 20, 42-55.
- Garshelis, D. and B. McLellan. 2004. **Bear Specialist Group Notes: Where are the bears?** *International Bear News* 13:10-1
- Jackson, R. and D.O. Hunter. 1996. **Snow leopard survey and conservation handbook.** International Snow Leopard Trust, Seattle, Washington and U.S. Geological Survey, Fort Collins Science Center, Colorado, pp.39 and appendices.
- Martzanis, G. 1994. **Brown bear in Greece: distribution, present status, and ecology of northern pindus subpopulations.** International Conference on Bear Research and Management, 9, 187-198.
- NWFP Wildlife Department. **Chitral. 2004-07. Distribution and status of wildlife in NWFP.** Annual Reports.
- Rasool, G. 1982. *Jungle Kai Basi* (Urdu). WWF Pakistan, Lahore, Pakistan.
- Roberts, T.J. 1997. **The mammals of Pakistan.** Oxford University Press, New York, New York, USA.
- Sathyakumar, S. 1999. **Status and management of the Himalayan brown bear in India.** Pages 125-128.

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FERAL FAUNA OF SIKKIM: A PRELIMINARY SURVEY

by Jha Ajeya and Jha Vanya

Introduction

Sikkim is the second smallest state of India. Geographically, it lies at the head of the Bay of Bengal. At its Eastern frontier the Richi Pangola range and the river Dichu separate it from Bhutan. Khangchenzonga and Singlila ranges define its western limit. In the north the boundary between Sikkim and Tibet lies along the crest of the Great Himalaya and Donkya ranges, which form the watershed between the Teesta River in Sikkim and Yaruchu River in Tibet. The country is shaped like a horseshoe and is 80 to 100 km wide (east to west) and about 160 km long (north to south).

There are many geographical factors that contribute to Sikkim's awesome biodiversity, but perhaps the altitudinal gradation alone is responsible for most of it. The landscape offers almost every possible mountain panorama. Such an immense topographic heterogeneity of landscape is unrivalled for such a small tract of land. The altitude ranges from 300 to 8,580 m; thus, summers are hot and the temperature in the lower reaches may soar to about 40°C. Winters are extremely cold, particularly at the higher elevations where snow covers the landscape throughout the year. Further, a typical tropical monsoon prevails over this tract. The heavy rainfall this region receives and its proximity to the Bay of Bengal makes it one of the most humid tracts in the Himalayas and therefore, thick and vast forests cover practically the entire state. There are also regions in Sikkim which are practically rainless. Partly because of its ecologically crucial location (between the paleoarctic and oriental regions) Sikkim's biodiversity is matched by only a few other regions in the world.

Feral animals

Most of the animals that have been domesticated by humans can be categorized into three categories (Inbal Brickner, 2000; Inbal Brickner, 2003):

- **Domestic pets** – animals that live as pets with an individual or a household. Their owners provide for most of their requirements.
- **Strais** – animals that live in and around cities, towns and rural areas. They generally survive on resources provided by the human beings they live around, but are not owned.
- **Ferals** – animals that live and reproduce in the wild and survive by hunting or scavenging. None of their needs are provided intentionally by people.

These represent stages and not necessarily the animals. This distinction, therefore, is not categorical as the same animal could be a pet, stray or feral depending upon the time and circumstances. Such animals, therefore, are very often comfortable being pet, stray or feral and even thrive (Inbal Brickner, 2003). All animals are descended from wild ancestors. The features that essentially differentiate feral animals from the pet ones are the extent to which they rely on humans and also to some extent on their behavior towards people (Scott and Causey, 1973; Green and Gipson, 1994). Feral dogs, for example differ from their pet cousins in being highly social and they continue to live together in the same pack for years (Daniels and Bekoff, 1989). This could be because pet dogs look upon their human companions as their "pack". Feral dogs on the other hand find motivation to make relatively permanent packs for enhanced vigilance resulting in greater protection against potential predators and increased ability to gain access to higher quality food resources (Daniels and Bekoff, 1989). Feral animals have an intense interaction with their ecosystem – very often with disastrous results.

In Italy, it was reported in one instance that five dogs completely destroyed the largest flamingo colony in the country (Cagkiari, Sardinia) and the total destruction of water bird colonies caused by

dogs is regularly reported in several lagoon complexes in Italy. Wildlife scholars are focused on research on feral and invasive species work because of their rapid spread, economic cost, and effects on ecological systems. (Larson, 2005)

It is therefore vital to undertake a study of the feral animals in every ecosystem. In Sikkim a few sporadic reports on feral populations exist but no comprehensive study has been conducted so far. The present study was undertaken to make a preliminary investigation of a few important feral species in the state and ascertain their status on the basis of a widely accepted nomenclature system proposed by Colautti and MacIsaac.

Methodology

The study was based on general observation and data collection over a period of 6 years. It was confined to the state boundaries of Sikkim. The study is largely exploratory in design and is based on literature review and participatory surveys. Primary data for the study was collected by

interviewing local inhabitants and army personnel posted in Sikkim. The interview questions were largely open-ended and were confined to the presence, movements and status of feral animals in the state. The researchers also made independent observations to verify at least some of the information collected through the surveys. As mentioned earlier, an attempt has been made to ascertain the status of select feral fauna on the basis of a nomenclature system proposed by Colautti and MacIsaac.

Definitions in the context of feral and invasive species have been inconsistent, which has resulted in confusion both in literature and in popular publications (Williams and Meffe, 2005). It is obvious that the use of even simple, basic terms to articulate ecological concepts can lead to confused debates and damage conservation efforts (Colautti and MacIsaac, 2004). In this context a nomenclature system has been proposed by Colautti and MacIsaac as given in Table 1. This has been used to assign the status of the select feral fauna of the state.

Table 1: Nomenclature System Proposed By Colautti And Macisaac

Stage	Characteristic
0	Propagules residing in a donor region
I	Traveling
II	Introduced
III	Localized and numerically rare
IVa	Widespread but rare
IVb	Localized but dominant
V	Widespread and dominant

Results and discussion

In all, eight common domestic species were identified and studied. These include three birds and five mammals. The list comprises Pigeon,

Peacock, Kalij pheasant, Dogs, Cats, Pigs, Goats and Yaks. Their respective status has been provided in Table 2.

Table 2: Status of Feral Fauna as per nomenclature provided by Colautti and Macisaac

S.N.	Feral Species	Stage	Characteristic
1	Dogs	V	Widespread and dominant
2	Cats	V	Widespread and dominant
3	Boar	IVa	Widespread but rare
4	Goats	III	Localized and numerically rare
5	Yak	III	Localized and numerically rare
6	Peacock	IVb	Localized but dominant
7	Pigeon	V	Widespread and dominant
8	Kalij Pheasant	IVa	Widespread but rare

Conclusion

From the results it may be concluded that Sikkim has its share of feral species which require closer scrutiny to understand their spread and impact on the environment. This is creating problems for the local fauna of this biodiversity hotspot. Feral dogs, for example, have been known to be powerful predators and have killed rare species such as Red panda, Musk deer, Gorals and even migratory birds (Anon, 2009; Anon, 2009a; Anon, 2013). Researchers recorded the killing of a Barking deer by stray dogs in the campus of Sikkim Manipal Institute of Technology. Some incidents of humans being attacked by feral dogs in North Sikkim have also been reported (Anon, 2012).

The characteristics of the biogeography of select feral species in the state have been recorded and it is hoped that this information will be incorporated in the overall conservation plans of the state.

References

- Anonymous. 2009. **Feral dogs pose threat to wild animals in Sikkim.** *The Times of India*, June 7, 2009
- Anonymous. 2009a. **Project launched to catch feral dogs in Sikkim.** *The Assam Tribune*, June 15, 2009
- Anonymous. 2012. **Feral Dog attacks on the rise in east Sikkim.** *Sikkim Now*, May 8 2012
- Anonymous. 2013. **Corporation to emulate Sikkim model to sterilize stray dogs.** *The Times of India* June 16, 2013
- Colautti, R.I., and H.J. MacIsaac. 2004. **A neutral terminology to define 'invasive' species.** *Diversity and Distributions* 10: 134-41
- Daniels T.J. and M. Bekoff. 1989. **Population and social biology of free-ranging dogs, *Canis familiaris*.** *Journal of Mammalogy*.)) 70: 754-762.
- Green J.S. and P.S. Gipson. 1994. **Feral Dogs. Prevention and Control of Wildlife Damage 1994.** Cooperative Extension Division Institute of Agriculture and Natural Resources University of Nebraska – Lincoln United States Department of Agriculture Animal and Plant Health Inspection Service Animal Damage Control Great Plains Agricultural Council Wildlife Committee.
- Inbal Brickner. 2000. **The impact of domestic dogs (*Canis familiaris*) on wildlife welfare and conservation: a literature review.** With a situation summary from Israel report submitted to Prof. Yoram Yom-Tov.
- Larson, B.M.H. 2005. **The war of the roses: demilitarizing invasion biology.** *Frontiers in Ecology and the Environment* 3(9):495-500

Scott M.D. and K. Causey. 1973. **Ecology of feral dogs in Alabama.** *Journal of Wildlife Management.* 37: 253-265

Williams, J.D. and G.K. Meffe. 2005. **Status and trends of the nation's biological resources: Nonindigenous species.** Washington, DC: US Geological Survey

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DIVERSITY AND DISTRIBUTION OF MAMMALS IN AMCHANG WILDLIFE SANCTUARY

by Bidyut B. Sharma, Saugot Choudhury, Dipankar Lahkar, Biswajit Barua and Arup Barua

Introduction

This paper reports the results of a survey carried out in Amchang Wildlife Sanctuary, in Assam, India, to identify the mammalian fauna. The Amchang WLS comprises three Reserve Forests (RF), viz., Amchang RF (53.18 km²), South Amchang RF (15.50 km²), and Khanapara RF (9.96 km²). The entire wildlife sanctuary has an area of 78.64 km². The three reserved forests were combined to establish this sanctuary, vide government notification (order no. FRW.11/224/25), on 19-06-04.

Although the government has recognized the richness of the biodiversity of the area, not much effort has been given to studying the faunal and floral assemblages of the sanctuary. There are no records of previous faunal studies of this area. However, the preliminary documentation of the floral and faunal diversity by forest officials prior to declaration of the three reserved forests as a sanctuary, recorded the presence of 24 species of mammals. The intent of this report is to provide a checklist of the mammals found and record preliminary information regarding their distribution in the sanctuary.

Study area

Amchang WLS lies between 26° 13'E - 26° 09'E and 91° 50'N - 91° 59'N. Geologically, the

area is a continuation of the Khasi and Jaintia Hills of Meghalaya and forms a part of the Shillong plateau. The area is predominantly a granite terrain and the rocks are considered to be of pre-Cambrian age. Innumerable streams and streamlets and some brooks flow along the valleys in the hill ranges. Most of them are ephemeral in nature and remain dry in the winter season. They begin in the hills and flow outward, etching into the low-lying alluvial tracts, emptying finally into the river Brahmaputra. The flow patterns of the streams are dendritic in nature; a few marshy lands also occur, which were found to be well drained. The average elevation in the area is about 150-225 m.

The vegetation in the sanctuary is predominantly of the semi-evergreen and moist-deciduous type with secondary growth. Sal (*Shorea robusta*), teak (*Tectona grandis*), bamboo species, banana, cane, etc. are some of the dominant species. The undergrowth is very thick and dominated by numerous varieties of herbs, shrubs and grasses.

Methodology

A total of 8 sites were surveyed from September 2006 to May 2007, viz., Bonda, Panikhaiti, Hajongbari, Thakurkuchi, Panbari, Botahghuli, Kumarkuchi, and Khanapara. A modified transect method (Burnham *et al.*, 1980; Indo-US primate project, 1995; Struhsaker, 1997; Chetry *et al.*,

2003a.) was followed, depending upon the habitat and forest condition. Transects were laid in a stratified random manner to cover all representative areas of the park (Kent *et al*, 1994). The surveys were initiated in the morning (0600 hrs) and terminated in the evening (1600 hrs). While walking along forest trails searches were made to find evidence of prey killed by carnivores along with scats, dung, pellets and pugmarks. Animal drinking spots were surveyed for animal pugmarks. During the survey efforts were made to identify the calls of different animals. Whenever any animal group was sighted, the group size and group activity was noted down and if possible photographed. However, surveys were abandoned whenever there was continuous rainfall for more than one hour because this made the trails excessively muddy and slippery. Fringe villagers and woodcutters were also interviewed and color photographs were shown to ascertain the presence of some nocturnal mammals.

Results

A checklist of the mammalian fauna of Amchang WLS is listed below in Table-I. The status of species according to Wildlife (Protection) Act, 1972 and IUCN is given, along with their distribution inside the wildlife sanctuary.

Discussion

The present study has generated a fairly comprehensive list of species, although additional species may be present in the less accessible areas, or in dense vegetation or tall grass pockets. A total of 38 species were recorded during the study, which is more than what had been earlier recorded by forest officials. Also, the distribution of each species in the survey sites was determined, based upon direct sightings and information from local people. The status of most of the species according to the IUCN categories shows the importance of the sanctuary from a conservation perspective. It was observed that there is severe pressure on the sanctuary due to human activities. Although hunting of wild animals may occur, the main problem faced by the sanctuary is deforestation and encroachment. There is also the problem of stone quarrying, earth cutting and charcoal making, which are highly

detrimental to the sanctuary. Thus, a conservation management plan should be formulated and acted upon by the concerned authorities. Further research is required regarding the ecology and demographic status of the mammals in the sanctuary.

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References

- Barthakur, K. 1975. **Pre-Cambrian geology of the Narengi –Kamarkuchi area, Kamrup District, Assam.** *Unpublished M.Phil Dissertation.* Department of Geology, Gauhati University.
- Burnham, K.P., Anderson D.R., and J.L. Laake. 1980. **Estimate of density from line transect sampling of biological populations.** *Wildlife Monograph.* 72. Washington, D.C.: The Wildlife Society. 202pp.
- Champion, H., and S.K. Seth. 1968. **A revised survey of the forest type of India.** Government of India Press, Nasik.
- Chetry, D., Medhi, R., Biswas, J., Das, D., and P.C. Bhattacharjee. 2003a. **A Survey of non-human primates in the Namdapha National Park, Arunachal Pradesh (India).** *International Journal of Primatology.* Vol.24, No.2.pp.383-388.
- Choudhury, S., Sharma, B. B., Barua, B., Sarma, N., Lahkar, D., and A. Barua. 2007. **Documentation of faunal diversity of Amchang Wildlife Sanctuary with special reference to the lesser known forms.**
- Indo-US Primate Project. 1994-1995. **Annual Report-I.**
- Menon, V. 2003. **A field guide to Indian mammals.** Dorling Kindersely (India) Pvt. Limited, Delhi.
- NRC. 1981. **Techniques for the study of primate population ecology.** National

Research Council (NCR), National Academy Press, Washington D.C., 227.
 Sally Walker & Sanjay Molur (Compilers). 2006. **Conservation of Western Hoolock Gibbon- Summary 2006**. From PHVA Workshop Report, 2005, Zoo Outreach Organization, CBSG-South Asia, Coimbatore, 20pp.
 Shweta and V.K. Singh 2008. **Mammals of the world**. Stadium Press LLC, U.S.A.

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Table I: Checklist of the mammalian fauna of Amchang WLS

Sl. No.	Family	Name	IUCN Status	WPA, 1972 Status	Distribution (in Amchang WLS)
1	Lorisidae	<i>Nycticebus cougang</i>	DD	Sch I	S ₁ , S ₃ , S ₆
2	Pongidae	<i>Hylobates hoolock hoolock</i>	En	Sch I	S ₃ , S ₄
3	Cercopithecidae	<i>Macaca mulatta</i>	LR	Sch II	S ₁ , S ₂ , S ₃ , S ₄ , S ₅ , S ₆ , S ₇ , S ₈
4		<i>Macaca assamensis</i>	Vu	Sch II	S ₁ , S ₇
5		<i>Macaca nemestrina</i>	Vu	Sch II	S ₁ , S ₃
6		<i>Macaca speciosa</i>	Vu	Sch II	S ₁ , S ₃ , S ₄ , S ₇
7		<i>Presbytis pileatus</i>	Vu	Sch II	S ₁ , S ₃ , S ₄ , S ₆ , S ₇
8	Cervidae	<i>Cervus duvaucelii</i>	LR	Sch III	S ₂ , S ₃ , S ₄
9		<i>Axis porcinus</i>			S ₂ , S ₃
10		<i>Muntiacus muntjak</i>			S ₂ , S ₃ , S ₆
11	Bovidae	<i>Bos gauras</i>	Vu	Sch I	S ₁ , S ₂ , S ₃ , S ₄ , S ₅ , S ₆ , S ₇ , S ₈
12	Suidae	<i>Sus scrofa</i>	LR	Sch III	S ₁ , S ₃ , S ₆
13	Elephantidae	<i>Elephas maximus</i>	En	Sch I	S ₁ , S ₂ , S ₃ , S ₄ , S ₆
14	Canidae	<i>Canis aureus</i>	LR	Sch I	S ₂ , S ₃ , S ₄ , S ₅ , S ₆ , S ₇ , S ₈
15		<i>Canis alpinus</i>	Vu	Sch II	S ₁ , S ₂ , S ₃ , S ₄ , S ₅ , S ₆
16		<i>Vulpus bengalensis</i>	LR	Sch II	S ₁ , S ₂ , S ₃ , S ₄ , S ₅ , S ₆ , S ₇ , S ₈
17	Felidae	<i>Panthera pardus</i>	LR	Sch I	S ₃ , S ₄ , S ₆
18		<i>Neofelis nebulosa</i>	Vu	Sch I	S ₃ , S ₄ , S ₆
19		<i>Felis chaus</i>	LR	Sch I	S ₂ , S ₃ , S ₅ , S ₆
20		<i>Felis bengalensis</i>	Vu	Sch I	S ₁ , S ₃ , S ₆ , S ₈
21		<i>Felis viverrina</i>	Vu	Sch I	S ₃ , S ₅

Table I: Checklist of the mammalian fauna of Amchang WLS (con't)

Sl. No.	Family	Name	IUCN Status	WPA, 1972 Status	Distribution (in Amchang WLS)
22	Viverridae	<i>Viverricula indica</i>	LR	Sch II	S ₃ , S ₄
23		<i>Viverra zibetha</i>	Vu	Sch II	S ₄
24		<i>Paradoxurus hermaphroditus</i>	LR	Sch II	S ₃ , S ₄
25		<i>Artictis binturong</i>	DD	Sch I	
26	Herpestidae	<i>Herpestes auropunctatus</i>		Sch IV	S ₁ , S ₂ , S ₆ , S ₈
27	Manidae	<i>Manis pentadactyla</i>	LR	Sch I	S ₁ , S ₆
28	Leporidae	<i>Lepus nigricollis</i>			S ₃ , S ₄ , S ₅ , S ₆
29	Hystricidae	<i>Hystrix brachyura</i>	Vu	Sch II	S ₁ , S ₃ , S ₄ , S ₅ , S ₆
30	Sciuridae	<i>Ratufa bicolor</i>		Sch II	S ₁ , S ₂ , S ₃ , S ₄
31		<i>Callosciurus macclellondi</i>			S ₁ , S ₃ , S ₄ , S ₅ , S ₆ , S ₇ , S ₈
32		<i>Callosciurus pygerythrus</i>			S ₁ , S ₃ , S ₄ , S ₅ , S ₆ , S ₇ , S ₈
33	Pteropodidae	<i>Pteropus giganteus</i>		Sch V	S ₁ , S ₂ , S ₃ , S ₄ , S ₅ , S ₆ , S ₇ , S ₈
34	Vespertilionidae	<i>Pipistrellus coromandra</i>		Sch V	S ₁ , S ₂ , S ₃ , S ₄ , S ₅ , S ₆ , S ₇ , S ₈
35	Muridae	<i>Bandicota sp.</i>		Sch V	S ₁ , S ₂ , S ₃ , S ₄ , S ₅ , S ₆ , S ₇ , S ₈
36		<i>Rattus rattus</i>		Sch V	S ₁ , S ₂ , S ₃ , S ₄ , S ₅ , S ₆ , S ₇ , S ₈
37		<i>Mus musculus</i>		Sch V	S ₁ , S ₂ , S ₃ , S ₄ , S ₅ , S ₆ , S ₇ , S ₈
38	Rhizomidae	<i>Rhizomys sinensis</i>		Sch V	S ₁ , S ₂ , S ₃ , S ₄ , S ₅ , S ₆ , S ₇ , S ₈

DD=data deficient, En=endangered, LR=lower risk, Vu=vulnerable

S₁ = Bonda, S₂ = Panikhaiti, S₃ = Hajongbari, S₄ = Thakurkuchi, S₅ = Panbari, S₆ = Botahghuli, S₇ = Kumarkuchi, and S₈ = Khanapara.; WPA= Wildlife (Protection) Act, 1972

FOREST NEWS

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NEW ZEALAND HOSTS THE “SILVER ANNIVERSARY” 25th SESSION OF THE ASIA-PACIFIC FORESTRY COMMISSION



Hiroyuki Konuma, FAO's Assistant Director-General for Asia and the Pacific, receives a traditional Maori greeting at the Opening Session of the 25th APFC meeting held in Rotorua, New Zealand.

Forestry can contribute vastly to enhancing prosperity if concerted efforts are made by forest managers, governments and the private sector. This was the message that emerged from a gathering of more than 200 leading forestry experts and policy makers, meeting in Rotorua, New Zealand, 5-8 November 2013. At the invitation of the Government of New Zealand, Rotorua, the heartland of forestry of New Zealand, hosted the “Silver Anniversary” 25th Session of the Asia-Pacific Forestry Commission (APFC). This was the second time that Rotorua hosted the Commission – the first being nearly half a century ago, in 1964.

The main theme of the Session was “Forests for prosperity.” The theme highlighted the multi-dimensional and complex linkages between forests, society and prosperity. The topic was considered timely since the role of forests in enhancing prosperity has not been fully understood or widely appreciated. Delegates discussed the theme at length and proposed new ideas to foster collaborative efforts to seize the opportunity for forests to make real contributions to prosperity and well-being.

The objectives of the 25th Session of APFC were to:

- (i) discuss and assess technical and policy issues and trends of relevance to forestry in the region;
- (ii) develop and advance mechanisms for regional and sub-regional cooperation in addressing forestry problems;
- (iii) advise FAO on policy formulation and on priorities for its forestry programmes in the region.

Participants came from a wide range of backgrounds, including delegates from 28 member countries and 2 United Nations organizations, and observers and representatives from 16 regional and international inter-governmental and non-governmental organizations. The heads of forestry from 17 member countries participated.

Opening ceremony

At the opening of the 25th Session of APFC, delegates were welcomed by a traditional *maori powhiri*, a welcoming ceremony conducted by the local *Te Arawa iwi* tribe, which included speeches, dancing, singing and a *hongi* (traditional greeting done by pressing one's nose and forehead at an encounter).

Following the *powhiri*, Mr. Hiroyuki Konuma, the FAO Assistant Director-General and Regional Representative for Asia and the Pacific, welcomed participants on behalf of FAO. He thanked the Government of New Zealand and especially the Ministry for Primary Industries, for their outstanding preparatory work and arrangements. He stressed the importance of pursuing proactive, prosperity-enhancing approaches as he said, "In a world where people's aspirations are changing rapidly and dramatically, it is not enough to simply lift people above the poverty line; a proactive prosperity-enhancing approach must be pursued."

Ms. Eva Muller, FAO Director of Forest Economics, Policy and Products welcomed participants on behalf of the FAO Assistant Director-General for Forestry. She highlighted the importance of people-centred, landscape-scaled approaches in forestry that recognize and maximize the contributions of forests and trees to

food security, sustainable livelihoods and eradication of poverty.

The Honorable Jo Goodhew, Associate Minister for Primary Industries, Government of New Zealand, welcomed the distinguished guests and delegates to Rotorua. She emphasized her government's commitment to sustainability, including the importance assigned to indigenous forests. She stressed the importance of combating illegal logging due to the harm it causes to the environment, local communities and the legitimate industry.

Forests for prosperity

The Commission recognized that the Millennium Development Goals provide a framework for enhanced global prosperity and poverty alleviation. Delegates highlighted a need for sustained growth with equity, recognizing a need to avoid depletion of natural resources. Several countries highlighted a need to accelerate towards green economy principles.

Forest financing: Investing for prosperity

The Commission noted that forest financing is a major challenge with significant shortfalls in funding for sustainable forest management. While the challenge exists, delegates also recognized that broad options for forest financing include state budgets, private sector investment, financing from the international community and payments for ecosystem services. Delegates noted a significant opportunity to mainstream forestry in national planning and policy-making, including allocation of national budget, in view of the values provided by forest ecosystems.

The Commission noted the importance of recognizing, and reflecting in market considerations, the multiple benefits provided by forests, including timber, non-wood forest products and ecosystem services, in order to strengthen the financial basis for sustainable forest management. However, delegates also recognized significant difficulties in valuing ecosystem services, and in implementing practical systems of payments for ecosystem services, as appropriate for respective member countries.

The Commission emphasized that more needs to be done to draw attention to the multiple benefits of forests, including strengthening forestry communications efforts. It further highlighted a need for further work on methodological issues related to payments for ecosystem services, including development of valuation methods that recognize the full benefits and values of forests. Finally, the Commission urged FAO to assist countries in understanding and accessing sources of forest financing such as from multilateral development banks.

Forest law enforcement, governance and trade (FLEGT): Emerging legality restrictions and responses

The Commission welcomed the many tangible measures and support for addressing issues related to FLEGT that had evolved in recent years, including legality requirements in consumer countries, voluntary partnership agreements, timber legality verification systems, forest certification, codes of practice for forest harvesting, guidelines for forest enterprises and operators, timber tracking systems, chain-of-custody certification, and enhanced monitoring by civil society.

Delegates requested FAO to continue efforts to raise awareness and increase understanding of evolving international demand-side legality requirements, through regional information or training workshops and other mechanisms, and further coordinate with other FLEGT support programmes. In this regard, the Commission encouraged efforts to more actively engage the private sector in these activities.

The Commission requested FAO, in collaboration with other partner organizations, to address FLEGT capacity building needs through targeted support provided through the EU-FLEGT Programme. Noting particular challenges in meeting legality assurance requirements to small-scale timber producers, and to those sourcing raw materials from these smallholders, and/or from trees outside forests, home gardens and farm forests, the Commission urged FAO to give particular attention to supporting them.

Delegates appreciated the development of the Voluntary Guidelines on Responsible Governance of Tenure of Land, Fisheries and Forests and highlighted their usefulness in helping to inform tenure reform processes and providing a framework for further discussions on sensitive issues related to forest and land tenure. The Commission recommended that FAO build awareness of the Voluntary Guidelines on Responsible Governance of Tenure of Land, Fisheries and Forests and facilitate the sharing of experiences and approaches in implementing the Guidelines.

State of forestry in the Asia-Pacific region

Delegates underscored continuing threats to forests from a number of sources such as land concessions for agro-industrial development, mining, and hydro-electric and other infrastructure were noted. Furthermore, escalating pressures on forests as a result of growing populations, expanding economic development and changing societal expectations were noted. The Commission encouraged FAO to conduct additional analysis on the impacts of these drivers of change on forests.

In line with the “Forests for prosperity” theme of the Commission session, several countries reported on recent initiatives to expand value-added wood processing, enhance wood recovery from forest resources, tap new market opportunities, develop payments for ecosystem services, and create more jobs in the forestry sector.

Delegates highlighted the growing importance given to adaptive and mitigative measures to respond to climate change and natural disasters. Significant progress was reported in strengthening capacities for measurement, reporting and verification, forest monitoring and assessment, and national forest inventories, often supported by REDD+ readiness programmes. Progress was also reported with respect to governance structures and participatory processes, and disaster risk assessment and preparedness. The Commission nonetheless noted many remaining challenges, including lack of technical capacity and high costs constraining REDD+ readiness activities, climate

change adaptation, and resilience to natural disasters.

Delegates highlighted continuing emphasis on decentralization and devolution of forest management, community forestry, participatory approaches, and strengthening of forest tenure and access rights for local forest-dependent people.

The Commission encouraged FAO to work with regional partners and member countries to give increased attention to forest landscape restoration, including natural regeneration of forests, and to develop natural regeneration strategies to complement intensive planted forest programmes.

In-session seminar: Building resilience in forests, landscapes and communities

The Commission noted a need to ensure resilience building activities in the full range of forest types including secondary forests, coastal forests and mangroves. The importance of restoring forests and maintaining natural forest dynamics, before severe depletion occurs, was also noted.

The Commission recognized an urgent need to increase self reliance and resilience in many forest-dependent communities. The importance of capturing cross sectoral synergies between forestry and agriculture in building community resilience was noted. Delegates highlighted the potential of the Forest and Farm Facility for building the capacity of countries in this regard and noted that globalization and new regional trade agreements may adversely affect some rural communities.

The Commission requested FAO to: (i) facilitate the sharing of experiences on building resilience in forests, landscapes and forest dependent communities; (ii) give increased attention to building resilience to natural disasters, including developing a regional action plan in relation to forests and natural disasters; (iii) produce a knowledge product relating to forests and droughts in Asia and the Pacific; and (iv) that member countries explore opportunities to interface these activities with the International Year of Family Farming (2014).

Progress in implementing APFC- and FAO-supported activities in the region

The importance of the Global Forest Resources Assessment (FRA) programme was acknowledged. Delegates noted the importance of trees outside forests, including fruit trees, in many countries in the region. The use of remote sensing technology and associated capacity building and technology transfer under the FRA programme was welcomed. The Commission urged member countries to participate actively in the 2015 Global Forest Resources Assessment and to submit their reports in a timely manner. The Commission further requested FAO to provide technical support for strengthening national capacities for forest monitoring and assessment, and efforts to harmonize data collection and reporting.

The Commission welcomed the establishment of the Asia-Pacific Forest Policy Think Tank (APFPTT) and the Asia-Pacific Forestry Communications Network (APFCN) as mechanisms for capacity building, awareness raising, and sharing information, expertise and knowledge. Delegates highlighted the roles of the two mechanisms in promoting grassroots success stories in Asia-Pacific forestry.

The Commission noted the importance of research and education in developing a sound foundation for sustainable forest management. The various initiatives of international organizations working to promote education and research in the region were acknowledged, including FAO's efforts to establish an Advisory Panel on Forest Knowledge.

The Commission acknowledged FAO's on-going efforts to promote forest landscape restoration and forest rehabilitation. The Commission requested FAO to continue to give this work high priority, including giving attention to watershed management and soil and water conservation.

The Commission noted the particular vulnerabilities of Small Island Developing States (SIDS) to natural disasters. A need for individualized approaches to provision of support to SIDS was acknowledged. Several countries appreciated FAO assistance in utilization of senile coconut resources. Delegates

highlighted a need for support to some countries to obtain access to appropriate forest tree seed supplies.

The Commission noted the need for greater support to communities and grassroots stakeholders in countries. The Commission highlighted the benefits of translation of relevant publications into local languages.

The Commission noted on-going work on mainstreaming gender into forest policies and requested FAO and partner organizations to develop a regional action plan on gender mainstreaming to progress this work.

Several countries noted the complex array of international agreements, processes and financing mechanisms (including the Global Environment Facility) relating to forestry. The Commission requested that FAO continue to assist countries in understanding and responding to international agreements, participating in dialogues, and formulating proposals for donor support.

The Commission urged FAO to continue to seek opportunities to collaborate and harmonize work on cross-cutting issues with other international agencies including the member organizations of the Collaborative Partnership on Forests.

The Commission noted the potential for greater involvement of national offices of FAO Representatives in forestry activities. Delegates highlighted the value of receiving written reports on implementation of their activities from relevant international forestry organizations at future APFC sessions.

Heads of forestry dialogue: Policies to support wood processing development

Some delegates noted a wide range of constraints to investment in wood processing, including poor or excessive regulation, trade restrictions, low profitability, issues surrounding economies of scale, security of wood supplies, distance from markets, weak supporting infrastructure, monopolistic industry structures, relative incentive regimes, deficiencies in capacities and expertise, and limited access to appropriate science and technology.

Delegates noted a number of key elements in creating enabling environments for wood processing, including firm political commitment, market-driven policies, investment in research and development of technology, upgrading competitive advantages, development of raw material resources, and regulatory frameworks conducive to business.

Countries recognized a general desire to enhance domestic wood processing capacities, including development of downstream and remanufacturing facilities. Several delegates highlighted potential benefits of sharing experiences in developing wood processing industries. The Commission encouraged member countries to report on progress in developing new wood processing capacity at subsequent APFC sessions.

The Commission requested FAO to explore mechanisms to support special diagnostic missions to interested countries, with a view toward fostering an enabling environment for rational and competitive wood processing.

Forests and climate change: Pathway to prosperity?

Delegates noted that the links between forests and climate change had served to effectively draw the attention of diverse interest groups to the environmental, social and cultural importance of forests. The Commission urged members to seize the opportunity for promoting the importance of the forestry sector.

The Commission highlighted the critical roles of local stakeholders in managing forests effectively in the face of challenges posed by climate change. Delegates highlighted the need for adequate financial and technical support to implement community-based natural resources management.

The Commission requested FAO to continue working closely with partner organizations within the framework of the United Nations Framework Convention on Climate Change to support REDD+ initiatives.

Delegates noted the predicted increase in the frequency and severity of natural disasters as a

result of climate change. The Commission therefore encouraged FAO and member countries to work to increase disaster preparedness and build greater understanding of the roles of trees and forests in mitigating natural disasters and supporting post-disaster recovery.

Delegates noted that attention has largely shifted to adaptation considerations in many countries, but that capacities to support adaptation to climate change is limited in many areas. The Commission requested FAO to provide technical support to build capacities in member countries to address climate change adaptation at policy levels and to strengthen resilience and implementation of climate change adaptation measures at community levels. The Commission requested FAO to support regional sharing of information, forest data, and experiences related to the roles of forests in climate change adaptation, in collaboration with other international and regional partners and established mechanisms.

Strategic developments in FAO and the UN

In view of FAO's role as the leading global forestry organization the Commission emphasized the importance of continuing FAO's core technical work in forestry under the new strategic framework. Delegates highlighted emerging areas such as the contribution of forests to food security and nutrition, and resilience of forest-dependent communities.

The Commission recommended FAO's role in the global forest architecture, especially the Collaborative Partnership on Forests, to be strengthened taking into account the review of the international arrangement on forests to be conducted for the eleventh session of the United Nations Forum on Forests in 2015.

The Commission noted that the multi-functionality of forests and their contributions to all three dimensions of sustainable development are inadequately reflected in the Millennium Development Goals. Delegates noted that forests have been recognized as an important element in "The future we want," the outcome document of the Rio+20 conference.

The Commission strongly recommended the development of a stand-alone sustainable development goal on forests and emphasized the need to raise the profile of forests in the Sustainable Development Goals (SDGs), with targets and indicators reflecting the multi-functionality of forests and their contribution to sustainable development.

The Commission noted that the Open Working Group on Sustainable Development Goals (OWG) established through the Rio+20 process is currently debating the formulation of sustainable development goals. Key features of SDGs are that they should be action-oriented, aspirational, easy to communicate and should address all three dimensions of sustainable development. The Commission urged countries in the Asia-Pacific region to actively engage in the discussions on a forest-related SDG through the OWG.

The Commission requested FAO to support the process of consideration and development of an SDG on forests and particularly the development of relevant targets and indicators.

Tools for sustainable forest management

The Commission welcomed initial work on the development of the SFM Toolbox and noted that it could provide valuable support for sustainable forest management in the region. Delegates encouraged FAO to collaborate with other forest-related organizations, in particular ITTO and CIFOR, in the further development of the Toolbox and to focus on identified gaps and to avoid duplication of efforts. The Commission requested FAO to provide training on the use of the Toolbox when completed.

The Commission welcomed the work of FAO on the development of the Voluntary Guidelines on National Forest Monitoring as requested by COFO 2012 and endorsed the proposed scope and process. Delegates suggested to include a section on how to integrate forest monitoring results into policy and decision-making processes in countries.

The Commission urged FAO to continue to work with other organizations to harmonize definitions and streamline forest-related reporting, building on

the work of the Collaborative Partnership on Forests Task Force on streamlining forest-related reporting and on the Collaborative Forest Resources Questionnaire. The Commission further urged FAO to continue to provide support to countries to design and implement national forest monitoring systems.

Delegates shared experiences on forest fire management, noting that fire management is a tool and that community-based forest fire management has proved to be effective in the region. Delegates recommended focusing more strongly on fire prevention and on the development of emergency response management systems. Delegates were provided with additional information on the International Wildland Fire Conference that will be held in the Republic of Korea in 2015.

The Commission welcomed the update on the “Smart Fire” Umbrella Programme and encouraged FAO to identify additional resources for its implementation. It encouraged members to take advantage of the inclusion of disaster risk reduction and wildfires in GEF-6. The Commission urged FAO to continue to strengthen international cooperation on fire-related activities and support regional networks and initiatives.

Forests and food security: Follow-up to the conclusions of the international conference

Delegates agreed that the conference had been valuable and timely in highlighting the numerous contributions that forests make to food security and nutrition and encouraged further initiatives to highlight these important linkages. It was suggested that World Food Day celebrations offered excellent opportunities to highlight the contributions that forests make to food security in each country.

Delegates emphasized that efforts to ensure food security and nutrition should be balanced with needs for sustainable forest management, including production of timber and non-wood forest products and provision of ecosystem services of forests. Delegates further stressed that agricultural production could be increased without further loss or degradation of forests and that safeguards were

needed to ensure that the full impacts of forest conversion are taken into account.

Delegates noted that there was a lack of comprehensive data and information on the contributions of trees and forests to food security and nutrition. The Commission requested FAO to develop methodologies, standard definitions and terminology to support the collection, analysis, and reporting of such data, and to provide guidance and assistance to member countries in implementing such activities.

Preparations for the XIV World Forestry Congress

The Commission welcomed the preparations being made for the XIV World Forestry Congress, which will be held in Durban, South Africa, in September 2015.

The Commission recognized that the Congress would provide an excellent opportunity to promote the findings of the Global Forest Resources Assessment 2015.

The Commission requested FAO to explore the potential for incorporating a high-level ministerial component as part of the Congress.

Regional issues identified by the commission for the attention of the committee on forestry (COFO) and the FAO regional conference for Asia and the Pacific

The Commission noted the new governance structure of FAO including the increased importance of the Committee on Forestry (COFO) and the FAO Regional Conference for Asia and the Pacific in the development of the Organization’s programme of work and budget. The Commission expressed its concern over the potential for deprioritization of forestry in the new governance structure. The Commission encouraged member countries to ensure that forestry is strongly represented in national delegations and/or in national processes to develop priorities for presentation to the FAO Regional Conference.

The Commission proposed several topics for the agenda of the 22nd session of COFO including: (i)

development of a stand-alone SDG for forestry; (ii) the importance of forestry in combating climate change and land degradation; (iii) payments for ecosystem services; and (iv) forest financing.

The Commission noted that the Chair and the Secretary would work to identify other recommendations from the proceedings of the 25th session of APFC for the attention of COFO including: (i) issues relating to forest governance, particularly in relation to forest tenure and access rights; (ii) forest landscape restoration; and (iii) building resilience against climate change and natural disasters.

Other business

The Commission was informed of activities implemented by four of its working groups and initiatives: the Asia-Pacific Forest Invasive Species Network (APFISN); The Asia-Pacific Forest Policy Think Tank (APFPTT); the Asia-Pacific Forestry Communications Network; and the Kids-to-Forests (K2F) initiative.

Date and place of the next session

The Commission noted with appreciation the expression of interest by the delegation from the Philippines to host its twenty-sixth session.



L-R Patrick Durst (FAO-Secretary APFC), Eva Muller (FAO), Hiroyuki Konuma (ADG-FAO), Su Chunyu (China), Jo Goodhew (Associate Minister for Primary Industries, New Zealand), Jarred Mair (New Zealand-Chairperson APFC), Marcial Amaro Jr. (Philippines), Warren Parker (New Zealand)

Special features of the twenty-fifth session of APFC

Innovative approaches were used throughout the Session. Besides the formal Session of APFC there were a number of events and activities which were built around the Session to share information and stimulate discussions on certain topics, namely:

1. **The “Speed Geeking”** session featured 18 organizations presenting their activities and programmes and answering questions from audience participants within a relatively short time frame (5 minutes). After the allocated time had elapsed, the audience participants moved to the next presenter.
2. **A field trip** - the Ministry for Primary Industries of New Zealand organized a field trip on Thursday, 7 November 2013, in partnership with the following organizations: Scion, New Zealand’s Department of Conservation (Mokoia Island), Waiariki Institute of Technology, Crown Forestry and Lockwood.
3. **A side event** on “Implementing the Forest Instrument: Experiences from Pilot Countries” was held on Friday, 8 November.

ASIA-PACIFIC FORESTRY COMMISSION PARTNER EVENTS

Prior to the formal APFC Session, eight pre-session workshops were convened 3-4 November, namely:

- 1. Forest restoration at landscape level in Asia-Pacific (organized by RECOFTC and FAO);**
- 2. Mainstreaming gender issues into forest policy (organized by RECOFTC and FAO);**
- 3. Forestry strategic planning in the Asia-Pacific region (organized by APFNet and FAO);**
- 4. What has REDD+ done for us?, (organized by UN-REDD, FAO and GIZ);**
- 5. Third forestry college deans' meeting (organized by APFNet and FAO);**
- 6. Sustainable forest management for prosperity in the Pacific Island countries (organized by SPC, GIZ and FAO);**
- 7. Forests and natural disasters (organized by FAO, APAFRI and SPC);**
- 8. Tools for ecological and economic impact assessment of invasive alien species in forest ecosystems (organized by APFISN, USDA Forest Service, New Zealand Ministry of Primary Industries, Kerala Forest Research Institute (KFRI) and FAO).**

WHAT HAS REDD+ DONE FOR THE FOREST?

Twenty-two participants gathered to discuss the provocative question "What has REDD+ done for us?" This side event explored the concepts of "no regret" benefits of REDD+ Readiness initiatives. With the substantial investments already made in such initiatives in the Asia-Pacific region, will the anticipated results be of long term benefit to forest sector stakeholders whether or not an international climate change agreement is eventually forthcoming? Introducing the event, Wulf Killman (GIZ Pacific) noted the timeliness of this topic, particularly with regard to meeting the expectations of forest-dependent communities. Presentations and a panel discussion drew on experiences from Papua New Guinea, the Philippines, Vietnam and the wider Pacific region.

MAINSTREAMING GENDER INTO FOREST POLICIES

This one-day regional workshop was attended by 13 participants. It enhanced learning among stakeholders, including policy-makers, on promoting integration of gender equality in national forest policy. Stakeholders representing eight APFC member countries - Cambodia, Fiji, Indonesia,

Nepal, the Philippines, Sri Lanka, Thailand, and Vietnam - participated in the workshop. This allowed for cross-country learning and sharing of experiences in integrating gender perspectives into national forest policy. The workshop concluded the way forward and made a number of recommendations including: review policies and action plans; increase the sharing of good practices and examples; allocate resources to more gender-related activities; build capacity specifically for policy makers at all levels; and enhance the number of women in decision making.

FORESTRY STRATEGIC PLANNING IN THE ASIA-PACIFIC REGION

Why strategic planning? How can we collaborate in the future on this topic? These were amongst the key questions asked during this particular workshop. Patrick Durst (FAO) and Qu Guilin (APFNet) stressed the importance of building regional collaboration to support countries in their efforts to improve the strategic planning process. Yurdi Yasmi (FAO) indicated that there is a lot to learn from each other and a wealth of information available, for example the Asia-Pacific Forestry Sector Outlook Study. The following countries shared their experiences: Australia, China, Lao PDR, Malaysia, Mongolia, Myanmar, Papua New

Guinea, Philippines, Thailand, and the USA. The workshop suggested practical steps forward to continue collaboration and strengthen strategic planning process across the region such as through networking, workshop and capacity building.

FOREST LANDSCAPE RESTORATION (FLR)

Twenty people attended the workshop, which was convened to bring together key stakeholders in FLR to share knowledge, discuss future steps, and facilitate partnerships among organizations in the region. Presenters reviewed the history of FLR efforts, highlighted the shift towards managing forests for multiple values and ecosystem services, emphasized the need to scale up restoration efforts to the landscape scale, and identified policy and regulatory issues limiting FLP implementation.

Participants reflected on the current state of FLR and requirements for success, including strategic spatial planning, multi-stakeholder consultation, and clear tenure and use rights. The workshop concluded with a brain-storming session, which compiled suggestions for collaboration and future directions. These included identifying key actors, sharing knowledge, and creating new communication platforms and materials.

TOOLS FOR ECOLOGICAL AND ECONOMIC IMPACT ASSESSMENT

Patrick Durst (FAO) welcomed participants to the Asia-Pacific Forest Invasive Species Network (APFISN) workshop on tools for ecological and economic assessment of invasive alien species in forest ecosystems. Kenichi Shono provided opening remarks. Eighteen participants attended the workshop, representing 14 countries. The workshop aims to conduct hands-on training to the nodal officers of APFISN to undertake both economic and ecological impact assessment of alien invasive species in their forests. This is an essential pre-requisite to communicate the alien species to government officials and the general public. The training was facilitated by Shiroma Satyapale and Melanie Newfield, both from the

Ministry for Primary Industries, New Zealand, and Gary Man from the USDA Forest Service.

FORESTS AND NATURAL DISASTERS

This session addressed the multiple roles of forests and the forest sector in the various stages of disaster risk management, from mitigation and preparedness through to response and recovery. Session 1 summarized the underlying science and technical knowledge of the relationships between forests and hazards such as landslides, wildfires and floods. In Session 2, the focus shifted to the human dimensions of disaster risk management. In this session, presenters highlighted the contributions of community forestry in building resilience, and how social vulnerabilities, access to resources, and local capacities act to mediate disaster impacts. The workshop then broke into groups in order to brainstorm potential actions and directions for governments and international organizations to take at each stage of the “5 Rs” of disaster risk management. Simmathiri Appanah closed the workshop by reiterating that disasters can provide opportunities to redesign and rebuild, and that it is forest management rather than forests that can contribute to mitigating, or increasing, the risk of disasters.

SFM IN PACIFIC ISLAND COUNTRIES

Sustainable Forest Management (SFM) in the Pacific island nations, a workshop composed of 40 participants, served as the forum for countries to share their SFM methods and issues faced. Art Klassen, the keynote speaker, addressed the dilemma of SFM and stressed the need to “think globally, act locally.” Country presentations on SFM from each region were given by Fiji, Kiribati, Niue, Samoa, and Solomon Islands. Each representative introduced the current country status and the challenges encountered, as well as the guidelines and government policies. The final session titled “A dream or a reality?” was moderated by Wulf Killman, together with five panelists – representatives of Micronesia, Melanesia and Polynesia, Secretariat of the Pacific Community (SPC) and the private sector. Every country agreed that they were on the way to achieving SFM. SFM

is more than a dream, and each country is working in different ways to accomplish this reality.

THIRD FORESTRY COLLEGE DEANS MEETING

On 4 November 2013, the Third Forestry College Deans Meeting in the Asia-Pacific region was held in the Rotorua Energy Events Center, New

Zealand, gathering about 14 deans and chancellors from 13 regional economies. Facing the emerging challenges of forestry and education development, the deans and professors this time addressed the meeting theme of “Evolving methods of curriculum delivery in post-secondary forest education” and agreed in principle on a concrete action plan for advancing the Forestry College Deans’ Meeting Mechanism in the Asia-Pacific region.

APFC NEWSLETTER

An innovative feature of the APFC meetings, first introduced during the 22nd session held in Vietnam, was the daily newsletter that was circulated to all participants. The newsletter recapped the events of the previous day, announced the events for the next day, gave tips and interesting information

about the host country, and featured photos and spot interviews with participants about their views on how the meeting was going. The newsletters were creatively put together and represented a lot of hard work on the part of the team compiling it.



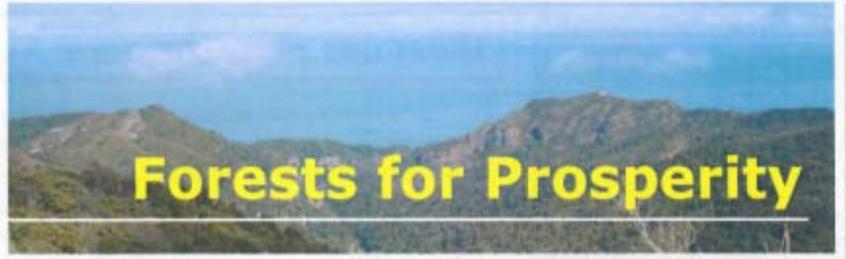
*Newsletter team (L-R): Sarah Dickson-Hoyle (IFSA)
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Rotorua, New Zealand
5-8 November 2013

Issue 1
5 November 2013
Inside this issue: Highlights
Of Pre-session workshops

25th Session of the Asia-Pacific Forestry Commission



New Zealand



Haere Mai! Welcome to New Zealand!

New Zealand (in Māori: **Aotearoa**) is geographically comprised of two main landmasses including the North Island and the South Island. **New Zealand** was one of the last major landmasses settled by humans.

Rotorua from Māori: **Te Rotorua-nui-a-Kahumatamomoe** is a city on the southern shores of the lake of the Kahumatamomoe, in the Bay of Plenty area of the North Island of New Zealand.

Rotorua		Partly Cloudy		16°	
Monday	16	19	16	18	12
Tuesday	16	19	16	17	12
Wednesday	16	19	16	17	11
Thursday	16	19	16	17	11
Friday	16	19	16	17	11
Saturday	16	19	16	17	11

Natural New Zealand: a slice of heaven!



Sea, snow and sky - stunning!



I am from New Zealand!

What is your first impression of New Zealand?

Take your Kiwi experience home!

Useful tips:

- Pak' N Save: the best place you can buy groceries (8am-10pm).
- No commission or bank charge if you exchange money at the Kiwi Bank!
- Free public wifi is available in most parts of the CBD (Rotorua_Free WiFi)



Portia G. Lapitan - New Zealand is the place where I want to be after my retirement.



Cenon Padohina - Rotorua is a great place for the workshop, perfect natural environment - I love the smell!



Pratiwi Donosoekarto - New Zealand is beautiful and it is spring time!

Preparations...

Reaching the stress level....



Still relax and enjoy NZ!



Serious team meeting



I can't take it anymore!



Ken in action!

Secretariat team in action....



What do we need to bring tomorrow? Happy smiling in the end!



Happy smiling in the end!



Almost done!



The publication booth team.

Welcome note from Eduardo Rojas, FAO Assistant Director General for Forestry



Distinguished participants,

Welcome to the 25th Session of the Asia-Pacific Forestry Commission!

I would like to express my apologies that I could not attend this important event due to an unavoidable commitment. I would, however, like to extend a warm welcome to the 25th "Silver Anniversary" Session of the Asia-Pacific Forestry Commission. I sincerely hope the week's discussions will result in recommendations for effective collaboration in tackling the challenges ahead and contribute positively to the aims of the APFC—most particularly the achievement of sustainable forest management throughout the region.

Coming today.....

- *Opening ceremony*
- *Adoption of agenda and election of officers*
- *Agenda items 3, 4, 5, & 6*
- *Reception dinner*

Tomorrow.....

- *In-session seminar*
- *Agenda items 8, 9, 10 & 11*
- *Speed geeking*

WORLD WILDLIFE DAY



The Collaborative Partnership on Sustainable Wildlife Management (CPW) welcomes the United Nations General Assembly decision to proclaim 3 March as World Wildlife Day, as a means of celebrating the importance of the world's flora and fauna, strengthening efforts to conserve biodiversity and stepping up the fight against the illegal trade in wildlife.

As a voluntary partnership comprising 12 international organizations with substantive mandates and programmes in wildlife management, the Partnership offers a unique platform for coordinated action among its twelve founding members in promoting the sustainable use and conservation of terrestrial vertebrate wildlife in all biomes and geographical areas.

Established in March 2013, the Partnership helps generate better understanding of critical wildlife management issues and their linkages to human-wildlife-conflict, food security, sustainable livelihoods and good governance. Building on the expertise of its members, its focus has been on assessing different policy options to ensure cross-sectoral cooperation in support of efforts by countries to manage their wildlife resources sustainably.

On the occasion of World Wildlife Day, the Collaborative Partnership on Sustainable Wildlife Management calls on all governments, parties to multilateral environmental agreements, donor agencies, including development banks, private

and corporate donors, and business consortia, other relevant international bodies and organizations, indigenous and local community organizations and civil society, to make concerted and coordinated long-term efforts to support actions that promote innovative initiatives that conserve wildlife, improve the health and well-being of humans and combat illegal activities related to wildlife.

Such action needs to recognize the cross-sectoral dimensions of wildlife management by involving and engaging stakeholders outside the wildlife conservation community, including, local communities and Indigenous Peoples, and supporting their efforts.

The Partnership will examine underlying causes of unsustainable wildlife management practices, their social, economic and ecological implications, and report on progress in fulfilling its work, through its collaborative arrangement among members. The next meeting of the Partnership, on the margins of the General Assembly of the International Council for Game and Wildlife Conservation, in April 2014, will further the implementation of its work programme and strengthen fundraising. Subsequently, the first progress report of the Partnership will be presented in October 2014, in Pyeongchang, Republic of Korea, during the twelfth session of the Conference of the Parties to the Convention on Biological Diversity.

<http://www.fao.org/forestry/wildlife-partnership>

ASIA-PACIFIC FORESTRY CHIPS AND CLIPS

REDD+ LEARNING SESSIONS

The WWF Forest and Climate Programme's online Learning Sessions are free and designed to leverage and share REDD+ knowledge and expertise. Every month a REDD+ expert is invited to present a webinar on a key issue, so that REDD+ practitioners around the globe can have access to the latest information related to REDD+. Learn more at the following website: http://wwf.panda.org/what_we_do/footprint/forest_climate2/redd_learning/learning_sessions/
– *WWF Global* –

MANGROVES CAN ADAPT TO RISING SEA LEVELS

“The response of mangrove soil surface elevation to sea level rise,” a new report by The Nature Conservancy and Wetlands International, shows that mangroves can adapt to rising sea levels by building up soils in some locations, allaying fears that mangroves may be lost as sea levels rise.

Coastal ecosystems such as mangroves can reduce risk to people and infrastructure from wave damage and flooding. The continued provision of these coastal defense services by mangroves is dependent on their capacity to adapt to projected rates of sea level rise. This report explores the capacity of mangrove soil surfaces to increase in elevation in response to local rises in sea level.
– *Wetlands International Global Newsletter August 2013* –

WORLD BANK AIDS LAOS' FORESTS

The World Bank has signed a grant agreement of \$31.83 million to aid the Government of Lao People's Democratic Republic's sustainable forest management project.

The \$31.83 million grant agreement is for Laos' Scaling-Up Participatory Sustainable Forest Management Project, which aims to achieve the expansion of areas under approved Participatory Sustainable Forest Management plans, as well as development and piloting of a landscape approach to forest management, in support of REDD+ to further avoid unnecessary loss of forest and increase carbon storage.

In addition, the project also aims to increase the number of people with monetary and non-monetary benefits from forests, decrease the rate of forest cover loss, enhance carbon storage from improved protection and forest restoration, and reduce emissions from deforestation and forest degradation in project areas.

The grant follows Laos' Forestry Strategy to the year 2020, with the goal of improving the quality and quantity of forested areas, as well as generate a sustainable stream of forest products.
– *EcoSeed* –

NEW TEAKNET COORDINATOR

The International Steering Committee of TEAKNET unanimously nominated Dr. P.K. Thulasidas, Scientist, Kerala Forest Research Institute, as the new TEAKNET Coordinator. Dr. Thulasidas has served in KFRI for 29 years, specializing in Wood Science, and has a special interest in anatomy and wood properties of teak and other tropical timbers. He is also the Coordinator of the IUFRO Teakwood Working Party.

7-11 September 2015, Durban, South Africa



FAO ASIA-PACIFIC FORESTRY CALENDAR

22-33 April 2014. ***Inception Workshop for TCP/RAS/3408 - Control and management of destructive forest invasive species in South Asian natural and planted forests.*** Colombo, Sri Lanka. Contact: Kenichi Shono, FAO Regional Office for Asia and the Pacific, 39 Phra Atit Road, Bangkok 10200, Thailand; E-mail: Kenichi.Shono@fao.org.

5-6 May 2014. ***Equitable Development - "Sustainable landscapes, green growth and poverty reduction."*** Contact: Yurdi Yasmi, FAO Regional Office for Asia and the Pacific, 39 Phra Atit Road, Bangkok 10200, Thailand; E-mail: Yurdi.Yasmi@fao.org

12-23 May 2014. ***7th Executive Forest Policy Course: People, land use and forestry in the Pacific - Policy challenges in the 21st Century.*** Nadi, Fiji. Contact: Patrick Durst, FAO Regional Office for Asia and the Pacific, 39 Phra Atit Road, Bangkok 10200, Thailand; E-mail: Patrick.Durst@fao.org

23-27 June 2014. ***22nd Session of the Committee on Forestry (COFO).*** Rome, Italy. Contact: Peter Csoka, Secretary COFO, Forestry Department, FAO, Rome, Italy; E-mail: Peter.Csoka@fao.org

7-11 September 2015. ***XIV World Forestry Congress.*** Durban, South Africa. Contact: Tiina Vahanen, Associate Secretary-General of the XIV World Forestry Congress, Forestry Department, FAO, Rome, Italy; E-mail: WFC-XIV-Info@fao.org

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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)
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- The role of coastal forests in the mitigation of tsunami impacts (RAP Publication 2007/01)
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- Helping forests take cover (RAP Publication 2005/13)
- Elephant care manual for mahouts and camp managers (RAP Publication 2005/10)
- Forest certification in China: latest developments and future strategies (RAP Publication 2005/08)
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- Advancing assisted natural regeneration (ANR) in Asia and the Pacific (RAP Publication 2003/19) - 2nd edition
- Practical guidelines for the assessment, monitoring and reporting on national level criteria and indicators for sustainable forest management in dry forests in Asia (RAP Publication: 2003/05)
- Applying reduced impact logging to advance sustainable forest management (RAP Publication: 2002/14)
- Trash or treasure? Logging and mill residues in Asia-Pacific (RAP Publication: 2001/16)
- Regional training strategy: supporting the implementation of the Code of Practice for forest harvesting in Asia-Pacific (RAP Publication: 2001/15)
- Forest out of bounds: impacts and effectiveness of logging bans in natural forests in Asia-Pacific: executive summary (RAP Publication: 2001/10)
- Trees commonly cultivated in Southeast Asia: an illustrated field guide - 2nd edition (RAP Publication: 1999/13)

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