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

January-March 2006

TIGERPAPER

Regional Quarterly Bulletin on Wildlife and National Parks Management

Vol. XXXIII : No. 1

Featuring

FOREST NEWS

Vol. XX : No. 1

TIGERPAPER

REGIONAL OFFICE
FOR ASIA AND THE PACIFIC

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

ISSN 1014 - 2789

Address

TIGERPAPER
FAO Regional Office for Asia and the Pacific
Maliwan Mansion, Phra Atit Road
Bangkok, 10200, Thailand
Tel: (662) 697-4000
Facsimile: (662) 697-4445
E-mail: fao-rap@fao.org

Editor: Janice Naewboonnien
Advisors: M. Kashio and P. Durst

Contents

TIGERPAPER

FOREST NEWS

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

Cover: Tigress jumping after quails
Photo: Gertrud & Helmut Denzau

Tigress with cub, Ranthambhore (Photo: Gertrud & Helmut Denzau)

THE TIGER AS SCAVENGER: CASE HISTORIES AND DEDUCED RECOMMENDATIONS

by Gertrud Neumann-Denzau

Introduction

The tiger (*Panthera tigris*) is an endangered species on the brink of extinction. Fragile tiger populations require effective management methods to ensure their survival. It is high time to utilize all opportunities for saving wild tigers and for mitigating tiger-human conflicts.

It is still a common belief that tigers in the wild will eat only creatures that they kill themselves. The first part of this paper gives a review of case histories of scavenging tigers to disprove that false opinion. This knowledge makes the management of tigers in the wild easier with the possibility of a carcass-baiting tool and enables to hinder poachers from using the same.

The second part of this paper draws attention to related aspects of the man-eating problem. This might be useful for better understanding and further discussions of the matter.

Case histories: tigers scavenging animal carcasses

Hamilton (1873) from South India: "The common idea that tigers will only eat animals killed by themselves is a complete fallacy (…) they always prefer putrid to fresh meat. I have often killed a bison and left him untouched in the forest; as long as he was fresh, the tigers, although they would come and walk around him, would never touch him. The moment the bison became putrid the

tigers would gorge themselves and never leave off eating, if undisturbed, until the whole was consumed. (…) Sometimes I have been unable to go and watch; and when I have gone I have found the place trampled down with foot-prints of the tigers, and nothing but the bones of the bison left."

'Young Nimrod' (1873): "I have to say that I have occasionally stumbled across the carcasses of deer in the Sunderbun forest, which I had two or three days before mortally wounded, half eaten up by tigers, as evidenced by the bullet-marks on the dead bodies, and the foot-prints of tigers round about the spot."

Jerdon (1874): "I met with one instance of a tigress and two full-grown cubs devouring a bullock that had died of disease (...) I followed their track, and found she had dragged the dead animal into the centre of a cornfield, and picked the bones quite clean." Jerdon also mentioned a letter of a sportsman in Khandeish, who had injured or killed a tigress. In the next morning he returned to the place and discovered that she had been dragged into a ravine by another tiger and a half of the carcass was devoured.

'Hawkeye' (1876): "In one district of South India tigers never ate carcasses of shot gaur, until they were approaching putrefaction. (…) A pair of tigers eating the putrid remains of a rhino killed a week earlier, stressed the fact that tigers allow game to lie until soft and decomposed."

Atkinson (1884): "The tiger does not confine itself to animals killed by it in the chase. It has been known to eat the putrid carcass of a buffalo that had died by accident, and in the hills [North-West Provinces of India] the common bait for the dead-fall trap is a dead sheep or goat."

Baker (1887) returning to a dead rhinoceros shot the day before in the Sundarbans: "The ground round this carcass was thickly marked with the footprints of tigers, several having visited it since noon of the day before; but beyond attacking the softer parts they had not yet made much impression."

Inverarity (1888) in his article on tigers: "They will also eat the dead carcass of an animal they have not themselves killed. Mr. Raitt, of the Bombay Uncovenanted Service, was killed by a tiger that the evening before had fed on the body of a bear that Raitt had shot."

Lydekker (1900): "In the condition of their food tigers are by no means particular, and they have on several occasions been observed gorging themselves on putrid carcasses, from which the vultures have been driven away by their appearance on the scene."

Dunbar-Brander (1923): "Besides killing for themselves, tigers will eat any fresh carcass they may happen across, and I have even known them eat animals which were absolutely putrid. I have already mentioned six tigers on a putrid chital stag. This animal was one I had wounded and lost, and it had been lying dead in long grass for a week. I discovered it by the smell. The men sent to fetch the head returned in great excitement, reporting several tigers on the carcass, and when I arrived I found that the body was a mere shell and that these tigers had been scooping out the inside which consisted of smell, maggots, and putrid flesh."

Somerville (1924) regarding tiger shooting in the Sundarbans: "It is well-known that the tiger (…) on making its kill, seldom eats the flesh of its victim the very day. He (…) drags the carcass into some secluded spot, to which he returns a few days later to feast on the partly decomposed flesh." Knowing also the tiger's weakness for the flesh of the crocodile [called muggur by him], Somerville proposed: "First shoot a decent-sized muggur, next drag the body well up on to the bank, but not too far inland, as this will excite suspicion. Select a spot where fresh pug marks leave no doubt in your mind as to the probability of a tiger finding it, and then either sit up or dig yourself in and await his arrival."

Beginner (1927) reported from the Central Provinces in India that herds of domestic buffaloes are frequently taken towards Bilaspur from Jubbulpore, Mandla and Saugor districts. "When they are taken in such great numbers naturally a few die on the road (…) It will not be out of place to surmise that the tiger in question must be taking

advantage of this gift of the gods. I have reasons to believe so, because it will be noticed from what I have said that he eventually did drag away our dead buffaloes not once, but on two occasions from the roadside in question." Beginner had tried to bait tigers with live buffaloes near the road, but unintentionally they died due to some kind of cattle disease or other sickness.

Pocock (1939): "But the animal [tiger] is not particular to what he kills himself or to the freshness of the meat. If he comes across a carcass in the jungle he will eat it even in an advanced state of putrefaction, maggots and all."

Hoogerwerf (1939) from Udjung Kulon in Indonesia: "That tigers consume meat in a very far stage of decomposition was recently shown to me during a trip to the reservation. At three bantengs, shot for veterinary research, no signs of tigers were found in the first night. I had the opportunity to check one of the dead bodies several days later. It was dragged and partly eaten. This could be only done by a tiger, as no other animal in this region would be able to do so. It had happened at least 48 hours after the bull had been shot, because I had checked the dead body during the first days and nights."

Corbett (1944) believed that tigers normally are not carrion eaters, but occasionally do eat animals not killed by themselves. Once he found a buffalo that had probably died from a snakebite and saw a tigress who found the body eating a meal of it. In another case Corbett left the carcass of a leopard in the jungle and, when he came back next morning to look for a forgotten knife, he witnessed a tiger eating two-thirds of it.

Morris (1948) forwarded the following extraordinary account from South India for publication. He reported, that Grant, while hunting in the Nilgiris, shot at a tiger in late afternoon and noticed seven to eight other tigers tearing the injured one to pieces. Grant shot two of the others and as they dropped, the rest came up and fell on them, along with a hell of fighting. The following morning Grant went to pick the carcasses and retrieved one tiger intact, one half eaten and one completely eaten.

Needham reported in 1951 that in April 1932 a tiger caught a bull from a Miri village in Assam, but was driven away. The bull got up, struggled back to the village, but died three days later. The owner buried the carcass where it died. In the next morning he noticed that the tiger had dug up the carcass and eaten from it. The author covered it again and managed to shoot the tiger, when it returned the following night.

Locke (1954), who was posted 1949 - 1951 in the Trengganu area in Malaysia, wrote: "Tigers will eat almost anything that they can kill or which they find lying dead. (…) A tame animal, which has died a natural death, or a wild one that has been shot and put as bait, proves just as acceptable to a tiger as a kill that he has obtained himself. (…) The method of shooting tigers most frequently employed in Malaya is to sit up, either over a natural kill or over a live or dead animal put out for bait. (…) A dead wild pig, weighing 80 lbs. or more, will probably prove a more successful bait than a live goat, as pork in any form seems irresistible to tigers. (…) A fully-grown tiger will eat up to 40 lbs. of meat at a meal, depending on how hungry he is. It makes no difference to him how putrid the flesh has become. I have heard a tigress making unusual blowing noises when eating from a dead buffalo of which little more was left than a seething mass of maggots and have no doubt that she was blowing to clear the grubs from her nostrils. Hungry tigers are far from being particular feeders and will readily devour any carrion to which they have been attracted by smell. Sometimes they stoop to outright scavenging, as did the tigress and her cub which made a habit of visiting a town refuse dump in Trengganu to see what scraps they could pick up."

Perry (1964) citing Pollock and other not exactly named sources: "In Burma and Malaya this habit of eating putrid game and carrion is very much more prevalent than in India. A fresh kill may be neglected in favour of a rotting carcass, or the four-day-old leg of a dead horse preferred to a live buffalo calf standing a few feet away from it. (…) Even diseased carcasses thrown out by villagers may be taken, and Campbell's brother mentions a tigress and her four cubs feeding on a diseased buffalo. (…) If the American hunter who always used dead bait because he found that tigers

came more readily to this than to live bait is unique in the sporting annals of India, there is also the testimony of Millet, Monestrol and Bazé, whose experiences were similar in Indo-China, where Millet's innovation of shooting over dead baits revolutionized tiger hunting, with an immense increase in the numbers of tigers attracted to bomas [hiding place on ground] by the putrid carcasses of buffaloes and elephants. Pollock, in Burma, also found the best bait was a buffalo or gaur in an advanced state of putrefaction: three tigers being shot in one night over the five-day-old carcass of an elephant. In the dense jungles of those countries, where tigers probably do not wander as widely as in India, live baits are likely to be overlooked, whereas the high smell of a dead bait is sufficient advertisement. How else would one explain the quite recent occurrence of a tigress and two adult tigers being shot on three successive nights at a kill, with the remains being finished up on the fourth night by a fourth tiger? In Malaya and Indo-China tigers are habitual carrion eaters, even of elephants, and must be attracted by smell." Perry (1964) continues: "Bazé employed a somewhat similar subterfuge in using an elephant to drag a high carcass in a series of mile-long rays into the jungle from the site of his boma, with the result that as many as four tigers would come in to it in a single night."

Schaller (1967) studied the behaviour of tigers in Kanha (Central India) not only at buffalos staked out alive to attract the big cats, but sometimes he also placed out domestic livestock that had died from disease or other causes for observing tigers from a blind in a distance of 80 to 150 feet.

Hoogerwerf (1970) refers to cases of cannibalism from Indonesia reported by other authors, which could also be interpreted as simple carcass eating: A tiger shot in the afternoon in Bali 1910 was dragged away by a fellow-tiger about one hour afterwards and later the body was found partly eaten. In Sumatra, several times a tiger shot in the evening was found in the next morning largely eaten by another tiger.

McDougal (1977), based on regular baiting in Chitwan (Nepal), frequently observed tigers gathering at the bait site and taking turns in feeding, controlled by the tiger which had killed the animal. There are several other case histories of tigers turning up at a kill, made and partly consumed by another tiger. Thapar (1986) also observed such a situation in Ranthambhore: "A tigress had killed a nilgai bull and fed from the carcass together with her three young cubs. Two adult daughters of this tigress turned up, one by one, and were also allowed to feed. Soon afterwards, three more tigers arrived and all nine fed from the kill in turn." Sunquist & Sunquist (1988) described a male tiger dispatching a cow and a buffalo which had wandered into Chitwan. He fed on them for four days. After he left it, a tigress and her two large cubs came and ate for another three days.

Sinha (1979) reported from Palamau, that elephants killed the bait, a tethered buffalo, at night. The local staff dragged the carcass to a gully at the bank of the river. A tigress with three cubs located the dead buffalo in the following night and brought it out from the gully to a dry sandy patch, where they fed on the carcass.

Thapar (1986) described the unusual hunting technique of the tigress Noon in Ranthambhore, who specialised in rushing into the water and annexing a carcass from the crocodiles. Kublai, her mate, would often turn up and grab the carcass from her. "On one occasion, after two days of the crocodiles being unable to consume a large sambar stag, despite its putrefied and bloated state, Noon dragged the stinking carcass more than 100 metres towards a patch of grass." On another occasion a large chital stag was found dead on the shore of a lake. A crocodile made an effort to drag the carcass into the water. The next morning it was discovered that the tigress had successfully stolen the carcass from the crocodile and had dragged it into a bank of tall grass. Thapar: "I have also come to the conclusion that vulture activity is used by tigers as an aid in locating carcasses – either of animals that have died naturally or animals killed by other predators. On several occasions I have known male tigers appear from nowhere to steal the kill of a tigress. I have also seen tigers suddenly appear and chase feeding vultures from a carcass."

Sankhala (1993): "Tigers do not even despise diseased meat: I found tigers feeding on sambar

that had died of hepatic septicaemia in Sariska in 1970, and in 1981 at Ranthambhore." Sankhala appropriately named one tiger Daku, or robber, as it was his routine to driving away a tigress from her kill.

Shukla (1995) tells the story of some poachers in the range of Dudhwa Tiger Reserve not far from the village of Dharmapur in summer 1978. They were sitting at night in a pit next to a waterhole and shot cheetal and sambar with the help of a torch, as well as some peacocks at dawn. When they came out in the morning to collect their bag, they were surprised by a tiger and rushed back: "The poachers sat there at the safe perch and having regained their breath, they wondered about the unexpected arrival of the tiger. After much discussion they finally agreed that the tiger had smelt the carcasses of the shot animals lying around the pond and had now come to make a meal of them. It is not uncommon for a tiger or leopard to take up the job of scavengers. At times they may not deliberately search for signs of death, yet in case of a rightful opportunity they do not seem to deny their privilege. I have known of a few cases in which the dead cattle thrown away by the villagers were heartily devoured by tigers. Recently in one case at Sampurna Nagar, it happened near a farmhouse where the fetid smell rising from the decomposed buffalo corpse attracted a pair of mating tigers. They duly arrived and amidst the human voices stayed in the area for three days to finish it off at leisure."

Ahmed (2002) recalling Khasru Chowdhury, an expert on the Sundarbans tigers in Bangladesh: "He said he had seen dead dogs laced with pesticides being wrapped in polythene to be used later as bait. After digging a pit and filling it up with water, the dead dogs are put on a heap of earth by the pit. When the tiger eats the poisoned dog, the ingested pesticide, usually Endrine, makes the animal thirsty and the tiger gulps down water from the pit. As the water comes into contact with the toxin inside the tiger's body, the toxin becomes active and the tiger starts to choke and finally dies." This method has the advantage to leave the skin of the tiger undamaged and the poachers can sell it for a higher price.

Mills (2004): "The carcasses of animals that die of old age, diseases, starvation and fights with each other belong to everyone. They are quickly cleaned up by the scavenging brigade and tigers are not above joining in. A BBC film-team in Kaziranga watched a tiger arrive at the remains of a dead elephant. It grabbed a large piece of the elephant's trunk and ran off, holding it aloft like a giant sausage."

Mansur Fahrni (2005) observed numerous tiger tracks going back and forth to the carcass of a whale (possibly a Bryde's whale) in December 2004, a week after it was stranded at the shore of the Bay of Bengal in the southeastern Sundarbans of Bangladesh. Dark and oily tiger faeces in the surroundings indicated further, that the big cats had eaten from the whale.

Three wildlife film teams were working on tiger films in the Sundarbans of Bangladesh within the last few years (1998 - 2002). They used not live but dead cows for tiger baiting due to ethical reasons. The films are: "In search of man-eaters", "Swamp tigers", and "In quest of the Sundarban Bengal tiger". Tigers, equal to a success rate of 73 %, ate 11 out of 15 carcasses put out as bait. The mean time of discovery of the carcass by the tiger was 3.64 days (standard deviation 3.29 days, median 3.00 days, range 1-12 days, n=11). For good success the carcass had to be placed in an undisturbed area with fresh tiger pugmarks. In contrast, as known from historical records and very recent experiences, tiger baiting inside the Sundarbans with live baits (mainly cows, goats, or pigs) is not totally hopeless, but still rather unsuccessful.

Man-eating tigers

Man-eating (including man-killing) tigers are still a big problem, especially in some regions of India and Bangladesh. There are many reasons which might turn a tiger into a man-eater. The prevalence of man-eaters over periods of decades in certain localities such as Sundarbans or a particular district of the Central Provinces of India made Perry (1964) think of hereditary man-eating through education. He mentioned the possibility that grown cubs of a man-eating parent or parents will occasionally kill men if hungry, because they are

familiar with the ways of men and accustomed to their flesh. Other reasons could be shortage of natural prey, straying tigers without home ranges or hunting grounds, young, sick or old tigers without hunting success, habitat destruction and disturbances, etc. Several authors suspect that the disposal of dead human bodies as found during disasters such as floods, cyclones, droughts, war or epidemics, could habituate tigers to human flesh. So far nobody has discussed if man-eating in the afflicted regions could be explained by local burial traditions, when dead human bodies are neither buried nor burnt. According to local religious or folk traditions this may happen in case of disaster victims, disease victims, violence victims, murder or other unnatural death, snakebite victims, the death of pregnant women, or poor people (unable to pay the fuel for a cremation). Some case histories follow.

Case histories: dead human bodies neither burnt nor buried, and tigers scavenging human carcasses

Perry (1964): "Many tigers are carrion eaters. Therefore, any catastrophe that results in human bodies being left exposed can lead to tigers becoming addicted to human flesh, and subsequently killing deliberately in order to obtain this. Tun Yin has provided a modern example. In January 1942, when one hundred thousand Indians were evacuated from Burma through the Taungup pass of the Arakan Yomas, four thousand of them died in the crossing of that uninhabited wilderness of mountains and bamboo jungles. The tigers fed upon their bodies and became man-eaters, with the result that fourteen West African troops were seized by man-eaters when re-entering Burma through the Taungup in February 1946 (...). Plague, famine and drought may also result in outbreaks of man-eating, in as much as not only are there heavy losses among the tiger's natural prey, but human bodies are left unburied or hurriedly thrown into shallow graves instead of being cremated; and this may have been the case at Bhiwapur."

Jackson (1985): "Tigers can also get a taste for people in a more grisly fashion – by feasting on dead bodies. A Vietnam veteran, Major A.D. Ackels, told me that pilots and grave registration squads in Vietnam regularly reported seeing tigers scavenging bodies on battlefields. Some of these tigers even grew bold enough to attack live soldiers."

Locke (1954): "Among other contributory factors in India have been outbreaks of contagious or infectious disease which have swept the country. Hindus normally cremate their dead. When deaths are frequent, however, and the strength of a village is decimated by disease, it is sufficient from their religious point of view to place a live coal in the mouth of the corpse. It is then cast over a cliff or disposed of in some other way which obviates burial. It is known that carnivores have fed from such collections of dead bodies and have thus lost their fear of man and have acquired a taste for human flesh." Although the original source of Locke's description remains unknown, it is suspected that he consulted Corbett (1944). There is also evidence of this practice in some ethnological books as in Shasmal (1972), dealing with the Bauris of West Bengal: "Besides the burial and cremation, the Bauris sometimes leave the corpse in open air, on the burial ground. This is generally done by poorer sections of the community. It is also found in case of contagious diseases. Before leaving the dead body they touch fire on the mouth of the corpse."

Burton (1933): "It has been suggested that habits of man-eating in some cases have been acquired from the animals feeding on dead or dying victims in time of famine or epidemic disease, when people wander into the forests in search of natural produce on which to sustain life, such as various wild fruits and roots and the seed of the bamboo. But it is curious to find this propensity perhaps fostered by a custom for the disposal of the dead. Man-eaters are comparatively rare in Mysore, but Sir Stuart Fraser was told of a tiger that attacked parties bearing corpses to the burning ground and carried off the corpse. An Indian official wrote to him that it was the custom among the villagers not to burn or bury the dead bodies of pregnant females, but to expose them in the neighbouring jungles to be eaten by vultures and wild beasts. The body was tied to a tree in a sitting posture and a pot of water placed close by. Some cow-herd boys came across the dead body of a woman tied to a tree as described, and noticed the footprints of a tiger round it, but the body was

untouched. The boys cut the rope binding the body, which fell to the ground, and the next day the corpse was found partly eaten by the tiger."

Never associated before in this context is the floating burial of snakebite victims in the surroundings of the Sundarbans in India and Bangladesh. This old, possibly pre-Aryan tradition, also found in the mythology of the snake goddess Manasa, raises hope among the locals that a person who died from snakebite may be brought back to life if the dead body is set adrift on a raft. The author saw such a raft made of banana stems, carrying a dead human body, stranded during low tide on a mud bank inside the Indian Sundarbans in August 2001. People in the region confirmed that this tradition is alive and frequently practiced by Hindus and sometimes even by Moslems. Several other persons have seen such banana rafts in or next to the Sundarbans. Annotation: Bengal has the highest annual number of snakebite victims in India. Trying to find reasons for the numerous human casualties by tiger attacks in the Sundarbans, the effect of this practice should be considered. Is it possible that the availability of human carcasses (snakebite victims) turn some of the Sundarbans tigers into man-eaters? Could immediate treatment of the snake bitten with anti-venom serum help to reduce the number of snakebite victims in the region and so indirectly the number of human tiger victims?

Discussion

Recapitulating the available knowledge of the scavenging nature of tigers raises the following ideas, recommendations and remarks to stimulate a debate how to utilize these findings.

The phenomenon of cannibalism and blood rush could find new interpretations. Tigers eating dying or dead tigers that have been shot by man or even after fighting among themselves should perhaps not be called cannibals, as they do not kill their own species for consumption on purpose. Possibly, after the incident they become attracted by the unforeseen meat offering that is so easily available. Cattle-lifting

Stranded on a mud bank in Indian Sundarbans: a raft of banana stems carrying the body of a snake-bite victim under a mosquito-net (Photo: Gertrud & Helmut Denzau)

tigers in a blood rush frequently kill more animals than one at a time, if they are easily available. Is it because they plan to eat the bulk of meat much later when putrefactive?

A derived side aspect of carcass consumption is the following proposal for zoo research (under strict supervision): offer tigers fresh and old meat simultaneously and find the percentage of individuals, which prefer the latter – at any time, sometimes or never. Positive results of zoo research can burst forth the adoption and establishment of carcass baiting in the wild.

The method of carcass baiting in connection with poison is used by poachers in the Bangladesh Sundarbans, but it is possibly more widely practised than generally known. Therefore, forest staff should be instructed not to allow dogs, goats, cows or other domestic mammals, dead or alive, to be taken into the jungle, to prevent this poaching technique. Besides the negative application for the criminal destruction of tigers, there are many ways to apply carcass baiting as a tool for research and management.

The problem of man-eating tigers in the Sundarbans and in other places needs to be seriously studied. As a first measure the accessibility of dead human bodies to wild tigers should be banned as far as possible. In case of hungry tigers (as a conservation measure) or in fear of tiger attacks (in order to protect people like forest staff during field work), animal carcasses could be used for feeding.

Straying tigers in the surroundings of the Indian Sundarbans are caught in cage traps mainly with the help of tethered live goats and are released into the jungle. Statistics about the effectiveness of this trapping method are not available. According to Gomes (2003) 120 cases of straying tigers were revealed in the past twelve years from the Indian Sundarbans. Alternatively, an experienced trapping team should offer up dead animals instead. The two different baiting techniques have to be compared in order to obtain the best results. Straying tigers in the surrounding areas of Bangladesh's Sundarbans are scared away with the help of sounds (drums, crackers, blank fires, etc.). But often the forest staff comes too late and villagers have already killed such tigers with sticks or axes (Anon., 2003a,b,c), risking their own lives. A reliable method to catch straying tigers could help to save the lives of villagers and tigers as well. Translocations of wild tigers may be used not only for the benefit of straying animals, but also to regulate tiger population densities, by re-introductions into former tiger habitats, or for genetic enrichment of small populations.

Sometimes it is necessary to trap wild tigers for medical treatment, if injured or sick. Further reasons are health checks, prophylactic vaccinations, collection of blood or other samples. Scientists may want to earmark tigers for special identification or to radio-collar individuals to study their movements. Once captured, biological data like size, weight, age, sex, etc. and photographs should be taken as well. Veterenaries or biologists may use carcass baiting to lure wild tigers into close distance of their tranquillizing guns or into various kind of traps, such as snare traps or cage traps.

Baiting of tigers can also increase the success of camera traps, and sightings from a hide. The visual or photographic identification (for example the photographic capture - recapture method) can help to estimate local tiger populations, their numbers or densities, composition and conditions, habitat use, movement patterns and more. Photographs and films of tigers in the wild, sometimes impossible without baiting, are powerful tools for creating public awareness, which helps in turn to protect the endangered tigers and their ecosystems.

Carcass baiting as a promising management tool for wild tigers needs to be further investigated. Success rates have to be compared with those of the classical baiting technique in order to learn if it can be applied in general or only in certain regions like the Sundarbans. Finally it has to be mentioned that besides the ethical reasons, carcass baiting has the important advantage of lasting for many days without much further care. Live baits are more difficult to handle. Another benefit: a carcass as a bait is less attractive to thieves than a live goat for example.

References

Ahmed, S. 2002. **Losing battle for royal cats.** *The Daily Star*, 6th May 2002, Internet edition, http://www.thedailystar.net

Anon. 2003a. **Tiger clubbed to death.** *The Daily Star*, 29th May 2003, Internet edition, http://www.thedailystar.net

Anon. 2003b. **Villagers kill Royal Bengal in Bagherhat**. *The Daily Star*, 20th Oct. 2003, Internet edition, http://www.thedailystar.net.

Anon. 2003c. **Villagers kill lame tigress**. *The Daily Star*, 23rd Dec. 2003, Internet edition, http://www.thedailystar.net.

Atkinson, E.T. 1884. **The Himalayan Districts of the North-Western Provinces of India.** *Gazetteer of the North-Western Provinces.* Vol.11, Allahabad. Reprinted 1996. *The Himalayan Gazetteer*. Vol.2 (1), Natraj Publishers, Dehra Dun: 13-16.

Baker, E.B. 1887. **Sport in Bengal**. Ledger, Smith, & Co., London: 273.

'Beginner'. 1927. **Notes on tiger preferring carrion to live bait**. *J. Bombay Nat. Hist. Soc*. 31: 1025-1026.

Burton, R.G. 1933. **The book of the tiger**. Hutchinson & Co. Publishers Ltd., London: 174-175.

Corbett, J. 1944. **Man-eaters of Kumaon**. Oxford University Press, New York. Pp.233.

Dunbar-Brander, A.A. 1923. **Wild animals in Central India**. Edward Arnold & Co., London. Pp.296.

Gomes, J. 2003. **Sunderbans tiger no maneater**. *The Statesman* (Kolkata), 10th Nov. 2003, Internet edition, http://www.thestatesman.net

Hamilton, D. 1873. **Letter to the Times.** Reprinted in the *Oriental Sporting Magazine* 6: 587.

'Hawkeye' (Hamilton, R.) 1876. **Game.** *Observer Press*, Ootacamund (cited by Perry 1964: 127).

Hoogerwerf, A. 1939. **Uit het leven van den gevreesden „gestreepte"**. *De Tropische Natuur* 28: 4-13.

Hoogerwerf, A. 1970. **Udjung Kulon: the land of the last Javan rhinoceros**. E.J.Brill, Leiden: 259.

Inverarity, J.D. 1888. **Unscientific notes on the tiger**. *J. Bombay Nat. Hist. Soc*. 3(3): 144-154.

Jackson, P. 1985. **Man-Eaters**. *International Wildlife* 15(6): 4-11.

Jerdon, T.C. 1874. **The mammals of India**. John Wheldon, London: 94.

Locke, A. 1954. **The tigers of Trengganu**. Museum Press, London. Pp.187.

Lydekker, R. 1900. **The great and small game of India, Burma and Tibet**. Rowland Ward, London: 288.

Mansur Fahrni, E. 2005. Pers. communication.

McDougal, C. 1977. **The face of the tiger**. Rivington Books, London. Pp.180.

Mills, S. 2004. **Tiger**. BBC Books, London: 34-35.

Morris, R.C. 1948. **A tale of many tigers**. *J. Bombay Nat. Hist. Soc*. 48(1): 175-176.

Needham, F.M. 1951. **Tiger eating carrion**. *J. Bombay Nat. Hist. Soc*. 50(2): 389-390.

Perry, R. 1964. **The world of the tiger**. Cassell & Company Ltd., London. Pp.263.

Pocock, R.I. 1939. **Fauna of British India. Mammalia-Vol.1**, Taylor and Francis, London: 208.

Sankhala, K. 1993. **Return of the tiger**. Lustre Press, New Delhi: 37.

Schaller, G.B. 1967. **The deer and the tiger**. The University of Chicago Press, Chicago: 15.

Shasmal, K.C. 1972. **The Bauris of West Bengal**. Indian Publications, Calcutta: 153-154.

Shukla, R. 1995. **Killing grounds: the saga of encounters in wild**. Siddhi Books, New Delhi: 76-79.

Sinha, J.P. 1979. **Some interferences from baited tiger**. Papers, Proceedings and Resolutions of the International Symposium on Tiger, New Delhi, February 22-24, 1979: 91-93.

Somerville, A. 1924. **Shikar near Calcutta with a trip to the Sunderbunds**. W. Newman & Co., Limited, Calcutta: 87-88.

Sunquist, F. and M. Sunquist. 1988. **Tiger moon: tracking the great cats of Nepal**. The University of Chicago Press, Chicago: 121.

Thapar, V. 1986. **Tiger: portrait of a predator**. Collins, London. Pp.200.

'Young Nimrod'. 1873. **Will tigers eat animals not killed by themselves, and do they eat putrid flesh?** *Oriental Sporting Magazine* 6: 586-587.

Author's address:
Dr. Gertrud Neumann-Denzau,
Zoological Society for Conservation of Species and Populations (ZSCSP, Munich),
Im Brook 8, 24321 Panker, Germany.

RECOVERY OF BIRD ASSEMBLAGES RELATED TO VEGETATION SUCCESSION FOLLOWING ABANDONED HUMAN SETTLEMENT AREAS IN THUNG YAI NARESUAN WILDLIFE SANCTUARY, THAILAND

by Prateep Duengkae, Sompoch Maneerat, Permsak Kanidthachad and Sunate Karapan

Introduction

Secondary succession in tropical areas following recent human disturbances is becoming more common. This is particularly evident in regions of tropical rainforests, long valued by conservationists for their remarkable species diversity (Chinea, 2002). In Southeast Asia, as in the neotropics, central Africa and south Asia, tropical forests have been logged for timber, cleared and cultivated, exploited for non-timber natural products, submerged under reservoirs, and converted into plantations and other land uses (Johns, 1989; Raman and Sukumar, 2002).

As disturbed forests increase in protected areas in the tropics there is a clear need to assess their conservation values through studies of their vegetation and animal communities. However, Thai protected area managers lack data on how ecosystems respond after human disturbances. It was therefore the aim of this research to provide some guidelines to determine the changes in vegetation cover following abandoned settlement areas and the relationship between abandoned settlement areas (size and age) and bird assemblages.

Materials and methods

1. Study site

The 3,200 km^2 Thung Yai Naresuan Wildlife Sanctuary is located between latitudes 14º55′ to 15º45′ north, and longitudes 98º25′ to 99º5′ east. Together with the adjacent Huai Kha Kheang Wildlife Sanctuary, it constitutes Thailand's only Natural World Heritage Site, and forms the core of the largest contiguous protected and forest complex in mainland SE Asia (The Western Forest Complex). The topography is mountainous with the elevations ranging from 800 to 1,200 m. The climate is subtropical {summer (March -May), rainy (June-October), and cool (November-February) season} with average rainfall of 1,800 mm per year.

The principal vegetation types, and their estimated cover is as follows: hill evergreen forest (54,900 ha); dry evergreen forest (112,900 ha); mixed deciduous forest (164,100 ha); dry dipterocarp forest (3,600 ha); savanna forest (9,900ha); grassland (3,900ha); and agriculture (15,400 ha). The highest ground is generally covered with hill evergreen forest, also known as tropical lower montane rain forest, but slopes above 600 m generally support dry evergreen forest (seasonal evergreen forest). This latter formation is tall, dense, stratified, dominated by dipterocarps, and may appear to be evergreen in wet areas such as the central uplands. In some areas, particularly broad valleys, there is often a mosaic of vegetation types (Faculty of Forestry, 1989)

Before this forest area was gazetted as a wildlife sanctuary in 1957, indigenous hill tribes converted forest areas into agriculture land. Thung Yai Naresuan was declared a wildlife sanctuary in 1974 and was identified as the natural world heritage by UNESCO in 1991. The Hmong hill tribe villagers were removed from Thung Yai Naresuan by the Royal Forest Department and the Royal Thai Army in 1987 and resettled in Prop Phra District of Tak Province; however, Karen villagers still remained in the area. This research focused on the 6-12 year old abandoned settlements of the Hmong hill tribe.

2. Site selection

The study was designed to collect data on the bird assemblages in dry evergreen forests and abandoned hill tribe settlement areas located in Thung Yai Naresuan Wildlife Sanctuary. Four established Hmong hill tribe village areas were selected: Ka Ngae Kee (K), Ta Su Kee (T), Thung Na Noi (N) and Huay Num Khew (H). The four sites differed in time of abandonment and size. Elevation varied between 700 –900 MSL (Table 1).

Table 1: Characteristics of settlement area study sites

Sites	Time since abandonment (year)	Size of area (km^2)	Elevation (masl)
Ka Ngae Kee(K)	~6	~16	~700
Ta Su Kee(T)	~8	~8	~700
Thung Na Noi(N)	~10	~16	~800
Huay Num Khew(H)	~12	~2	~900

3. Vegetation composition

Data from Maneerat *et al.* (1999) were modified to compare between the abandoned settlements and the dry evergreen forests. Sixteen 1 ha permanent plots in the four hill tribe settlement areas were established: three in the abandoned settlement areas and one in the dry evergreen forest ares.

4. Bird survey

The line transect method was used to survey avian diversity and estimate the abundance of birds. Three permanent transects with the total length of 1.9 km were set in each study site. The line transects ran for 1 km in the abandoned settlement area and continued for another 0.9 km in dry evergreen forest, allowing about 100 m for the edge effects (Pattanavibool, 1999). However, due to the small size of Huay Num Khew, only 2 permanent transects were set there. Transects were marked at 100 m intervals with aluminum tags. Surveys were conducted three times per year in every season (dry, rainy, and cool season} from 7:00-10:00 a.m. and 4:00-6:00 p.m. in each transect for 2 consecutive days. It usually took 2.5-3 hours to complete the 1.9 km transect.

Observations were done by using binoculars (8x35). Every direct or indirect (call) bird observation within an estimated 30 m from the transect line was recorded (Round and Brockelman, 1998). The recorded data included identified species, number of individuals, time of observation, behavior and activity, and estimated height above the ground. Bird surveys were not done on rainy, misty, or stormy days because of the difficulty in observing birds and hearing their calls.

5. Analysis of data

The cluster analysis technique by the similarity index of Sorensen was used for grouping the plant communities. Data used in the analysis to construct a dendrogram were the Important Values (IV) of tree species (DBH>4.5 cm) from each 1-ha plot. The IV for each species per plot was calculated as the sum of relative density, relative frequency and relative dominance.

Bird data were compared between those in the abandoned settlement areas and in dry evergreen forest using relative abundance after Khobkhet (1999).

Relative abundance of birds was transformed {log (x+1)} before quantitative analysis. The cluster analysis technique by the similarity index of Sorensen was used for grouping bird communities. The ordination technique of Non-Metric Multidimensional Scaling (NMMDS) was used to generate scatter diagrams of bird species composition between the abandoned settlement areas and dry evergreen forests.

Results and discussion

1. Plant community

Analysis of sixteen 1 ha plots showed a clear difference in plant communities between dry evergreen forest and the abandoned settlement areas. The latter can be divided into two successional stages: 10-12 years (Ka Ngae Kee site; Ta Su Kee site) and 6-8 years (Thung Na Noi site; Huay Num Khew site), with the exception of Thung Na Noi plot number 1 located in an abandoned cemetery, and Ta Su Kee plot number 1 located beside a stream.

Our results demonstrated that plant communities in the abandoned settlement areas did not have the same life history patterns as primary forests (dry evergreen forest). Forest succession typically takes more than 12 years. Farm land abandoned less than 10 years ago was still covered by herbs according to Aide *et al.* (1995), and trees were not established until after more than 15 years. Ewel (1983) stated that it took more than 25 years for pioneer species to cover abandoned land after forest disturbance. Sukwong (1973) studied forest succession in the shifting cultivation around the Sakaerat Environment Research Station, Thailand. He concluded that grass species covered the area in the first 5-9 years and slowly changed to a vegetation type with fire resilient trees within 26 years. Therefore, the plant community in abandoned settlement areas in Thung Yai Naresuan should take at least 15 years for recovery.

2. Bird community

One hundred and eighty-five bird species were recorded during this study. The cluster analysis dendrogram showed a clear difference in bird assemblages between the old settlement areas abandoned 6-10 years ago and dry evergreen forests, and an older settlement area abandoned 12 years ago.

According to the two-dimensional ordination chart of bird species composition, birds can be classified into five groups:

Open resident species: Red-rumped Swallow (*Hirundo daurica*), Vinous-breasted Starling (*Sturnus burmannicus*), Slaty-backed Flycatcher (*Ficedula hodgsonii*), Yellow-eyed Babbler (*Chrysomma sinense*), Collared Falconet (*Microhierax caerulescens*), Common Myna (*Acridotheres tristis*), Grey-breasted Prinia (*Prinia hodgsonii*), and White-browed Piculet (*Sasia ochracea*)

Open-secondary forest non-resident: Yellow-streaked Warbler (*Phylloscopus armandii*), Lanceolated Warbler (*Locustella lanceolata*), Golden-spectacled Warbler (*Seicercus burkii*), Oriental Turtle Dove (*Streptopelia orientalis*), Common Rosefinch (*Carpodacus erythrinus*), Maroon Oriole (*Oriolus traillii*), Hill Blue Flycatcher (*Cyornis banyumas*), Blue-winged Pitta (*Pitta moluccensis*), Purple Sunbird (*Nectarinia asiatica*), Radde's Warbler (*Phylloscopus schwarzi*), and Wedge-tailed Green Pigeon (*Treron sphenura*).

Dry evergreen forest non-resident species: Blue Whistling Thrush (*Myiophonus caeruleus*), Pied Cuckoo (*Clamator jacobnus*), Black-winged Cuckooshrike (*Coracina melaschistos*), Banded Woodpecker (*Picus mineaceus*), Red-throated Flycatcher (*Ficedula parva*), Rosy Minivet (*Pericrocotus roseus*), Blue-winged Leafbird (*Chloropsis cochinchinensis*), Ashy Minivet (*Pericrocotus divaricatus*), Oriental Hobby (*Falco severus*), Rufous-browed Flycatcher (*Ficedula solitaris*), Orange-bellied Leafbird (*Chloropsis hardwickii*), and White-bellied Yuhina (*Yuhina zantholeuca*).

Dry evergreen forest resident species: Rufous-throated Partridge (*Arborophila rufogularis*), Black-throated Laughingthrush (*Garrulax chinensis*), Common Flameback (*Dinopium javanense*), Orange-breasted Trogon (*Harpactes oreskios*), Great Hornbill (*Buceros bicornis*), Long-tailed Broadbill (*Psarisomus dalhousiae*), Common Green Magpie (*Cissa chinensis*), Black-naped Oriole (*Oriolus chinensis*), Greater Necklaced Laughingthrush (*Garrulax pectoralis*), White-hooded Babbler (*Gampsorhynchus rufulus*), Asian Fairy Bluebird (*Irena puella*), Grey-headed Flycatcher (*Culicicapa ceylonensi*), Blue-throated Barbet (*Megalaima asiatica*), and White-throated Bulbul (*Alophoixus flaveolus*).

Generalist species: Greater Coucal (*Centopus sinensis*), Large Hawk Cuckoo (*Hierococcyx sparverioides*), Red Junglefowl (*Gallus gallus*), Grey Treepie (*Dendrocitta formosae*), Scarlet Minivet (*Pericrocotus flammeus*), and Coppersmith Barbet (*Megalaima haemacephala*).

The study of the relationship between wildlife and plant succession focused on birds because they were sensitive to the changes in the habitat. The avifauna of the secondary forest of different ages showed that some species originated from open lands, whereas others were canopy species that followed the foliage-air interface of the forest (Andrade and Rubio-Torgen, 1994). Johns (1989) compared the avifauna in undisturbed forest, slightly logged forest, secondary growth, and crop fields, and concluded that many species were found in most habitat types, although the similarity decreased with an increase in disturbance intensity.

Our results reflect the same trend seen from the results of Knok and Corlett (2000), who concluded that bird species diversity in forest plantations were not significantly different when compared with secondary forest, but did differ in species composition.

Results from the cluster analysis indicated that the bird community in settlement areas abandoned 12 years ago had the same species composition as in primary forest. This was evident at the Huay Num Khew site, which had a secondary forest type with pioneer trees species such as *Broussonetia papyrifera*, *Macaranga indica*, *Trema angustifolia*, and *Colona flagrocarpa* (Maneerat *et al.*, 1999). Moreover, the results from this study indicated that although plant composition in the study areas was not similar to primary forests, it still supported bird species normally found in primary forests.

Conclusions and recommendations

Plant communities in abandoned settlement areas do not have the same life history patterns as primary forest (dry evergreen forest). Although forest succession takes more than 12 years, study areas were often disturbed by forest fires once every 3-5 years. In order to restore the plant community in abandoned settlement areas in a shorter period of time, forest fires should be prevented.

One hundred and eighty-five bird species were recorded in this study. The species assemblage of the two sites was clearly different. However, bird species assemblages in the 12-year-old settlement areas had the same composition as those in the dry evergreen forest. Birds can be divided into 5 groups: open species, secondary forest non-resident species, dry evergreen forest non-resident species, dry evergreen resident species, and generalist species.

The study also suggests that plant and the bird communities showed a clear recovery pattern after abandonment. It is concluded that for ecological restoration, especially in the protected areas, it is important to limit human disturbances as much as possible to allow ecosystems to fully recover. However, to speed up the recovery process for avian diversity, native pioneer tree species should be planted in abadoned settlement areas to create an environment suitable for birds of primary forests.

Acknowledgments

We are grateful to WWF-Thailand and Unocal Thailand, Ltd., for financial support for this study. We appreciate the fieldwork of the forest rangers of Eastern Thung Yai Naresuan Wildlife Sanctuary. Dr. Lon Grassman is thanked for his assistance with editing this manuscript.

References

Aide, T. M.J.K. Zimmerman, L. Herrera, M. Rosario and M. Serrano. 1995. **Forest recovery in abandoned tropical pastures in Puerto Rica**. *For. Ecol. Manage*. 77:77–86.

Andrade, G.I. and H. Rubio-Torgen. 1994. **Sustainable use of tropical rain forest: evidence from the avifauna in a shifting cultivation habitat mosaic in the Columian Amazon**. *Conserv. Biol*. 9:545–554.

Chinea, J.D. 2002. **Tropical forest succession on abandoned farms in the Humacao Municipality of eastern Puerto Rico**. *For. Ecol. Manage*. 167:195–207.

Ewel, J. 1983. **Succession**. Pp. 217-223. In F. B. Golley (ed.). *Tropical rain forest* ecosystem. Elsevier Scientific Publishing Company, New York.

Faculty of Forestry .1989. **Management plan for the Thung Yai Naresuan Wildlife Sanctuary**. Kasetsart University, Bangkok. (in Thai)

Johns, A. D. 1986. **Effect of selective logging on the ecological organization of a Penisular Malasian rainforest avifauna.** *Forktail* 1:65-79

Johns, A.D. 1989.**Recovery of a Penisular Malasian rainforest avifauna following selective timber log-**

ging : the first *twelve years. Avifauna. Forktail* 4:89-105

KhobKhet, O. 1999. **Bird survey technique**. pp. 207-230. In *Biodiversity Study Technique*. Biodiversity Study Center, Kasetsart University. (in Thai)

Knok, H. K. and R.T. Corlett. 2000. **The bird communities of a natural secondary and a *Lophostemon confertus* plantation in Hong Kong, South China**. *For. Ecol. Manage*. 130:227-234.

Luken, J.O. 1990. **Directing Ecology Succession** .Chapman and Hall Company, London.

Maneerat, S., Duengkae, P, Marod, D.and S. Sangkhaew. 1999. **Succession of Plant community after removed people in Thung Yai Naresuan Wildlife Sanctuary**. Wildlife Conservation Section, Natural Resources Conservation Office, Royal Forest Department, Bangkok. (in Thai)

Pattanavibool, A. 1999. **Wildlife response to habitat fragmentation and other human influences in tropical montane evergreen forests, Northern Thailand.** Ph.D Thesis. University of Victoria.

Raman, T.R.S and R. Sukumar. 2002. **Responses of tropical rainforest birds to abandoned plantations,edges and logged forest in the Western Ghats, India**. *Anim. Conserv.* **5**:201-216.

Round, P.D. and W.Y. Brockelman. 1998. **Bird community in disturbed lowland forest habitat of Southern Thailand.** *Nat. Hist. Bull. Siam. Soc.* 46:171-196.

Sukwong, S. 1973. **Succession of dry evergreen forest**. *In Proceedings of the twelfth siminar on National Agriculture and Biology*, Kasetsart University, Bangkok. (in Thai)

Appendix 1. Bird species and feeding guilds in this study

No.	Scientific name	Feeding guild[1]
1	*Buceros bicornis* Linnaeus, 1758.	FF
2	*Serilophus lunatus* (Gould) 1834.	FGI
3	*Gampsorhynchus rufulus* Blyth, 1844.	FGI
4	*Dicrurus paradiseus* (Linnaeus) 1766.	FGI
5	*Phylloscopus trochiloides* (Sundevall) 1837.	FGI
6	*Garrulax leucolophus* (Hardwicke) 1815.	FGI
7	*Pellorneum tickeli* Blyth, 1859.	FGI
8	*Harpactes erythrocephalus* (Gould) 1834.	FGI
9	*Alophoixus flaveolus* (Gould) 1836.	AIF
10	*Ducula badia* (Raffles) 1822.	AF
11	*Polyplectron bicalcaratum* (Linnaeus) 1758.	TIF
12	*Picus flavinucha* Gould, 1834.	BGI
13	*Hemipus picatus* (Sykes) 1832.	FGI
14	*Cissa chinensis* (Boddaert) 1783.	FGI
15	*Harpactes oreskios* (Temminck) 1823.	FGI
16	*Dicrurus remifer* (Temminck) 1823.	FGI
17	*Sitta frontalis* Swainson, 1820.	BGI
18	*Aethopyga saturata* (Hodgson) 1836.	AF
19	*Hypothymis azurea* (Boddaert) 1783.	FGI
20	*Gallus gallus* (Linnaeus) 1758.	TF
21	*Arborophila brunneopectus* (Blyth) 1855.	TIF
22	*Anthracoceros albirostris* (Shaw and Nodder) 1807.	FF
23	*Irena puella* (Latham) 1790.	AF
24	*Hypsipetes mcclellandii* Horsfield, 1840.	AIF
25	*Hemixos flavala* (Blyth) 1845.	AIF
26	*Megalaima asiatica* (Latham) 1790.	AF
27	*Blythipicus pyrrhotis* (Hodgson) 1837.	BGI
28	*Dicrurus macrocercus* (Vieillot) 1817.	FGI
29	*Alcippe poioicephala* (Jerdon) 1844.	FGI
30	*Oriolus traillii* (Vigors) 1832.	FGI
31	*Lacedo pulchella* (Horsfield) 1821.	P
32	*Garrulax monileger* (Hodgson) 1836.	FGI
33	*Garrulax strepitans* Blyth, 1855.	FGI
34	*Macropygia ruficeps* (Temminck) 1834.	TF
35	*Ficedula westermanni* (Sharpe) 1888.	FGI
36	*Napothera epilepidota* (Temminck) 1827.	TI
37	*Caprimulgus macrurus* Horsfield, 1821.	SwI
38	*Iole virescens* Blyth 1845.	AIF
39	*Pericrocotus roseus* (Vieillot) 1818.	FGI
40	*Dendrocopos canicapillus* (Blyth) 1845.	BGI
41	*Melanochlora sultanea* (Hodgson) 1837.	FGI
42	*Culicicapa ceylonensis* (Swainson) 1820.	FGI
43	*Megalaima virens* (Boddaert) 1783.	AF
44	*Pericrocotus flammeus* (Forster) 1781.	FGI
45	*Loriculus vernalis* (Sparrman) 1787.	AF
46	*Oriolus tenuirostris* Blyth, 1846.	FGI
47	*Chalcophaps indica* (Linnaeus) 1758.	TF
48	*Spilornis cheela* (Latham) 1790.	R
49	*Megalaima australis* (Horsfield) 1821.	AF

50	*Phylloscopus ricketti* (Slater) 1897.	FGI
51	*Garrulax pectoralis* (Gould) 1836.	FGI
52	*Cyornis banyumas* (Horsfield) 1821.	FGI
53	*Yuhina zantholeuca* (Blyth) 1844.	FGI
54	*Myiophonus caeruleus* (Scopoli) 1786.	TI
55	*Megalaima haemacephala* (Muller) 1776.	AF
56	*Dendrocitta formosae* Swinhoe, 1863.	FGI
57	*Macronous gularis* (Horsfield) 1822.	FGI
58	*Abroscopus superciliaris* (Blyth) 1859.	FGI
59	*Phylloscopus schwarzi* (Radde) 1863.	FGI
60	*Dicaeum ignipectus* (Blyth) 1843.	AF
61	*Oriolus chinensis* Linnaeus, 1766.	FGI
62	*Luscinia cyane* (Pallas) 1776.	FGI
63	*Clamator coromandus* (Linnaeus) 1766.	FGI
64	*Ficedula solitaris* (Muller) 1835.	FGI
65	*Napothera crispifrons* (Blyth) 1855.	TI
66	*Napothera brevicaudata* (Blyth) 1855.	TI
67	*Dicrurus paradiseus* (Linnaeus) 1766.	FGI
68	*Terpsiphone paradisi* (Linnaeus) 1758.	FGI
69	*Turdus obscurus* Gmelin, 1789.	TI
70	*Zoothera citrina* (Latham) 1790.	TI
71	*Pitta phayrei* (Blyth) 1863.	TI
72	*Treron sphenura* (Vigors) 1832.	AF
73	*Psarisomus dalhousiae* (Jameson) 1836.	FGI
74	*Pericrocotus cinnamomeus* (Linnaeus) 1766.	FGI
75	*Pericrocotus divaricatus* (Raffles) 1822.	FGI
76	*Alcippe morrisonis* Swinhoe, 1863.	FGI
77	*Hemicircus canente* (Lesson) 1830.	BGI
78	*Picus mineaceus* Pennant, 1769.	BGI
79	*Mulleripicus pulverulentus* (Temminck) 1826.	BGI
80	*Rallina fasciata* (Raffles) 1822.	TF
81	*Accipiter badius* (Gmelin) 1788.	R
82	*Spizaetus nipalensis* (Hodgson) 1836.	R
83	*Microhierax caerulescens* (Linnaeus) 1758.	R
84	*Phylloscopus reguloides* (Blyth) 1842.	FGI
85	*Stachyris striolata* (Muller) 1835.	FGI
86	*Arachnothera magna* (Hodgson) 1837.	IN
87	*Tephrodornis gularis* (Raffles) 1822.	FGI
88	*Lophura leucomelanos* (Latham) 1790.	TIF
89	*Phylloscopus trochiloides* (Sundevall) 1837.	FGI
90	*Chloropsis cochinchinensis* (Gmelin) 1788.	FGI
91	*Hierococcyx sparverioides* (Vigors) 1832.	FGI
92	*Muscicapa ferruginea* (Hodgson) 1845.	FGI
93	*Iole propinqua* (Oustalet) 1903.	AIF
94	*Zosterops palpebrosus* (Temminck) 1824.	FGI
95	*Hypsipetes leucocephalus* (Gmelin) 1789.	AIF
96	*Pomatorhinus hypoleucos* (Blyth) 1844.	FGI
97	*Copsychus malabaricus* (Scopoli) 1788.	FGI
98	*Aceros undulatus* (Shaw) 1811.	FF
99	*Seicercus burkii* (Burton) 1836.	FGI
100	*Orthotomus sutorius* (Pennant) 1769.	FGI
101	*Stachyris rufifrons* Hume, 1873.	FGI
102	*Pycnonotus melanicterus* (Gmelin) 1789.	AIF
103	*Arborophila charltonii* (Eyton) 1845.	TIF
104	*Arborophila rufogularis* (Blyth) 1850.	TIF
105	*Coracina macei* (Lesson) 1831.	FGI
106	*Chloropsis aurifrons* (Temminck) 1829.	FGI
107	*Pycnonotus atriceps* (Temminck) 1822.	AIF
108	*Gracula religiosa* Linnaeus, 1758.	AF
109	*Phylloscopus borealis* (Blasius) 1858.	FGI
110	*Glaucidium brodiei* (Burton) 1836.	R
111	*Aceros nipalensis* (Hodgson) 1829.	FF
112	*Anorrhinus tickelli* (Blyth) 1855.	FF
113	*Cyornis rubeculoides* (Vigors) 1831.	FGI
114	*Pitta cyanea* Blyth, 1843.	TI
115	*Pycnonotus striatus* (Blyth) 1842.	AIF
116	*Celeus brachyurus* (Vieillot) 1818.	BGI
117	*Sasia ochracea* Hodgson, 1836.	BGI
118	*Prinia flaviventris* (Delessert) 1840.	FGI
119	*Prinia rufescens* Blyth, 1847.	FGI
120	*Centopus sinensis* (Stephens) 1815.	TI
121	*Pycnonotus jocosus* (Linnaeus) 1758.	AIF
122	*Aegithina tiphia* (Linnaeus) 1758.	FGI
123	*Lonchura punctulata* (Linnaeus) 1758.	AF
124	*Timalia pileata* Horsfield, 1821.	FGI
125	*Pellorneum ruficeps* Swainson, 1832.	TI
126	*Saxicola caprata* (Linnaeus) 1766.	FGI
127	*Elanus caeruleus* (Desfontaines) 1789.	R

128	*Nectarinia jugularis* (Linnaeus) 1766.	AF
129	*Pycnonotus aurigaster* (Vieillot) 1818.	AIF
130	*Pomatorhinus schisticeps* Hodgson, 1836.	FGI
131	*Ficedula parva* (Bechstein) 1792.	FGI
132	*Copsychus saularis* (Linnaeus) 1758.	FGI
133	*Centropus bengalensis* (Gmelin) 1788.	TI
134	*Streptopelia tranquebarica* (Hermann) 1804.	TF
135	*Coracina melaschistos* (Hodgson) 1836.	FGI
136	*Streptopelia chinensis* (Scopoli) 1786.	TF
137	*Treron curvirostra* (Gmelin) 1789.	AF
138	*Dicrurus hottentottus* (Linnaeus) 1766.	FGI
139	*Artamus fuscus* Vieillot, 1817.	SaI
140	*Eumyias thalassina* Swainson, 1838.	FGI
141	*Oriolus xanthornus* (Linnaeus) 1758.	FGI
142	*Dicrurus leucophaeus* Vieillot, 1817.	FGI
143	*Phaenicophaeus tristis* (Lesson) 1830.	FGI
144	*Passer flaveolus* Blyth, 1844.	AF
145	*Phylloscopus tenellipes* Swinhoe, 1860.	FGI
146	*Phylloscopus coronatus* (Temminck and Schlegel) 1847.	FGI
147	*Orthotomus atrogularis* Temminck, 1836.	FGI
148	*Lonchura striata* (Linnaeus) 1766.	AF
149	*Saroglossa spiloptera* (Vigors) 1831.	AF
150	*Nectarinia asiatica* (Latham) 1790.	AF
151	*Chrysomma sinense* (Gmelin) 1789.	FGI
152	*Stachyris chrysaea* Blyth, 1844.	FGI
153	*Psittacula roseata* Biswas, 1951.	AF
154	*Luscinia calliope* (Pallas) 1776.	FGI
155	*Turnix suscitator* (Gmelin) 1789.	TF
156	*Muscicapa sibirica* Gmelin, 1789.	FGI
157	*Merops viridis* Linnaeus, 1758.	SaI
158	*Carpodacus erythrinus* (Pallas) 1770.	AF
159	*Emberiza rutila* Pallas, 1776.	AF
160	*Tephrodornis pondicerianus* (Gmelin) 1789.	FGI
161	*Motacilla cinerea* Tunstall, 1771.	TI
162	*Hirundo daurica* Linnaeus, 1776.	SwI
163	*Hirundo rustica* Linnaeus, 1758.	SwI
164	*Ardeola bacchus* (Bonaparte) 1855.	P
165	*Chrysocolaptes lucidus* (Scopoli) 1796.	BGI
166	*Lanius cristatus* Linnaeus, 1758.	FGI
167	*Lanius collurioides* Lesson, 1834.	FGI
168	*Lanius tephronotus* (Vigors) 1831.	FGI
169	*Hirundapus giganteus* (Temminck) 1825.	SwI
170	*Accipiter trivergatus* (Temminck) 1824.	R
171	*Coracias benghalensis* (Linnaeus) 1758.	SaI
172	*Acrocephalus bistrigiceps* Swinhoe, 1860.	FGI
173	*Rhipidura albicollis* (Vieillot) 1818.	FGI
174	*Prinia hodgsonii* Blyth, 1844.	FGI
175	*Dicaeum concolor* Jerdon, 1840.	AF
176	*Phylloscopus inornatus* (Blyth) 1842.	FGI
177	*Picumnus innominatus* Burton, 1836.	BGI
178	*Cypsiurus balasinensis* (Gray) 1829.	SwI
179	*Stachyris nigriceps* Blyth, 1844.	FGI
180	*Pycnonotus flavescens* Blyth, 1845.	AIF
181	*Arachnothera longirostra* (Latham) 1790.	IN
182	*Upupa epops* Linnaeus, 1758.	FGI
183	*Chloropsis hardwickii* Jardine and Selby, 1830.	FGI
184	*Dicrurus aeneus* Vieillot, 1817.	FGI
185	*Zosterops erythropleurus* Swinhoe, 1863.	FGI

[1] Feeding guilds were defined as follows: AF- arboreal frugivore, AIF - arboreal insectivore/frugivore; BGI - bark- gleaning insectiv ore, FF - arboreal faunivore/frugivore, FGI - foliage-gleaning insectivore, IN - insectivore/nectarivore, P - piscivore, R – raptor, SaI - sallying insectivore, SwI - sweeping insectivore, TF - terrestrial frugivore, TI - terrestrial insectivore, and TIF - terrestrial insectivore/frugivore.

Prateep Duengkae and Sunate Karapan, Forest Biology Department, Faculty of Forestry, Kasetsart University, Bangkok 10900 Thailand. E-mail prateep.du@ku.ac.th; Sompoch Maneerat and Permsak Kanidthachad, Protected Area Innovation Unit,Department of National Parks,Wildlife and Plant Conservation, Bangkok 10900. Thailand.

AN ASSESSMENT OF THE BUSHMEAT TRADE IN NORTHERN SRI LANKA

by Ranjini Mylvaganam, T. Baheerathi, S. Wijeyamohan and Charles Santiapillai

Sri Lanka is identified as one of the biodiversity hotspots in Asia. Although many of the endemic species are found in the hill country, the low country dry zone is home to some of the most seriously threatened species of wildlife. In the past, concerns about the loss of biodiversity have largely focused on the impact of indiscriminate deforestation caused by slash and burn (*chena*) cultivation, fuel wood extraction and timber harvesting. Habitat loss and indiscriminate hunting have always been identified as the two major threats to wildlife. However, following the protracted armed conflict, it appears that defaunation rather than deforestation poses a greater immediate threat to wildlife in Sri Lanka.

The almost two decade-long civil conflict in Sri Lanka has radically altered the economic and social conditions of the people in the north, with profound impacts on the environment, biological diversity and natural resources. As Shambaugh *et al.* (2001) argue, habitat destruction and the accompanying loss of wildlife are among the most common and far-reaching impacts of armed conflicts on the environment. Nowhere is this problem more serious today than in the northern region of Sri Lanka where, given that large numbers of displaced refugees are being resettled, the over-exploitation of natural resources for both subsistence and commercial reasons is likely to become a serious conservation problem. Armed conflicts may be beneficial to the environment only if they keep people out of large areas (Darulans & Krunkelsven, 2002). In the region known as Vanni in northern Sri Lanka, given the threat of land mines, many local communities are unable to practice their traditional agriculture. They are therefore increasingly forced to rely on bushmeat and wild plants to supplement their dietary calories. While people living in urban areas increasingly depend on the supermarket and modern technology in their lifestyle, refugees resettled in the war-ravaged northern Sri Lanka appear to make wide use of local wildlife to supply their daily needs. Hunting has always been a part of the local culture of the Vanni people and so bushmeat has always been an important source of protein and cash for them.

Although the bushmeat trade is sustainable in areas of low human population density and relatively high wildlife biomass, if such exploitation is carried out on a large scale, it may prove to be unsustainable even in the short-term. To date, except for the study carried out by Santiapillai & Wijeyamohan (2003) on the impact of the civil war on wildlife in Sri Lanka, there has been no assessment of the trade in bushmeat.

Much of the northern part of Sri Lanka is referred to as the Vanni, which refers to the three Administrative Districts of Vavuniya, Mullaitivu and Kilinochchi. Although there are no natural freshwater lakes, the region is dotted with numerous artificial, man-made, irrigation reservoirs known as tanks. Vavuniya District alone once had 533 tanks, while there were 178 tanks in Mullaitivu District (Lewis, 1895).

Data on bushmeat trade was obtained by interviewing 52 hunters using a questionnaire over a period of three months (August-October 2003). In many instances, the hunter and seller were the same. From each source, information regarding the target species, the amount of bushmeat sold per month, frequency of hunting and the methods employed in capture/culling of wildlife was obtained.

At least 12 species are hunted and sold as bushmeat in the three districts of Vanni, despite the fact that the guerrillas known as the Liberation Tigers of Tamil Eelam (LTTE) have explicitly banned the hunting of all wildlife except the wild

boar (*Sus scrofa*) and the black-naped hare (*Lepus nigricollis*). The two most popular species harvested for bushmeat are the wild boar (*Sus scrofa*) and the monitor lizard (*Varanus bengalensis*).

Particularly disturbing is the fact that 62% of the respondents deal with the sale of monitor lizard, which is no longer commonly encountered in the wild in the north. It is one of the most important reptiles used in coconut estates to control coconut pests and the introduced land snail *Achatina fulica* (Deraniyagala, 1953). Despite its usefulness, the land monitor is one of the preferred bushmeat among the Vanni people, especially by pregnant women. It is usually captured with a noose and killed by a blow given on the back of its neck with a clenched fist. Today, this valuable natural resource is under serious hunting pressure. A monitor lizard could yield between 25-30% of its weight in dry meat, a product highly valued by local populations and sold at prices above that of fish.

The most popular bushmeat is wild boar, which is not a protected species. It is considered a pest species in agricultural areas and hence its harvesting is allowed. However, despite its high fecundity, it also suffers a very high juvenile mortality through predation. Santiapillai & Chambers (1980) found that 75% of young pigs disappeared within a year in the wild. Meat from spotted deer (*Axis axis*) and sambar (*Cervus unicolor*) is also widely sold.

The volume of bushmeat traded in Vanni during the three months of study was considerable. Wild boar meat ranks first, with a total of 9,060 kg per month. Monthly earnings from the bushmeat trade exceeds US$10,000, with wild boar contributing about 44% of the revenue.

Based on the amount of bushmeat obtained in the wild for sale, it is possible to calculate a crude estimate of the number of animals that would have had to be killed to sustain such a volume of trade. These estimates refer to the minimum numbers killed, since the study did not include all the hunters operating in Vanni. Many traders carry out their trade clandestinely and are tight-lipped about their activities for fear of punishment. Nevertheless, even the minimum numbers killed are disturbing. It appears that about 66 monitor lizards and about 50 jungle fowl – an endemic species – are killed every month. Jungle fowl is in fact much cheaper than broiler chicken. Wild boar is killed at the rate of 3.8 animals per day, while the black-naped hare suffers a mortality rate of 5.5 per day. Of the three species of cervids, the spotted deer and sambar together account for 43% of the bushmeat sold monthly in Vanni, which entails the daily killing of 1.9 and 0.5 animals respectively.

The most popular method of killing wildlife for bushmeat is through the use of firearms, which are now freely available in Sri Lanka – a legacy of the armed conflict. In addition, home-made shotguns are available in many rural households in Vanni where hunting has always been a way of life. Shotguns were used in 45.5% of the kills, the use of dogs accounted for 29.9%, pits 16.9% and the noose 7.8%. The problem with home-made shotguns is that they usually kill more than a single animal found in a herd or group: the exploding cartridge scatters a number of ball bearings that kill or injure more than the animal targeted. The use of dogs and snares is more selective. If the hunters adopt more efficient hunting techniques, hunting pressure on wildlife can be expected to increase.

Given the small size of Sri Lanka (65,610 km^2) and the relatively high human population density (300 km^2), wildlife habitats have declined while the demand for bushmeat has increased. In Vanni, the bushmeat trade appears to be a major component of the rural economy. It is not only an important source of income, but also fulfills the need for animal protein among refugees where the highest degree of malnutrition among children under 5 years of age prevails (Wickremasinghe & Santiapillai, 1999). Since wildlife populations cannot grow to keep pace with the demand for meat (Barnes, 2002), it is important that the bushmeat trade is controlled so that it is sustainable. Despite being a renewable natural resource, wildlife can still be overexploited leading to local depletions or even extinction of populations.

Bennet *et al.*, (2002) recognized habitat loss and hunting as the twin threats to wildlife across the

world, but singled out hunting as the major threat across the tropics. In northern Sri Lanka, commercial hunting is unsustainable and it is a far more serious threat to wildlife than the subsistence hunting carried out by people living near conservation areas. The problem has been exacerbated by the armed conflict that raged for almost two decades. Wildlife has been hunted for food by both government troops and guerrillas. The impact would have been most severe on large mammals with slow reproductive rates, as these are the ones likely to disappear first.

In the long term, hunting in natural ecosystems is sustainable only if the harvest is regulated (Ling *et al.*, 2002). Productive species such as wild boar or black-naped hare may be hunted at safe levels, but species with lower reproductive rates are vulnerable, and hence their exploitation must be kept within strict limits. A total ban on bushmeat would deny the poor people an important source of protein. Another factor that complicates the bushmeat trade in Vanni is the so called "remittance economy" based on the money sent by expatriates abroad. This has led to the development of a wealthy middle-class with cash to spare. As Robinson and Bennett (2002) point out, with an increase in wealth, the demand for wildlife would also increase.

The information gathered during this study represents only a partial assessment of the bushmeat trade in the northern Sri Lanka. We do not know the true extent of the bushmeat trade and its impact on wildlife. None of the three districts concerned has a national park, and hence wildlife species have no refuge where they could enjoy total protection as they do elsewhere in Sri Lanka. Therefore, it would be unwise to ignore the plight of wildlife and concentrate exclusively on the welfare of the people in Vanni, since depletion of natural resources and environmental degradation can easily drag the people themselves into a vicious cycle of poverty, greater environmental degradation, and even greater poverty (Shambaugh *et al.*, 2001). Imposing a total ban on hunting bushmeat for domestic consumption will not solve the problem in the absence of acceptable substitutes (Wilkie *et al.*, 1998). As forests shrink and human populations grow, the best long-term hope for wildlife lies in the provision of access to alternative food sources for the local people (Whitfield, 2003). Instead of banning the bushmeat trade completely, ways should be found to regulate hunting. There should be closed seasons during which wildlife populations can recover. While controlled management of hunting may regulate wildlife mortality, it should be matched by efforts to protect wildlife habitats.

References

Barnes, R.F.W. 2002. **The bushmeat boom and bust in West and Central Africa**. *Oryx*, 36:236-242.

Bennett, E.L., Milner-Gulland, E.J., Bakarr, M., Eves, H.E., Robinson, J.G. and D.S. Wilkie. 2002. **Hunting the world's wildlife to extinction**. *Oryx*, 36:328-329.

Deraniyagala, P.E.P. 1953. **A Colored Atlas of Some Vertebrates from Ceylon. Vol. II. Tetrapod Reptilia.** The Ceylon Government Press, Colombo, 1953

Darulans, D. and E.V. Krunkelsven. 2002. **The impact of war on forest areas in the Democratic Republic of Congo.** *Oryx*, 36:35-40.

Lewis, J.P. 1895. **Manual of the Vanni Districts (Vavuniya and Mullaitivu) of the Northern Province, Ceylon.** H.C.Cottle. Acting Government Printer, Colombo.

Ling, S., Kumpell, N. and L. Albrechtsen. 2002. **No new recipes for bushmeat**. *Oryx*, 36:330.

Redford, K.H. and J.G. Robinson. 1991. **Neotropical Wildlife Use and Conservation**. The University of Chicago Press, Chicago.

Robinson, J.G. and E.L Bennett. 2002. **Will alleviating poverty solve the bushmeat crisis?** *Oryx*, 36:332.

Santiapillai, C. and M.R. Chambers. 1980. **Aspects of the population dynamics of the wild pig (*Sus scrofa* L.) in the Ruhuna National Park, Sri Lanka.** *Spixiana*, 3:239-250.

Santiapillai, C. and S.Wijeyamohan. 2003. **The impact of war on wildlife in Sri Lanka**. *Current Science*, 84:1182-1183.

Shambaugh, J., Ogelthorpe, J. and R.Ham (with contributions from Sylvia Tognetti). 2001. **The Trampled Grass: Mitigating the impacts of armed conflict on the environment**. Biodiversity support Program, Washington D.C. USA

Whitfield, J. 2003. **The law of the jungle**. *Nature*, 421:8-9

Wickremasinghe, C.S. and C.Santiapillai. 1999. **Can wildlife pay for its conservation?** *Loris*, 22:18-21

Wilkie, D.S., Curran, B., Tshombe, R. and G.A. Morelli. 1998. **Managing bushmeat hunting in Okapi Wildlife Reserve, Democratic Republic of Congo**. *Oryx*, 32:131-144.

Authors' addresses: Ranjini Mylvaganam, T. Baheerathi and S. Wijeyamohan c/o Department of Biological Science, Faculty of Applied Science, University of Jaffna (Vavuniya Campus), Kurumankadu, Vavuniya, Sri Lanka and Charles Santiapillai, Department of Zoology, University of Peradeniya, Sri Lanka.

Table 1: The amount of bushmeat traded, the revenue earned, and the approximate number of animals killed by hunters per month (from August to October 2003) in the three Vanni districts of northern Sri Lanka

Common name	Species	Average adult weight & yield (kg)		Amount per month (kg)	Revenue per month (US$)	No. killed/ month
Monitor lizard	*Varanus bengalensis*	11	8	530	318	66
Soft terrapin	*Lissemys punctata*	7	3	variable	-	-
Jungle fowl	*Gallus lafayetti*	3	2	100	60	50
Grey francolin	*Francolinus pondiceraianus*	2.5	1	variable	-	-
Buffalo	*Bubalus bubalis*	800	600	600	450	1
Spotted deer	*Axis axis*	75	50	2,900	2,320	58
Sambar	*Cervus unicolor*	215	175	2,670	2,135	15
Mouse deer	*Tragulus meminna*	3.2	2.5	210	190	84
Wild boar	*Sus scrofa*	100	80	9,060	4,530	113
Hare	*Lepus negricollis*	3	2	335	250	167
Pangolin	*Manis crassicaudata*	19	10	variable	-	-
Porcupine	*Hystrix indica*	15	10	100	90	9
Total				16,505+	10,343+	563+

REPTILIAN DIVERSITY OF JAMBUGHODA WILDLIFE SANCTUARY, GUJARAT

by Raju Vyas

Introduction

There are some detailed reports available on the reptile fauna of Gujarat, especially from the protected areas of Gujarat. However, there are other protected areas in the state that have not been explored by herpetologists and even baseline preliminary data on herpetofauna is not available, i.e. Jassor Wildlife Sanctuary, Balaram-Ambaji Wildlife Sanctuary, Pania Wildlife Sanctuary, Ratanmahal Wildlife Sanctuary and Jambughoda Wildlife Sanctuary.

As little information has been published about the various species of reptiles in Jambughoda Wildlife Sanctuary (Pandya & Oza, 1998; Mehta & Varshney, 2002), a more detailed study was needed. Thus, the present study was carried out in Jambughoda Wildlife Sanctuary to investigate and prepare an inventory of reptilian diversity.

Study area

Jambughoda Wildlife Sanctuary is located between latitudes 22º20-20º33' N and longitudes 73º35'-73º45' E in the Panchmahal and Vadodara districts of Gujarat State, India. The terrain is undulating and is covered by hills, forests and cultivated lands in villages situated in the valley. The hills are the southern-most extension of the

Aravalli Hills, forming the western fringe of the Vindhya mountain ranges. Previously it was the "Shikar Reserve" (game sanctuary) of the ex-princely state of Jambughoda, and since May 1990 it has been one of the most important protected areas in Gujarat. The sanctuary encompasses 130.38 km^2 of forest at altitudes ranging from 230 to 354 m above mean sea level. There are no perennial rivers traversing the sanctuary, but the Sukhi River (a tributary of the Narmada River) runs almost parallel to its eastern boundary. There are a few perennial springs present at Jhand, Jabban and Ranjitnagar. The draining waters from the hills have been check dammed at several places in the sanctuary, e.g. Kada, Targol, Lafani and Dharia, to conserve the available water. Two waterbodies are connected with Sukhi Dam canal and provide water throughout the year to the peripheral villages.

There are about 51 villages located in and around the sanctuary area, with 31 situated inside the sanctuary. According to the forest classification of Champion and Seth (1968), the entire forest area is of the Southern Tropical Dry Deciduous type, further classified into four sub-types, i.e. 5A/C 1b dry teak forest, 5A/C 2 southern dry mixed deciduous forest, 5/E 9 dry bamboo brakes, and 3B/C 2 southern moist mixed deciduous forest.

The climate is sub-tropical arid, which turns humid during the monsoon. The rainfall in general is erratic and irregular, consisting of a few heavy showers interspersed with long spells of drought. The recorded average annual rainfall (1990-2000) is 900-950 mm. It becomes exceedingly dry and cold from November to February, followed by a long, hot summer, with the highest temperatures in May and June. The mean annual temperature in the sanctuary is 25.5ºC, with a maximum of 45ºC and a minimum of 7ºC.

Methodology

The inventory was carried out from October 1998 to February 2003 during seven trips with a total 60 days (8 hrs/day) spent on field work. Further detailed studies will be carried out with the help of secondary data gathered from relevant literature. Information will also be gathered from the local people in surrounding villages and forest personnel through interviews and showing pictures of reptiles that possibly occur in the area.

The study area was divided into 30 zones based on village boundaries. Each zone was randomly explored on the basis of habitat structure, possibility and availability of species. All important major and minor perennial water bodies were extensively explored for aquatic species. All collected specimens were examined carefully and identified by using the diagnostic keys given by Smith (1935, 1943) and Daniels (1997). The nomenclature of reptilian species adopted for this report is that of Das (1994).

Results and discussion

During the study, a total of 28 species of reptiles belonging to 12 families were recorded from the sanctuary, including one species each of crocodile and turtle, 12 species of lizard and 14 species of snake.

A five-foot long marsh (or mugger) crocodile (*Crocodylus palustris*) was sighted in January 2000 at Targol, which remained almost three months in the water reservoir and then disappeared. The water reservoir is connected to the Sukhi canals and further on to the Dev dam. A small breeding population of marsh crocodile is present in Dev dam and some animals might be migrating to the reservoir through the canals. There was an earlier report of an adult crocodile sighted in the same reservoir in 1997.

The Kada and Targol reservoirs are located in the sanctuary area and both are connected with the Sukhi irrigation project. Somehow, the presence of marsh crocodile in Targol supports the suggestion of Vijaykumar (1997) that the reservoirs of Jambughoda Wildlife Sanctuary are some of the best new sites for restocking the marsh crocodile population in the state. A large-sized (2.6 meters) marsh crocodile that had been previously rescued was released in October 2003 in Targol Dam by the Vadodara Division of the State Forest Department.

Only one species of turtle (*Lissemys p. punctata*) was recorded in all four reservoirs in the sanctuary. That no specimens of the Indian star

tortoise (*Geochelone elegans*) were recorded in the sanctuary was surprising, because earlier Vyas and Parasharya (2000) had recorded *G. elegans* from Chapaner, Panchmahal. Chapaner is 20 km from Jambughoda Wildlife Sanctuary. As the sanctuary is connected with the Pavagadh hills further north by a reserved forest of dry deciduous teak forest, the entire tract should have similar habitat. Therefore, it is still possible that the species inhabits the area.

A total of 12 species of lizards belonging to 5 families were recorded in the sanctuary. The Gekkonidae family is dominant, represented by four species of geckos. Bark gecko (*Hemidactylus leschenaultii*) is common in the forest and usually found on the tree trunks of *Madhuca longifolia, Tectona grandis* and *Butea monosperma*. A record of Blanford's rock agama (*Psammopilus blanfordanus*) from Jant Hanuman forest area indicates the western-most range of the species and is the first record from the sanctuary and the second from the state (Vyas, 2000). Pandya & Oza (1998) recorded *Calotes rouxii* from the sanctuary, but during the study the author did not find any specimens of this species. The record of *C. rouxii* might be due to confusing it with *P. blanfordanus,* which it superficially resembles from a distance. Pandya & Oza (1998) mentioned a photograph of *C. rouxii*, but it is actually *P. blanfordanus*.

A total of 14 species of snakes belonging to 5 families were recorded, including 5 species of venomous snakes. Sightings of the Indian rock python (*Python molurus*) in the sanctuary shows the importance of the area. Evaluating the status of all the snake species is difficult to do in a short term study, but it was observed that *Amphiesma stolata, Ptyas mucosus, Xenochrophis piscator* and *Echis carinatus* are common in the area. Mehta and Varshney (2002) mentioned a species of kukri snake (*Oligodon venestus=O. venustus*) and sand snake (*Psammophis* sp.) in the management plan for the sanctuary. But such kukri species are endemic only to the Western Ghats and distributed in southern Western Ghats from Goa Gap to Travancore (Smith, 1943). Another species of sand snake is also possibly present in the sanctuary.

There is a question as to whether the population of *P. molurus* is a natural population or was introduced. As this sanctuary is geographically quite close to the urban city of Vadodara (70 km), many non-governmental organizations and forest officials release snakes which have been rescued from urban areas into the forest area. The author knows of a few such incidences where the Forest Department released pythons into the forest.

Acknowledgements

The author would like to thank the Deputy Conservator of Forests, Vadodara, and the Chief Conservator of Forests, Gandhingar, for permission to carry out the study and for their support.

References

Champion, H.G. and S.K. Seth. 1968. **A revised survey of the forest types of India**. Government of India, Delhi. 404 pp.

Daniels, R.J. 1997. **A field guide to the frogs and toads of the Western Ghata, India. Parts I, II and III.** *Cobra* (27 to 29): 1-25, 1-24, and 1-13.

Das, I. 1994. **The reptiles of South Asia. Checklist and distribution summary**. *Hamadryad* 19:15-40.

Mehta, S.K. and A.K. Varshney. 2002. **Management Plan, Jambughoda Wildlife Sanctuary 2002-2011**. D.C.F., Wildlife Division, Kothi Annexe, State Forest Department, Vadodara. 272 pp.

Pandya, T.M. and G.M. Oza. 1998. **Bioregion common property resource management studies.** International Society of Naturalists, Vadodara, India. 197 pp.

Smith, M.A. 1935. **Fauna of British India. Reptile & Amphibian. Vol.II**. Taylor and Francis, London. 185 pp.

Smith, M.A. 1943. **Fauna of British India. Reptile & Amphibian. Vol.III**. Taylor and Francis, London. 185 pp.

Vijaykumar, V. 1997. **Evaluation of restocked mugger crocodiles and its implication in long-term conservation and management of the species in Gujarat, India.** Gujarat Institute of Desert Ecology, Bhuj-Kachh, Gujarat. 65 pp.

Vyas, R. 2000. **First record *Pasammophilus blanfordanus* (Stoliczka, 1871) (Family: Agamidae) from Gujarat State**. *Journal of the Bombay Natural History Society* 97(3):432-434.

Vyas, R. and B.M. Parasharya. 2000. **Distribution and status of the star tortoise (*Geochelone elegans*) in Gujarat State, India.** *Zoo's Print Journal* 15(4):239-242.

Author's address: 505, Krishnadeep Apartments, Mission Road, Fatehgunj, Vadodara – 390002, Gujarat, India.

Table 1: Reptilian species recorded at Jambughoda Wildlife Sanctuary, Gujarat

No.	Order	Common name	Family/Species
	Crocodylia		**I: Crocodylidae**
1		Mugger or Marsh crocodile	*Crocodylus palustris*
	Testudines		**II: Testudinidae**
2		Co. flap shell turtle	*Lisseyms punctata*
	Lecertilia		**III: Gekkonidae**
		Brook's gecko	*Hemidactylus brookii*
		Yellow-green house gecko	*Hemidactylus flaviviridis*
		Bark gecko	*Hemidactylus leschenaultia*
		Termite gecko	*Hemidactylus triedrus*
			IV: Agamidae
		Garden lizard	*Calotes versicolor*
		Blanford's rock agama	*Psammophilus blanfordanus*
		Fan-throated lizard	*Sitana ponticeriana*
			V: Chamaeleonidae
		Indian chameleon	*Chamaeleo zeylanicus*
			VI: Scincidae
		Supple skink	*Lygosoma puncatus*
		Co. keeled grass skink	*Mabuya carinata*
		Bronze back skink	*Mabyua macularia*
			VII: Varanidae
		Bengal monitor	*Varanus bengalensis*
	Serpentes		**VIII: Typhlopidae**
		Brahminy worm snake	*Ramphotyphlops braminus*
			IX: Boidae
		Red sand boa	*Eryx johnii*
		Indian rock python	*Python molurus*
			X: Colubridae
		Buffstriped keelback	*Amphiesma stolata*
		Rat snake	*Ptyas mucosus*
		Co. bronzeback tree snake	*Dendrelaphis tristis*
		Indian green keelback	*Macropisthodon plumbicolour*
		Streaked kukri snake	*Oligodon taeniolatus*
		Checkered keelback water snake	*Xenochrophis piscator*
			XI: Elapidae
		Spectacled cobra	*Naja naja*
		Slender coral snake	*Calliophis melanurus*
			XII:Viperidae
		Russell's viper	*Doboia russellii*
		Bamboo pit viper	*Trimeresurus gramineus*
		Indian saw-scaled viper	*Echis carinatus*

UTILIZATION OF FOOD PLANTS BY MIGRATORY ELEPHANTS IN THE WILDERNESS OF SOUTH WEST BENGAL

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

Introduction

During the last two decades there has been a regular phenomenon of elephant herds migrating into new habitats and therefore it has become an important issue for managing the population of wild elephants in India (Nath and Sukumar, 1998). Since 1987, a group of 40-60 elephants has been migrating from Dalma Wildlife Sanctuary of Jharkhand state to vast areas of South West Bengal's forests each year during August-September, and remaining there for 6-7 months. Prior to 1987 elephants were rare in the area due to forest losses and the poor cover quality of Sal (*Shorea robusta*) forests (Palit, 1991; Panda, 1996). The migratory movement of elephants since 1987 possibly coincided with the revival of forest cover as a result of the decade-old participatory forest protection initiatives with local communities (Malhotra, 1995). The gradually increasing duration of the stay of elephants has long been a source of concern to the local people because of the associated loss of property and human life (Singh *et al.*, 2002). As a result, the conservation of migratory elephants has become a burning issue in South Bengal.

Although the elephants' diet varies with the locality and season, the migratory elephants in South West Bengal's forests prefer only certain plants for food. Interestingly, many of the wild plants consumed by elephants are also taken by the local people for different uses. Knowing which food plants are utilized by wild elephants is important and fundamental data for managing the forest habitat and suggests a possible solution to the problem of migratory elephants. Therefore, the present study was conducted to determine the utilization pattern of food plants by migratory elephants in the wilderness of South Bengal.

Study area

The study area is located in the districts of West Midnapur, Bankura and Purulia, between latitudes 22º25' to 23º15' N and longitudes 86º30' to 87º49' E. The geographical area covers about 11,000 km^2, with forests spread over 1,850 km^2. It is bounded by Burdwan district in the north and Jharkhand and Orissa states in the west. Elephants occupy an overall area of 3,368 km^2, but intensive range utilization is restricted to 243 km^2. Dalma hill forest, the home of the migratory elephants, is located to the west of the study area in Jharkhand state. The terrain is hilly and undulating and the greater part of the study area is agricultural land.

The area has two major seasons, viz hot-humid and cold-moist. Temperatures in the summer months can reach as high as 46ºC and during winter drop to 5ºC. The annual rainfall during the period 1995-2000 ranged from 1,033 to 1,981 mm.

The topographical features have a remarkable influence on the vegetation (Anon, 1993). There are four principal river catchments: Subernrekha, Kangsabati, Silabati and Darkeshware. The forest types in South West Bengal are Tropical Dry Deciduous dominated by Sal (Champion and Seth, 1968.). The forests are divided into four broad categories: Sal coppice, open scrub, open scrub with sporadic Sal, and plantations. As mentioned earlier, the South West Bengal forest is dominated by *Shorea robusta*. Other dominant flora found in the area are *Anogeissus latifolia, Lagerstroemia parviflora, Diospyros melanoxylon, Buchanania latifolia, Terminalia tomentosa, Lannea grandis, Madhuca latifolia* and *Pterocarpus marsupium.*

According to the historical records (O'Malley, 1911), the area was rich in fauna 100 years ago. Tigers and wild buffaloes once roamed this region. In the present time, leopards are occasionally seen in Ajodhya and Kankrajhore tracts. Sloth bear is found in hilly tracts during the flowering of mohua trees (*Madhuca latifolia*) in February-March. Other fauna such as wolf, hyaena, wild pig, common langur, etc. are gradually vanishing from the area. Avifauna and reptiles are poorly represented.

The human population in the three districts of South West Bengal was reported to be 12.33 million, with varying density of 355-591 persons/km^2 (Singh *et al.*, 2002)

Methods

Four plots measuring 1,500 m^2 each were laid out in four forests, viz Uthan Nayagram, Kuilibandh, Swargabati and Indkata to record patterns of different plant species consumed by the elephants. The total number of plants consumed with respect to the total number of plants present in the plots was estimated through evidences of broken branches, broken main-stems, twisted stems, bark peeling, uprooting and tusk markings (Ishwaran, 1983). The degree of utilization was calculated based on the ratio of total individual plants consumed to the total number of plants in the plot. The maximum or minimum preference for particular food plants by elephants was recorded.

Results and discussion

The utilization pattern of wild plant species by migratory elephants in South Bengal forests revealed that the elephants are highly selective in their food habits. It was observed that 17 plant species were utilized as food plants. The bark of *Ficus hispida* was fully consumed wherever available. Out of the total recorded plant species, five non-tree species (*Smilax macrophylla, Acacia chundra, Butea superba, Zizyphus xylopyra* and *Mucuna pruriens*) were found to be consumed occasionally by elephants. Plant parts such as leaves with stems, and the bark and fruits of these non-tree species were consumed. It was also observed that *Diospyros melanoxylon* was utilized the most (34.39%), followed by *Pterocarpus marsupium* (24.76%) among all the recorded plants. Only the leaves and bark of *P. marsupium* were consumed by migratory elephants, whereas the roots were utilized in the case of *D. melanoxylon*. The bark of *Buchanania latifolia* was moderately utilized (10.38%). All other plants were utilized at below 10.0 % level. The bark of *Shorea robusta* was poorly utilized (4.23%) in spite of this species having the highest abundance in the forests. Although heavy debarking of *Pterocarpus* spp. in the rain forest of Malaysia was reported (Olivier, 1978), Dalma elephants showed strong preference for the leaves of *P. marsupium.*

Since migratory elephants have the strongest preference for *P. marsupium, D. melanoxylon* and *B. latifolia*, these plants should be protected by dissuading people from cutting them. The selective utilization of wild food plants is possibly due to the heavy reliance of migratory elephants on agricultural crops to meet the majority of their food requirements. The elephants might be less inclined to attack agricultural crops if more of the plants they preferred were grown in the forest habitat.

Acknowledgements

The authors would like to thank the Chief Wildlife Warden, Government of West Bengal, for granting permission to work in the South West Bengal forests. They are also grateful to the many forest staff for their cooperation and encouragement during the study.

References

Anon. 1993. **Forest cover mapping of West Bengal state through digital image processing of Indian remote sensing satellite data: Procedural manual and inventory**. Joint collaboration project of the Forest Department, Government of West Bengal and the Regional Remote Sensing Service Centre, Kharagpur, Indian Space Research Organization, Dept. of Space, Govt. of India.

Champion, H.G. and S.K. Seth. 1986. **A revised survey of the forest types of**

India. Govt. of India publication, New Delhi.

Ishwaran, N. 1983. **Elephant and woody-plant relationships in Gal Oya, Sri Lanka**. *Biol. Cons*. 25:255-270.

Krishnan, M. 1972. **An ecological survey of the larger mammals of Peninsular India**. *J. Bombay Nat. Hist. Soc.* 69(2):297-321.

Nath, C.D. and R. Sikumar. 1998. **Elephant-human conflict in Kodagu, Southern India: distribution patterns, people's perception and mitigation methods**. Asian Elephant Conservation Centre, Centre for Ecological Science, Indian Institute of Science, Bangalore, India.

Olivier, R.C.D. 1978. **On the ecology of the Asian elephant *Elephas maximus* Linn. with particular reference to Malaya and Sri Lanka**. Unpublished Ph.D. thesis, University of Cambridge, England.

O'Mally, L.S.S. 1911. **Bengal District Gazetteers-Midnapur**, Government of West Bengal. Reprint, 1995.

Singh, A.K., Singh, R. and S. Chowdhury. 2002. **Human-elephant conflicts in changed landscapes of South West Bengal, India.** *The Indian Forester*, 128(10):1119-1132.

Author's address: Dr. Ajit Kumar Santra, Associate Professor, Department of Livestock Production & Management, College of Veterinary Science & A.H., Anjora, Durg – 491001, P.B. No.-6, Chhattisgarh, India.

Table 1: Overall utilization of food plants by migratory elephants in different areas of South West Bengal forests

Plants consumed	% of diet
Mucuna pruriens	0.52
Trewa nudiflora	0.52
Albizzia lebbeck	1.05
Terminalia belerica	0.52
Zizyphus xylopyra	1.05
Butea superba	0.52
Lannea grandis	4.23
Shorea robusta	4.23
Diospyros melanoxylon	34.39
Terminalia tomentosa	0.52
Aegle marmelos	3.17
Acacia chundra	3.17
Ficus hispida	1.58
Smilax macrophylla	6.87
Pterocarpus marsupium	24.86
Semecarpus anacardium	2.64
Buchanania latifolia	10.58

COMMUNITY PERCEPTIONS TOWARDS ASIAN OPENBILL IN PAILOM & AMPUVARARAM TEMPLE WILDLIFE NON-HUNTING AREA, THAILAND

by Subas P. Dhakal

Introduction

The Asian Openbill (*Anastomus oscitans*) is one of the larger wading birds belonging to the stork family Ciconiidae. Like other members of the family, it is characterized by wide wing spans, long legs and large bills (Sonobe and Usui, 1993). However, it is the unique curved opening between the mandibles of the adult Openbill that distinguishes it from other stork species. The Openbill is widely distributed across the wetlands of South and Southeast Asia, and is a resident and/or migratory waterbird of Thailand (Lekagul and Round, 1991). The Openbill population is yet to be quantified at the global scale, but it is not believed to have approached the threshold criterion for population decline of the *IUCN Red List.* Hence, it is listed as a Species of Least Concern (Birdlife International, 2004a).

Thailand is one of the few countries in the region where the Openbill has protected status (ARCBC, 2005). The Openbill is favored by farmers because of its significant ecological role in controlling the Golden Apple Snail (*Pomacea canaliculata*), an invasive mollusk that infests paddy fields (Birdlife International, 2004b). Furthermore, it is often attributed as having economic benefits accruing from being a recreational attraction. Unfortunately, the recent bird flu outbreak almost led authorities to cull Openbills because of the perception that they were spreading the flu. Culling was forgone only after persistent pressure from conservation-oriented organizations based on scientific findings that the perception of Openbills being a vector of the flu was erroneous (Birdlife International, 2004b). Sporadic incidences of avian flu have nonetheless remained a vigilant concern for human well-being, particularly in and around the Openbill's habitat. Thus, the community's perceptions towards the Openbill could play a significant role in its continued survival. Perceptions generally refer to an individual's appraisal of an object as experienced in the immediate situation (Fransson and Garling, 1999) and they have increasingly been accepted as an appropriate feedback towards formulating conservation strategies (Pavlikakis and Tsihrintzis, 2003). In that milieu, a study was undertaken with an aim to investigate community perceptions towards conservation and management of the Openbill.

Study area

Pailom and Ampuvararam Temple Wildlife Non-Hunting Area (hereafter referred to as PATWNHA) is located in Samkhoke district of Pathum Thani province. It was established in 1978 on the outskirts of Bangkok and covers an area of 12 hectares (PATWNHA, 2005). It represents some of the few remaining freshwater marsh/forest ecosystems of the lower central plains and is one of the oldest habitats of Openbill in Thailand. Based on its ecological significance, PATWNHA is listed as one of the high priority wetlands (OEPP, 2002). Most of the Openbills migrate here from South Asia in October, where they nest, mate, lay eggs and raise their young before most of them fly back home in June, although some remain all year round. Table 1 depicts a five-year trend of nests and population counts within PATWNHA.

Table. 1: Tally of Asian Openbill nests and population in PATWNHA (Source: PATWNHA, 2005)

Year	Total number of nests	Total number of Openbills
1996	13,697	54,788
1997	14,818	59,272
1998	16,000	40,024
1999	8,461	42,844
2000	26,335	105,420
2001	22,649	90,596

Several small settlements are scattered outside the periphery of PATWNHA and the study was carried out in the community of Ban Soun Ma Maoung Tai (Moo-5). Moo-5 is located adjacent to the northeastern border of the wildlife non-hunting area, and comprises 62 households with a total population of 244. This community was chosen in particular as the study site because it is one of the oldest settlements of the area and has coexisted with Openbills and the temples even before the establishment of PATWNHA.

Methodology

A quantitative survey among the heads of households and a qualitative consultation among the major stakeholders were carried out between June and September 2005. A semi-structured questionnaire was administered to each head of household based on a census method. The respondents perceptions of the statements in the questionnaire were assessed using the five-point Likert Scale that ranks opinions into 5 categories, i.e. strongly disagree, disagree, moderate, agree and strongly agree. Each opinion was then assigned with a progressive value of 0,1,2,3 and 4 respectively. To measure the perceptions of the respondents for each statement, the weighted score (mean index of perceptions) was computed using the following equation: $WS = S (x_i \times n_i) / S n_i$ where, WS = weighted mean index of perception, x_i = quantified value of perception and n_i = number of respondents that have perception ranked as x_i respectively.

Results and discussion

Socioeconomic information: 62.9 % of the 62 survey respondents were female, while 37.1 % were male. The average age of the respondents was 42.08, and the average length of residence in the community was 32.11 years. A majority (50.8 %) of the respondents had primary level education and the typical occupation of the respondents was farming (30.6%). The average monthly household income was 8,895.83 baht, slightly below the national average of 10,889 baht (NSO, 2002).

Respondent's perceptions: 84.12 % of the respondents believed that the Openbill population has decreased in recent years. This perception was consistent with that of the abbot of Ampuvararam temple and that of the head of the wildlife non-hunting area. The respondents' perceptions about the conservation and management of Openbills were assessed through five statements in the questionnaire: 1) Establishment of a wildlife non-hunting area was necessary to conserve Openbill and its habitat; 2) The presence of Openbills in the vicinity of the community is a primary issue of concern; 3) The Openbill and its habitat can be beneficial to the community; 4) Conservation activities of the wildlife non-hunting area are adequate to conserve the Openbill and its habitat; and 5) The wildlife non-hunting area management consults with the community regarding the management of Openbills and their habitat. Details in frequency, percentage and the weighted scores of the perceptional responses to the statements are provided in Table 2.

Table. 2: Community's Perceptions

Perceptions to Statements:	Strongly Disagree	Disagree	Moderate	Agree	Strongly Agree	Total	Weighted Score
			Number/Percent				
1. Establishment of PATWNHA was necessary	0	6	2	45	9	62	2.92
	0	9.68	3.22	72.58	14.52	100	
2. Openbill's presence in vicinity is a primary issue of concern	10	14	22	12	4	62	1.77
	16.13	22.58	35.48	19.36	6.45	100	
3. Openbill and its habitat can be beneficial to community	1	4	0	52	5	62	2.98
	1.61	6.45	0	83.87	8.07	100	
4. Conservation activities of management are adequate	1	10	14	37	0	62	2.4
	1.61	16.13	22.58	59.68	0	100	
5. Management consults with community for decision-making	18	23	3	18	0	62	1.34
	29.03	37.1	4.84	29.03	0	100	

Qualitative analysis: It is evident from the weighted scores that the community did not perceive the Openbill to be an issue of primary concern. Follow up qualitative discussions further revealed that the Openbill was neither associated with the avian flu, nor considered a threat to the community's well-being. These perceptions were consistent with those of the abbot of Ampuvararam temple and with the head of the wildlife non-hunting area. Both of these leaders also stressed that the proposed culling of Openbills was ethically, ecologically and economically inappropriate. There was, however, one issue of concern within the community that needed prompt attention, namely the visual pollution resulting from the Openbill's droppings and the associated odor. Moreover, widespread dissatisfaction over the PATWNHA management's unresponsiveness in consultations with the community towards systematizing the management of available recreational opportunities was revealed during the follow up discussions.

Conclusions and recommendations

Based on the analysis of the community's perceptions, it was concluded that: a) the Openbill was not perceived as an immediate threat to the community's well being; and b) conservation efforts regarding the Openbill and its habitat were adequate, but hindered by management's inadequate outreach with the community. The community's responses indicated that economic factors played a crucial role in shaping their perceptions regarding how and why the Openbill should be protected. In order to boost economic prospects within the community and reduce the threats to the Openbill's continued survival, a collaborative approach in institutionalizing the management of the currently available recreational opportunities is recommended.

Acknowledgements

This paper is based on the author's Master's thesis of 2005, entitled – "Local People's Perception and Willingness to Pay towards Participatory Management of Recreational Opportunities in Wetlands of Pailom & Ampuvararam Temple Wildlife Non Hunting Area, Pathum Thani, Thailand.". Mahidol University, Thailand. ISBN 974-04-6527-7. 122 pp. The author would like to express his gratitude to Dr. Sansanee Choowaew, Dr. Kulvadee Kansuntisukmongkol, Mr. Patompong Saguanwong, Mr. Anuchit Thangon, as well as to the community of Moo-5, for their meaningful contribution to the research.

References

ARCBC. 2005. **Biodiversity Information Sharing Service (BISS).** Asean Regional Center for Biodiversity Conservation. (URL: http:www.arcbc.org accessed on 09/2005)

Birdlife International. 2004a. **Species Fact Sheet: *Anastomus oscitans*.** BirdLife International. (URL: http://www.birdlife.org accessed on 09/2005)

Birdlife International. 2004b. **Wild Birds Accused of Spreading Avian Flu**. *World Birdwatch* Vol. 26. No.3: 4.

Fransson, N. and T. Garling. 1999. **Environmental Concern: Conceptual Definitions, Measurement Methods and Research Findings**. *Journal of Environmental Psychology* 19:369-382.

Lekagul, B. and P. Round. 1991. **A Guide to the Birds of Thailand.** Saha Karn Bhaet Co. Ltd. 56 pp.

NSO. 2002. **Key Statistics of Thailand**. National Statistics Office, Office of the Prime Minister. Bangkok.

OEPP. 2002. **An Inventory of Wetlands of International and National importance in Thailand**. Ministry of Science and Technology and Environment. Office of Environmental Policy and Planning. Bangkok. 414 pp.

PATWNHA, 2005. **Asian Openbill the Friendly Alliance of Pathum Thani. Pailom and Ampuvararam Temple Wildlife Non Hunting Area**. Pathum Thani, Bangkok.

Pavlikakis, G.E. and V.A. Tsihrintzis. 2003. **A Quantitative Method for Accounting Human Opinion, Preferences and Perceptions in Ecosystem Management**. *Journal of Environmental Management* 68: 193–205.

Sonobe, K. and S. Usui (Editors). 1993. **A Field Guide to the Waterbirds of Asia.** Wild Bird Society of Japan. Tokyo.

Author's Address: c/o Wetland and Wildlife Unit, Conservation Education. PO Box 5170 Kathmandu Nepal.
Email: subasdhakal@gmail.com

ISLAND BIOGEOGRAPHY - THE FOREST BIRDS OF THE ANDAMAN ISLANDS AS A CASE STUDY

by Mohammed A. Ashraf

Introduction

The question of whether area per se or habitat diversity is more important in influencing species richness on islands has been subject to biogeographical debate (Williams, 1964; MacArthur & Wilson, 1967). One hypothesis (Boecklen, 1986) is that habitat diversity significantly influences the species richness when area is factored out. This hypothesis has highly influenced conservation practices, where the relative merits of large vs. small reserves are contested based on the interpretations of island biogeographic theory (Wilson & Willis, 1975). However, in most cases the effects of area and habitat diversity are closely related and often influence each other directly or indirectly. Recent work has shown that habitat diversity and availability of particular habitat types might be important in determining the species richness of Agean land snails (Welter-Schultes & Williams, 1999). The Andaman Islands, which lie off the coast of S.E. Asia in the Bay of Bengal provide a natural laboratory for testing the island biogeographical theory in relation to the effects of area, habitat diversity and habitat types on the species richness of forest birds. In the case of the Andamans, the habitat use patterns and the biogeographical history of the birds are also known (Yoganand & Davidar, 2000), making inferences easier than for other taxa.

Geographical location & climatic features of Andaman Island

The Andaman Islands lie between 10º30' - 13º41'N and 92º12' - 93º57'E, off the coast of S.E Asia in the Bay of Bengal, about 571 km from the Malay peninsula and 1,330 km from southern India. The northernmost islands are about 285 km from Myanmar. The climate is tropical and oceanic, receiving rainfall from both the southwest and northeast monsoon winds. The average annual rainfall is 3,000 mm, increasing from the northern to the southern islands. This results in a north-south vegetation gradient, with predominantly drier forests in the northern islands and wetter forests in the southern islands (Davidar *et al.*, 1995). Most of the land area of the Andamans comprises four large, contiguous islands, i.e. North Andaman Island, Middle Andaman Island, Baratang and South Andaman Island. Rutland, a large island, lies close to the southern tip of South Andaman Island. Little Andaman, another large island, is 67 km south and the southernmost of the Andaman group. Ripley & Beehler (1989) listed 104 species of breeding birds from the Andaman Islands. However, 47 were identified as being predominantly forest dwelling. In the context of this essay, only 47 forest dwelling birds are considered for establishing the effects of island area, distance to source pool, latitude, habitat diversity and habitat types on species richness.

Island biogeography

Effects of habitat type

The relationship between species and area on islands with or without wet forests was analysed and the results showed that on islands without wet forests, species richness was saturated on mid-sized islands, whereas it continued to increase on islands with wet forests. When islands of similar size with the same level of habitat diversity were compared, wet forests were significantly associated with increased species richness of forest birds on the island. The higher levels of species richness in the Middle and South Andamans are probably related to the presence of wet forests on the smaller islands. Wet forests in the Andamans are probably reservoirs of many habitat specialists (Yoganand & Davidar, 2000). The importance of wet forests to forest birds might be related to the biogeographical history of the Andamans, and also because wet forests are species rich ecosystems.

Determinants of species richness

Island size and habitat diversity have a significant influence on the species richness of forest birds in the Andamans, although distance did not have an effect. The importance of island size and habitat diversity in influencing species richness was supported by an analysis within the island groups and for smaller islands as well. Latitude also had a significant effect on species richness. This is evident when the North Andaman group is compared with the Middle and South Andamans. Large and mid-sized islands in the North Andaman supported fewer species than islands of similar area in the Middle and South Andamans. Although area was very important in influencing the species richness, the underlying habitat-related factors control the process at a micro level.

Habitat preference of birds

An analysis of the habitat preferences of 30 forest birds indicated that approximately half of them preferred wet forests, and the rest preferred deciduous forests. However, these habitat preferences did not correspond with the overall distribution of these species within the Andamans, i.e. species with restricted distribution were not specialists of wet forests (Davidar, 2000).

Conclusion

An attempt was made to analyse the importance of island biogeography theory and its implication on wildlife conservation in species rich tropical off shore islands in South and South East Asia. While area and habitat diversity have equal influence in determining species richness on islands, the role of species habitats needs to be explored further. Habitat type can markedly influence the species richness, hence certain habitats which maintain the biodiversity at a regional scale can be called *keystone habitats.* These *keystone habitats* which maintain the regional biodiversity need to be identified and protected on a priority basis for

the conservation of species and the management of tropical biodiversity.

References

Boecklen, W.J. 1986. **Effects of habitat heterogeneity on the species-area relationships of forest birds**. *Journal of Biogeography*, 13: 59-68.

Davidar, P., Yoganand, K. and T. Ganesh. 1995. **Distribution of forest birds and butterflies in the Andaman islands, Bay of Bengal: nested patterns and process**. *Ecography*, in press.

Devy, M.S., Ganesh, T. and P. Davidar. 1998. **Patterns of butterfly distribution in the Andaman islands: implications for conservation.** *Acta Oecologica*, 19: 527-534.

MacArthur, R.H. and E.O. Wilson. 1967. **The theory of island biogeography**. Princeton University Press, Englewood Cliffs, NJ, USA.

Ripley, S.D. and B.M. Beehler. 1989. **Ornithogeographic affinities of the Andaman and Nicobar islands**. *Journal of Biogeography*, 16: 323-332.

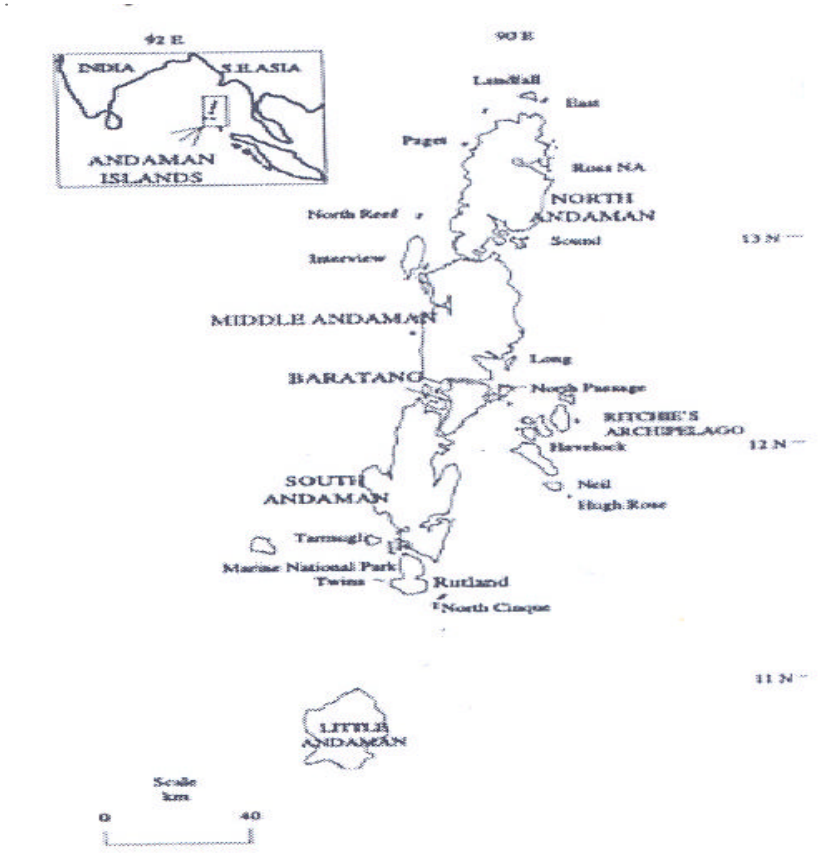
Welter-Schultes, F.W and M.R. Williams. 1999. **History, island area and habitat availability determine land snail species richness of Aegean islands**. *Journal of Biogeography*, 26: 239-249.

Williams, C.B. 1964. **Patterns in the balance of nature**. Academic Press, London.

Wilson, E.O. and E.O. Willis. 1975. **Applied biogeography.** In: (Eds. M.L. Cody and J.M. Diamond) *Ecology and evolution of communities*. Harvard and Belknap, Cambridge, MA, USA.

Yoganand, K. and P. Davidar 2000. **Habitat preferences and distributional status of some forest birds in Andaman islands**. *Journal of Bombay Natural History Society*, 97: 375-380.

Author's address: Acorn House, Bilsborrow, Preston, PR3 0SE, Lancashire, UK
E-mail: bengal_tiger010@yahoo.com



EXTENT OF BIOTIC PRESSURE ON UNPROTECTED SLOTH BEAR HABITAT AND HUMAN-BEAR CONFLICT IN NORTH BILASPUR FOREST DIVISION

by Naim Akhtar, Harendra Singh Bargali and N.P.S. Chauhan

Introduction

Sloth bear (*Melursus ursinus*) is one of the most widely distributed large mammals in India. At the same time, the sloth bear has suffered as much as other large mammals from human impacts on forested areas. The North Bilaspur Forest Division, Chhattisgarh, which is an un-protected area, harbours a large number of sloth bears. In Pendra and Marwahi administrative ranges of NBFD, the habitat available for sloth bears is highly degraded and interspersed by villages and agricultural crop fields. In this region sloth bears are very aggressive and causing lot of nuisance; incidences of humans being mauled and killed occur quite frequently. Due to the ongoing encroachment on the forest land and habitat degradation over the years, the status of the sloth bear is not only endangered in this area, but is also leading to a more conflicting situation. About 4.72 % of the India's geographical area is under protection for *in situ* biodiversity conservation and many wild animals are living in unprotected habitats (Rodgers *et al.,* 2004). Sloth bear is an endangered and threatened species belonging to schedule 1 of the Indian Wildlife Protection Act 1972 and Appendix II of CITES (Servheen, 1990).

The impacts of biotic pressures might be less on species living in protected areas, but is believed to be high on those species living outside the protected areas in man-altered situations. The studies on assessment of biotic pressures on tiger (Mathur *et al.,* 1995), goral (Roy *et al.,* 1995) and grizzly bear (Hood and Parker, 2001) helped to map the affected habitats. In America, direct, human-caused mortality of grizzly bears was an arguable cause of population decline (Craighead and Mitchell, 1982; Brown, 1985; Servheen, 1989 and Mattson, 1990). The presence of human beings and dogs in the proximity of brown bear dens has been attributed to an increased level of aggressiveness among bears in Scandinavia (Swenson *et al.,* 1999).

This study was undertaken to determine the extent and level of biotic pressures and their impacts on the sloth bear, as well as to assess the status of human-bear conflicts. Findings of the study will suggest measures for bear conservation, as well as measure to reduce the human-bear conflict on a long term basis. This intensive study was conducted between 1996 to 2001, and the study area is still being monitored to date.

Study area

The study was carried out in the Pendra and Marwahi administrative ranges of the North Bilaspur Forest Division, Chhattisgarh, covering an area of 1,395 km^2. Pendra and Marwahi forest ranges come under the Pendra, Marwahi, and Gaurella administrative blocks. The study area lies between 22^0 40' N and 23^0 06' N longitudes and 81^0 44' E and 82^0 13' E latitudes. The forest cover is patchy and fragmented, covering an area of 337 km^2. Forest blocks in the area range from 11 to 97 ha. The study area lies in one of the oldest mountain chains of India – the Vindhya or Maikal range. Ecologically, this area is a part of the Eastern Deccan Biogeographical Zone (Rodgers *et al.,* 2004). The topography is undulating, interspersed with chains of hillocks and rocks, ranging in elevation from 450 m-1050 m. Some hillocks are isolated and surrounded by villages; these hillocks provide caves (dens) for sloth bears. One major river, the Son, runs through this area and there are several seasonal streams. Ponds and check dams scattered throughout the study area are the main sources of water. The average annual rainfall is 1,376 mm, 85% of which is received during the winter monsoon. Champion and Seth (1968) have classified the forest types of the area as dry deciduous peninsular sal forest, northern

tropical dry mixed deciduous forest and northern tropical secondary moist mixed deciduous forest.

In addition to sloth bears, other large mammals in this area include leopard (*Panthera pardus*), nilgai (*Boselaphus tragocamelus*), spotted deer (*Cervus axis*), hyena (*Hyena hyena*), jackal (*Canis aureus*), Indian fox (*Vulpes bengalensis*), four-horned antelope (*Tetracerus quadricornis*), wild pig (*Sus scrofa*), common langur (*Semnopithecus entellus*), rhesus macaque (*Macaca mulatta*), toddy cat (*Paradoxurus hermaphroditus*) and Indian porcupine (*Hystrix indica*).

Methods

To assess the impact of biotic pressures on sloth bear habitats, 78 linear transects were laid out covering all the available habitats and landuse categories in North Bilaspur Forest Division. Each transect was 1 km in length and sample plots of 10 m radius at 250 m intervals were examined to assess the impact of biotic pressures on bear habitat. In total there were 390 plots and evidence of biotic pressures such as cattle grazing (dung), lopped trees, collection of non-timber forest produce, distance from human habitation, disturbance from roads, stone mining, camping of graziers and other human activities were recorded in the predesigned formats. Locations of the affected areas were marked on toposheets. Altogether, eight broad habitat categories were identified from the plots. Information thus collected was finally transferred onto a study area map divided into grids of 200 x 200 m each. The extent of biotic pressures was categorized as nil, low, moderate, high and very high (not occupied by bears). Each grid on the map was assigned a value as per the category of biotic pressure and random checking of the grids was done to ensure precision in marking each grid. After the ground check, the value of each grid was transferred to Arc/Info and Arcview software of Sun GIS domain. Finally, area statistics of each category and a map showing biotic pressures was generated in Arcview (1996). In addition to transect methods, information on biotic pressures was also collected through village surveys over a period of three years. Data on human-bear conflicts was collected from all villages of the study area through interviews and questionnaire formats.

Results

The impact of biotic pressures on sloth bear habitat and the status of the human-bear conflict is discussed below.

Extent of biotic pressures and collection of non-timber forest produce

In Pendra and Marwahi ranges, forests were highly fragmented and interspersed with human habitations and cultivation areas. The human population estimated by revenue department in the Pendra, Gaurela and Marwahi blocks (administrative unit) of the two ranges was 53,343, 72,688 and 96,694 respectively. The livestock population in the same blocks was 44,633, 51,437 and 70,000 respectively. About 46% area of NBFD was found to be highly affected, whereas only 2.5% of the area was without any biotic pressures, which was judged to be the most suitable area for sloth bear. More than 27% of the area was severely affected and was not used by the bears. Altogether, 42 items of non-timber forest produce (NTFP) were identified as being regularly collected by villagers from the bear habitats in NBFD. Thirty-two items were of plant origin, 3 were insects and 7 were mushroom species. These NTFP items belonged to 21 families, 28 genera and 32 species.

Lopping of trees and livestock grazing

The extent of lopped trees in different habitats was estimated as a measure of biotic pressure. The number of lopped trees per hectare was highest in Sal mixed forest (191.67), followed by mixed forest (179.07), Sal forest (177.52), plantations (95.54), land near to water bodies (87.05), scrub land (83.24) and crop fields (6.75). An average 10.43% increase in the lopping activity was recorded during one year. The presence of cattle dung in the bear areas is the most prominent disturbance factor. Dung abundance per hectare was found to be greatest in open land (197.45), followed by plantations (179.71), scrub land (158.87), land near to water bodies (121.02), mixed forest (83.81), crop fields (75.13), Sal mixed forest (58.98), and Sal forest (51.9). In summer, nomadic

graziers from Gujarat visit Achanakmar wildlife sanctuary and NBFD to graze their sheep and goats, which also puts tremendous pressure on bear habitats. Graziers were frequently seen camping at Silpahri, Pakariya, Salekota, Lityasarai, Chullapani and Andhiyarkho forests – all important bear habitats. Dhaiyan are a forest-based local community who are involved in selling milk and milk products. Dhaiyan camps and grazing cattle were noticed in Bedkudra and Karangra forests of the Amarkantak hills area of the Pendra range.

Stone mining activities, forest fires and encroachment on forest land

During the fieldwork, we identified more than 109 den sites of sloth bear. All the den sites were located in separate hillocks. These bouldered hillocks scattered throughout the ranges provide good shelter or resting sites for bears. Due to illegal stone mining activities, den sites such as Jhandi dongri of Surungtola (Masurikhar panchayat), Marakot in Marwahi, Jhandi and Bhuthi dongris of Barbasan in Pendra were being destroyed. This caused the displacement of bears and they were increasingly moving out, and thus their survival was highly threatened. Mining along the dry streams of Karangra village and hill tracts of Bedkhudra located on the border of NBFD and Shahdol district was also recorded. Bears were frequently seen on the move in these areas. In dry deciduous vegetation, the accumulation of dry leaves on the ground was highly vulnerable to catching fire in the summer season. In NBFD, forest fires did not impact much on trees, but they adversely impacted the abundance of fruiting shrubs. The occurrence of two wild fruit shrub species, i.e. makoiya (*Ziziphus oenoplia*) and jungali ber (*Ziziphus nummularia*), both important food species of bears, was drastically reduced. Most of the fire incidences were found to be man-made. The most fire-prone areas were Silpahri, Ratga, Ghusariya, Lityasarai, Karhanhia, Chullapani and Rumga in the Marwahi range, and Pakariya, Padwania and Amarkantak belt in the Pendra range.

At many places in the forest areas of Karangara, Padwania, Pakariya, Bedkhudra and Andhiyarkho in Pendra and Ghusariya, Madwahi, Charheri, Lityasarai, Silpahri, Chilan, and Chullapani in Marwahi, land was being encroached upon either for agricultural purposes or the establishment of houses.

Status of sloth bear populations and human-bear conflicts

An average of 5.83 bears were found at each den site. Identifying the sex of sub-adults and cubs was very difficult, but adult male and female bears were counted easily. In NBFD, the bear population is estimated to be 326 ± 90 bears in an area of 1395.8 km^2 (Akhtar, 2004). The population abundance is found to be 0.23 bear/km^2 or one bear per 4.28 km^2. In the Marwahi range, active den sites of a similar nature were greater in comparison to the Pendra range; thus, the bear population was high in the Marwahi areas.

In Pendra and Marwahi ranges of the North Bilaspur Forest Division, a total of 395 incidences of human maulings and killings were recorded. Out of 178 villages, 122 were affected (Bargali, 2003). Incidences of humans being mauled by bears were much higher (93.7%) than killings (6.3%). Incidences of humans being mauled and killed in the Pendra range was 27.3%, comparatively less than the incidences in Marwahi range (72.7 %). Most of the incidences occurred while the victims were collecting non-timber forest produce (30.95%), followed by attacks while walking inside the forest (28.1%), while tending to cattle grazing (24.29 %), during fuel wood collection (11.9%) and while answering calls of nature near the backyards of dwellings (4.76%). In both ranges, incidences of men being mauled were highest 70.63%, followed by women (18.73%) and children (4.3%). Incidences of mauling and killing occurred at different hours of day and night. Most of the cases occurred between 6:00-8:00 hrs (20.3%) followed by the incidences between 4:00-6:00 hrs (18%), 10:00-12:00 hrs (17.5%), 8:00-10:00 hrs (17.2%) in the morning hours and 14:00-16:00 hrs (6.8%), 18:00-20:00 hrs (6.6%) and 16:00-18:00 hrs (5.3%) in the evening. Most of the incidences occurred in forests (53.16%), followed by crop fields (26.33%) and villages (20.51%).

Discussion

Developmental activities and the exploitation of natural resources like water and non-timber forest produce are exerting their combined effect on species, and in such a situation, animals have few options to avoid these pressures. In Pendra and Marwahi ranges, the forest patches interspersed with human settlements and agriculture areas are highly disturbed by biotic pressures. The concentration of bears in areas with high biotic pressures was attributed to the availability of bear den sites in the hillocks. The areas with maximum disturbances were not occupied by bears. Avoidance of these highly disturbed areas was due to the absence of forest cover and hillocks, which could be considered as the limiting factors for bear distribution. The economy of the local people is based on agriculture and non timber forest produce (42 items) collection. The NBFD is a major region for harvesting tendu patta and mahua flowers and seeds in the Chhattisgarh state. Indiscriminate collection of NTFP in huge quantities from these areas exerts tremendous pressure on sloth bears and their habitats. The bear areas were found to be highly disturbed during the collection time of tendu patta and mahua. Many of the NTFP such as mahua flowers and fruit, char and bel fruit were the food items of bears (Bargali *et al.,* 2004). The forest cover, which was already disturbed, degraded and insufficient to sustain bear needs, was further disturbed by the people while collecting the food items that make up the bear's diet. Under these circumstances, competition for food and man-bear encounters were inevitable. These were the major causal factors for man-bear conflicts in the North Bilaspur Forest Division.

The increase in biotic pressures could be correlated with the increase in human interference and increased livestock population in these areas. Nomadic shepherds and Dhaiyans were found to exert tremendous pressure on bear habitats by taking their sheep and goat herds in the vicinity of den sites, staying in the forests and causing disturbances. In India, the livestock population is very high; it has 15% of the world's cattle, 10% of the sheep and goats, and 50% of the buffaloes in 4% of the global land area. The grazing pressure is estimated to be to about 5 livestock per ha of forest and pastureland. The heavy livestock pressure affects the forest vegetation succession at potential shifts of species driven by climatic parameters. Kothari *et al.* (1989) reported the average human and livestock density within the protected areas as 0.38/ha and 0.21/ha respectively. At the national level, livestock density was 5 head of livestock/ha. The North Bilaspur Forest Division has less grazing pressure as it harbors only 1.18 animals per hectare as compared to the national livestock density, but it is still considered very high and may be detrimental to sloth bear habitats. Similarly, the human population density in the NBFD was very high compared to the country's human population.

Lopping of trees was mainly for extraction of fuelwood and timber wood. Zudeima *et al.* (1994) has projected that the areas under the forests would sharply decline in coming decade in India. Fuelwood is the dominant biomass in the forests. The current consumption level has been estimated at 224 metric tons (Ravindranath and Hall, 1995) and has been projected to increase to 350 metric tons by 2005, which would worsen the condition of the forests. In NBFD, the rate of increase of lopping trees per year was estimated as 10.4%. Presently in NBFD, although the forests are highly disturbed and degraded, they do still support a substantial number of sloth bears that can be compared with bear populations in protected areas of Nepal and Sri Lanka. The density of sloth bear in Chitwan National Park was 0.1 bear/km^2 (Laurie and Seidensticker, 1977) to 0.27 bear/km^2 (Garshelis *et al.*, 1999), in Mudumalai it was 0.17 bear/km^2 (Desai *et al.*, 1997), and in Ruhena Wilpattu National Park it was 0.05 bear/km^2 (Santiapillai and Santiapillai, 1990). In North Bilaspur Forest Division, a density of 0.23 bear/km^2 was found to be comparatively high.

Due to the presence of many den sites, the Marwahi range harbors bears in higher numbers than the Pendra range; thus, extent of maulings was found to be higher in Marwahi than in the Pendra range. Generally, men are involved in non-timber forest produce collection and livestock grazing activities and consequently were found to be highly vulnerable to bear attacks. Moreover, these activities are done in early hours of the day, so most of the incidents occurred during the morning

hours. In Pendra and Marwahi ranges of NBFD, there were no bears in the vicinity of Basantpur, Pendra, Semra, Gaurela and Murmur towns in Pendra range, and Kudri, Kotmi, Kurkai and Patgawa towns of Marwahi range, which covered 27% of the total area. The location of >96% den sites perhaps revealed that bears were largely dependent on villages for obtaining their food (Akhtar, 2004). However, water was not a limiting factor behind the location of den sites as water was plentiful across the study area.

Conservation of sloth bear

There are many isolated den sites in the Pendra range viz. Barbasan, Tauli, Surungtola, and in the Marwahi range viz. Katra, Karhaniya, Karsiwa, which are surrounded by human settlements and agriculture fields. During evening hours the bears come out from these dens and raid agriculture crops such as maize (*Zea mays*), ground nut (*Arachis hypogea*), and fruiting trees (e.g. *Ziziphus mauritiana* and *Mangifera indica)*. In such a situation, frequent encounters with humans also take place, often resulting in mauling and killing cases. Sloth bears using these den sites do not have a bright future for survival and chances of encounters with human are always there. In view of the fact that the bear population has been found to be very high, it is necessary to translocate bears from these areas to other suitable areas. A strategy should also be developed to check the increase in the bear population so as to mitigate human-bear conflicts on a long term basis. Achanakmar sanctuary, situated 30 km from Pendra and 80 km from the Marwahi ranges could be a good relocation site for bears from the isolated den sites of NBFD. But before doing this, the status and distribution of sloth bears and the feasibility of sloth bear survival in Achanakmar sanctuary must be ascertained, since this area is also a tiger reserve. The animals at the den sites which have surplus bears need to be relocated to other suitable areas. At the same time, protection should be given to the bear habitats that still have good forest cover.

Acknowledgements

We are grateful to the Director, Wildlife Institute of India, Dehradun, for making this project possible, and for the guidance provided during the fieldwork and writing the report. Acknowledgement is also rendered to the Chhattisgarh Forest Department for providing permission to conduct research and for their tremendous support to the project. This work would not have been completed without Kamlesh and Phul Singh, Field Assistants who always moved ahead of us in the field. We are also very thankful to Mr. Panna Lal, who helped us with the GIS mapping.

References

Akhtar, N. 2004. **Habitat use, ranging pattern and management of sloth bear (*Melursus ursinus*) in North Bilaspur forest division, Madhya Pradesh**. Ph.D. thesis, Wildlife Institute of India, Dehradun.

ARCVIEW software. 1996. **Arcview 3.1 extension software.** USGS-BRD, Alaska Biological Science Centre.

Akhtar, N., Bargali, H.S. and N.P.S. Chauhan. 2004. **Sloth bear habitat use in disturbed and unprotected areas of Madhya Pradesh, India**. *Ursus*, 15(2): 197-202.

Bargali1, H.S., N. Akhtar. and N.P.S. Chauhan. 2004. **Feeding ecology of sloth bears in a disturbed area in central India.** *Ursus* 15(2):212–217.

Bargali, H.S. 2003. **The ecology of the problematic sloth bear (*Melursus ursinus*) and mitigation of human-bear conflicts in Bilaspur forest division, Madhya Pradesh**. Ph.D. thesis, Wildlife Institute of India, Dehradun.

Brown, D. E. 1985. **The grizzly bear in the Southwest**. University of Oklahoma Press. Norman. 274 pp.

Champion, H.B. and S.K. Seth. 1968. **A revised survey of forest types of India.** Govt. of India. New Delhi. Manager of Publications. 404 pp.

Craighead, J.J. and J. A. Mitchell. 1982. **Wild animals of North America: biology, management and economics.** In J.A. Chapman and G.A. Feldhamer, eds. John Hopkins University. Press, Baltimore, MD. 515-556.

Desai, A. A., Bhaskaran, N. and S. Venkatesh. 1997**. Behavioural ecology of the sloth bear in Mudumalai Wildlife Sanctuary**

and National Park. Report. Tamil Nadu and Bombay Natural History Society collaborative project.

Eisenberg, J.F. and M.C. Lockhart. 1972. **An ecological reconnaissance of Wilpattu National Park, Ceylon.** *Smithsonion. Contribution. Zoology*. 101-118.

Garshelis, D., Joshi, A. and D. Smith. 1999. **Estimating density and relative abundance of sloth bears**. *Ursus*, 11: 87-98.

Hood, G.A. and K.L. Parker. 2001. **Impact of human activities on grizzly bear habitat in Jasper National Park.** *Wildlife Society Bulletin*, 29 (2): 624-638.

Kothari, A., Pande, P., Singh, S and D. Variava. 1989. **Management of National Parks and Sanctuaries in India. A status report**. Environmental studies division, I.E.P.A., New Delhi.

Laurie, A. and J. Seidensticker.1977. **Behavioural ecology of the sloth bear (*Melursus ursinus*).** Journal of Zoological Society London, 182:187-204.

Mathur, V.B., Dixit, N. and A.R. Shirish. 1995. **Spatial pattern analysis of forested landscape between Kanha tiger reserve and Achanakmar sanctuary for identification and evaluation of wildlife corridors.** Report. Wildlife Institute of India, Dehradun.

Mattson, D.J. and R.R. Knight. 1991. **Application of cumulative effects analysis to the Yellowstone grizzly bear population.** Interagency grizzly bear study team. Report, 8 pp.

Ravindranath, N.H. and D.D. Hall. 1995. **Biomass energy and environment - a developing country perspective from India**. Oxford University Press, New York, NY, USA, 376 pp.

Rodgers, W.A., Panwar, H.S. and V.B. Mathur. 2002. **Planning a Wildlife protected area network in India.** Wildlife Institute of India, Dehradun. (1and 2): 83-116 pp.

Roy, P.S., Shrish, A.R., Rajadnya, N., Das. K.K., Jain, A. and S. Singh. 1995. **Habitat suitability analysis of *Nemorhaedus goral* - A remote sensing and geographic information system approach**. Current Science, 69 (8): 685-691.

Saharia, V.B. 1980. **Wildlife census and monitoring in India - a review**. Proceedings of the workshop on wildlife ecology . Zoological survey of Inida, Dehradun, 159-172.

Santiapillai, A. and C. Santiapillai. 1990. **Status, distribution and conservation of sloth bears (*Melursus ursinus*) in the Sri Lanka**. Tiger Paper,13-15.

Servheen, C. 1989. **Monitoring of bear populations**. Environmental encounters series, Council of Europe,6:39-45.

Servheen, C. 1990. **The status and conservation of bears of the world. International Conference Bear Research and Management.** Monograph Series No. 2. 32 pp.

Swenson, J.E., Jansson, A., Riig, R and F. Sandegren. 1999. **Bears and ants: myrmecophagy by brown bears in central Scandinavia.** *Canadian Journal of Zoology*, 77: 551-561.

Zuidema G., Van den Born, G.J., Alcamo, J and G.J.J. Kreileman. 1994. **Simulating changes in global land cover as affected by economic and climatic factors**. *Water Air Soil Pollution*. 76: 163-198.

Authors' addresses: Naim Akhtar and N.P.S. Chauhan, c/o Wildlife Institute of India, P.O. Box 18, Chandrabani, Dehradun 248001, India, E-mail: nay_in@yahoo.com and npsc@wii.gov.in; Harendra Singh Bargali, 2WWF-India, Lodhi Estate, New Delhi-03, India E-mail: harendrasingh@yahoo.com

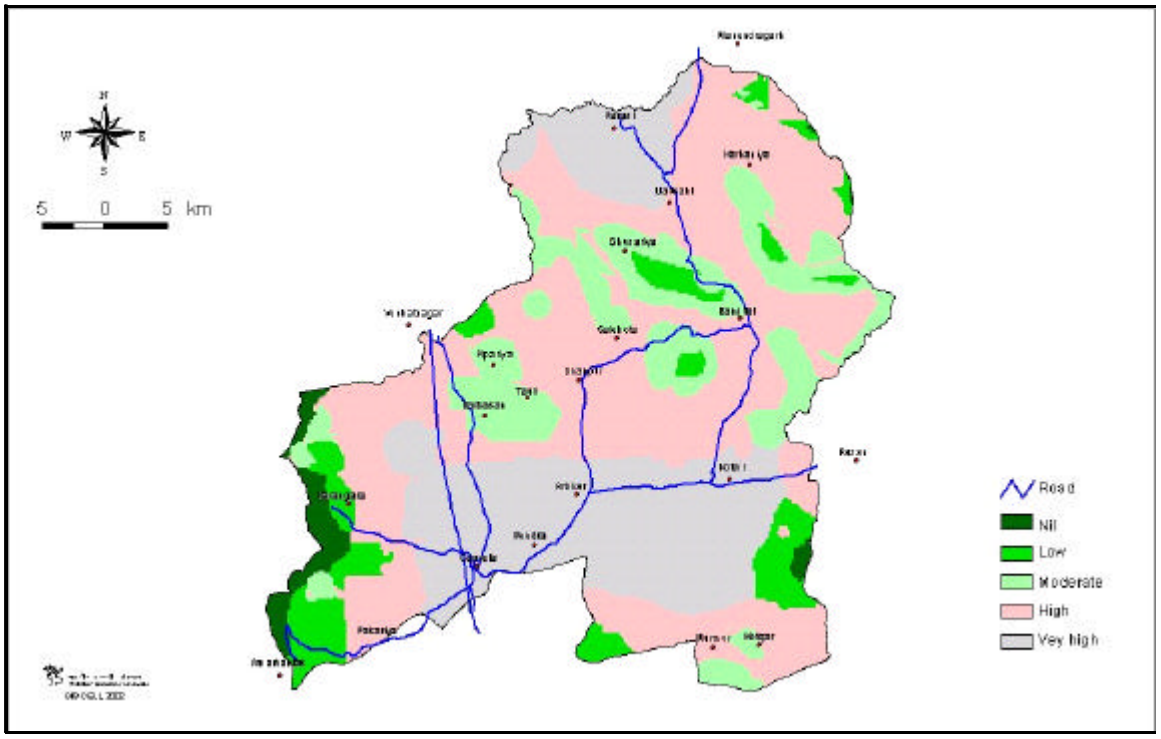
Table 1: List of non-timber forest produce collected by people in NBFD

Common name	Scientific name	Family/class	Part collected
Sitaphal	*Anona squamosa*	Anonaceae	Fruit
Mango	*Mangifera indica*	Anacardaceae	Fruit
Bhelwa	*Semicarpus anacardium*	Anacardaceae	Fruit
Chironji	*Buchanania lanzan*	Anacardaceae	Fruit, kernel
Semel	*Bombex ceiba*	Bombacaceae	Fruit
Bahera	*Terminalia bellirica*	Combretaceae	Fruit
Harra	*Terminalia chebula*	Combretaceae	Fruit
Kohwa	*Terminalia arjuna*	Combretaceae	Fruit
Imli	*Tamarindus indica*	Caesalpiniaceae	Fruit
Babool	*Acacia nilotica*	Caesalpiniaceae	Fruit
Amaltas	*Cassia fistula*	Caesalpiniaceae	Fruit
Chakora	*Cassia tora*	Caesalpiniaceae	Fruit
Koliar	*Bauhinia purpurea*	Caesalpiniaceae	Seed
Mahul	*Bauhinia vahlii*	Caesalpiniaceae	Seed
Sal	*Shorea robusta*	Dipterocarpaceae	Seed, leaves
Tendu	*Diospyros melanoxylon*	Ebenaceae	Fruit
Aonwala	*Emblica officinalis*	Euphorbiaceae	Fruit
Karanj	*Pongamia pinnata*	Fabaceae	Fruit
Palas	*Butea monosperma*	Papillionaceae	Flower, root
Kareel	*Dendroclamus spp.*	Graminae	Rhizome
Senha	*Largerstroemia parviflora*	Lytharaceae	Fruit
Musli	*Chlorophytum spp.*	Liliaceae	Root
Bargad	*Ficus bengalensis*	Moraceae	Bark
Acacia	*Acacia auriculiformes*	Mimosaceae	Fruit
Jamun	*Syzygium cumuni*	Myrtaceae	Bark
Bel	*Aegle marmelos*	Rutaceae	Bark
Kusum	*Schleichera oleosa*	Sapindaceae	Fruit, seed
Mahua	*Madhuca indica*	Sapotaceae	Flower, seed
Lac	*Laccifer lacca*	Orthopoda	Lac
Kusum	*Laccifer lacca*	Orthopoda	Lac
Chindi	*Phoenix acualis*	Palmaceae	Leaves, fruit
Grass	*Eragrostris spp.*	Graminae	Leaves, fruit
Phulbehri	*Thysonolaena maxima*	Graminae	Whole plant
Moa	*Imperata cylindrica*	Graminae	Whole plant
Chirhoo Chatni	-	Basidomycetes	Whole plant
Pottu	*Lycoperdon spp.*	Lycoperdaceae	Whole plant
Lamhitya	*Agaricus spp.*	Basidomycetes	Whole plant
Kumbha	*Lentinus subnudus*	Basidomycetes	Whole plant
Tithi	*Agaricus spp.*	Basidomycetes	Whole plant
Gojaya	-	Unidentified	Whole plant
Dokra chatni	-	Basidomycetes	Whole plant
Kosa	*Bombyx mori*	Insecta	Cocoon

Table 2: Distribution of sloth bear den sites in relation to the villages and their use by bear in NBFD

Distance from habitation (m)	Active dens	Temporary dens	Total
0-250	12	15	27
250-500	18	9	27
500-750	6	5	11
750-1000	3	5	8
1000-1250	13	10	23
1250-1500	1	2	3
1500-1750	1	5	6
1750-2000	0	0	0
2000-2250	2	2	4
Total	56	53	109

Figure 1. Extent of biotic pressure in North Bilaspur forest division, Chhattisgarh India



FOREST NEWS

Vol. XX: No. 1 Jan-Mar 2006

REINVENTING FORESTRY AGENCIES

Forestry institutions in the Asia-Pacific region are confronted with rapid change with respect to expectations and demands on forests by society. Most forestry agencies in the region are struggling to come to terms with new roles and responsibilities, as well as new ways of conducting their business. In many instances, structures, capacities and capabilities are outmoded and ineffective for implementing new responsibilities. If government forestry agencies – including forestry ministries and departments, as well as research institutions – are to remain relevant, they need to "re-invent" themselves to better align with new roles, sectoral restructurings and society's expectations. To date, there are very few positive examples of institutions that have effectively managed this transitional process.

Under a new Asia-Pacific Forestry Commission (APFC)/FAO initiative on *Reinventing Forestry Agencies*, an expert consultation was organized in Manila, Philippines, 28 February - 1 March 2006, to consider these issues. The consultation was co-organized by FAO and the Department of Environment and Natural Resources, Philippines, and was attended by 28 participants, including authors of eight national case studies.

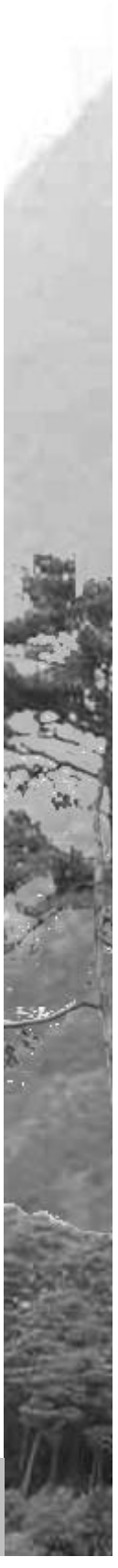
Dr. CTS Nair, Chief, Forest Economics Service, FAO, Rome, made a presentation entitled "*What future for public sector forestry agencies?*" which put the process in context and set the stage for the workshop. The presentation outlined the major changes, including the driving forces that are altering the role of the public sector agencies, the opportunities and challenges in institutional transformation, the pace at which changes are being made, and the need for institutions to incorporate relevant changes on a continuous basis.

During the subsequent sessions eight case studies were presented that examined institutional restructuring of the Forest Research Institute Malaysia, the Forestry Department in the Indian State of Chattisgarh, Nepal's forestry sector (with special focus on community forestry), New Zealand's forestry sector, Philippines' forestry sector, the State Forest Administration in China, the USDA Forest Service, and Vietnam's forestry sector. These case studies provided insights into some of the critical issues relating to institutional changes.

The workshop sought to identify commonalities and differences among the case studies and to identify implications for future institutional restructurings of forestry agencies in the region. Among the important issues discussed were:

- conditions that necessitate change;
- directions and pace of change;
- roles of leadership;
- multiplicity of different agencies and stakeholders;
- trends towards decentralization and privatization; and
- mechanisms and processes for implementing change.

The workshop findings will be incorporated with other detailed analysis of the case studies in a publication *Reinventing Forestry Agencies*, that is due out in September 2006.



A NEW FOREST POLICY NETWORK FOR ASIA AND THE PACIFIC?

How much are forest policies contributing to forest loss in the Asia-Pacific region?
Is policy development an effective process in the region?
Are forest policies meeting the needs of people in the region?

The answers to these questions hardly tell a glowing story of success. During the 1990s, an annual average of 2.5 million hectares of the region's natural forests was cleared each year, despite almost every country in the region avowing commitment to sustainable forest management.

A wide variety of approaches to strengthening forest policy development have been utilized, including traditional education modes such as seminars, workshops and congresses; pilot testing of policies through field projects; and direct assistance to national forest programme development. In recent times, the Asia-Pacific Forestry Commission (APFC) and FAO have collaborated to implement a short series of targeted studies, addressing national experiences in implementing specific policies (such as logging bans, plantation incentives, and reinventing forestry agencies). These studies and the success of this type of collaborative approach to informing policy-makers suggest potential for the concept of a more formalized Asia-Pacific forest policy network. The concept envisaged would provide a more strategic approach to coordination and joint learning and provide a clear structure within the region for the exchange of information on the subject.

An expert consultation to explore the scope for establishing a regional forest policy network was held 2-3 March 2006, in Manila, Philippines, in conjunction with the consultation on *Reinventing Forestry Agencies*. The consultation was attended by more than 40 participants from the region.

At the opening session, Dr. Neil Byron (Commissioner, Australian Productivity Commission) gave a keynote address entitled "The challenges in defining, implementing and refining forest policies." This was followed by a panel discussion outlining what is needed at the national level to improve the policy process and the objectives and functions of a possible policy network for the region.

Much of the subsequent discussion took place in three working groups on: a) policy information; b) policy formulation process; and c) policy implementation – specifically identifying the potential role of a regional network in each of the above.

The consensus of the consultation was strongly in favor of moving forward to establish a network. The consultation did not, however, endeavor to identify concrete proposals on the structure and modalities of organizing the network. It was felt that the concept should be given time to mature and that it would be counter-productive to push ahead with a structure that may be expedient in the short term, but may not survive in the long term. Among the "next steps" identified was that the concept should be submitted to the 21st session of the Asia-Pacific Forestry Commission for formal endorsement.

Reports on the expert consultations on Reinventing Forestry Agencies and Establishing a Forest Policy Network for Asia and the Pacific are in preparation and will be available from Patrick Durst, Senior Forestry Officer, FAO. Fax (662) 697 4445; E-mail: Patrick.durst@fao.org

FIRST ANNOUNCEMENT WORKSHOP ON FOREST GOVERNANCE AND DECENTRALISATION IN ASIA AND THE PACIFIC Yogyakarta, Indonesia, 4-6 September 2006

Decentralisation reforms are reshaping the distribution of authority and responsibility between government, the private sector and civil society across the Asia-Pacific region. This political trend has affected all economic sectors, including forestry and forest management, which is especially well suited to local democratic control, relative to other sectors.

Throughout the last twenty years, many countries have been actively engaged in exploring innovative approaches that transfer power from the center to the periphery. Most initiatives that redefine the roles of key stakeholders in forestry and related natural resource sectors have generated high expectations. As identified challenges are tackled, new issues emerge and need to be addressed so that decentralisation can effectively lead to positive social and environmental outcomes. Great enthusiasm for change and a rush to execute decentralisation processes are accompanied by hesitancy for supporting reforms and resistance to transfer appropriate and sufficient powers to local organizations.

In the Asia-Pacific region, the struggle to find the appropriate forms to decentralise forest management and the right level for forest governance is ongoing. The Workshop on Forest Governance and Decentralisation in Asia and the Pacific will bring together diverse stakeholders and international experts to share experiences. It will especially provide a forum for listening to voices from the field and for sharing the experiences as they are felt by local people in their struggle to manage locally important resources that are, at the same time, of global interest. As local perspectives are enriching international discussions, the workshop aims to strengthen local involvement in the regional and global dialogue on forests.

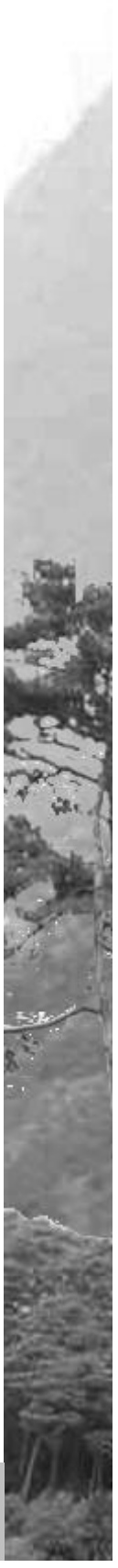
Objectives

• Share recent experiences and lessons learned from countries implementing decentralization and broader governance reform in their forestry sector at different levels of administration;
• Identify the implications of trends and lessons learned for national and sub-national forest policy formulation and implementation processes, and poverty reduction strategies; and
• Recommend approaches for strengthening policies, institutions, and practices of decentralized forest governance systems to reduce the gap between theory and practice.

Workshop Organizers

The workshop will be hosted by the Ministry of Forestry (MoF), Government of Indonesia (GoI) under the auspices of AFP. It will be organized by a consortium of partners: MoF/GoI, Government of the Philippines, Food and Agriculture Organization of the United Nations (FAO), Regional Community Forestry Training Center (RECOFTC), Center for International Forestry Research (CIFOR), Intercooperation, a Swiss Foundation for Development and International Cooperation.

For further information, please contact:
Tonny Soehartono,
E-mail: tsoehartono@cbn.net.id
or
Carol J. Pierce Colfer,
E-mail: c.colfer@cgiar.org



EARLY WARNING SYSTEMS FOR FOREST INVASIVE SPECIES

The workshop "Early warning systems for forest invasive species' was held at the Kerala Forest Research Institute, Kerala, India, 21-24 February 2006. It was arranged as an activity of the Asia-Pacific Forest Invasive Species Network (APFISN) in collaboration with the Asia-Pacific Forestry Commission (APFC), USDA Forest Service, Food and Agriculture Organization of the United Nations (FAO), Asia-Pacific Association of Forest Research Institutions (APAFRI) and Kerala Forest Research Institute (KFRI).

The main objectives of the workshop were:

- to become familiar with key early warning strategies for forest invasive species;
- to identify key challenges to implementing early warning systems for forest invasive species and possible solutions to address these challenges;
- to develop working relationships and contacts with colleagues from other countries on invasive species; and
- to develop an action plan to address the early warning of invasive species on a regional scale.

The workshop was attended by 48 participants from 13 countries viz., Australia, Bangladesh, P.R. China, India, Indonesia, Malaysia, Maldives, New Zealand, Philippines, Thailand, United Kingdom, USA and Viet Nam. Representatives of APAFRI and FAO also participated in the workshop.

The four Technical Sessions covered the following topics:

- An Overview of Early Warning Systems;
- Identifying Potential Threats;
- Early Detection of Invasive Forest Species; and
- Assessing Potential Impacts of Forest Invasive Species.

After the Technical Sessions, there was a panel discussion. Led by Dr. S.T. Murphy and Mr. A.K. Goyal, the panelists included Prof. P.S. Ramakrishnan, Mr. Frank Sapio, Dr. Ross Wylie, Dr. Chris Baddeley, Dr. Sun Jianghua and Mr. Pham Quang Thu (Vietnam). After the initial discussions, the meeting participants formed three groups to discuss and consolidate suggestions to develop an action plan for early warning on a regional scale.

Detailed discussions were held on each issue especially on information sharing, general public awareness, linkages among quarantine-agriculture-forestry, taxonomy, diagnostic protocols, impact assessment, specific IAS problems at country level and regional level, regulatory harmonization, collaborative research projects, promoting exchange of biocontrol agents/ promising germplasam and capacity building. Appropriate suggestions/recommendations were made wherever possible. The other issues discussed included a source of funding for the network, the availability of expertise, the use of sophisticated technologies for dealing with IAS, and methodologies for impact assessment.

Outcomes and recommendations

Some of the key recommendations of the workshop are given below:

Specific IAS problems at country level

- Prioritizing the IAS (Introduced and established, recently introduced, potentials to be introduced)
- National coordinator and network coordinator to facilitate as soon as possible

<u>Involvement of local communities (traditional knowledge)</u>

- National coordinator
- Start immediately and look for sponsors for funding locally and globally)

<u>Detection/fumigation of timber and NTFP's</u>

- National coordinators are entrusted to ensure and pursue the matter

Regulatory harmonization

APPPC (legislation, list of quarantine pests)

- Network coordinator to look into

Listing of quarantined pests of concern to the region

- National coordinator needs to arrange

Listing of quarantine pests of concern to the country

- National coordinator and network coordinator should work together

Collaborative research projects

- Pilot projects
- Biocontrol projects
- Risk assessment and case studies
- National coordinators and Network coordinator need to take the initiative
- Bilatral/trilateral projects to be identified

Capacity building

- Institutional mechanism at country level
- Use of matrix to finalize the areas
- Network coordinator and National coordinator to start working time frame – September 2006

ASIA-PACIFIC FORESTRY CHIPS AND CLIPS

VIETNAMESE HERB WITH ANTI-MELANOMA PROPERTIES DISCOVERED

A tuber of the plant *Stephanis brachyandra* (Menispermaceae) has been used traditionally by the hill tribes of northern Vietnam for many purposes, but its anti-melanoma properties were previously unknown. The herb came to the attention of University of Otago researchers through an NZAID project that aims to save endangered medicinal plants and develop sustainable incomes for Vietnamese hill tribes. The patent for melanoma treatment will be assigned to a collective of the hill tribes people in the Sa Pa district.

– *Scoop Independent News* –

MINDANAO TO PROTECT REGION'S REMAINING FOREST

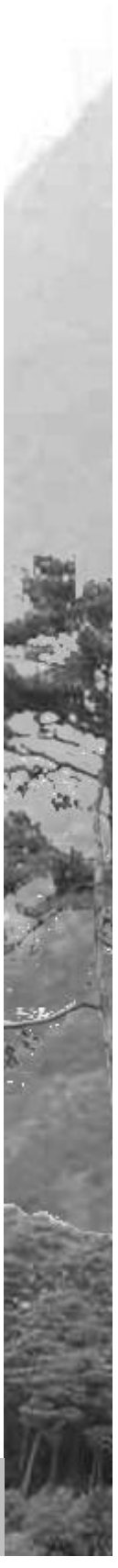
The Autonomous Region in Muslim Mindanao (ARMM) has passed a law on sustainable forest management, paving way for protection of the region's remaining forest. The law requires local governments within the autonomous region to implement forest management plans that designate forest areas for protection and other areas for sustainable production. The ARMM contains about 120,000 ha of closed-canopy forests and 123,000 ha of open forests.

- *Philippine Inquirer* -

VIETNAM TRIES TO STOP TIDE OF DESERTIFICATION

About 7.85 million hectares of Vietnam's 9.34 million hectares of natural land remain uncultivable as a result of the desertification process. Areas facing the risk of desertification include 7 million hectares of infertile land and more than 850,000 hectares of land affected by saltwater, drought or sandstorms. The government will focus on five measures to reverse desertification: promoting sustainable forest management; improving degraded soils; planting trees; promoting water resource management; and establishing a warning system to mitigate the impacts of droughts. Vietnam is a member of the United Nations International Convention to Combat Desertification.

- *Vietnam News* -



NEW CLIMATE CHANGE INSTITUTE TO BE ESTABLISHED

A new institute, the Climate Institute (Australia) Ltd., will be established in Sydney with a $10 million grant from an Australian philanthropic group. The institute will focus on persuading Australians of the dangers of climate change and the need for governments to take urgent action. The funding comes through the Poola Charitable Foundation.
- *The Australia Institute* -

INTRODUCED INSECT TO BE RELEASED TO CONTROL BUDDLEIA

Buddleia, brought to New Zealand from China as a garden ornamental, has escaped to become one of the worst weeds in central North Island plantations, where it competes with young pine trees. Scientists have identified another Chinese native, a leaf-eating weevil as a potential biological control agent. The weevil will soon be released on experimental scale, with more substantial distribution to follow. If successful, it could save the forest industry millions of dollars in control costs and pine losses.
- *Radio New Zealand* -

AUSTRALIA HELPS VIETNAM DEVELOP ITS FOREST RESOURCES

Australia's AU$919,000 grant will help Vietnam to develop the country's forest and timber resources. The funds will be used for projects to domesticate certain tree species in Southeast Asia and Australia, and to increase timber yield from eucalyptus plantations. Since 1993, Australia has assisted Vietnam in 93 projects related to agro-forestry development and irrigation. Australia has pledged to continue its support and about AU$3 million was expected to be granted in 2005-2006.
- *Vietnam News* -

FIVE FOREST CONCESSION HOLDERS PERMITTED TO RESUME ACTIVITIES IN ACEH

The Indonesian government has licensed five forest concession holders (HPH) to resume their activities Aceh to meet the demand of 200,000 cubic meters of timber needed for reconstruction. The government, Badan Rehabilitasi dan Rekonstruksi (BRR) and the public can monitor the activities of the five HPHs, to ensure that they abide by the existing regulations.
– Antara News–

CHOPSTICKS TAX IN CHINA

China produces an estimated 45 billion pairs of chopsticks (or some 1.3 million cubic meters of wood) per year, and in an effort to help preserve its forests, the Chinese government is introducing a 5% tax on disposable wooden chopsticks. The announcement came as China is raising additional consumption taxes in a bid to help the environment and narrow the gap between rich and poor. Taxes on yachts, luxury watches, golf clubs, gas-guzzling cars and wooden floor panels are rising by 5-20%.
– BBC News –

NEW ZEALAND'S CARBON SINKS SHRINK

New Zealand's plantation forests, which are the center of the country's Kyoto compliance hopes, have decreased in area. Information released by the Ministry of Agriculture and Forestry (MAF) shows that only 6,000 hectares of new forest land and 32,000 hectares of harvested forest land were planted in 2005. This compares with 10,600 and 40,600 in 2004. New plantings peaked at 98,000 hectares in 1994, but are currently at their lowest since 1960. According to the Forest Owners Association, the decrease in planted area is partly due to the government's Kyoto policies [related to the ownership of carbon credits]. The association says that the numbers make a case for overhauling the government's policy surrounding forests.
– New Zealand's National Business Review –

SLOW BUT PROMISING RECOVERY FOR VIETNAM'S FOREST AREA

According to recent surveys, the national forest cover in Vietnam has risen to 12.3 million hectares or 37.8% of the total land area, compared to 36.7% in 2004. Vietnam has set an ambitious target of 43% by 2010. The Ministry of Agriculture and Rural Development (MARD) indicated that the quality of the forests has been deteriorating and

natural-growth pockets have become increasingly isolated. However, the recent Law on Forest Protection and Development, which came into effect in April 2005 has helped slow deforestation.
– Vietnam News –

INDONESIAN GOVERNMENT INVESTS IN FOREST REHABILITATION

The Indonesian government has allocated Rp3.8 trillion (US$421 million) for forest rehabilitation programs in 2006. It is estimated that of its 120 million hectares of forest, some 60 million hectares are damaged. The forestry department estimates that these damaged forests are causing a financial loss of some Rp25-34 trillion (US$2.7-3.7 billion) to the state.
– Antara News –

CHINA TO PUSH ITS NATIONAL FOREST COVER TO 20% BY 2010

The State Forest Administration announced ambitious plans to increase China's forest cover from the current 18.21% to 20% by 2010. China has implemented a forestry development strategy over the past five years, investing a total of 212 billion yuan (US$ 26.5 billion) in key projects including the protection of natural forests, replanting forests on former agricultural land.
– China View –

END OF INDONESIA'S PLYWOOD DOMINATION IN JAPAN

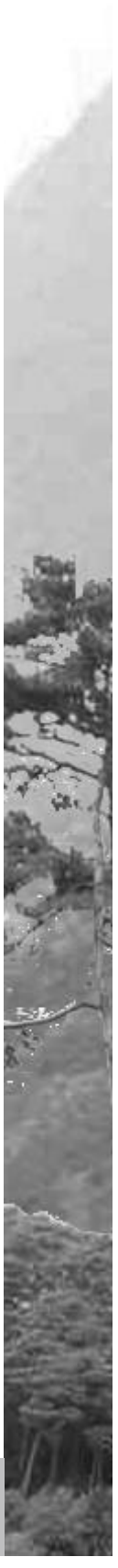
Malaysia has become Japan's largest supplier of plywood in 2005, ending Indonesia's long-term domination of the market. Malaysia exported 2.18 million cubic meters (47.6% of Japan's 4.57 million cubic meters of plywood imports), followed by Indonesia with 1.85 million cubic meters (40.4%). The Indonesian supply has been seriously affected by log shortages, the ongoing crackdown on illegal logging and a massive closure of plywood mills.
– Source: ITTO Tropical Timber Market Report –

CHINA ACHIEVES FIRST TRADE SURPLUS IN FOREST PRODUCTS

China achieved a surplus in the foreign trade of forest products for the first time in 2005. The total value of foreign trade in national forest products was US$38.32 billion in 2005. This accounted for some 43% of the forestry industry's total output. Exports of forest products have become a major source of revenue for some local governments, boosting farmers' incomes and creating jobs. Wooden furniture remains the top export product and continues to grow rapidly.
– ITTO Tropical Timber Market Report –

VIETNAM TO ALLOW FOREIGNERS FOREST LEASE RIGHTS

A new government decree allows overseas Vietnamese and foreign individuals and organizations to lease forests for making forestry products and providing tourism and other services. A lease agreement with any party should conform to the national plan for forest protection and development and be approved by the local People's Committees. The decree stipulates the lease must be clearly specified in terms of nature, area and others at the time of allotment which must be by auction. They can only be allotted a maximum of 30 hectares for a period of less than 50 years in the case of primary forests. The term can be extended in disadvantaged, remote areas.
– Nhân Dân –



"The man planting trees by the wayside will enjoy bliss in heaven for as many years as there are fruits and flowers and leaves in what he planted."

Padma Purana
(Indian Epic)

THE MOUNTAIN PARTNERSHIP

The Mountain Partnership is a voluntary alliance of partners dedicated to improving the lives of mountain people and protecting mountain environments around the world.

Launched at the World Summit for Sustainable Development in 2002, the Mountain Partnership taps the wealth and diversity of resources, information, knowledge, and expertise of its members to support positive change in mountain areas.

Presently, 45 countries, 14 intergovernmental organizations and 64 major groups (e.g. civil society, NGOs and the private sector) are members of the Mountain Partnership and membership is growing.

Supporting the Mountain Partnership

The Mountain Partnership is being supported by a Secretariat, hosted by the Food and Agriculture Organization of the United Nations (FAO). The Secretariat is acting as a central reference point for networking and liaison for the Mountain Partnership and is collaborating closely with the Mountain Forum to deliver key information and communication services to all Partnership members.

from: the Mountain Partnership website: http://www.mountainpartnership.org/

FAO ASIA-PACIFIC FORESTRY CALENDAR

17-21 April 2006. Dehradun, India, ***21st Session of the Asia-Pacific Forestry Commission.*** Contact: P. Durst, Senior Forestry Officer, FAO Regional Office for Asia and the Pacific, Maliwan Mansion, Phra Atit Road, Bangkok 10200, Thailand; Tel. (662) 697-4139; Fax: (662) 697-4445; E-mail: Patrick.Durst@fao.org

15-19 May 2006. Jakarta, Indonesia. ***FAO Regional Conference for Asia and the Pacific (28th session).*** Contact: Biplab Nandi, Senior Food and Nutrition Officer, FAO Regional Office for Asia and the Pacific, Maliwan Mansion, Phra Atit Road, Bangkok 10200, Thailand; Tel. (662) 697-4143; Fax: (662) 697-4445; E-mail: Biplab.Nandi@fao.org

29 May-10 June 2006. Bangkok, Thailand. ***Forest Policy Short Course.*** **Contact:** T. Enters, NFP Facilitator, FAO Regional Office for Asia and the Pacific, Maliwan Mansion, Phra Atit Road, Bangkok 10200, Thailand; Tel. (662) 697-4328; Fax: (662) 697-4445; E-mail: Thomas.Enters@fao.org

5-8 September 2006. Jakarta, Indonesia. ***Regional Workshop on Forest Governance and Decentralization in Asia.*** **Contact:** T. Enters, NFP Facilitator, FAO Regional Office for Asia and the Pacific, Maliwan Mansion, Phra Atit Road, Bangkok 10200, Thailand; Tel. (662) 697-4328; Fax: (662) 697-4445; E-mail: Thomas.Enters@fao.org

2-6 October 2006. Ho Chi Minh City, Viet Nam. ***International Conference on Managing Forests for Poverty Reduction: Capturing Opportunities in Forest Harvesting and Wood Processing for the Benefit of the Poor.*** **Contact:** P. Durst, Senior Forestry Officer, FAO Regional Office for Asia and the Pacific, Maliwan Mansion, Phra Atit Road, Bangkok 10200, Thailand; Tel. (662) 697-4139; Fax: (662) 697-4445; E-mail: Patrick.Durst@fao.org

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

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

- APFC - The unwelcome guests: Proceedings of the Asia-Pacific Forest Invasive Species Conference (RAP Publication 2005/18)
- Helping forests take cover (RAP Publication 2005/13)
- Waves of hope – report of the regional coordination workshop on rehabilitation of tsunami-affected forest ecosystems: strategies and new directions (RAP Publication 2005/07)
- Forest certification in China: latest developments and future strategies (RAP Publication 2005/08)
- Forests and floods – drowning in fiction or thriving on facts? (RAP Publication 2005/03)
- In search of excellence: exemplary forest management in Asia and the Pacific (RAP Publication 2005/02)
- What does it take? The role of incentives in forest plantation development in Asia and the Pacific. Executive summary (RAP Publication 2004/28)
- What does it take? The role of incentives in forest plantation development in Asia and the Pacific (RAP Publication 2004/27)
- Forests for poverty reduction: opportunities for Clean Development Mechanism, environmental services and biodiversity (RAP Publication 2004/22)
- Report of the 20th Session of the Asia-Pacific Forestry Commission (APFC), 2004 (RAP Publication: 2004/09)
- Forests for poverty reduction: can community forestry make money? (RAP Publication: 2004/04)
- State of Forestry in Asia and the Pacific – 2003: status, changes and trends (RAP Publication 2003/22)
- Advancing assisted natural regeneration (ANR) in Asia and the Pacific (RAP Publication 2003/19) - 2nd edition
- Bringing back the forests: policies and practices for degraded lands and forests (RAP Publication 2003/14) **out of print**
- Community forestry – current innovations and experiences (CD-ROM included)
- Community-based fire management: case studies from China, The Gambia, Honduras, India, the Lao People's Democratic Republic and Turkey (RAP Publication: 2003/08)
- Practical guidelines for the assessment, monitoring and reporting on national level criteria and indicators for sustainable forest management in dry forests in Asia (RAP Publication: 2003/05)
- Giants on our hands: proceedings of the international workshop on the domesticated Asian elephant (RAP Publication: 2002/30)
- Communities in flames: proceedings of an international conference on community involvement in fire management (RAP Publication: 2002/25)
- Applying reduced impact logging to advance sustainable forest management (RAP Publication: 2002/14)
- Monograph on benzoin (Balsamic resin from *Styrax* species) (RAP Publication: 2001/21)
- Proceedings of the International Conference on Timber Plantation Development, 7-9 November 2000, Manila, Philippines
- Trash or treasure? Logging and mill residues in Asia-Pacific (RAP Publication: 2001/16)
- Regional training strategy: supporting the implementation of the Code of Practice for forest harvesting in Asia-Pacific (RAP Publication: 2001/15)
- Forest out of bounds: impacts and effectiveness of logging bans in natural forests in Asia-Pacific: executive summary (RAP Publication: 2001/10)
- Forest out of bounds: impacts and effectiveness of logging bans in natural forests in Asia-Pacific (RAP Publication: 2001/08)
- Asia and the Pacific National Forest Programmes Update 34 (RAP Publication: 2000/22)
- Regional strategy for implementing the Code of Practice for forest harvesting in Asia-Pacific (July 2000)
- Development of national-level criteria and indicators for the sustainable management of dry forests of Asia: background papers (RAP Publication: 2000/08)
- Development of national-level criteria and indicators for the sustainable management of dry forests of Asia: workshop report (RAP Publication: 2000/07)
- Asia-Pacific Forestry Commission: the first fifty years (RAP Publication: 2000/02)
- Decentralization and devolution of forest management in Asia and the Pacific (RAP Publication: 2000/01)
- Asia-Pacific Forestry Towards 2010 - report of the Asia-Pacific Forestry Sector Outlook Study
- Trees commonly cultivated in Southeast Asia: an illustrated field guide - 2nd edition (RAP Publication: 1999/13)
- Code of Practice for forest harvesting in Asia-Pacific (RAP Publication: 1999/12)

For copies please write to: *Senior Forestry Officer for Asia and the Pacific,*
FAO Regional Office for Asia and the Pacific, 39 Phra Atit Road, Bangkok 10200, Thailand.
Or visit the FAO website for an electronic version: http://www.fao.or.th/publications/publications.htm