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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

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Cover: Uriel on the Dureji Game Management Area
Photo: Mike Frisina - 1999

Contents

TIGERPAPER

Status of Blanford's Uriel and Sindh Ibex in the Dureji Game Management Area, Pakistan.....	1
Establishing Specialized Management Units Within Protected Areas.....	6
Himalayan Musk Deer in Annapurna Conservation Area..	11
Report on the Survey of Higher Vertebrates of Rivers Yamuna and Ganga.....	18
The Existence of the Kouprey in Cambodia.....	21
Fatal Viral Disease in Asian Elephant found in SE Asia...	25
Food Habits of Tigers in Parambikulam Wildlife Sanctuary.....	26
Distribution and Conservation of File Snake from Sri Lanka.....	31

FOREST NEWS

Asia-Pacific Forestry Leaders Meet in Dehradun to consider Regional Forestry Issues.....	1
Pre-Session Workshops:	
- Forests and Poverty Reduction	8
- Planted Forests Code.....	8
- Future Directions for Forest Resources Assessment in Asia-Pacific.....	9
- Forest Genetic Resources Conservation and Management.....	10
- Development of a Strategy for the Asia-Pacific Forest Invasive Species Network (APFISN).....	10
Elephant Care Manual Workshop.....	11
FAO-Finland Regional Tsunami Programme:	
2006 Workshops.....	12
India Launches First Model Forest.....	14
Asia-Pacific Forestry Chips and Clips.....	15
FAO Asia-Pacific Forestry Calendar.....	16

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Urial on the Dureji Game Management Area, Pakistan, browsing on Euphorbia. Note the well-defined browse line on the large Euphorbia plant. (Photo: Mike Frisina)

STATUS OF BLANFORD'S URIAL AND SINDH IBEX IN THE DUREJI GAME MANAGEMENT AREA, PAKISTAN

by Michael R. Frisina, Ghulam Ali Awan and Michael H. Woodford

Introduction

The Dureji Game Management Area (DGMA) is a 1,301 km² private wildlife reserve in Balochistan Province, Pakistan, that maintains significant numbers of Blanford's urial (*Ovis orientalis blanfordi*) and Sindh ibex or Sarra (*Capra aegagrus blythii*). The DGMA was first established informally in 1972, when the Bhootani family created a 178,259 ha wildlife reserve. Due to its importance the area was first declared a wildlife sanctuary in a draft Wildlife Act. Later, its status as a wildlife sanctuary was secured under the Balochistan Wildlife Protection Act (1974). The reserve was established out of concern for declining urial and Sindh ibex populations in their large habitat near the town of Dureji. By 1975, a game guard system was in place providing effective protection for urial, Sindh ibex, and chinkara. Currently, 38 game guards protect the

wildlife in the DGMA. Although no systematic surveys were conducted, available evidence indicates that the urial population increased in response to this protection. Informal surveys conducted by the Bhootanis and their game guards led them to believe the urial population had increased to 1,000-1,200 animals by the late 1990's. During this time frame (with the exception of periodic, limited trophy hunting) urial were vigorously protected. Fees derived from hunting are an important incentive in the protection of urial and several other wild species on the area.

In 1998, on the recommendation of IUCN-Pakistan, the Government of Balochistan changed the status of DGMA from sanctuary to game reserve. Due to continued efforts by the Bhootani family, management of the area was significantly improved with the change from a sanctuary to a reserve. The result was improved enforcement

and government assistance, which resulted in effective wildlife protection. Currently, the Bhootani family supervises government staff and has employed additional game guards to enhance enforced protection of wildlife on the DGMA.

In 1998, the DGMA became a government-sanctioned official community-based sustainable use hunting area. The authors were asked to assist with the development of a population monitoring protocol for determining sustainable use harvest quotas. In April 2001 they visited the DGMA to conduct a survey of the urial and ibex populations. This was the first such survey done for the DGMA and here the data resulting from our visit and management recommendations are summarized.

Conservation status

The taxonomic status of urial is unclear, especially the designations of various subspecies. Some authors considered the Blanford's urial to be a separate subspecies (Clark, 1964; Ellerman and Morrison-Scott, 1966), while others considered it to be synonymous with the Afghan urial (*Ovis orientalis cycloceros*) (Valdez, 1982; Shackleton and Lovari, 1997). All urials are listed in CITES Appendix II, except for the subspecies Ladakh urial (*Ovis orientalis vignei*), which is listed in CITES Appendix I. The Afghan urial is listed as "vulnerable" in the **IUCN Red List** (IUCN, 2000). Urial and Sindh ibex are protected under the 1974 Balochistan Wildlife Act.

Study area

The DGMA is located in southern Pakistan, about 150 km northwest of Karachi near the town of Dureji. The area consists of mountain ridges running in a roughly north-south direction and adjacent plains with occasional rocky outcrops. The highest point of urial and ibex habitat in the study area is Mount Bhuedar at ~1,000 m. The elevation of valleys varies between 150-210 m.

Although the area is arid with an average summer rainfall (June-September) of 149 mm, a network of ephemeral streams and water courses, which generally flow from north to south, drain into the Arabian Sea (HBP, 1998). The Habb River is the only perennial water source. Natural springs, along

with a few watering holes, are the primary source of water for people, livestock, and wildlife inhabiting the study area. The study area is within the "dry sub-tropical and temperate semi evergreen scrub forest" (Roberts, 1991). Human land use is primarily farming and livestock grazing. Urial, ibex, and chinkara (*Gazella bennetii*) are the large wild ungulates inhabiting the study area.

Methods

Urial and ibex were systematically surveyed within a 26,308 ha portion of the study area during a 4-day period from April 10 to 13, 2001. Surveys were conducted while walking along predefined travel routes and from observation points. Drop off points, base camp locations and observation points were documented using GPS technology. Animals were observed with the aid of 8X and 10X binoculars. One or 2 observation groups of 3 to 4 experienced observers went into the field each day to observe urial and/or ibex. Censuses were conducted in different parts of the study area each day to minimize the risk of counting the same animal more than once. When the possibility existed that the same animal was observed more than once, only the first observation was recorded to minimize error. Location and altitude of urial and ibex observation sites were recorded using GPS technology.

Observed urial and ibex densities were determined by dividing the number of animals observed by the size of the area surveyed. The size of the survey area was determined from a 1:75,000 topographic map using a dot counter. Through interviews with local game guards and an assessment of general habitat characteristics (factors such as steepness, remoteness, productivity, etc.), each survey area listed in Table 1 was rated as a high or low density habitat for urial and ibex. Each urial observed was classified into one of the following categories: adult female, lamb, or ram. Rams were classified by size classes based on horn length as follows: Class I (1-2 years old), Class II (3-4 years old), Class III (5-6 years old), and Class IV (>6 years old). Ibex were similarly classified except males were classified into 2 size classes: Class I (< 6 years old) and Class II (> 6 years old). Horns from 9 adult male

urials and 8 adult male ibexes were aged by counting annual growth rings (Geist, 1966).

Results and discussion

Urial

During the April survey, 504 urials were observed (236 females, 63 lambs, 190 males, 15 unclassified). The 190 males were classified as Class I: 21 rams, Class II: 25 rams and Class III and IV: 144 combined. During the 4-day survey, 126 urials were observed per day in the field, indicating that urials are abundant in the DGMA. Urials were widely scattered throughout the area with many sightings of single animals or small groups of fewer than 5. A total of 263.32 km² of urial habitat in DGMA was surveyed and a density of 1.9 urial per km² was observed. A total of 187.56 km² of high density urial habitat was surveyed and the urial density observed in this type was 2.3 per km². An additional 75.76 km² of low density urial habitat was surveyed and a density of 1 urial per km² observed.

The observed April population structure at DGMA is summarized in Table 2. The largest proportion of rams in the population was Class III (76%), indicating good survival of rams into adult age classes. Due to communication difficulties with local guides, we were not consistently able to classify mature males into the more specific age classes. During late December 1998 and early January 1999, the second author observed 69 rams in the DGMA. Their composition was Class I: 14%, Class II: 18%, Class III: 22%, and Class IV: 35%. These data indicate a good survival of rams into older age classes. A ratio of 27 lambs:100 ewes was observed, which is not unusual for arid habitats like Dureji. IUCN (1998) estimated 600-800 urials in the DGMA. HBP (2000) estimated 200 urials on Hamalig hill and described a 10:1 ratio of mature females to young in the southern end of Hamalig ridge.

The only population data collected systematically within the DGMA was collected during this survey. April is a poor time of year to census a urial population, as ewes are scattered due to lambing, recently born lambs are difficult to observe, and rams are scattered across their range. The result

is a significantly lower number of total animals observed by sex and age class than would be observed during a time of year when ewes and rams are more visible – such as the fall breeding season. Thus, using data from this survey to make a population estimate provides a very conservative total population number. To estimate the total number of urial within the DGMA, we multiplied the number of urials observed per km² in high density habitat (2.3) by the total amount of high density habitat (235.49 km²) within the DGMA. Then the number of urial observed per km² in low density habitat (1) was multiplied by the total amount of low density urial habitat (315.65 km²) within the DGMA. The estimates for low and high density habitat were then added together to produce an estimated population of 858 urial for the DGMA in April 2001.

Ibex

During the April survey 365 ibex were observed (170 females, 22 lambs, 173 males). The 173 males included 82 Class I (< 6 years) and 91 Class II (> 6 years) animals. During the 2 days spent in that portion of the DGMA containing ibex habitat, 183 ibex were observed per day in the field, indicating that ibex are abundant in the DGMA. Ibex, although more concentrated than urial within their habitat area, were widely scattered with many single animals or small groups of fewer than 5 observed. A total of 140.17 km² of ibex habitat in the DGMA was surveyed and a density of 2.6 ibex per km² observed. A total of 75.76 km² of high density ibex habitat was surveyed and the ibex density observed in this type was 3.8 per km². An additional 64.41 km² of low density ibex habitat was surveyed and a density of 1.3 ibex per km² observed.

The observed April population structure at DGMA is summarized in Table 3. About half of the observed population was rams. The largest proportion of rams in the population fell under Class II (53 %), indicating good survival of rams into adult age classes. Almost half of the male population segment were younger Class I males, indicating good survival of kids during recent years. Due to communication difficulties with local guides we were not consistently able to classify mature males into more specific age classes. Early

April is lambing season at Dureji. This is likely why the percentage of lambs observed in the population was only 6 percent or 13 kids:100 nannies. Almost half of all ibex observed were nannies.

As reported for the urial survey, April is not the month to record maximum numbers of ibexes, being subject to the same conditions. To estimate the total number of ibex within the DGMA, we multiplied the number of ibex observed per km² in high density habitat (3.8) by the total amount of high density habitat (75.76 km²) within the DGMA. Then the number of ibex observed per km² in low density habitat (1.3) was multiplied by the total amount of low density urial habitat (88.23 km²) within the DGMA. The estimates for low and high density habitat were then added together to produce an estimated population of 403 ibex for the DGMA in April 2001. IUCN (1998) estimated 300-400 ibex in the DGMA.

Population viability for sustainable harvesting

Data from this survey, although limited, indicates that the urial and ibex populations at Dureji are viable (Soulé, 1987). The DGMA is a Government-sanctioned community-based sustainable use hunting area. One requirement for the area is the establishment of hunting quotas that will not negatively affect the population. For similar species and populations, Harris (1993) concluded that an annual harvest of trophy males in numbers equivalent to 1 or 2 percent of the total population size can be maintained without negative consequences. Using the approach described by Harris (1993) and the April 2001 population estimates of 858 urial and 403 ibex, a trophy hunting quota of up to 17 urial and 8 ibex could be established for the DGMA.

Conclusions and recommendations

- The urial and ibex populations at Dureji appear to be viable for both population and genetic processes and a sustainable use trophy harvest quota of about 17 male urial and 8 male ibex could be established without negative impact to the population.

- Periodic and intensive surveys for urial and ibex in the DGMA, using the protocols developed for this survey, should be conducted during the fall breeding season to monitor population trends and adjust hunting trophy quotas.
- Future surveys should emphasize classifying Class III and Class IV urial rams as separate age classes.
- Future surveys should emphasize classifying the ibex into more specific age classes. Mature males of trophy size and yearling males should be classified as separate age classes.
- A detailed analysis of the DGMA urial and ibex habitats should be conducted. This should include describing the variety and extent of plant communities present, the diversity of plant species present, and the ecological condition of soils and vegetation. The aforementioned information is essential for determining habitat carrying capacity for urial and ibex.
- All trophies harvested should be aged and standard physical measurements taken of the carcasses and horns. Field necropsy for disease, parasites, and assessing animal health at time of death should be performed on all harvested trophies. This might require special training for local staff, but provides essential data for population management.

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Authors' addresses: Michael R. Frisina, PO Box 4712, Butte, MT 59701, USA; Ghulam Ali Awan, 3-91 Alice St. Vanier, Ottawa K1L 7X7, Canada; Michael H. Woodford, Wildlife Veterinarian, Apdo: 215, 8100 Loule, Algarve, Portugal.

Table 1. Area of urial and ibex habitat in the Dureji Game Management Area, by location.

Location	Total ha	Total km ²	Urial Habitat km ²			Ibex Habitat km ²		
			High Density	Low Density	Not Urial Habitat	High Density	Low Density	Not Ibex Habitat
Lakhan (West)	2,298	22.98	22.98	0.00	0.00	0.00	0.00	22.98
Lakhan (East)	4,665	46.65	0.00	46.65	0.00	0.00	0.00	46.65
Lokhir	7,667	76.66	0.00	76.66	0.00	0.00	0.00	76.66
Karo (Center)	2,495	24.95	24.95	0.00	0.00	0.00	0.00	24.95
Karo (Outer)	2,495	24.95	0.00	24.95	0.00	0.00	0.00	24.95
Khatto	4,832	48.30	0.00	48.30	0.00	0.00	0.00	48.30
Hamalig (South)	4,332	43.33	0.00	43.33	0.00	0.00	0.00	43.33
Hamalig (North)	12,317	123.15	123.15	0.00	0.00	0.00	0.00	123.15
Obai/Bhuedar (South)	6,442	64.41	64.41	0.00	0.00	0.00	64.41	0.00
Obai/Bhuedar (North)	7,567	75.76	0.00	75.76	0.00	75.76	0.00	0.00
Bagga	2,382	23.82	0.00	0.00	23.82	0.00	23.82	0.00
Urial/Ibex Habitat	57,492	574.96	235.49	315.65	23.82	75.76	88.23	10.97

Note: Shaded areas are locations included in the survey.

Table 2. Urial (*Ovis orientalis blanfordi*) population sex and age structure for the Dureji Game Management Area, April 2001.

YEAR	No.	%			% Rams by Size Class ¹		
		Ewes	Lambs	Rams	I	II	III & IV
2001	489	48	13	39	11	13	76

¹I: 1-3 years old, II: 3-4 years old, III: 5 years or older

Table 3. Ibex (*Capra aegagrus blythii*) population sex and age structure for the Dureji Game Management Area, April 2001.

Year	N	Percent			Percent Rams by Size Class	
		Females	Kids	Rams	I <6 yrs	II >6yrs
2001	365	47	6	47	47	53

ESTABLISHING SPECIALIZED MANAGEMENT UNITS WITHIN PROTECTED AREAS FOR EFFECTIVE PROTECTED AREA MANAGEMENT

by John Parr

Protected areas are essential for the conservation of biological diversity and for meeting a range of community objectives. Recently, IUCN redefined the protected area categories and management objectives (Davey, 1998)

The definition of a national park is: "Natural area of land and/or sea, designated to (a) protect the ecological integrity of one or more ecosystems for present and future generations, (b) exclude exploitation or occupation inimical to the purposes of designation of the area, and (c) provide a foundation for spiritual, scientific, educational, recreational and visitor opportunities, all of which must be environmentally and culturally compatible."

The definition of a wilderness area – or wildlife sanctuary – is a: "Large area of unmodified or slightly modified land, and/or sea, retaining its natural character and influence, without permanent or significant habitation, which is

protected and managed so as to preserve its natural condition."

For each of these protected area management categories, the objectives of management should be clearly defined. These universal objectives are often adequately described in management plans. A standardized set of goals and objectives for a national park are as follows.

The goal and objectives for park management

Management of the park has an overall goal; and three complementary principle objectives, each with corresponding sets of operational objectives and prescribed management actions.

The goal of park management for a national park is: *to restore, maintain and enhance the biodiversity, habitats and conservation values of the park.*

The three principal objectives of achieving this goal are:

1. To enhance the capacity of government and local communities to effectively manage the park for the conservation of its natural resources.
2. To increase the options for sustainable livelihoods and income generation in local communities living in and around the park.
3. To enhance the access and use of the park for tourism, recreation and environmental education.

These three principal objectives should be identical for all terrestrial national parks and all marine national parks within a country like Thailand. These objectives should be modified slightly for managing wildlife sanctuaries, as these areas do not promote tourism or recreation, reflecting the Wild Animal Reservation and Protection Act (1992).

Taking account of these holistic objectives, practical consideration needs to be given at the field level as to how these objectives may most effectively be achieved. Most fundamentally, the institutional arrangements required at the field level to enable protected areas in Thailand to most effectively work towards achieving these objectives, needs consideration. The most effective institutional arrangements would be the establishment of specialized units. These should include the following seven units:

1. Biological Resources Unit
2. Community Outreach Unit
3. Law Enforcement Unit
4. Natural Resources Management Unit
5. Nature Education and Interpretation Unit
6. Construction and Maintenance Unit
7. Finance and Administration Unit

Sections 1.1 –1.7 provide guidance on the basic areas of specialization deemed appropriate for effective protected area management in Thailand.

1.1 Biological Resources Unit

Both national parks and wildlife sanctuaries are established to protect outstanding or representative ecosystems, geological or physiological features and/or species for present and future generations. Both categories of

protected area encompass large, unmodified or slightly modified land and/or sea. Both types of reserves are preserved for scientific research/study.

The protected area authorities in each reserve should respond to this strong emphasis on ecosystem management and scientific research by establishing a Biological Resources Unit.

Unit Mandate: This Unit – ideally comprising 4–8 personnel – should have a clear remit to obtain, collate and disperse information regarding the biological resources found inside the protected area. They should maintain an inventory of past and proposed biological research.

Activities: These staff should have a management objective to understand the distribution of these natural resources within the reserve, and understand the location of rare, fragile species. It is also important to monitor changes in the populations of the species found within the reserve. By conducting research and collating distributional data, the protected area authorities can modify their management activities, heightening protection of vulnerable species through increased patrols, awarding special conservation measures, through the designation of the important habitat as a Species Protection Zone, and to educate the local villagers about species of conservation value.

Sources of information will come from experts conducting research (scientists), from casual visitors (naturalists and other visitors) and other protected area staff working inside the reserve, particularly during field activities (law enforcement). To some level, the Biological Resources Unit should develop its own research and monitoring program, particularly focusing on those species deemed important to the reserve.

Reporting: The Biological Resources Unit should submit annual reports on biological resources to a defined Division within the Department of National Parks, Wildlife and Plant Conservation. These reports should contain information on research priorities as well as staffing levels, equipment, including both those in possession and those required (e.g. field guides, binoculars,

telescopes, camera traps, GPS systems, mist nets, Longmann's traps, etc.), and training needs.

Recommendation: Biological Resources Units should be established in every protected area in the country. Only staff showing a keen interest in the field of work should be recruited.

1.2 Community Outreach Unit

National parks and wildlife sanctuaries are managed to preserve ecosystems in their natural condition. Both categories of protected area take account of the needs of indigenous people, including subsistence resource use.

"There is no ignoring it: protected areas cannot be viewed in isolation from the communities within and near them" according to Brown and Kothari (2002). It is important to recognize that the local communities traditionally harvest natural resources from these reserves and gain livelihood benefits from the adjacent protected areas. In the United States and Canada there is increasing emphasis on community outreach.

The protected area authorities in each reserve should respond to this strong emphasis on community outreach by establishing a Community Outreach Unit.

Unit Mandate: This Unit – ideally comprising up to a quarter of the workforce – should have a clear remit to interact with local communities living within or immediately adjacent to the protected area. They should collate information regarding the traditional harvesting of natural resources from within the protected area.

The protected area should have a unit of staff with a clear remit to monitor utilization, reach agreement and maintain dialogue with the local communities regarding the utilization of biological resources found within the protected area. Activities should include conducting socio-economic assessments, conducting land-use planning exercises with local communities regarding their traditional harvesting rights of natural resources within reserves, drafting local rules in collaboration with the local communities and zoning of these resources. To some level, the

Community Outreach Unit should develop its own monitoring programme, particularly focusing on those communities deemed important to the reserve.

Reporting: These Community Outreach Units should submit annual reports on the socio-economic environment to a defined Division within the Department of National Parks, Wildlife and Plant Conservation. These reports should contain information on the socio-economy of key communities living in enclave villages and villages in the buffer zone, as well as staffing levels, equipment, including both those in possession and those required (e.g. cameras, projectors and educational materials, etc.), and training needs.

Recommendation: Community Outreach Units should be established in every protected area in the country. Only staff with outgoing, friendly personalities should be recruited.

1.3 Law Enforcement Unit

Both national parks and wildlife sanctuaries are managed to protect or preserve habitats, ecosystems and species in as undisturbed a state as possible, maintaining their natural attributes.

In Thailand - and indeed all countries in Asia - the supporting legislation for wildlife sanctuaries (the Wild Animal Reservation and Protection Act, 1992) and national parks (the National Parks Act, 1961) places strong emphasis on prohibited actions in these protected areas as well as complimentary penalties.

The protected area authorities in each reserve should respond to this strong emphasis on protection by maintaining a Law Enforcement Unit.

Unit Mandate: This Unit – ideally comprising up to a quarter of the workforce – should have a clear remit to conduct law enforcement activities on a regular basis. Law enforcement activities will be executed if the protected areas are subdivided into management sectors. Patrols can then be undertaken into these sectors, recording: i) disturbance to the habitats (including forest clearance and fire outbreaks); ii) disturbance to

species (including selective logging, hunting, traps, hunters' camps); and iii) during the course of these field patrols they should also record observations of biological significance.

Reporting forms should be prepared from each of the management sectors.

Reporting: Law Enforcement Units should submit detailed quarterly and annual reports on patrolling activities to a defined Division within the Department of National Parks, Wildlife and Plant Conservation. These reports should contain information on disturbance to the habitats and the disturbance to species within the different management sectors (each sector encompassing 20-40 km²), as well as staffing levels, equipment, including both those in possession and those required (e.g. weapons, binoculars, GPS systems, mist nets, etc.), and training needs.

Recommendation: Presently, a heavy emphasis is placed on "arrest forms", which are prepared out of legal necessity. Thus, the strategy for monitoring illegal activities within the reserves needs to be thoroughly reviewed. Reporting systems should be established so that senior government personnel, senior protected area personnel and the Law Enforcement Unit have a clear understanding of illegal pressures in the different management sectors of the reserves.

1.4 Natural Resources Management Unit

As stated in Section 1.3, both national parks and wildlife sanctuaries are managed to protect or preserve habitats, ecosystems and species in as undisturbed a state as possible, maintaining their natural attributes. Sometimes the threats to these protected areas are generated indirectly from anthropogenic causes. Most notable in Thailand is the level of deforested or degraded areas within the protected areas, as well as the threat of forest fire outbreaks. Other less clearly evaluated threats include exotic introductions.

The protected area authorities in each reserve should respond to this strong emphasis on management by maintaining a Natural Resources Management Unit.

Unit Mandate: This Unit should provide a liaisoning function – comprising 2-4 personnel and have a clear remit to conduct reforestation interventions and fire prevention activities.

Reporting: The Natural Resource Management Unit should submit detailed quarterly and annual reports on activities to a defined Division within the Department of National Parks, Wildlife and Plant Conservation. These reports should contain information on deforestation, replanting efforts and forest fire disturbance to the habitats and the disturbance to species within the different management sectors (each sector encompassing 20-40 km²) as well as staffing levels, equipment, including both those in possession and those required (e.g. tree nurseries, fire fighting equipment, GPS systems), and training needs.

Recommendation: This Unit needs to liaise with the Forest Protection Units as well as the Community Outreach Unit on participatory reforestation efforts and participatory forest fire prevention efforts, and with the Law Enforcement Units on monitoring forest fire outbreaks.

1.5 Nature Education and Outreach Unit

Protected areas provide sites for tourism, recreation and nature education. The protected area authorities in each national park should respond by maintaining a Nature Education and Outreach Unit.

Unit Mandate: This Unit – comprising 6-12 staff – should have a clear remit to provide quality public services to visitors. The main nature education and interpretation activities will include: i) preparing and maintaining exhibitions in the visitor centers; and ii) maintaining nature trails, interpretation and providing specialized services to target groups (schools, specialist interest groups).

Activities: These staff should have a management objective to provide education and nature interpretation to visitors.

Reporting: The Nature Education and Outreach Unit should submit annual reports on tourism and recreation activities to a defined Division within

the Department of National Parks, Wildlife and Plant Conservation. These reports should contain information on exhibits, the maintenance of nature trails and the provision of public services to visitors.

Recommendation: Nature Education and Outreach Units should be established in every national park in the country.

1.6 Construction and Maintenance Unit

Protected areas provide a range of recreational facilities for tourists, and provide additional infrastructure to accommodate the daily operations of the protected area management authority. A protected area should have a unit of staff with a clear remit to construct and maintain buildings and related infrastructure, nature trails, boardwalks, bridges, signposts.

The protected area authorities in each reserve should respond to this strong emphasis on servicing facilities and infrastructure by maintaining a Construction and Maintenance Unit.

Reporting: This Unit should submit annual reports on construction and maintenance activities to a defined Division within the Department of National Parks, Wildlife and Plant Conservation. These reports should contain information on infrastructure priorities as well as staffing levels, equipment, including both those in possession and those required (e.g. building materials, tools, etc.), and training needs.

Recommendation: None required. Construction and Maintenance Units already operate effectively in every national park in the country.

1.7 Finance and Administration Units

Protected area management requires a wide range of expenditures to execute the full remit of tasks. The sizable work force requires salaries. A protected area should have a unit of staff with a clear remit to conduct financing for the reserve. Protected area management also requires a unit of staff with a clear remit to conduct administration for the reserve.

Reporting: The Finance Unit should submit annual reports on financial matters to a defined Division within the Department of National Parks, Wildlife and Plant Conservation. These reports should contain information on staff salaries, entrance fees and accommodation fees, as well as staffing levels, equipment, including both those in possession and those required (e.g. bookshelves, cupboards, computers, printers, stationary, etc.), and training needs. The Administration Unit should submit annual reports on administration to a defined Division within the Department of National Parks, Wildlife and Plant Conservation. These reports should contain information on general administration as well as staffing levels, and equipment, including both those in possession and those required.

Recommendation: None required. Finance and Administration Units already operate effectively in every national park in the country.

Conclusion

The absence of unit specialization in protected area management has severe consequences on effective protected area management, for example:

- Simple reporting systems, including monthly and annual reports, are of poor quality, acting as an immense barrier to the formal collection of important data for protected area management. This, in turn, is a fundamental constraint on management planning.
- Training of protected area staff is effectively diluted, and limited expertise in protected area management is developed.
- The data available to senior management to provide technical support, and guide the formulation of policy statements, also severely impinges improving effective protected area management.
- The impacts of conservation interventions achieved by conservation NGOs projects undertaken in protected areas are often severely reduced, as a consequence of limited institutional sustainability.

*The author is Director of Conservation, WWF Thailand.
Address: 104 Outreach Building, AIT, Klong Nung,
Klong Luang, Pathum Thani 12120, Thailand.*

HIMALAYAN MUSK DEER IN ANNAPURNA CONSERVATION AREA, NEPAL

by Achyut Aryal

Musk deer (*Moschus chrysogaster*), one of six deer species that occur in Nepal, belongs to Order-Artiodactyla, Family-*Moschidae*. In Asia, it is distributed in Afghanistan, Bhutan, China, India, Myanmar, Nepal, and Pakistan. In Nepal, it is found in the Annapurna Conservation Area (ACA), Kanchenjunga Conservation Area (KCA), Sagarmatha, Langtang, Shey Phoksundo, Rara, Khaptad and Makalu Barun National Parks and Manaslu Conservation Area, where a major problem is poaching (NBS, 2002). In these areas, they are distributed in alpine forest and the vegetation consists of oak, fir, rhododendron, blue pine, juniper, grass, lichens and scrub between elevations of 2,200 to 4,300 m on the eastern and southern edge of Tibet and the southern slopes of the Himalayas. *M. chrysogaster* usually lives in forests with moderate to steep slopes (Kattel, 1991; Green, 1987).

Musk deer is a protected mammal and listed as an endangered species by the National Parks and Wildlife Conservation Act 1973, in Nepal. It is listed by CITES in Appendix I for Afghanistan, India, Nepal and Pakistan, and in Appendix II for Bhutan and China.

The purpose of the study “Status (population, poaching and habitat) of musk deer (*Moschus chrysogaster*) in Annapurna Conservation Area of Manang district” was to determine the musk deer population, habitat structure, extent of poaching activities and the deer’s current status in Manang district of Annapurna Conservation Area of Nepal, where this data is lacking. The objectives of the study were as follows:

1. to determine the population status of musk deer in study area;
2. to assess the present habitat structure;
3. to assess past and present poaching activities on musk deer in the study area;

4. to map out distribution and potential poaching areas in ACAP; and
5. to identify current threats to the musk deer population and their habitats.

Musk deer was once widely distributed throughout most of the Nepal Himalayas between about 3,050 m to 4,270 m altitudes. The habitat of musk deer in the upper Langtang Valley, in the vicinity of the Thyangboche monastery in Khumbu, and in upper Budi Gandaki Valley is better protected than in other parts of country. According to Jamwal (1972), areas where musk deer are more commonly found in Nepal are Bajhang, Doti, Simikot, Markhor Lake, Dhorpatan, Manang and Langtang in the west and central regions.

Study area: Manang District

The study area was located in Manang District of the Western Development Region of Nepal (Humde area and Pisang), which lies in the north-central part of Nepal. It covers an area of 2,246 km², lying between 28° 27' and 28° 54' N latitudes and 83° 40' and 84° 34' E longitudes. The elevation ranges from 1,600 m (in Tal) to 8,156 m (in Manasu I). The altitudinal variation has resulted in diverse climatic conditions. The land use pattern of this district is not suitable for agriculture, which represents only about 0.5% of the total land usage.

Methods

Population status

A pellet count was carried out in transect lines marked out in both study areas and the silent

drive count method was done in one study area (Humde). Pellet groups were counted in the transect lines with the help of local people. Both the silent drive and pellet group count were done in the Humde area. This was done to estimate the population density by pellet groups in other sites with reference to the Humde area result. Only the pellet group count was done in the Pisang area.

Pellet density was also recorded for pellets up to approximately 30 days old in transect lines of 10 m x 500 m from altitudes of 3,500 m to 4,000 m. Both pellet density and silent drive count methods were used in the Humde area. In the Pisang area only pellet density was observed. In the Humde area a pellet density survey and a silent drive count were conducted twice (summer and autumn). Musk deer drop pellets in the same place, so a distinct layer forms comprising older and new pellets; when the lower layer and upper layers are less than 30 days old, they are counted as two pellet groups.

The regression model for the prediction of population density/km² of musk deer through data pellet density/km² was developed on the basis of two data collections from the Humde area; both times the same area was used for the pellet density survey and silent drive count.

Regression equation: $X = a + bY$

Where X = Population density/km² (dependent variable)

Y = Pellet density/km² (independent variable)

$$a = X - b Y$$

$$b = \frac{N \sum XY - (\sum X)(\sum Y)}{N \sum Y^2 - (\sum Y)^2}$$

Habitat structure analysis

Vegetation analysis

A vegetation analysis was carried out in Musk deer habitat. A floristic survey was conducted with random sampling methods in all representative areas. Sample plots were laid where encounters with pellets occurred and plots were also laid where pellets were absent. The sample plot size for plants used were as suggested by Schemnitz (1980), i.e. 10 m x 10 m for tree layer, 4 m x 4 m for all woody undergrowth to 3 m in height, and 1

m x 1 m for the herb layer in composite plots, calculating plant density, frequency, abundance etc. The IVI of tree species was obtained by the summation of relative density, relative frequency ~~and relative dominance~~ $IVI = \text{relative density} + \text{relative frequency} + \text{relative dominance}$

Physical feature analysis of habitat/Past and present trend of poaching/Mapping the poaching and distribution areas

Other features of habitat such as cover, ground morphology (broken, unbroken, smooth, presence of boulders or small rocks) and erosion, cliffs, caves and water sources were noted, as was the slope, elevation and aspect, by directed observation using appropriate instruments. Past and present poaching trends were determined through interviews with local people. After completion of the field visit, the data was plotted on the original map to show the poaching and distribution.

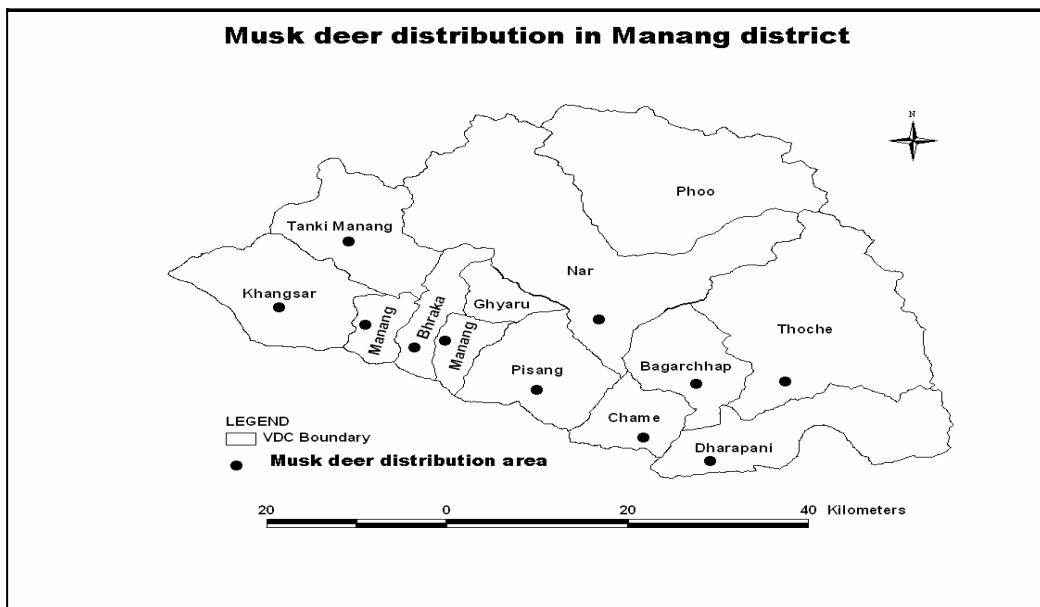
Results and discussion

Present distribution of musk deer in ACAP region

Manang and Mustang districts have provided prime habitat for musk deer. In Manang district they are distributed in Thoche, Tache Bagarchap, Dharampani, Chame, Manang, Tanki Manang, Khansar, and Nar VDCs. Nyeshang valley (which is the largest valley of Manang and starts from Pisang VDC to Throng Phedi and covers the six VDCs) harbors a high density of musk deer populations. Similarly, in Mustang district musk deer is found in Tukuchhe, Jomsom (at higher altitudes), Marpha, Muktinath, Kobang, Dzong and Kagbeni VDCs. In 2000, an ACAP patrolling team, led by Ajay Pandey (Officer-ACAP) and Rajesh Gupta (Ranger-ACAP), encountered musk deer in Parche and Namarjung VDCs of Kaski district as well.

Population status

The study area of Humde was approximately 3 km². Pellet density of musk deer in Humde area was recorded at 11.33/ha in the summer and 11 musk deer were counted. In autumn, the pellet density recorded was 17.45/ha and 16 musk deer



were recorded using the silent drive count method. On the basis of the silent drive count method, the average population density of musk deer was 4.5 individuals/km² in the Humde area. The potential habitat of musk deer in Humde forest is 5.1 km², so we can estimate there are approximately 23 musk deer present.

Number of Musk deer records in the Humde area in September, 2004, and June, 2005 using silent drive methods of census.

S.N.	Adult			Juvenile	Total
	Male	Female	Unclassified		
Summer	3	-	7	1	11
Autumn	5	6	5	-	16

The regression model for the predication of population density/km² of musk deer through data pellet density/km² was developed on the basis of two data collections from the Humde area. Both times the same area was used for the pellet density survey and the silent drive count.

The regression equation for the estimation of population density/km² (X) is:

$$(X) = 0.59 + 0.003Y, \quad \text{where } a = 0.59, \quad b = 0.003.$$

On the basis on this equation the population density of musk deer in Pisang forest was 3.4 individuals/km². There is a 7.82 km² area which provides potential habitat for musk deer; therefore, it is

The pellet density in the Humde area was 11.33/ha and 17.45/ha in the summer and autumn surveys respectively. The pellet density in the Pisang area was 9.33/ha.

estimated that at least 27 individual musk deer may be in Pisang forest. There was high poaching pressure in Pisang forest but in the Humde area there have been no recorded deaths of musk deer by hunters/poachers in the last 3 years. This may explain why the population density of musk deer is low in Pisang forest compared to Humde forest.

Population trends

According to the local people, the present population of musk deer is low compared to the past 10 years. Heavy poaching occurred in Pisang VDC. According to interviews with herders and other local people in the study area, in Pisang there is high poaching pressure on musk deer and about

90% of the respondents agreed that the population was gradually decreasing

In both study areas, before 1991, there was a high population of musk deer, and from 1991-1998 there was high poaching pressure. An elderly former herder said that the population of musk deer has changed drastically compared to before 1991. At that time there were more than 200 musk deer in Pisang and more than 100 musk deer in Humde. But now, only around 50 remain in Pisang and about 25 in Manang VDC. Most of the respondents in Pisang indicated that the population of musk deer was declining gradually, but while the respondents in Humde indicated that the population of musk deer was also declining, it was less significant than in the Pisang area because the influence of poachers is lower in Humde than in Pisang. Many respondents blamed poaching, killing by predators, and human and livestock disturbance in its habitat as the main causes of the decline in the population of musk deer.

Habitat preference

The musk deer frequented lower altitudes in times of snow. The preferred altitude of the musk deer in Pisang is 3,800 m (± 300 m) and 3,700 m (± 200 m) in Humde in Manang district.

The highest rates of encounter with musk deer pellets were at 36° to 45° angles of slope in both study areas.

In Pisang, a higher number of pellets were found in the NW aspect compared to other aspects and in Humde almost all pellets were found on northern slopes. This may be due to the pressure of human activities (timber and fuel wood collection) and livestock grazing was higher in other aspects than in the NW aspect of Pisang. The Humde study site faced the northern slope. The musk deer were more active on northern slopes and they rested more on southern slopes. Northern slopes may be warmer at night because they are probably more sheltered (Green, 1987).

During the study period almost all of the ground layer vegetation was dry. The ground level was covered with litter and partly with snow. The

highest amount (34%) of pellet groups were found in very sparse (0-25%) ground cover in Pisang.

Musk deer habitat in Pisang was dominated by *Abies sp.* forest and the musk deer habitat of Humde area was dominated by *Betula sp.* forest.

Tree/shrub/herb status in musk deer habitat

In Pisang, 6 tree species, 9 shrub species and 11 herb species were recorded, while 5 tree species, 4 shrub species and 7 herb species were recorded in a sample plot in Humde.

In Humde, *Betula utilis* was the most prominent tree species of musk deer habitat, while in Pisang, *Abies sp.* was most prominent followed by *Betula utilis*, *Juniperus sp.*, *Cupressus torulosa*, *Pinus wallichiana* and *Rhododendron campanulatum*. Similarly in Humde, the important species were *Betula utilis* followed by *Cupressus torulosa*, *Abies sp.*, *Juniperus sp.* and *Pinus wallichiana*.

Past and present poaching activities and potential poaching areas

Hunters use a variety of techniques to kill musk deer, including snaring and shooting, the latter sometimes aided by dogs. In the past, hunters usually used guns and dogs, but now due to the security situation in the country, shooting has been replaced by snaring. Pisang is one of the potential poaching areas of Manang district. And according to local people, the eastern part of Humde where there is less movement of local people is also a potential site for poaching. Three years ago, many snares were found in Humde but this year patrolling teams were unable to find any snares in the area. In Pisang, which sees heavy poaching every year, many snares were destroyed by the patrolling group. Generally, Meraka danda, Namche, Nalgo, Kyadi and Kyothopa Pakha are high potential poaching areas of Pisang. A high number of snares were destroyed by patrolling teams in Nalgo, Namche, and Meraka danda of Pisang area. The eastern part of Humde is also a potential site for poaching. In 2004, patrol teams from Pisang found 6 snares containing evidence of the remains of musk deer. Ankhwaching Gurung and Bhujung Gurung (CAMC, Pisang), estimated that about 25 musk deer were killed by

poachers in 2002-2004 from Pisang forest. There is also high poaching pressure in Tilche forest of Thoche VDC.

Trade pattern in Manang

It was very difficult to identify the trade pattern of musk deer in the study area. During the study periods many snares and signs of poaching of musk deer were found in the study area, which shows that there is also trade in musk deer. The trade is impossible without the involvement of local people who provide information about patrolling, but do not necessarily set snares or kill musk deer directly, and it is very difficult to discover who is involved. Generally, poachers come from Gorkha, Dhading, Lamjung and Tanahaun districts. According to the local people and former hunters, one male musk deer produces about 3 tola (1 tola = 11.64 gm) of musk. At the local level, one tola of musk is priced at NRs 5,000. Poachers supply to local middle-men, who then send the product to Tibet. Poachers also sell to middle-men in Kathmandu, hiding the musk pods in ghee (clarified butter) bottles. In 2004, patrol teams in Pisang found 6 snares with evidence of the remains of musk deer.

Conservation status of musk deer in Manang

The religion of Manang (Buddhism) advocates the conservation of wildlife. Sherpa Gulcha (a Buddhist Lama), has made great contributions and encouraged the conservation of musk deer in Manang VDC. He encouraged the formation of musk deer conservation committees and provided NRs. 50,000 (approx. US\$715) for the conservation of musk deer. That committee is now under the CAMC, Manang VDC and Tanki Manang VDC, i.e. *Musk deer conservation joint sub-committee, Manang and Tanki Manang VDC*, which was established in 1996. ACAP provided NRs. 85,000 (approx. US\$1,215) as an endowment fund and CAMC Manang and Tanki Manang, VDC also collected the same amount and deposited the funds in the committee's bank account, using the interest for the conservation activities, in particular for patrolling. Presently, the committee has NRs. 209,000

(approx. US\$2,986). The musk deer conservation joint sub-committee has invested about NRs. 50,000 (approx. US\$7,143) over the last 6 years for patrolling and other community development activities. CAMC Pisang also operates a musk deer conservation committee (there is no separate body for the conservation of musk deer). CAMC Pisang has mobilized local people for the conservation of musk deer and does regular monitoring work for the conservation of not only musk deer, but also other wildlife in their area. They patrol musk deer habitat regularly and destroy large numbers of snares every year. They can punish those who are responsible for musk deer poaching. Two years ago, the musk deer conservation joint sub-committee of Manang and Tanki Manang levied fines netting about NRs. 800,000 (approx. US\$11,429) from those responsible for the poaching of musk deer. The funds generated have been used for musk deer conservation work and community development works. These instances indicate that the harnessing of religious elements and indigenous systems with conservation connotations may be beneficial for the overall conservation efforts of ACAP.

The study shows that poaching of musk deer has declined over the last 3 years due to regular patrolling in musk deer habitat by CAMC Pisang and the musk deer conservation joint sub-committee Manang and Tanki Manang VDC. CAMC, Pisang and the musk deer conservation joint sub-committee members have been patrolling during their free time from agriculture work. When the farmers or local people are busy with their agricultural activities, the poachers are more active in putting out snares and hunting musk deer. Therefore, the committee is being more careful and will do regular patrolling with the help of local people.

Threats

Habitat loss

Excessive degradation and fragmentation eventually leads to habitat loss. Potential habitat of musk deer has already been lost due to heavy deforestation and fires in the northwest part of

Humde. Local people in Humde are highly dependent on musk deer habitat for fuel wood, and in Pisang forest they depend on the timber available there. Pisang suffers from high rates of deforestation for timber and fuel wood. Conversion of the northwest part of Humde's forest into degraded land and the heavy pressure on the forests of Pisang and Humde for fuel wood and timber is causing loss of good habitat for the sensitive musk deer.

Predators

According to local people, yellow-throated martens have killed about 15 juvenile musk deer over the last three years. During a field visit in September 2004, the author found a piece of musk deer skull and scat of both snow leopard and yellow-throated marten. The scat of both species contained musk deer hair. Generally though, the yellow-throated marten is the main predator of the juvenile musk deer.

Grazing

Owing to high seasonality and low primary productivity, the Himalayan region supports a relatively low ungulate/herbivore biomass. It is therefore obvious that with the increase in the biomass of domestic livestock in many areas, wild ungulates such as musk deer have suffered competitive exclusion. Sathyakumar *et al.* (1993) reported that increased livestock grazing and the associated impacts have led to low musk deer densities in many areas in Kedarnath Wildlife Sanctuary, India. In Pisang, 58% of the musk deer habitat suffered domestic livestock grazing pressure, while there is 62% grazing pressure in musk deer habitat in Humde.

Poaching

Poaching is one of the main threats to the population of musk deer in the study area. Pisang VDC has a large favourable area for the musk deer but there is also heavy poaching in this region. The musk deer conservation committee and CAMC, Pisang have been patrolling regularly and each year they find many snares and signs of killing of musk deer by poachers. Poaching is higher in Pisang compared to Humde. According

to a field survey, 75% of the respondents of Pisang reported ongoing poaching of musk deer, while only 29% of respondents in Humde reported poaching in Humde.

Conclusions

1. Musk deer is distributed in all VDCs of Manang district except Phu VDC. A high density of musk deer is found in Nyeshang Valley. Pisang harbored a good number of musk deer, followed by Tilcho forest of Thoche VDC, Manang and Tanki Manang, Khansar, Chame, Dharapani, Tache Bagarchap and Nar VDCs.
2. Potential musk deer habitat in the study area covered 7.82 km² for Pisang VDC and 5.1 km² in Humde. A total of 8 and 12 forest sites in Humde and Pisang respectively had the highest potential as musk deer habitat.
3. The average population density of musk deer in Humde area was 4.5 individuals/km² and an estimated 23 animals are present in Humde. Similarly, the population density of musk deer in Pisang area is 3.4 individuals/km² and approximately 27 individuals are present in Pisang forest.
4. The regression equation for the estimation of population density/km² (X) is: (X) = 0.59+0.003Y on the basis of pellet density/km² (Y).
5. The musk deer population trend has been declining at a high rate in all VDCs of Manang district, except for Manang and Tanki Manang VDC.
6. Musk deer preferred to occupy the 3,300 to 3,700 m altitudinal range in the study area, having 36 to 45 degrees angle of slope, a northwest and northern aspect, with good cover structure (dense forest).
7. A high percentage of musk deer pellets were counted in forest land, followed by shrub land, grazing land and open land.
8. A high percentage of pellets were counted in areas of 50% to 75% crown cover and 50% to 75% ground cover.
9. In Humde, *Betula utilis* was the most prominent tree species in the Musk deer habitat, while in Pisang VDC, *Abies* sp. was the most prominent tree species, followed by *Betula utilis*, *Juniperus* sp., *Cupressus* sp.,

(Continued on page 17)

- Pinus wallichiana* and *Rhododendron campanulatum*. In Humde, the important species were *Betula utilis* followed by *Cupressus torulosa*, *Abies* sp., *Juniperus* sp. and *Pinus wallichiana*.
10. Snaring/trapping is currently the preferred method of poaching. In the past, poachers used guns, poison and dogs for killing musk deer.
 11. Other threats to musk deer habitat include overgrazing by domestic livestock, forest fires, timber and other forest product collection.

Recommendations

- There is an urgent need to increase trans-boundary co-operation between Nepal, India and China to control the illegal trade of wildlife products.
- An awareness programme is essential for school students, leaders, villagers, etc., to change the attitude of local people towards the conservation of musk deer and other species.
- Detailed studies (ecology, distribution range, movement pattern, population, etc.) should be carried out in the whole potential habitat of Annapurna Conservation Area and ACAP should develop a musk deer conservation Action Plan with full participation by the local people.
- For truly effective conservation measures, popular participation is essential, particularly in the Nepal context of poor enforcement and little rule of law. Hence, the following conservation measures are recommended:
 - Enforcement of existing protection measures against poaching, and vigorous action against hunters and traders.
 - The Humde area of Manang is a potential site for the establishment of a musk deer breeding/farming center. ACAP should take action to explore this potential and seek necessary cooperation and support from the relevant government authorities.
 - Special forest zones should be established for musk deer. A core area should be demarcated in prime musk deer habitat where local people are prohibited to graze domestic livestock, collect forest products,

or to carry out any activities which may disturb musk deer.

- Feasibility studies should be undertaken to explore the potential for ranching and safe harvesting of musk from deer in their natural habitat.
- The musk deer conservation joint sub-committee can be strengthened by training, introducing an incentive programme for local people, etc. for the effective conservation of musk deer in natural habitat.
- Regular patrolling should be done in all musk deer habitats, particularly in times when agriculture work demands many people to be out in the farms and forest land.

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Author's address: The Biodiversity Research and Training Forum (BRTF), P.O.Box-299, Pokhara, Nepal & Institute of Forestry, Pokhara, Nepal.

Email: ntfpsearch@yahoo.com;
achyutsinensis@hotmail.com

REPORT ON THE SURVEY OF HIGHER VERTEBRATES OF RIVERS YAMUNA AND GANGA

by R.K. Sharma

Introduction

The Forest Departments of Madhya Pradesh and Uttar Pradesh have been concerned about the status and conservation of higher riverine vertebrates (dolphins, otter, crocodilians, turtles and birds) for the last two decades and a number of river sanctuaries have been notified for this purpose. Surveys of rivers to evaluate the status and estimate animal populations are essential for the planning and implementation of these conservation programs. Available information about the occurrence of higher vertebrates in the rivers of northern India are long outdated, besides being anecdotal and fragmentary. The Yamuna River below its confluence with the Chambal, and the section of the Ganga flowing into the Yamuna, have not been systematically surveyed for higher vertebrates so far.

Surveys of the above-mentioned sections of rivers have a special significance with regard to the status of the gharial, because they can reveal information regarding the migration of this species from the National Chambal Sanctuary, which contains breeding populations and releases considerable numbers of captive-reared gharial to supplement wild populations. With the above objectives in mind, a survey was carried out in February 1977. The surveys assumed special importance for the assessment of the effects of

severe floods that occurred in the 1996 monsoon season in the riverine/riparian ecosystem of the Yamuna and Ganga.

Survey methods and program

In northern India, gharials will bask for long periods during the day in winter if left undisturbed. Therefore, daytime counts of gharials in winter can reveal a high proportion of the total numbers of gharial inhabiting a specific section of the river. Counting gharials during the winter daylight hours from a moving craft is a valid method for censusing gharials, as the possibility of counting an individual more than once is precluded because the gharial will remain within their preferred home range after the observer has moved on to the next area.

The Yamuna and Ganga rivers were surveyed during daytime travel on the rivers by a boat equipped with a 40 HP outboard motor. 10x50 power binoculars were used as visual aids. The survey was conducted between 3-7 February 1997, covering a total river length of 650 km along the Yamuna river, extending from its confluence with the Chambal river, downstream to its confluence with the Ganga, and along the Ganga downstream to Varanasi .

Approximately equal lengths of the river were covered on each of the survey days. When animals were spotted from afar, the boat was stopped and approach was made on foot to prevent disturbance to the animals and to avoid the possibility of any animals entering unseen into the water. Sightings of all animals were recorded on Survey of India maps at a scale of 1:50,000. As far as possible, the body lengths and size of all animals were estimated and the size class of animals was also recorded. Whenever possible, people residing along the river or engaged in riverine/riparian activity were interviewed to obtain any relevant information regarding river fauna. This survey was meant to complement the results of the systematic survey of the Chambal river conducted between 1984 and 1996 (Singh, 1985; Sharma, 1985; Singh and Sharma, 1985; Rao and Sharma, 1987; Sharma *et al.*, 1993; Sharma *et al.*, 1995 a,b)

Results and discussion

The results of the survey are presented by faunal group in Table 1.

Gharial:

Sightings of gharials were uniformly rare, with a mean sighting frequency of one gharial per 35 km of river. This is much lower than that found in the National Chambal Sanctuary, where in the most recent surveys the observed sighting frequency is 2.92 gharials per km of river. Clearly, gharials dispersing from the Chambal river have not succeeded in reaching the Yamuna or Ganga rivers at the surveyed sites. The most probable reasons for this failure are the inimical factors of cucurbit horticulture on mid-river sand bars and fishing with gill nets and other gear.

Mugger crocodile:

Mugger sightings were even rarer than that of gharial, as is the case in all large rivers in North India. This may be ascribed to the habitat preferences of the mugger, which prefers smaller rivers and stagnant water bodies as ideal habitat. There is also a trend for the mugger sightings to decrease with increasing distance from the Yamuna/Chambal confluence.

River dolphins:

Dolphins were encountered more frequently than gharial or mugger, with a mean sighting frequency of 1 dolphin per 8.35 km of river. This is approximately 50% less than in the Chambal river, where in 1995-96 the frequency of dolphin sightings was 1 dolphin per 5.6 km, if averaged for the entire river length in the Chambal Sanctuary, and 1 dolphin per 3.75 km if only the restricted distribution of dolphins in this river is taken into consideration. Of the total 64 dolphins sighted during the survey, 53 (83%) were adults and 11 (17%) were juveniles. The percentage of juveniles in different sections of the river ranged between 18.2-14.3%. The section of the Ganga from Augasi to Vindhyaachal represented the most optimal conditions for the dolphin, with not only the maximum animals (39) sighted in this section and the highest sighting frequency (1 animal per 5.1 river km), but also the highest percentage of juveniles (17.9%).

Turtles:

Three species of hard shelled turtles – *Kachuga tentoria*, *K. dhongoka* and *K. kachuga* – and at least two species of soft shelled turtles – *Chitra indica* and *Aspideretes* sp. – were identified while they were basking. As observed elsewhere, the hard shelled turtles preferred rocky outcrops and hard soil banks, while soft shelled turtles preferred sand banks for basking. Recent and fresh nesting activity of large hard shelled turtles was noted during the survey, while old, predicated nests of small hard shelled turtles were also seen.

Birds:

During the survey, 82 species of birds were recorded between Pachnada to Varanasi. The area has a good potential for birds as there are sufficient roosting sites available along the river. During the survey of wetland avifauna, the maximum number of bird species recorded were pintails (5,464), followed by common pochard (4,690). Sightings of particular significance were of osprey (1) and king vulture (2).

Table 1: Showing status of Gharial, Mugger and Dolphin from Chambal/Yamuna confluence at Pachnada to Varanasi

Area covered (Date)	Approximate distance (km)	Number of animals sighted		
		Gharials	Muggers	Dolphins
Chambal/Yamuna confluence Pachnada-Kalpi (3.2.97)	0-80	5	4	12
Kalpi to Augasi (4.2.97)	80-210	3	1	7
Augasi to Pandura (5.2.97)	210-305	2	1	17
Pandura to Vindhya Chal (6.2.97)	305-410	1	-	22
Vindhya Chal to Varanasi (7.2.97)	410-535	4	-	6
		15	6	64

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Author's address: National Chambal Sanctuary, Morena - 476 001, P.O. Box 29 (M.P.), India.

THE EXISTENCE OF THE KOUPREY (*Bos sauveli*) IN CAMBODIA

by Lic Vuthy

Introduction

The continued existence of the kouprey (*Bos sauveli*) in Cambodia and or the Indochina sub-continent has been treated with skepticism among zoologists up to the present day. Studies have been conducted since 1939 in Indochina – mostly in Cambodia – to learn more about the biology and ecological behavior of the kouprey (Wharton, 1957). The peak efforts of searching for kouprey took place during the late 1980s, including a seminar-cum-workshop among the Indochina countries (Cambodia, Lao PDR, Thailand and Vietnam) held in Hanoi, Vietnam (MacKinnon & Stuart, 1989).

During the 1980s the studies were mostly conducted in Lao and Vietnam because of the security problem in Cambodia. Thailand was not focused on because there was little hope that any kouprey still remained in the country at the time. After the security problem improved in the mid 1990s, studies were conducted in Cambodia by Cambodian and international experts from India and the United Kingdom (Desai and Vuthy, 1996; Le Xuan Canh *et al.*, 1998).

The kouprey was designated as Cambodia's national animal in 1964 by His Majesty Norodom Sihanouk of Cambodia. One young kouprey was transported to Paris, France by Mr. Sauvel. Recently the Cambodian government, under the lead of the Ministry of Agriculture, Forestry and Fisheries (MAFF), re-designated the kouprey as a national "Symbol Animal" after national recognition had been absent for more than thirty years during 1970 to 2004.

This paper reviews existing reports conducted in the region, combined with extensive field surveys that were carried out in Cambodia during the 1990s

and early 2000. The paper addresses the question of whether the kouprey still exists in the Indochina region or in Cambodia; and if not, then when the last reliable record of its occurrence was and from where.

Since 1992, the wildlife conservation efforts for kouprey and other large mammal species such as elephant, gaur, banteng, Eld's deer and wild water buffalo, have revealed that wildlife species in Cambodia are in a fragile state. Although most anecdotal references say that populations of wild animals drastically declined in the 1990s, in fact they have been decreasing since the mid-1970s when Cambodia entered into the war in Vietnam.

Physical characteristics of kouprey

The kouprey belongs to the Bovid family, which are ruminants. The kouprey's most outstanding feature is its dewlap, which extends down below the knees. Male koupreys are a darker-brown color and bigger than the females. Below the knees the legs are white, as is the back of the body. The male kouprey's horns curve out to the sides and then turn back in, upward to the front. A typical characteristic is the brush-like appearance on the tip of the horns.

Habitat

Home range

Koupreys inhabit dry forest areas with open grasslands that are isolated from human presence (Wharton, 1957). The animal's home range could include Preah Vihear province (Chhep, Kulen Prum Tep) Stung Treng, Ratanakiri, Mondulkiri, and Kratie provinces.

Because of the security problem in Cambodia during the past, some people believed that koupreys may have fled from inside Cambodia to the border areas of Lao PDR, Thailand, and Vietnam. However, studies conducted during the 1980's and 1990's in those areas did not record any kouprey.

Food

Like other bovid species, the kouprey is a ruminant, grass-eating animal. Bamboo leaves were also seen to be eaten by kouprey but they generally prefer grass to other bush leaves. However, there were few records that discussed the kouprey's diet.

Field survey reports

Kouprey were commonly known to the Khmer-Morn people for more than a thousand years before being placed in the scientific record in 1937 by French zoologist Achille Urbain. Mr. Urbain realized that one of the new species of mammals transported by ship from Cambodia to Paris by Sauvel was a young kouprey. The animal was caught from Chhep, Preah Vihear province, Cambodia, and transported through Saigon (Ho Chi Minh City) to Paris.

In the 19th century scientists focused their efforts on a few new species, which included the kouprey. Wharton, who was the first man to study the kouprey, worked with Cambodian scientists to observe kouprey behavior and its ecological habitats in northern and northeastern Cambodia. Wharton concluded that kouprey had been wandering around the Kingdom of Khmer (Cambodia) for thousands of years.

With the Cambodians' assistance, Wharton spent two months in Choam Ksan and Koh Ke (areas of Preah Vihear and Siem Reap provinces) during his journeys looking for kouprey. He and his team made short trips to the east of the Mekong to seek information about kouprey abundance there.

Reporting the results of his study in 1957, Wharton concluded that there were about 400-500 kouprey present west of the Mekong, 200-300 individuals east of the Mekong (in Lomphat Wildlife

Sanctuary), and about 50 head in Samrong district (currently Sambo district) of Kratie province. Wharton planned to increase the scale of the kouprey program to include *ex-situ* conservation of kouprey in 1964. However, his plan was cut off because of the security problem in the country created by Viet Cong troops in the former kouprey home ranges, particularly east of the Mekong.

In 1949, about 10 years before Wharton's study, Sauvel estimated that kouprey numbers varied from 500-600 individuals west of the Mekong to about 200 heads east of the Mekong.

Following a film about kouprey made by Wharton, His Majesty Norodom Sihanouk designated the kouprey as a National Animal and declared Kulen Prum Tep, Lomphat, and Phnom Prich as wildlife sanctuaries dedicated especially for kouprey conservation (Royal Reserves, 1964).

According to the studies by Boonsong Lekagul (Lekagul, 1982), the noted Thai zoologist, kouprey had occurred along the Cambodian-Thai border until the 1950's. He first saw a kouprey horn by chance in a Chinese market in Bangkok in 1944, after which he began conducting his studies. He came to Cambodia in 1970-1975 to do field studies. His conclusion was that the kouprey could travel back and forth from Cambodia to Thailand according to the direction of monsoon. The studies were halted due to security issues until 1980. In 1982, Dr. Boonsong reported that koupreys were spotted wandering along the Thai-Cambodian border in the battle fields of the Khmer Rouge and the government army of Phnom Penh. However, his field trip was cancelled because of the tragic death of one of his team members by stepping on a land mine. Since then, there have been no reports about the kouprey from Thailand.

Dr. Boonsong participated at the regional workshop held in Hanoi, Vietnam in 1988, organized by IUCN and WWF. The workshop was held to discuss and work out proper strategies for the survey of kouprey and its conservation. In their country reports, each country representative estimated the possible numbers of koupreys occurring in their country. Cambodia estimated up to 200 koupreys (Chan Sarun, 1985), Lao PDR estimated about 40-100 individuals, and Vietnam

about 27 heads. The Thai representative said there were no indications of kouprey in Thailand at that time, but that if there were any they may occur only along the border of the three countries, i.e. Cambodia, Lao PDR, and Thailand (MacKinnon & Stuart, 1989).

Following the workshop, intensive field surveys were conducted in Lao PDR and Vietnam during 1989 to 1991. Since there were no indications that koupreys still existed in the two countries, and with the subsequent improvement of the security situation in Cambodia, kouprey studies were organized in the early 1990's within Cambodia and along its border areas, especially bordering Lao PDR and Vietnam.

Discussion

Following Wharton's discovery of the kouprey in 1957, there have been continuous studies conducted in the Indochina region, especially in its home range. In 1964, Wharton led a team to try to capture a kouprey for *ex-situ* conservation. He mentioned that the kouprey also occurred in the northeastern parts of Cambodia. Nevertheless, his project was cancelled because of the security problem in the field. Ta Nhem, a villager of Sre Angrong, Kaun Mom district, Ratanakiri province, has owned a female kouprey horn since 1954. The female kouprey was shot by a soldier friend and sold to him. This evidence makes clear that kouprey used also to occur in northeastern Cambodia. Some of Lon Nol's soldiers reportedly also saw kouprey in the northeast during 1970-1974 missions in the area.

From the many reports there seems to be a consensus that most of the kouprey occurred within and around Cambodia during the 1980s. Some first-hand reporters, who actually hunted the kouprey, confirmed that they had seen kouprey in 1982-1983. Since then, there has been no evidence or first-hand reports about kouprey sightings, but mainly second- or even third-hand reports. No proper evidence of kouprey has been reported since the one killed in the areas of O tang-O Leo of the Ratanakiri province adjacent to the Vietnam border in 1989.

It is recognized that since its discovery, the population of koupreys has been steadily decreasing. Wharton said that around 500 kouprey existed in the areas during the 1950s, but this number fell to 6-10 individuals in the 1990s, and there has been no new confirmation since then.

Chay Sakun, Deputy Director of the Department of Planning, Statistics and International Cooperation, MAFF, formerly of the Forest and Wildlife Office of Mondulkiri province, reported that he was informed that many koupreys had died of disease during the 1970s. Carcasses of koupreys were seen, mostly in the dry forest areas of Lomphat and Phnom Prich wildlife sanctuaries of Mondulkiri province. Their horns were eaten by porcupines and the meat was eaten by flocks of vultures and other raptors and carnivores.

It is crucial to note that according to reports studying wildlife in general and kouprey in particular, there are still a few small areas of the kouprey home ranges that have not been surveyed or even accessed.

Conclusions

Although there are a few locations that remain un-surveyed, it is believed that the last sighting of kouprey was in 1983. Kouprey existed in Cambodia for more than thousand years and were still present in the early 1980s. However, there is no evidence of its presence now.

Recommendations

It is important that the Cambodian people remember that one of the main wildlife species, the rhinoceros, no longer exists in Cambodia. We do not want any other wild species to disappear from Cambodia. In order to ensure this, we all must work hand in hand to protect the remaining species from extinction for the next generations.

Our contribution would not be difficult. Just do not buy and/or consume endangered wild animal products, particularly of the kouprey, and report any sightings as soon as possible to the government officials near by. This would help safeguard the Cambodian wildlife.

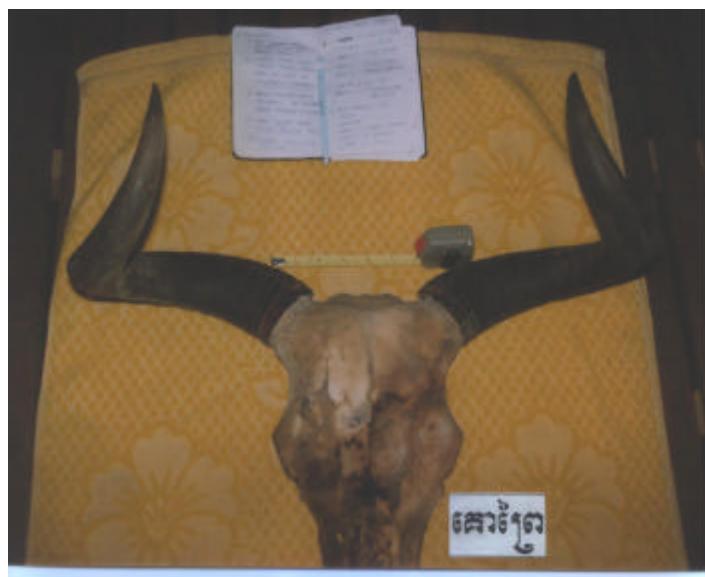
Some other remaining wildlife species that are at the edge of extinction also need contributions and collaboration in order to save them. These include the tiger, Eld's deer, elephant, serow, hog deer, endangered bird species such as the crane, giant

ibis, black-necked stork, and Bengal florican and some reptile species.

Author's e-mail address:
licvuthy@yahoo.com



*Believed to be the horns of a male kouprey (Photo by Sun Hean).
The photo was taken in Poi Pet Market, Cambodia-Thai border, in 1995.*



Female Kouprey horn. Photo taken from Mr. Ta Nhem, villager of Sre Angrong, Kaun Mom district, Ratanakiri province by the author and the team of WPO in 1996. It was shot in the 1950's.

WARNING: FATAL VIRAL DISEASE IN ASIAN ELEPHANT FOUND IN SOUTH EAST ASIA

by Parntep Ratanakorn

In 2003, cases involving a fatal viral disease among elephants were first found in India and Cambodia. Elephant Epitheliotropic Herpes Virus, or EEHV, was diagnosed and confirmed by PCR technique. EEHV caused several fatal and non-fatal cases among captive Asian elephants throughout European and American zoological parks. This virus was first discovered in the African elephant, which is able to tolerate this virus without ill effect, and then can become a carrier for EEHV. EEHV can be transmitted from African elephants to Asian elephants or from Asian elephants to Asian elephants via direct contact of secretions or fetal material from the genital tract which is contaminated with EEHV.

African and Asian elephants that are kept in the same confinement area and have physical contact with each other are at high risk of passing on the disease, which causes higher mortality among calves and young animals than among adults. An infected calf will have a sudden onset of symptoms and exhibit several signs such as oedema of the forehead and head, as well as the proboscis; the tongue exhibits cyanosis and the animal's symptoms progress through dyspnoea, leucopenia, thrombocytopenia, internal hemorrhage and sudden death.

It would be very dangerous if EEHV was to spread to Thailand's domestic elephant population, which are raised to roam free in the forest periphery that shares habitat with wild Asian elephants. Some of the domestic and wild elephants court and mate, and EEHV could spread from domestic to wild elephants. This would be disastrous among calves and young wild Asian elephants and a great threat to our valuable and endangered species. The extinction of Asian elephants could arrive sooner than we fear.

A reference diagnostic lab for EEHV will be established in Thailand at the Faculty of Veterinary Science, Mahidol University, as agreed upon at the EEHV expert meeting in Houston, USA, in 2005. This lab will assist in the diagnosis of EEHV in elephants' specimens which are submitted from the South-East Asia region. We hope to give an early warning and prevent this disease from spreading.

*For more information, please contact:
vspri@mahidol.ac.th*

The author's address is: c/o Faculty of Veterinary Science, Mahidol University, Salaya, Phutthamonthon, Nakhon-Pathom 73170, THAILAND

FOOD HABITS OF TIGERS IN PARAMBIKULAM WILDLIFE SANCTUARY

by Shijo Joseph and A.P. Thomas

Introduction

The tiger (*Panthera tigris tigris*), once widely distributed across the riverine grasslands and forests of Asia, has become highly endangered due to habitat loss and fragmentation and is now localized only in small isolated forest areas. The conservation methodology for tiger is constantly changing, and the human-altered landscape requires a clear understanding of the prey-predator dynamism. Food habits of tigers are central to their ecological niche, play an important role in explaining the animal's behavior and population density, and may also have an important implication in the life histories of its prey. The study of diet can help to understand the role of a species in the energy flow and nutrient cycle of an ecosystem. It also sets a foundation for the understanding of behavior, population dynamics, habitat use and social organization of a species. Although tigers have a major role in stabilizing the ecosystems, there is little information available on the exact distribution, community structure and interaction between herbivores and tigers in most protected areas. Therefore, the present study was undertaken to analyze the diet of tiger in comparison with leopard (*Panthera pardus*) and wild dog (*Cuon alpinus*) in Parambikulam Wildlife Sanctuary, to assess the diversity of prey species.

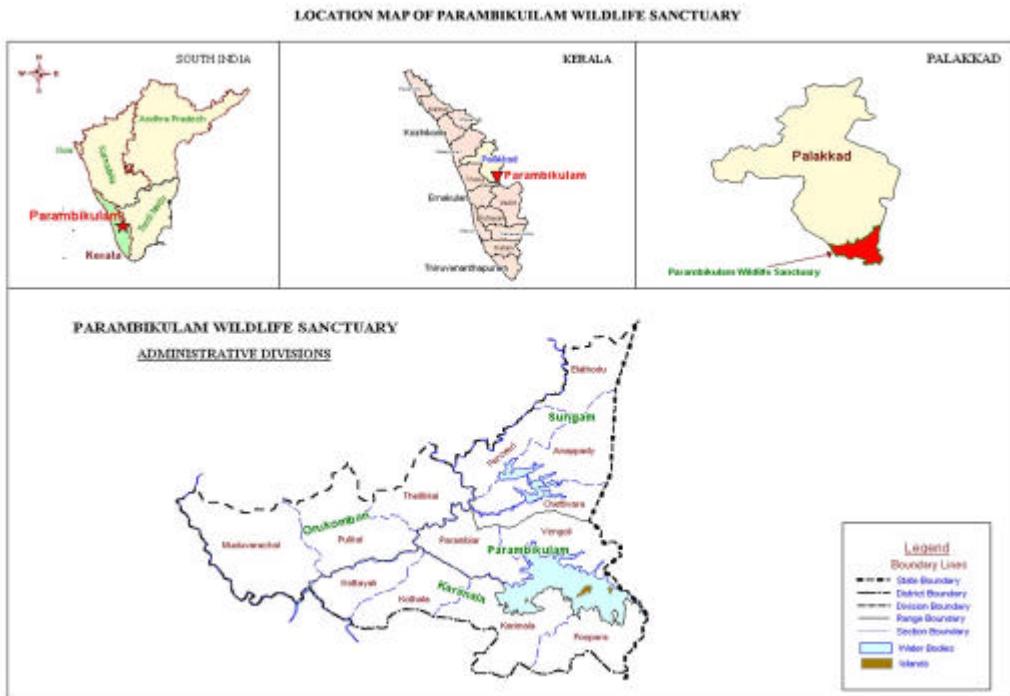
Materials and methods

Study area – The area selected for the study was Parambikulam Wildlife Sanctuary, which is situated in Palghat district, Kerala State, India (between 76° 35' and 76° 50' E and latitudes 10° 20' and 10° 26' N), covering an area of 275 km².

It is part of a large, contiguous area of forest comprising Anamalai, Nelliampathi, Sholayar, High Ranges and Palani Hills. The average annual rainfall is 2,300 mm and average temperature is 30°C. The vegetation includes evergreen, semi-evergreen, moist deciduous, dry deciduous, wet temperate forests (shola) and man-made teak plantations. The diverse habitats and strategic location of Parambikulam make it one of the faunistically richest areas in Kerala. Easa & Balakrishnan (1990) have described the mammals of Parambikulam WLS. According to Wikramanayake *et al.* (1998) Parambikulam is one of the seven Level-II Tiger Conservation Units (TCU) in South East Asia. The biotic pressure from human habitation is high in the sanctuary.

Methods – The diets of tigers, leopards and wild dogs were studied by the scat analysis technique. Scats were collected from nine selected paths, sealed in plastic bags and numbered. Excess scats were removed from the path to prevent repeated sampling at the next sampling period.

The collected scats were categorized based on size, shape and bone content, as well as associated signs like scraping and scenting marks. All the scats were soaked in water and then washed thoroughly to separate prey remains like bones, hooves, hairs, etc. The hairs were then dried, washed in alcohol for ten minutes and then in xylene. Next the hairs were mounted on a slide in xylene and examined under a microscope for characteristic medullary patterns. The prey species is identified from hairs found in scats using the key of Koppikar and Sabnis (1976), Mukherjee (1994) and Easa (1995). The diversity index, niche breadth and niche overlap were calculated using the formulas below.



Diversity index

The food species diversity in the diet of the three large carnivores is measured using Shannon-weaver (1949) H' - diversity index.

$$H' = - \sum p_i \ln p_i$$

Where,

p_i = proportion of ' i 'th item in the total resource used.

Niche breadth

Niche breadth values were based on Levins (1968) measure of niche breadth using the following formula.

$$B = \frac{1}{\sum p_i^2}$$

Where,

p_i = proportion of ' i 'th item in the total resource used.

This measure was standardized to a scale of 0-1 by using the following formula.

$$B = \frac{1}{\sqrt{\sum p_i^2}} = \frac{1}{\sqrt{\frac{n(n+1)}{2}}} = \frac{2}{\sqrt{n(n+1)}}$$

Where,

n = number of possible resource states.

Niche overlap

The niche overlap values between tiger, leopard and wild dog were calculated as described by Schoener (1970) using the following formula,

$$\text{Oxy} = \frac{1 - \frac{1}{2} \sum_{i=1}^n P_{ij} \cdot P_{ik}}{n}$$

Where,

Oxy = niche overlap between species x and y
 P_{ij} = proportion of use of ith resources by species j
 P_{ik} = proportion of use of ith resource by species k.
 n = number of resource states used.

Results and discussion

Scats were sampled systematically at 15-day intervals along the sampling transect from November 2002 to April 2003. A total of 377 scats (tiger:103, leopard:188, wild dog:86) were collected. The occurrence of various prey species in the scats of tiger, leopard and wild dog were noted. A total of 103 scats were analyzed for tiger, among which chital, sambar

and gaur were found to constitute about 80% of their diet. A total of 188 scats were analyzed for leopard and the result shows that the leopard's diet is more diverse than the tiger's and is adaptable to different sizes of prey species. Their preferred food species are chital, sambar and langur. Of the total of 86 scats that were analyzed for wild dog, it was determined that chital and sambar constituted about 70% of the total prey species consumed.

Table-1: Percentage occurrence of different prey species in the scats of large carnivores in Parambikulam WLS

Prey Species	Tiger (%)	Leopard (%)	Wild dog (%)
Chital (<i>Axis axis</i>)	33	31	37
Sambar (<i>Cervus unicolor</i>)	28	20	33
Gaur (<i>Bos gaurus</i>)	19	7	1
Nilgiri langur (<i>Presbytis johni</i>)	-	14	-
Barking deer (<i>Muntiacus muntjak</i>)	6	6	10
Wild boar (<i>Sus scrofa</i>)	4	1	4
Nigiri tahr (<i>Hemitragus hylocrius</i>)	3	7	7
Black naped hare (<i>Lepus nigricollis</i>)	2	5	5
Mouse Deer (<i>Tragulus meminna</i>)	2	4	-
Porcupine (<i>Hystrix indica</i>)	-	2	-
Unidentified	3	4	3

Niche overlap analysis showed that a strong overlap in diet exists among the three large carnivores, because all are dependent on the same two or three prey species for the majority of their diet. Tigers and wild dogs showed a higher overlap (0.84), followed by tiger and

leopard (0.75) and leopard and wild dog (0.71). All niche overlap values were higher than 0.5, indicating that all the large carnivores species are in competition with each other. Our results support the study of Karanth and Sunquist (1995) in Nagarhole National Park and Arivazhagan (1997) in Sigur and Thalamala

Reserve Forest. The niche breadth hierarchy was in the order of leopard (0.57) > tiger (0.5) > wild dog (0.48). Leopards showed high niche breadth

value because of their wider access to different sizes of prey species.

Table-2. Food niche overlap between three predatory species (tiger, leopard and wild dog) in Parambikulam WLS during the study period Nov. 02-Apr. 03. (Based on scat analysis)

S. No	Predatory species	Niche overlap values
1	Tiger x Leopard	0.75
2	Tiger x Wild dog	0.84
3	Leopard x Wild dog	0.71

Table-3. Food niche-breadth values for tiger, leopard and wild dog in the study area during the study period Nov. 02 – Apr 03. (Based on scat analysis)

S. No	Predator Species	Niche breadth values (B)	Standard niche breadth values (B)
1	Tiger	5.007	0.5
2	Leopard	6.690	0.57
3	Wild dog	4.381	0.48

According to the Shannon - Weaver diversity index of the diet of large carnivores, the leopard's diet (2.11) is more diverse than the tiger's (1.82) or the wild dog's (1.68), and it supports Sankhala's

(1977) conclusion that leopards are versatile animals and their diet includes a variety of smaller animals and thus avoids competition with the tiger.

Table-4. Food species diversity index (Shannon & Weaver, 1949) in three predatory species during the study period (Nov. 02 – Apr. 03)

S. No	Predator species	Shannon's diversity index. H'
1	Tiger	1.82
2	Leopard	2.11
3	Wild dog	1.68

Conclusion

The study of the foraging ecology of three large carnivores in a human-dominated landscape showed that all of them preferred the deer family for the bulk of their diet. So for the conservation of these large carnivores it is necessary to protect the deer family and its habitat. The diversity index and niche breadth values of the tiger's diet were smaller than that of the leopard and slightly higher than for the wild dog. The niche overlap study showed that tigers and wild dogs are in strong competition in terms of their prey selection.

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- Authors' address:* School of Environmental Sciences, Mahatma Gandhi University, Kerala, India For correspondence: shijo@wii.gov.in

DISTRIBUTION AND CONSERVATION OF FILE SNAKE

Acrochordus granulatus SCHNEIDER, 1799

(REPTILIA:ACHROCHORDIDAE) FROM SRI LANKA

by L.D.C. Bhathiya Kekulandala and L.J. Mendis Wickramasinghe

Introduction

The File snake (*Acrochordus granulatus*) is a non-venomous snake found in shallow marine habitats, such as mangrove swamps, fishponds, rivers and estuaries (Bacolod, ____). This snake exhibits some similar physiological and anatomical adaptations as sea snakes, even though it does not belong to the Hydrophiidae family, but is in fact a member of the family Colubridae and subfamily Acrochordinae (Dunson & Dunson, 1973). Major identifying characteristics given by Deraniyagala (1955) are: nostrils in annular nasals that are rimmed, close-set and antero-dorsal; no cephalic scutes; scales broader than long, juxtaposed, carinate. A mental sulcus with fine scales is present. A median ventral ridge of three or four rows of scales, no ventral scutes; costals 98, 154 and 17. The color pattern of the body exhibits alternate rings of dark brown and buff, which become subequal at mid-body. The rings are very distinct in young snakes, but gradually disappear in adults to give a more uniform brownish color (Deraniyagala, 1955). File snakes are viviparous and normally produce about four to five offspring (De Silva, 1980).

This species is now regarded as a nationally threatened species (IUCN - Sri Lanka, 2000). An extensive literature survey was carried out to discover the present status of its distribution and especially to find out information about its ecology and behavior. Though we found a little information on the distribution of this particular snake, almost nothing was found on its ecology and behaviour. So we have incorporated studies that were carried out in other parts of the world, especially in South East Asia, and backed them by field observations made here.

Distribution

Acrochordus granulatus is found in the sea as well as in rivers along the coasts of South Asia (Cantor, 1847; Boulenger, 1912). In Sri Lanka, this species can be seen in coastal wetlands and estuaries (Deraniyagala, 1955). The authors have observed this species in Muthurajawela Sanctuary Bellanwilla – Attidiya marsh, Panadura estuary, Kaluganga estuary, Panapitiya Area, Bentara Ganga, Honduwa Estuary, Madhuganga in Balapitiya, and Dodanduwa Estuary. But we did not find any recent records of this particular snake from Bellanwilla – Attidiya, although there are some recent records of this snake from other coastal systems. The most striking factor is that these records are very occasional and incidentally made. Some observations in Muthurajawela, Bolgoda and Madhuganga areas reveal that the population of this species might be very low. We usually encountered only two or three specimens during field sampling. Most of these specimens were found dead, entangled in nets laid by fishermen. When comparing the number of observations per site with other aquatic snakes, the number of observations was very low.

Physiology

File snakes have a high blood volume, which facilitates their immersion in water for long periods of time (Feder & Gorman, 1979). There are some remarkable physiological adaptations in the body. The animal's blood pressure has been found to be much higher than in other aquatic and marine snakes. Slender and radial muscle masses in the body have enabled this snake to adapt to a fissional life in the bottom (Feder & Gorman, 1979).

Behavior

Acrochordus granulatus is found in both marine and freshwater habitats, but quite frequently in brackish water habitats (De Silva, 1980). It is highly adapted to an aquatic environment and is very slow and clumsy on land (De Silva, 1980). This snake is most frequently encountered in intertidal mudflats associated with coastal lagoons, marshlands and estuaries (Cantor, 1847; Boulenger, 1912). It is primarily a nocturnal feeder and hides in a burrow dug in the muddy substratum. Studies of its diet have revealed that it basically feeds upon goby species, which are very abundant in the substratum (Bacolod, __). It has been observed that this snake moves from burrow to burrow while searching for prey (Bacolod, __). In the Philippines, *Acrochordus granulatus* has been observed crawling through shallow tidal pools, possibly as a strategy to capture small fishes that are trapped in small pools after the tide recedes (Lillywhite & Sanmartino, 1993).

Discussion

Acrochordus granulatus is a poorly studied snake in Sri Lanka. The authors were unable to track down any comprehensive research work carried out in Sri Lanka. *Acrochordus granulatus* is listed as a nationally threatened species (IUCN Sri Lanka, 2000) and the lack of proper scientific data on its population size, behavior and ecology is a major concern because the habitats of this species are coastal lagoons and estuaries, which are among the most threatened habitats in Sri Lanka.

The exploding human population growth, especially in coastal areas, has put immense pressure on these ecosystems. Land reclamation, industrial and domestic sewage, dumping of garbage and discarded fishing nets are the most common factors that affect the population of these snakes and its habitats. Another major threat to these snakes, especially in wetlands that are popular with the tourists such as Maduganga, is the operation of motorboats. This has led to the destruction of the sediments at these wetlands and to the degradation of feeding habitats of these snakes. It is all too clear that we don't have

sufficient ecological, behavioral and distribution data of *Acrochordus granulatus* to draw up comprehensive species conservation initiatives to ensure the survival of this species.

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Authors' address:: IUCN- The World Conservation Union, Sri Lanka Country Office, 53, Horton Place, Colombo 07

FOREST NEWS

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ASIA-PACIFIC FORESTRY LEADERS MEET IN DEHRADUN TO CONSIDER REGIONAL FORESTRY ISSUES

Record numbers of delegates and participants converged on the historic city of Dehradun, India, 17-21 April 2006, to attend the twenty-first session of the Asia-Pacific Forestry Commission (APFC). The meeting tackled a wide range of regional issues including progress toward sustainable forest management, financing, codes of practice, the role of regional mechanisms in promoting sustainable forest management, illegal logging and forest law compliance, and fire management.

Five side events, field trips, and a lively evening “open forum” complemented the formal APFC sessions. The five pre-session workshops focused on forests and poverty reduction, conservation and management of forest genetic resources, invasive species, future directions for forest resources assessment in Asia-Pacific, and development of a planted forests code.

Representatives from 29 Asia-Pacific countries, along with observers and representatives from 3 non-member countries and 25 regional and international inter-governmental and non-governmental organizations participated in the session. The Commission welcomed Kiribati and Tuvalu as new members.

The opening of the session featured several high-level speakers, including the Minister of State for Environment and Forests, Government of India, the Chief Minister for the Indian State of Uttarakhand, the Chairperson of the Intergovernmental Panel on Climate Change, senior officials from the Ministry of Environment and Forests (hosts of the session) and senior FAO

officials. Ministers responsible for forestry in Tuvalu and Vietnam also addressed the session.

Progress towards sustainable forest management in the region

Results of the Forest Resources Assessment 2005

Delegates noted the positive trend of forest plantation expansion in the region, which has resulted in a net gain in forest area in the region over the past five years, but they were concerned over the continuing loss of natural forests. Insufficient budgetary resources, weak institutional capacities, and inadequate political will were cited as common constraints to achieving faster progress toward sustainable forest management.

FAO was requested to assist countries in the region in monitoring and reporting, including practical and cost-effective approaches for assessing the impacts of wildland fires, forest conservation, trees outside forests, and livelihood aspects. It was recommended that emphasis continue to be given to ground-based surveys and inventories to ensure reliability of data.

APFC and other FAO accomplishments in the region

Activities during the past two years generally had been concentrated in four areas: (a) ensuring sustainable supplies of wood and fiber;

- (b) continuous improvement in forest management;
- (c) participatory forestry and devolution of forest management; and
- (d) cross-cutting initiatives.

The Commission recommended that member countries, FAO and the National Forest Programme Facility strengthen support for national forest programmes.

Delegates acknowledged the need for improved capacity for developing and implementing forest policies and urged FAO to continue efforts to enhance capacities for policy analysis, development and implementation.

Strong concern was expressed over the incidence of illegal logging and associated trade in forest products. APFC member countries were urged to increase efforts to improve forest law compliance and governance and other measures to combat deforestation and forest degradation in collaboration with FAO and other interested and regional organizations.

Noting the vast extent of degraded forests in the region, the Commission emphasized the need for effective approaches and technologies for forest rehabilitation, including the creation of enabling environments to encourage investments by the private sector and local communities. FAO was requested to continue its support for practical and cost-effective methods and approaches for forest rehabilitation.

The Commission expressed appreciation for FAO's support for reconstruction and rehabilitation of tsunami-affected areas. FAO was urged to provide continued support for the ongoing reconstruction efforts, including for integrated coastal area planning and management, technically sound rehabilitation of mangroves and other coastal vegetation, and development of sustainable livelihoods in affected areas.

The importance of non-wood forest products in contributing to rural livelihood strategies in many countries was noted. FAO was asked to continue providing information and assistance for the sustainable management, utilization and marketing of non-wood forest products to maximize the benefits to the rural poor.

Delegates also highlighted the importance of sound agroforestry practices in the livelihood strategies of the region's rural poor and acknowledged FAO's comparative advantage in supporting agroforestry development.

Delegates recommended that FAO continue promoting sound conservation and utilization of biological resources.

The Commission recognized the emergence of important new issues confronting forestry (including climate change, demand for biofuels, water issues, the contributions of forests in poverty reduction, and the potential role of coastal forests in mitigating the impacts of tsunami events) and requested FAO to assist member countries in better understanding the possible implications of these issues for future forest management.

Financing sustainable forest management

The Commission considered the challenges of securing adequate financing for sustainable forest management at regional, national and local levels.

Delegates stressed the need to ensure that policy makers fully appreciate the wide range of contributions that forests make to the environment, rural development, poverty reduction and other economic sectors. It encouraged member countries to work to reflect these values in national accounting systems, national poverty reduction strategies, and other decision-making frameworks, and to ensure that sound scientific knowledge on the actual benefits of forests and trees was readily available to policy makers.

The Commission recognized that some countries have potential to increase investments in forestry using domestic resources, but that more efforts were required to convince high-level policy makers of the importance of investing in sustainable forest management. FAO and other organizations were asked to help in raising awareness of the importance of such investments.

Delegates stressed the importance of official development assistance in supporting forest management in developing countries, especially in serving as a catalyst for innovation and further development of the sector.

Difficulties in accessing funds for forest management activities from various existing international mechanisms, such as the Clean Development Mechanism under the Kyoto Protocol and the Global Environment Facility were highlighted. Delegates urged greater input from the forestry sector in the negotiation processes related to such mechanisms.

Delegates stressed the critical importance of private sector investment in forestry, for developing and managing forest resources, as well as for processing and marketing of forest products. Member countries were urged to review policies and regulations, with the aim of removing unnecessary constraints to private sector investment.

The growing acceptance of forest certification systems was acknowledged, but it was noted that there have been only minor price premiums in markets for certified products to date. The Commission encouraged FAO and other international organizations to seek greater incentives for forest certification.

Delegates appreciated the numerous direct and indirect contributions of local communities in supporting sustainable forest management, but were concerned that these contributions are often overlooked or under-appreciated. Member countries were urged to enhance the environment for communities to contribute to sustainable forest management by increasing access to resources, strengthening local capacities, and ensuring equitable sharing of benefits.

The Commission noted the emergence of various innovative financing arrangements that potentially offer opportunities for increasing investments in forest management, including payments for environmental services, dedicated forestry funds, conservation concessions and public-private partnerships. There was considerable debate on the merits and potential of these mechanisms to yield

tangible results, however, and concerns were expressed over prospects for their practical implementation.

Delegates acknowledged the value of the sourcebook on funding for sustainable forest management developed by the Collaborative Partnership on Forests (CPF) and requested that FAO, in collaboration with other CPF organizations, maintain and update this valuable reference as appropriate (Note: to access the sourcebook, see <http://www.fao.org/forestry/foris/webview/cpf/index.jsp?siteId=2225&sitetreeId=6117&langId=1&geoid=0>).

In-session seminar: payments for environmental services

During a special in-session seminar, the Commission reviewed the status and potential of payments for environmental services.

Delegates acknowledged that payment for environmental services is an evolving concept and that the actual implementation was currently limited.

Delegates debated the concepts of public-private partnerships, competitive tenders, and payments linked to carbon sequestration and supplies of clean water. Concerns were expressed over the high transaction costs related to payments for environmental services, the difficulties in defining their values and property rights, and uncertainties over required biophysical information.

Delegates also debated whether the “public good” aspects of environmental services might preclude establishing efficient mechanisms to link suppliers of environmental services with beneficiaries. Some delegates expressed concern over equity issues relative to payments for environmental services, noting that little evidence exists to indicate that payments actually result in improvements in the livelihoods of rural poor. Others noted variations in the level of payments available in developed countries relative to those made for similar services in developing countries.

It was noted that afforestation and reforestation were the only eligible forestry activities under

the Clean Development Mechanism. Some delegates expressed concern about what components of forestry would be included under the Kyoto Protocol for the second commitment period.

From global to local: the role of regional mechanisms in sustainable forest management

Panelists from FAO, the United Nations Forum on Forests (UNFF), Asia Forest Partnership, Asia Forest Law Enforcement and Governance, Association of Southeast Asian Nations, UN Economic and Social Commission for Asia and the Pacific, Asia Pacific Association of Forestry Research Institutions (APAFRI), Asia Forest Network, and the South Asia Cooperative Environment Programme shared their views on regional approaches and mechanisms to support sustainable forest management and link national and local efforts with global initiatives.

The Commission recommended that two-way linkages be enhanced between the global forest policy dialogue and the regional level. Delegates emphasized that no new mechanisms should be created, but that existing processes should be used to ensure increased interaction between global and regional levels.

The Commission recommended that APFC, while reporting to FAO's Committee on Forestry (COFO), also recommend regional priorities that the UNFF should take into account in future work. It further recommended to seek modalities for a more substantive discussion of global forest policy issues raised by UNFF at future APFC sessions.

Codes of practice

Planted forests code

Delegates acknowledged the increasingly significant role of planted forests in meeting social, cultural, environmental and economic benefits in the Asia-Pacific region. They noted that the Planted Forests Code currently being formulated through a multi-stakeholder process will provide a global voluntary framework of guiding principles to assist policy makers, senior decision makers

and managers to strengthen policy, legal, regulatory and institutional conditions for sound development of planted forests. The Commission stressed the complementarity of the Planted Forests Code with other instruments aimed at implementing sustainable forest management.

It was recommended that the draft Planted Forest Code be presented to the eighteenth session of COFO, in March 2007, for its consideration and appropriate action.

Codes of practice for forest harvesting

Several countries in the region have made positive advances in formulating and implementing national codes of practice for forest harvesting, consistent with the *Code of Practice for Forest Harvesting in Asia-Pacific* developed by APFC.

Various factors are constraining the implementation of codes, however, including lack of forest workers trained in reduced impact logging techniques and skilled field operations managers, lack of awareness of codes and the potential for improved forest harvesting, and resistance to change from current practices.

Delegates requested FAO to provide support for overcoming these constraints.

Fire management code

Acknowledging the significant impacts of fire on the environment, livelihoods and land use in the region, delegates appreciated efforts to develop a Fire Management Code (previously referred to as "Voluntary Guidelines for Wildland Fire Management"). The Commission recognized that the Fire Management Code would provide a global framework of guiding principles and operational guidelines for holistic approaches to fire management and to facilitate greater collaboration related to prediction, prevention, preparedness, rapid response and restoration following fires.

The Commission recommended that the draft Fire Management Code be presented to the eighteenth session of COFO and suggested that COFO may also wish to consider ways and means of providing required technical support to member countries

for implementing the code, monitoring and reporting on implementation, and continuation of the multi-stakeholder process initiated in deriving the code.

Broader code for forest management?

The Commission recognized that sustainable forest management encompasses a multitude of factors and that existing codes do not adequately cover many aspects of forest management, such as management of non-wood forest products, natural forests and others.

Delegates acknowledged that advantages could be gained by developing comprehensive codes of practice that extend beyond the harvesting focus of existing codes, but recognized that development of such comprehensive codes would require substantial effort and cost.

Information items

Illegal logging and forest law compliance

The Commission was informed of ongoing regional activities related to forest law enforcement, including an initiative by FAO and ITTO on best practices for improving law compliance in the forest sector. Delegates were informed of plans to convene a regional workshop on best practices for improving law compliance in collaboration with the Asia Forest Partnership, Asia FLEG and other partners.

The Commission requested FAO to support the efforts of member countries in combating illegal

logging by enhancing the exchange of information and sharing experiences on relevant programs.

Asia-Pacific Forestry Sector Outlook Study

Delegates were informed of preparations for a new *Asia-Pacific Forestry Sector Outlook Study*.

The Commission acknowledged the value of the first *Asia Pacific Forestry Sector Outlook Study* and noted that its time horizon ends in 2010. It endorsed the implementation of a new outlook study and requested that preliminary findings be presented to the next session of the Commission.

Other business

Report of the Expert Consultation on Establishing a Forest Policy Network for Asia and the Pacific

Forty-four participants, from 19 countries, had attended the expert consultation in March 2006, in Manila, Philippines. The consultation acknowledged the positive processes and outcomes of previous APFC and FAO regional policy studies examining logging bans, plantation incentives, devolution and other issues, and urged the establishment of a flexible mechanism to expand such policy work in the region. The consultation had also identified several potential functions of a regional forest policy network, and possible options for its structure.

Date and place of the next session

The Commission noted with appreciation the offer of the delegation from Vietnam to host the twenty-second session in 2008.

PUBLICATIONS AVAILABLE ON CD-ROM

The report of the 21st APFC session will soon be available on CD-ROM in limited numbers. For copies, please contact Patrick Durst, Senior Forestry Officer, FAO Regional Office for Asia and the Pacific, E-mail: Patrick.Durst@fao.org.

Also available is a CD-ROM containing FAO-RAP and APFC forestry publications (1996-2005) and *Tigerpaper* issues from 1999 through 2005.

SUMMARY OF APFC RECOMMENDATIONS

For the attention of Governments and FAO

The Commission recommended:

- giving greater attention to wildland fires, forest conservation, trees outside forests, and livelihood aspects in future Forest Resources Assessments;
- strengthening support for national forest programme processes and implementation;
- improving forest law compliance and governance to combat deforestation and forest degradation;
- working to accurately reflect the contributions that forests make to the environment, rural development, poverty reduction and other economic sectors in national accounting systems, national poverty reduction strategies and other decision-making frameworks;
- ensuring that sound scientific knowledge on the actual benefits of forests and trees is readily available to policy makers;
- identifying, documenting and promoting traditional and innovative options for increasing the level of financing devoted to sustainable forest management;
- identifying options for new and additional funds to finance sustainable forest management;
- enhancing the awareness and understanding of various existing international mechanisms and strengthening the capacity of forestry officials to effectively contribute to them;
- reviewing policies and regulations, with the aim of removing unnecessary constraints to private sector investment in forestry;
- seeking greater incentives for forest certification, including through enhanced recognition and increased market access for certified forest products;
- expanding efforts to address the challenges of illegal logging and associated trade of forest products;
- enhancing the conditions for communities to contribute to sustainable forest management by increasing access to resources, strengthening local capacities, and ensuring equitable sharing of benefits;
- enhancing two-way linkages between the global forest policy dialogue and the regional level;
- conveying regional priorities identified by APFC to the UNFF for it to take into account in its future work;
- seeking modalities for a more substantive discussion of global forest policy issues raised by UNFF at APFC sessions;
- providing suggested revisions and inputs on the draft Planted Forests Code and the draft Fire Management Code to FAO by 30 September 2006;
- assessing the need for voluntary guidelines for trees outside forests to complement the Planted Forests Code, and considering the prospects for developing comprehensive codes of practice that extend beyond the harvesting focus of existing codes;
- implementing the recommendations of the pre-session workshop on forests and poverty reduction;
- expanding further the programme of activities of the Asia-Pacific Forest Invasive Species Network to strengthen capacities, raise awareness and share information;
- implementing a new Asia-Pacific Forestry Sector Outlook Study: Towards 2020 and reporting on the preliminary findings at the twenty-second session in 2008;
- exploring further the options for formally establishing an Asia-Pacific Forest Policy Network as an inter-sessional activity of the Commission.

For the attention of FAO

The Commission recommended:

- giving continued high priority to the Global Forest Resources Assessment, including expanded elements for monitoring, assessing and reporting on progress toward sustainable forest management;
- increasing support and seeking additional funding for strengthening national forest assessment capacities, including those of national FRA correspondents;
- maintaining a focus on ground-based forest surveys and inventories;
- developing cost-effective approaches for assessing expanded parameters under FRA;
- enhancing capacities for forest policy analysis, development and implementation;
- continuing support for cost-effective methods and approaches for forest rehabilitation;
- further promoting of the recommendations of the APFC study on forest plantation incentives;
- continuing support for reconstruction and rehabilitation of tsunami-affected areas, including integrated coastal area management, rehabilitation of mangroves and other coastal vegetation, and the development of sustainable livelihoods;
- providing information and assistance for the sustainable management, utilization and marketing of non-wood forest products;
- enhancing support for agroforestry development in the region;
- promoting sound conservation and utilization of biological resources;
- giving increased attention to emerging priority issues, including climate change, biofuels, water issues, the contributions of forests in reducing poverty, and the potential role of coastal forests in mitigating the impacts of tsunami events;
- raising awareness of the importance of investments in the forestry sector;
- monitoring and documenting the development of the various financing mechanisms and continue to inform member countries on their potential application;
- maintaining and updating the sourcebook on funding for sustainable forest management developed by the Collaborative Partnership on Forests;
- providing sound scientific information on relationships between forests and water, forests and carbon sequestration, and other environmental services;
- facilitating the continued exchange of information and views on the development and evolution of experiences with payments for environmental services;
- strengthening collaboration and harmonization with other organizations and processes, with a view towards avoiding duplication and improving efficiencies;
- building additional capacity building in member countries to support the development and implementation of codes of practice for various aspects of forest management;
- continuing the multi-stakeholder processes for formulating the Planted Forests Code and the Fire Management Code, including at regional, national and sub-national levels;
- presenting the draft Planted Forests Code and the draft Fire Management Code to the eighteenth session of COFO, in March 2007, for its consideration and appropriate action;
- monitoring the need for technical guidelines for field-level activities related to planted forests in different ecological zones, for different purposes, and for different species groups, and assisting in developing such guidelines as appropriate;
- providing continuing support for the implementation of codes of practice for forest harvesting and the application of improved forest harvesting practices;
- supporting further practical training, awareness raising activities, demonstration forests, and dissemination of information on reduced impact logging;
- seeking additional resources to support the implementation of the regional strategy for the Asia-Pacific Forest Invasive Species Network.

Five pre-session workshops were organized in Dehradun before the main APFC session. The outcomes and recommendations of the workshops were presented at the 21st APFC session, and are summarized below.

FORESTS AND POVERTY REDUCTION

The pre-session *Workshop on Forests and Poverty Reduction* was convened on 15 April 2006, at the Wildlife Institute of India, in Dehradun. The purpose of the workshop was to increase awareness of the links between forestry and poverty reduction, identify barriers limiting forestry's contribution, and explore possible actions to reverse the situation.

The following recommendations were made to FAO for consideration and appropriate follow up, within the framework of the Asia-Pacific Forestry Commission (APFC) or directly with member countries:

1. Facilitate policy formulation in those countries without a formal forest policy, through technical and financial support, and encourage and assist countries to review existing policies and incorporate new approaches through open processes with broad stakeholder participation.
2. Assist, through technical and financial support, in reviewing existing forest legislation and, where appropriate, drafting new laws or amendments.

3. Enhance capacity of countries, at all levels, to undertake forest policy research and analysis.
4. Promote multi-stakeholder, community-based forest management as a poverty reduction strategy; encourage investment plans; and enhance dissemination of information related to managing forests for poverty reduction.
5. Promote and support information sharing, including scientific and indigenous knowledge, communication and technology transfer, and market information within and among government agencies, the private sector, NGOs, and local organizations to effectively reduce poverty among local communities.
6. Facilitate experience sharing among member countries on different models for the decentralization of decision-making processes and empowerment of communities for greater roles in the management of local forest resources.
7. Support the design of effective delivery systems for poverty reduction that integrate and coordinate planning and management of development activities across institutions and sectors.

PLANTED FORESTS CODE

The pre-session *Workshop on the Planted Forests Code* was convened 16 April 2006, at the Forest Research Institute, Dehradun, India.

The workshop made the following recommendations to the 21st Session of the Asia-Pacific Forestry Commission:

1. The draft Planted Forests Code should be presented to the 18th Session of the Commit-

- tee on Forestry (COFO) for its consideration and appropriate action.
2. Appropriate technical and other support should be allocated for capacity building in implementing the Planted Forests Code.
 3. The multi-stakeholder process in developing the Planted Forests Code should be continued at all levels (i.e. international, regional, national and local).

4. The need and mechanism for monitoring and reporting on implementation of the Planted Forest Code should be determined.
5. Consideration should be given to the need for developing a separate voluntary instrument for trees outside forests to complement the Planted Forests Code.

FUTURE DIRECTIONS FOR FOREST RESOURCES ASSESSMENT IN ASIA-PACIFIC

The *Workshop on Future Directions for Forest Resources Assessment in Asia-Pacific* was held at the Forest Survey of India, Dehradun, on 16 April 2006, with an additional session on 19 April at the same venue.

The following recommendations were made to FAO and APFC for consideration and appropriate follow up:

1. FAO should continue to assist countries in building capacity for collection of reliable forest resources information and other important parameters related to the multiple functions of forests for meeting international and national obligations.
2. Countries, with assistance from FAO, should continue to plan for, and support, the ongoing collection of reliable information on forest resources, through their national institutes and national correspondents, which is critical for the reliable and timely supply of information to decision makers.
3. Countries should begin preparations now for implementing FRA 2010.
4. FAO should support the establishment of a regional network of FRA national correspondents in Asia and the Pacific, to

assist in building the capacity of member countries through sharing experiences and exchanging information, with a view toward improving the overall quality and reliability of forest information for sustainable forest management and reporting under future FRA initiatives.

5. FAO should develop Terms of References for the Regional Network of National Correspondents.
6. The Regional Network of National Correspondents should be established in a way that involves minimal additional expenditure, making maximum use of e-mail and website communication methods.
7. Periodic meetings of national correspondents are desirable, particularly in the lead up to the next data collection for FRA 2010; where possible, meetings should be held in conjunction with other gatherings to minimize costs and enhance efficiency.
8. FAO, member countries and donors should provide adequate financial support for enhancing country-level institutional capacity related to forest inventory and mapping activities.

FOREST GENETIC RESOURCES CONSERVATION AND MANAGEMENT

The pre-session *Workshop on Forest Genetic Resources Conservation and Management* was organized by the Asia Pacific Forest Genetic Resources Programme (APFORGEN), 15-16 April 2006.

Major achievements of the programme during the past three years included: (i) publishing of the inception workshop (2003) proceedings; (ii) preparation of nine priority species information sheets; (iii) printing of APFORGEN brochures; (iv) establishing the APFORGEN website (www.apforgen.org) and regular updating of the web pages; and (v) organizing two sub-regional meetings of the national coordinators. Updates by the APFORGEN national coordinators indicated that many of member countries have introduced new policies and research initiatives

relevant to forest genetic resources conservation and management in recent years.

The workshop also reviewed the draft action plans proposed during previous meetings. Many of the proposed actions have already been initiated by participating countries. It was decided that these action plans would need to be updated as the situation in many countries had changed during the past years. National coordinators agreed to submit the revised action plans to the APFORGEN Secretariat by the end of May 2006.

It was decided that the APFORGEN website will play a key role in information dissemination among member countries. In addition, the website will support individuals and activities outside member countries.

DEVELOPMENT OF A STRATEGY FOR THE ASIA-PACIFIC FOREST INVASIVE SPECIES NETWORK (APFISN)

The workshop on *Development of a strategy for the Asia-Pacific Forest Invasive Species Network* was convened at the Indira Gandhi National Forestry Academy, Dehradun, India, on 16 April 2006 as a pre-session adjunct to the 21st session of the Asia-Pacific Forestry Commission. The workshop reviewed APFISN activities during the past biennium, worked to finalize a draft strategy document that provides a preliminary framework for implementation of APFISN activities, and identified prospective new network activities.

A draft *Regional strategy for implementing the Asia-Pacific Forest Invasive Species Network* had been prepared and circulated to participants prior to the workshop. The substantive work of the meeting comprised a detailed review and re-

finement to finalize a strategic framework to facilitate network activities. Specific actions and outcomes were grouped within four strategic objectives:

- Raising awareness of invasive species throughout the Asia-Pacific region;
- Defining and developing organizational structures to support the Network;
- Building capacity within member countries and APFC; and
- Developing and sharing databases and information among member countries.

The concluding activity of the workshop identified a range of technical issues – encompassing key needs and concerns of APFISN member countries – that could be addressed by future workshops.

ELEPHANT CARE MANUAL NATIONAL WORKSHOP

The Asian elephant (*Elephas maximus* Linn. 1758) is an endangered wild animal protected under Appendix I of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). An FAO study carried out in 2000-2001 estimated the wild elephant population to be between 43,952 and 47,457 in 13 countries.

The Asian elephant is also kept in domesticity, though it has never been selectively bred over history and thus never truly been made a domestic animal. South and Southeast Asia still has between 13,689 and 15,189 domesticated elephants in eleven countries, with perhaps 2,500 of those animals in Thailand.

Several years ago, health care for the animals in Thailand was poor, with mahouts having very little understanding of the modern concepts of disease and treatment, and rare access to professional veterinary care (now much improved). Most health problems that turned chronic started with poor keeping techniques, including very little understanding of the need for prophylaxis and sanitation. A rapidly increasing number of inexperienced mahouts, managers and owners in Thailand were badly in need of learning basic keeping techniques that directly affect the health and well-being of the animals.

Recognizing these needs and constraints, the Forest Industry Organization (FIO) and FAO launched a project, 'An Elephant Care Manual for Mahouts and Managers' (MTF/THA/001/TFW) with financial support from the International Fund for Animal Welfare (IFAW) in May 2000. The main objective of the project was to produce an elephant care manual for mahouts and camp managers to improve their day-to-day health care techniques.

Workshop on the Elephant Care Manual (ECM)

FIO and FAO's Regional Office for Asia and the Pacific jointly organized a National Workshop on the Elephant Care Manual, 17-18 January 2006,

in Bangkok, Thailand. This was the final activity of the elephant care manual project and heralded the arrival of the following three publications:

- Elephant care manual for mahouts and camp managers (English edition) (FAO/RAP publication 2005/10);
- Elephant care manual for mahouts and camp managers (Thai edition); and
- Mahout handbook (in Thai).

The care manual will be most useful if it is widely distributed to the mahouts and camp managers through appropriate training programmes on how to use it. FIO has already planned a series of training workshops in different regions.

Scope for ECM extension programme in other countries

One of the aims of the English edition is to utilize it as a model for the preparation of other language versions, and FAO received some positive responses during the workshop. For example, ElefantAsia, a French NGO, has committed to incorporate this work in its elephant support project in Lao PDR. Mr. Olivier Piot, owner of Compagnie des Éléphants d'Angkor, an ecotourism company in Siem Reap, Cambodia, and Mr. Jayantha Jayewardene, Biodiversity and Elephant Conservation Trust, Sri Lanka, have expressed their interest to support the preparation of Khmer and Singhalese versions. After the workshop, FAO received offers from the Smithsonian Institution (USA) and Elephant Care International – a USA-based NGO. Both have indicated their interest to prepare Myanmar and Nepalese versions, respectively. FAO received a Japanese version of the ECM translated by Ms. Yumiko Kato, a veterinarian and wildlife biologist. The Asian Wildlife Research Center (AWRC), a Japanese NGO, has committed to assist the production of a Japanese version of the ECM.

These are very encouraging efforts and open a horizon with a hope to extend elephant care and welfare activities.

FAO-FINLAND REGIONAL TSUNAMI PROGRAMME: 2006 WORKSHOPS

FAO's "Forestry Programme for Early Rehabilitation in Asian Tsunami Affected Countries," funded by the Government of Finland, will hold three workshops this year to support rehabilitation and reconstruction efforts in Asian countries affected by the 2004 tsunami. The workshops are aimed at increasing understanding and sharing experiences in forest rehabilitation in the tsunami-affected areas and at improving knowledge on some key emerging issues of a longer-term nature.

The first of the workshops, entitled "**Coastal protection in the aftermath of the Indian Ocean tsunami: what role for forests and trees?**" will be held in Khao Lak, Thailand from 28 through 31 August 2006. The principal objective of the workshop is to improve understanding of the role of coastal trees and forests in protecting populations and assets from natural hazards, including tsunamis, cyclones, erosion, and strong winds and salt spray.

The workshop owes its existence to contrasting views that have emerged since the 2004 tsunami indicating that there are a complex set of variables that determine the role of forests and trees in coastal protection. Eye-witness accounts from Thailand, Sri Lanka, Indonesia and elsewhere reported that coastal forests and mangrove forests in particular had saved lives and, in some cases, whole villages from the destruction of the tsunami. Some analyses asserted that elevation and distance from the coast were more significant determinants of protection than the extent of forest cover. A better understanding of the variables that influence the degree to which forests and trees provide protection from the various types of coastal hazards can lead to improved coastal forest planning and management and disaster management strategies.

Information will be provided on protection against tsunamis, cyclones, erosion, and strong winds and salt spray. The workshop will bring together the best available scientific knowledge and practical

experience to give a clear picture of the roles that forests and trees play in protection against these main natural hazards in coastal areas of Asia. The workshop will put this in the context of coastal planning and social, economic and environmental considerations. It will also assess the value of trees and forests compared to other commonly used soft and hard (engineered) structures for coastal protection.

In addition to the proceedings, the workshop will produce a diagnostic tool that will identify the variables determining the protective functions of forests and trees against natural hazards affecting coasts in Asia and will facilitate decision making for coastal area planning and management.

The "**Workshop on coastal area planning and management in Asian tsunami-affected countries**" will be held in Bangkok, Thailand. The tentative dates are 27-29 September. The workshop will focus on issues of underlying importance to agriculture, forestry and fisheries in rehabilitation of tsunami-affected areas and coastal area planning and management.

The workshop responds to the need in many of the tsunami-affected countries for efficient and equitable long-term solutions to coastal management problems that have come under the spotlight after the tsunami. In many places, unsustainable land management practices had degraded lands and vegetation prior to the tsunami. In order to "build back better", improved land and resource management systems need to be put in place. The workshop will center on the presentation of papers from each of the eight Asian tsunami affected countries. Focal issues include:

- Major trends in coastal land use changes, the main driving forces and resulting issues and conflicts;
- Post-tsunami coastal area land utilization issues and conflicts;

- Lessons learned and solutions identified for land use issues;
- Policies and regulations governing coastal land/resource management and use: conflicts and gaps;
- Governance and institutional structures for coastal area management;
- Decision-making processes for coastal area land use decisions.

Papers will also be prepared covering the effects of land use change on environment and equity; integrated coastal zone planning, and land management in coastal zones with an emphasis on the agriculture, forest and fisheries sectors. Analysis, review and comparison of these issues across countries will help increase the awareness of resource managers, coastal land use planners and other stakeholders of issues that are often overlooked as a result of the sectoral nature of management interventions.

In addition to the proceedings, workshop outputs will include a set of recommendations aimed at supporting improved coastal area planning and cross sectoral integration, particularly in agriculture, fisheries and forestry. The workshop will provide an opportunity to identify common issues among countries, share experiences and identify actions that could be taken at national, regional and international levels to support improved coastal area management.

A one day “**Workshop on post-tsunami forest rehabilitation and coastal forestry policies in Asian tsunami-affected countries**”, will be held in Bangkok and is tentatively scheduled for 26 September. It will facilitate dialogue among countries on approaches to post-tsunami forest rehabilitation, coastal forest management and integration of forests into disaster management plans, highlight countries’ needs for support in these areas, and identify opportunities for collaboration.

Papers will be presented from the eight tsunami affected countries addressing the following topics:

- the pre-tsunami status of coastal trees and forest resources and the impacts of the tsunami;

- policies and legislation affecting coastal trees and forests and the extent to which forestry is included in rehabilitation and coastal management plans;
- the status of implementation of coastal forest rehabilitation and management, emerging issues and lessons learned.

Programs supported by national, regional and international organizations will be discussed.

Outputs of the meeting will include the workshop Proceedings and a set of recommendations of actions that could be taken at national and regional level to help implement rehabilitation plans and encourage cooperation and coordination of coastal forest rehabilitation and management.

Participants of the three workshops will include Government representatives of the eight Asian tsunami-affected countries, including staff from forestry and land use planning departments and research institutions. International and regional organizations, non governmental organizations, researchers and others involved in coastal land management, coastal forestry and related activities will be invited to attend.

For further details on the workshops, please contact Susan Braatz, Programme Coordinator of the “Forestry Programme for Early Rehabilitation in Asian Tsunami Affected Countries” at: Susan.Braatz@fao.org. Information on the workshops and on FAO’s tsunami-related forestry work is available at www.fao.org/forestry/site/tsunami/en.

Workshop on coastal protection in the aftermath of the Indian Ocean tsunami: what role for forests and trees? 28-31 August 2006, Khao Lak, Thailand.

Workshop on coastal area planning and management in Asian tsunami-affected countries. 27-29 September 2006, Bangkok, Thailand.

Workshop on post-tsunami forest rehabilitation and coastal forestry policies in Asian tsunami-affected countries. 26 September 2006, Bangkok, Thailand.

INDIA LAUNCHES FIRST MODEL FOREST

The Kodagu Model Forest was inaugurated on 1 October 2005 as the first model forest in India, officially joining the International Model Forest Network (IMFN). The ceremony was presided over by Sri Gurupadappa Nagamarapalli (Forest Minister, Government of Karnataka) and Sri Alangur Srinivas (Minister Incharge, Kodagu District). Elected officials representing Kodagu District in Parliament and the State Legislature also attended, along with numerous local forestry officials, NGO representatives and individuals responsible for making the Kodagu Model Forest a reality. International participants included representatives from the IMFN Secretariat, FAO, and Mr. Mukkatira K. Mahendrappa, a renowned Canadian scientist of Indian descent who championed the development of the model forest. The ceremony was held at the College of Forestry in Pannampet, Karnataka.

Kodagu District is 410,600 hectares in area and is one of the most densely forested districts in India (with approximately 80 percent forest cover). Located in the Western Ghats, Kodagu District harbors some of the richest biodiversity in the world. The mountains of Kodagu give rise to the source of four major rivers. The district is also the largest coffee-growing region of India. Spices (pepper, cardamom, ginger) and fruits are also major crops. Several distinct ethnic groups live in

the district, which has a rich culture of nature worship, including the protection and management of sacred groves. The long-term ecological and cultural integrity of the areas is being threatened, however, by modernization and economic pressures encouraging over-exploitation of resources.

A noteworthy feature of the Kodagu Model Forest is that it has been established with no significant external financial support. Several individual "champions" advanced the vision of establishing the Kodagu as a model forest, eventually forming the Kodagu Model Forest Trust (KMFT) in October 2003. Key support has been provided by Tata Coffee Ltd., local forestry officials, NGOs, and eminent scientists hailing from Kodagu who now reside in North America. The evolution of the Kodagu Model Forest to date is a solid testimony of what can be achieved by committed individuals, applied creativity, vision and hard work.

The Kodagu Model Forest joins other model forests in Asia, i.e. China, Indonesia, Philippines and Thailand as part of the International Model Forest Network. Since 1997, FAO has collaborated closely with the International Model Forest Network Secretariat, the Government of Canada, the Japan Forestry Agency, and other partners in supporting the development and management of model forests in Asia.

NEW HEAD OF FAO'S FORESTRY DEPARTMENT

FAO Director-General Jacques Diouf announced the appointment of Jan Erik Heino of Finland as the new head of the Forestry Department, effective 29 June 2006.

Mr. Heino has a Master's degree in Forestry and Nature Conservation from Helsinki University and has undertaken post-graduate education in Nordic countries, Germany and Belgium. He is a former Director-General of the Forestry Department of the Ministry of Agriculture of Finland, and currently Director-General of Metsahallitus, the Finnish State Forest Enterprise.

ASIA-PACIFIC FORESTRY CHIPS AND CLIPS

AGREEMENT REACHED ON NEW TROPICAL TIMBER AGREEMENT

The text of a successor treaty to the 1994 International Tropical Timber Agreement (ITTA) was adopted in Geneva on 27 January following intense negotiations. After more than two years of consultations and discussions, the objectives of the new agreement emphasize the importance of sustainable forest management and predictable funding for the international timber trade.

— Source: UNCTAD —

CAMPAIGN TO BOOST THE UTILIZATION OF DOMESTIC TIMBER IN JAPAN

The Japanese Forestry Agency has started a campaign to boost the use of domestic timber in Japan. The agency is organizing symposiums and seminars for consumers and the private sector, while publicizing the campaign through various media outlets.

— Source: Japan for sustainability – Information Center —

NEW SPECIES FOUND IN “GARDEN OF EDEN,” IN INDONESIAN NEW GUINEA

Conservation International’s Melanesia Centre for Biodiversity Conservation and a team of American, Indonesian and Australian scientists spent a month in November and December 2005 in the pristine forested Foja Mountains in Indonesia’s Papua province. During their month-long expedition, the scientists found 20 new frog species, 4 new butterfly species and 5 forest palms previously unknown.

— Source: Environment News Service —

GLOBAL FOREST RESOURCES ASSESSMENT 2005 LAUNCHED

The main report of FAO’s *Global Forest Resources Assessment 2005* was launched at the sixth session of the United Nations Forum on

Forests (UNFF 6) in New York. The report shows progress towards sustainable forest management at the global level, although biological diversity and forest ecosystems remain seriously threatened in several regions. According to the report, there are more positive than negative trends at the global level, including a trend towards multiple-use forestry, including social and environmental benefits. The full report is available online, via the following url: <http://www.fao.org/forestry/foris/webview/forestry2/index.jsp?siteId=101@sitetreId=16807&langId=1&geoId=0>.

— Source: The World Bank —

VIETNAM TO INVEST VND 2 TRILLION IN FORESTRY IN 2006

According the Forestry Department, under the Ministry of Agriculture and Rural Development, some VND 2.11 trillion (US\$ 123.7 million) will be sourced from the State budget for forestry development in 2006. The Department has indicated that the highest priority would be given to programs related to forest expansion, fire prevention, development of plant varieties, the forestry product processing industry and especially to the 5 million hectare afforestation project, which aims to increase forest cover up to 43 percent by 2010.

— Source: *Nhân Dân* —

FORESTS IN INDOCHINA RECEIVE FSC CERTIFICATION

Two natural forest areas in central Laos have been certified under the Forest Stewardship Council (FSC) certification scheme. In total some 50,000 hectares of community-based forest operations in the provinces of Khammouane and Savannakhet have been certified. The Tropical Forest Trust (TFT) and WWF supported the forests to achieve FSC standards.

— Source: WWF —

FAO ASIA-PACIFIC FORESTRY CALENDAR

10-14 July 2006 (tentative). Bangkok, Thailand. **Training Workshop on "Procedures for Monitoring and Evaluating (M&E) Compliance and Codes of Forest Harvesting Practices (GCP/RAS/192/JPN)**. 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

24-28 July 2006. Sapporo, Japan. **Inception Workshop on the Strengthening Monitoring, Assessment and Reporting (MAR) on Sustainable Forest Management in Asia (GCP/INT/988/JPN)** (organized by FAO in collaboration with the Forestry Agency of Japan and held in conjunction with the *17th Meeting of the Working Group on Criteria and Indicators for the Conservation and Sustainable Management of Temperate and Boreal Forests*). Contact: Masahiro Otsuka, Forestry Officer (Forest Monitoring Assessment and Reporting) for Project GCP/INT/988/JPN, FAO Regional Office for Asia and the Pacific, Maliwan Mansion, Phra Atit Road, Bangkok 10200, Thailand; Tel.(662) 697-4112; Fax: (662) 697-4130; E-mail: Masahiro.Otsuka@fao.org

28-31 August 2006. Khao Lak, Thailand. **Coastal protection in the aftermath of the Indian Ocean tsunami: what role for forests and trees?** Contact: Susan Braatz, Regional Coordinator, Forestry Programme for Early Rehabilitation in Asian Tsunami-Affected Countries, FAO Regional Office for Asia and the Pacific, Maliwan Mansion, Phra Atit Road, Bangkok 10200, Thailand; Tel.(662) 697-4112; Fax: (662) 697-4445; E-mail: Susan.Braatz@fao.org

3-6 September 2006. Yogyakarta, Indonesia. **Regional Conference on Forest Governance and Decentralization in Asia**. Organized in collaboration with the Center for International Forestry Research (CIFOR), the Regional Community Forestry Training Center (RECOFTC), Swiss Intercooperation and the Governments of Indonesia and Philippines. 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

26-29 September 2006. Bangkok, Thailand. **Workshop on post-tsunami forest rehabilitation and coastal forestry policies in Asian tsunami- affected countries** and **Workshop on coastal area planning and management in Asian tsunami-affected countries**. Contact: Susan Braatz, Regional Coordinator, Forestry Programme for Early Rehabilitation in Asian Tsunami Affected Countries, FAO Regional Office for Asia and the Pacific, Maliwan Mansion, Phra Atit Road, Bangkok 10200, Thailand; Tel.(662) 697-4112; Fax: (662) 697-4445; E-mail: Susan.Braatz@fao.org

2-6 October 2006. Ho Chi Minh City, Vietnam. **International Conference on Managing Forests for Poverty Reduction: Capturing Opportunities in Forest Harvesting and Wood Processing for the Benefit of the Poor**. Organized in collaboration with the Netherlands Development Organisation (SNV), the International Tropical Timber Organization (ITTO), the Asia-Pacific Forestry Commission (APFC), the Tropical Forest Trust (TTT), the Regional Community Forestry Training Center (RECOFTC) and the Department of Forestry in Vietnam. 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

Late 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

12-16 March 2007. Rome, Italy. **18th Session of the Committee on Forestry (COFO)**. Contact: Doug Kneeland, Secretary COFO, FAO Forestry Department, Via delle Terme di Caracalla, 00100, Rome, Italy; E-mail: Douglas.Kneeland@fao.org

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

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

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