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Featuring

FOREST NEWS

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Contents

TIGERPAPER

FOREST NEWS

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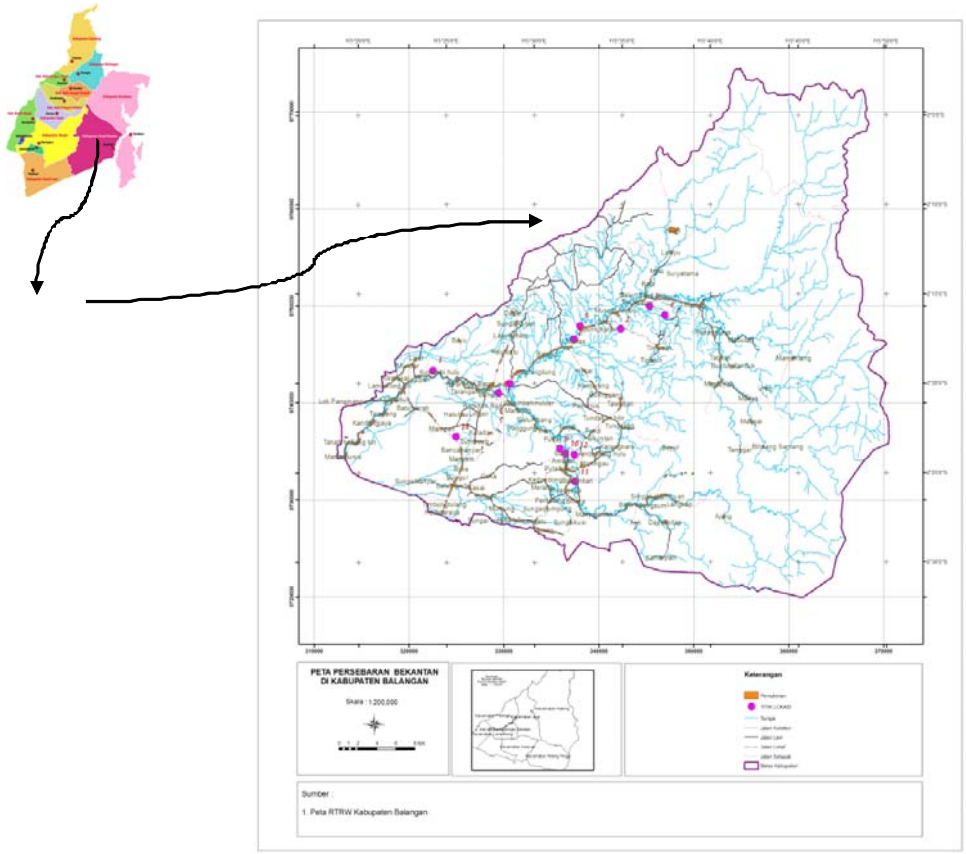
Front cover: *Male (left), female (upper right) and infant (bottom right) proboscis monkeys (Photos: Courtesy of Mochamad Arief Soendjoto)*
Back cover: *Female Sundarban tiger (Photo: Ashraf Mohammed)*

DISTRIBUTION OF THE PROBOSCIS MONKEY (Nasalis larvatus) IN BALANGAN DISTRICT, SOUTH KALIMANTAN, INDONESIA

by Mochamad Arief Soendjoto and Nazaruddin



Introduction

Among the habitats of the proboscis monkey (*Nasalis larvatus*), an endemic, non-human primate of Borneo, frequently cited are mangrove forest, swamp peat forest, and riverine forest. The presence and behavior of the proboscis monkey in those habitat types have been recorded in many studies (e.g., Alikodra, 1997; Alikodra & Mustari, 1994; Bennett, 1988; Bennett & Sebastian, 1988; Bismark, 1981, 1986; Boonratana, 1994, 2000; Jeffrey, 1979; Salter & Aken, 1983; Salter *et al*., 1985; Yeager, 1991; Yeager & Blondal, 1992). Therefore it is logical that the conservation efforts focus on those habitats.

The proboscis monkey was found living in rubber forest (*Hevea brasiliensis*) and swamp forests dominated with galam *Melaleuca cajuputi* (Soendjoto, 2004; Soendjoto *et al.*, 2001, 2002, 2003, 2005).

Rubber plants have been cultivated and developed in plantations for more than 50 years in South Kalimantan Province, including Balangan District, one of the 13 cities/districts in this province. This

district has an area of 1,878.3 km^2 and a population density of 60 people/km^2. Rubber is the main source of livelihood for increasing the peoples' income.

The present research aimed to map the types and status of the habitats and estimate the population of proboscis monkey in Balangan District, South Kalimantan. The data will be useful for strengthening the conservation strategy for the proboscis monkey.

Methods

Data was collected in May – June 2012. The activity was initiated with interviews with the people asking whether they have seen/met the proboscis monkey at locations where they carry out their daily activities, and if yes, where the location was. The name and coordinates of the location was recorded. Other data collected were habitat type, the dominant plants in the area, the status of land, and the population of the proboscis monkey based on sex and age class (male has bigger and longer nose than female; infant has smaller body with dark brown hair on its head and paler hair on its body).

Results

There were 13 locations where the proboscis monkey was found. In 8 locations the monkey was directly sighted and in 5 others its presence was reported by people interviewed. Most locations had rubber forest while others were non-rubber forest growing on *baruh*.

No	Name and coordinates of locations where populations were sighted	Type and condition of habitat
1.	Mandadar Forest, Kusambi Hulu Village, Lampihong Subdistrict; 02° 19' 14.9" S, 115° 24' 14.0" E The proboscis monkey seen 4 (1 M + 2 F + 1 SU)	Rubber forest; the average tree diameter was 34.5 cm (28 – 35 cm, n = 4) North: *ramping* and unused paddy-field South: *ramping*, resettlement, and rivulet East: rubber forest and rivulet West: rubber forest
2.	Pak Slametno's plantation, Mungkur Uyam Village, Juai Subdistrict; 02° 16' 56.5" S, 115° 34' 54.1" E The proboscis monkey was not seen directly	Prime seedling rubber plantation; the average tree diameter was 35.5 cm (34 – 37 cm, n = 9) North: resettlement and Halong River East, South, and West: rubber forest
3.	*Baruh* Tawayau, Galumbang Village, Juai Subdistrict; 02°15' 40.0" S, 115° 36' 32.2" E The proboscis monkey seen 3 (1 M + 1 F + 1 SU)	It is wide, inundated all year, and about 1 m in depth. Vegetation dominated by kujamas (*Syzygium stapfiana*) North: paddy field, resettlement, and Halong River East: rubber forest and *Baruh* Tambunau South: Kambing Stream, Opak Stream, and Juai Stream West: rubber forest
4.	*Baruh* Tambunau, Binju Village, Halong Subdistrict; 02° 16' 09.8" S, 115°37' 24.9" E The proboscis monkey seen 2 (2 SU)	North: paddy field, resettlement, and Halong River East: rubber forest South: Kambing Stream, Opak Stream, and Juai Stream West: rubber forest and *Baruh* Tawayau
5.	Gudang Gatah, Buntu Karau Village, Juai Subdistrict; 02°16' 45.9" S, 115° 32' 35.0" E; The proboscis monkey seen 5 (1 M + 3 F + 1 KT)	Rubber forest; the average tree diameter was 44 cm (26 – 47 cm, n = 6) North: Halong River East and west: rubber forest South: resettlement

6.	Buntu Karau Village, Juai Subdistrict; 02° 17' 30.9" S, 115° 32' 15.2" E The proboscis monkey was not seen directly	Rubber forest; the average tree diameter was 38 cm (31 – 42 cm, n=5) North: Halong River East and west: rubber forest South: resettlement
7.	Garuda Maharam, Gunung Pandau Village, Paringin Subdistrict; 02° 19' 59.2" S, 115° 28' 36.4" E The proboscis monkey was not directly sighted.	Rubber forest; the average tree diameter was 29 cm (27 – 31cm, n = 9) North: rubber forest and mining area of PT Adaro Indonesia East and West: resettlement South: Halong River
8.	Pahajatan, Tungkap Village, South Paringin Subdistrict ; 02° 20' 32.1" S, 115° 27' 58.4" E The proboscis monkey teramati 6 (1 M + 2 F + 3 KT)	Rubber forest (the average tree diameter was 48 cm; 47 – 51cm; n = 4); traditionally a religious place. North: vegetable garden and Halong River East: Halong River South: rubber forest West: resettlement
9	*Baruh* Katigan, Belanti Village, Awayan Subdistrict; 02°23' 38.0" S, 115° 31' 26.6" E The proboscis monkey was not directly sighted.	Plants dominating are kujamas North: Pitap Stream East and South: rubber forest and garden dominated by cempedak West: resettlement
10	Muslimin Graveyard, Belanti Village, Awayan Subdistrict; 02° 23' 54.8" S, 115° 31' 45.0" E The proboscis monkey seen 5 (2 F + 3 SU)	Rubber forest (the average tree diameter was = 64 cm; 40 – 88 cm; n = 2) and graveyard North and South: rubber forest East: Pitap Stream West: resettlement
11	Batang Banyu Mati, Pulantan Village, Awayan Subdistrict; 02° 25' 29.6" S, 115° 32' 18.7" E The proboscis monkey seen 15 (3 M + 6 F + 6 KT)	Rubber forest; the average tree diameter was 47 cm (43 – 50cm, n = 3) North and East: Pitap Stream South: rubber forest West: Mati Stream, rubber forest, and resettlement
12	*Baruh* Pacal, Maningau Village, Awayan Subdistrict; 02°23' 58.64" S, 115° 32' 15.92" E The proboscis monkey was not directly sighted.	Its width is more than 5 ha and it is inundated all year Plants dominating are kujamas North: rubber forest East: resettlement South: rubber forest West: Badalungga Stream, Pitap Stream, and resettlement
13	Pak Mursian's Plantation, Mampari Village, Batumandi Subdistrict; 02° 22' 57.7" S, 115° 25' 31.8" E The proboscis monkey seen 12 (2 M + 5F + 1 I + 4 SU)	Secondary forest 0.5 ha wide and a prime seedling rubber plantation (the average tree diameter was 32 cm; 25 – 67 cm, n = 5) East: rivulet (water flows all year) South: 8 m wide road, resettlement West and North: rubber forest

Note:
M = male; F = female; I = infant; SU = sex unidentified
The presence of the proboscis monkey at a site of location shows that the site is part of its home range. According to the people (dry-land farmers, rubber tappers, fisherman), the population of proboscis monkey is more than l5 individuals.
In locations 2, 6, 7, 9, 12 the proboscis monkeys were not directly seen. They might have been at other sites during the observation period.
In some rubber forests there is land planted with dry-land paddy or other food/fruit plants (such as banana, cempedak [Artocarpus integer]*, pampakin* [Durio kutejensis]*).*
Baruh (lebak): land that is lower than its surroundings, inundated with an average water depth of 1 m, and wide (more than 1 ha in general). During a long dry season some have no water. Plants growing on baruh generally are trees more than 5 m tall, such as kujamas.
Ramping: its width is less than 250 m^2. In a long dry season, there is no water. Plants growing on ramping are generally less than 1.5 m tall, such as bamban (Donax canniformis).

The perceptions and attitudes of the people toward the proboscis monkey varies. Most people (86.96%; n = 23) did not know that the proboscis monkey is a protected animal. Most people (91.30%; n = 23) were aware that hunting of the proboscis monkey was practiced.

Discussion

Habitat

Rubber forests differ from rubber plantations. In rubber forests other plants are allowed to grow (or are not cut) together with rubber trees that were planted purposely. For shifting cultivation farmers, this is a long-period treatment to make land naturally fertile (*bera* period). Rubber forest is cut if people need the land to plant paddy. The cutting is carried out when rubber is not productive or the when the need of paddy as a food increases.

In rubber plantations other plants are deliberately cleared or killed by cutting or spraying with herbicide. Plants that are tolerated to grow are grasses with some potential as food. By clearing or killing other plants the competition for nutrition is reduced, so rubber production increases.

The proboscis monkeys are found more frequently in rubber forests than in rubber plantations. Rubber forest comprises a variety of food and provides a safer hiding place from either disturbance or predators. One of potential disturbances is people moving around tapping rubber. Kujamas and salam (*Syzygium polianthum*) are two of many food sources for the proboscis monkey in the rubber forests of Tabalong District, South Kalimantan (Soendjoto *et al.*, 2006). Aren or timbatu (*Arenga pinnata*) growing at Sungai Mati, Muslimin Graveyard, Pahajatan, and Mandadar Forest are the hiding places for the proboscis monkeys. There are also reports that fruits of aren/timbatu are food for the proboscis monkey.

In addition to rubber forest, proboscis monkeys are also frequently found at the area called *baruh*. *Baruh* (mainly inundated all year) is not purposely planted for financial and technical reasons, so water-resistant plants grow wildly and form a forest ecosystem. In such conditions, baruh not only functions as water source for the proboscis monkey, but also provides food and becomes their hiding place. Baruh Tambunau of Binju Village, Halong Subdistrict and Baruh Pacal of Awayan Subdistrict are wide and deeply inundated, limiting people's activities.

Perception and attitude of the people

People have different perceptions and attitudes toward the proboscis monkey. Some people know that the proboscis monkey is a protected animal. They do not disturb the animal for the reason that their home range is far from human resettlements and activities. They maintain the *baruh* for the proboscis monkey.

However, some people keep the monkeys as a pets, for example at Teluk Bayur Village, Juai

Subdistrict . There has been no deeper investigation made as to whether they know that keeping a protected animal (moreover without authority's permission) is against the law. Many cases have proven that proboscis monkeys kept in captivity do not survive long. An inappropriate diet and stress are the most common factors.

Some rubber farmers view the proboscis monkey as a pest. The monkeys damage young rubber plants. Their jumping from one twig to another or from one branch to another can break twigs or branches. Because of such behavior, at Baru Village, Awayan Subdistrict the proboscis monkey is shot.

In addition, the proboscis monkey is hunted for consumption. Almost all the locations mentioned in the table had been visited by hunters. The hunters were transmigrants of Juai Subdistrict, Balangan District and people of certain ethnic groups coming from outside Balangan District (i.e., Central Kalimantan Province).

Many of the people's activities tend to damage the habitat of the proboscis monkey and result in the decrease of its population. Changes from secondary forest or rubber forest to resettlements, coal open-mining areas, and oil-palm plantations are occurring in South Kalimantan Province. They decrease the food availability and reduce the monkey's home range. On a more hopeful note, there is a population of the proboscis monkey reportedly living in a former coal mining area that was reclaimed and revegetated more than 15 years ago. The first author is investigating this.

Infant kept in cage

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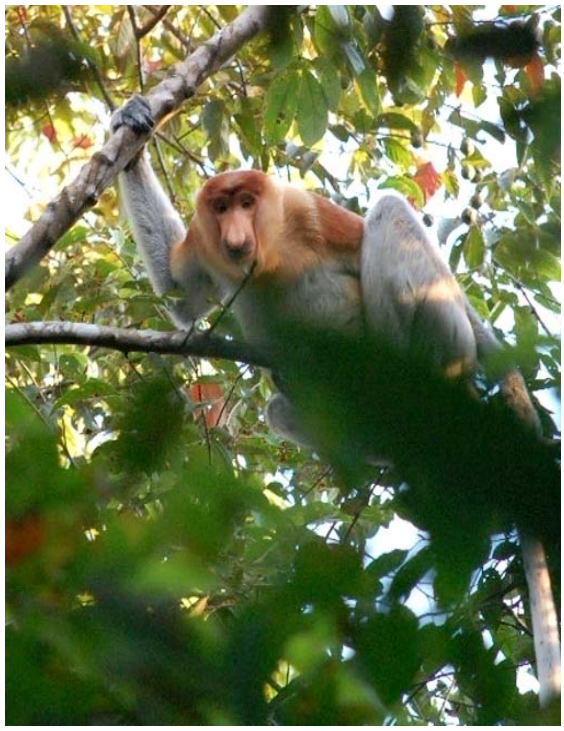

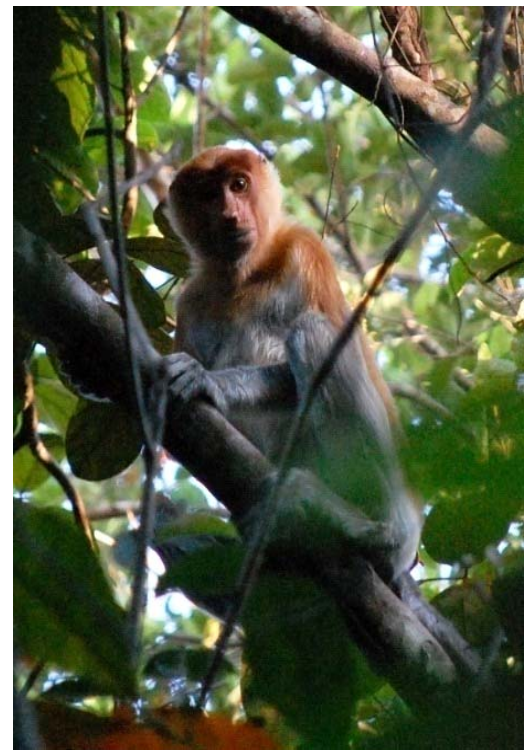

Male and female on rubber tree

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AN ASSESSMENT OF COMMUNITY-BASED BIODIVERSITY CONSERVATION AND RURAL LIVELIHOOD IMPROVEMENT IN THE BUFFER ZONE OF BARDIA NATIONAL PARK, NEPAL

by Damodar Gaire

Introduction

Community-based conservation reverses top-down, centre-driven conservation by focusing on the people who bear the costs of conservation. In the broadest sense then, community-based conservation includes natural resource or biodiversity protection by, for, and with local communities (Western & Wright 1994, p. 7). Nepal has joined hands with international communities and embarked on the modern era of biodiversity conservation since the 1970s. The establishment of national parks and other forms of protected areas has been considered a key conservation strategy to protect these natural heritages. So far, Nepal has created an impressive network of protected areas that cover more than 18% of the total surface area of the country. By signing the global Convention of Biological Diversity held in Rio de Janerio in 1992, Nepal expressed its strong commitment to the conservation and sustainable utilization of biological diversity for the socio-economic development of the country (HMGN, 2000). There has been a major shift in the management paradigm of protected areas – from protective to collaborative – with the introduction of conservation areas and buffer zones. It is not conceivable that protected areas could be managed for the long term without people's goodwill and active support. Over time, management has now focused more on meeting people's basic needs so that resource use pressure on protected areas could be alleviated. The formation and institutionalization of different community-based organizations in the buffer zone is a stepping stone toward empowering and involving people in resource management (Maskey, 2001).

Nepal's biodiversity conservation initiatives have taken place against the background of a number of national needs and international commitments. Many initiatives have been undertaken to conserve the rich biodiversity of Nepal. One of the main initiatives to date for protecting Nepal's biodiversity

is the National Parks and Wildlife Conservation (NPWC) Act of 1973. Under this Act, a number of key areas for wildlife and endangered species were given protection. Important areas for wildlife conservation were designated as protected areas. The Government of Nepal (HMGN) has established 16 protected areas (PAs) of various types, covering more than 23.23% of the country's surface area (DNPWC, 2011). The National Parks and Wildlife Conservation Act (HMG/N, 1973) has provided a legal foundation for the establishment and management of protected areas such as conservation areas and buffer zones, which is a new dimension in community-based biodiversity conservation. The Act has also made provision for financing community development activities in buffer zones and conservation areas by plugging back royalties accumulated from park-generated business such as tourism. The buffer zone receives 30%-50% of the royalties, while 100% of the income goes to conservation areas (Sharma, 1998).

Material and methods

Five Buffer Zone Community Forests (BZCFs) were studied to analyze the community-based biodiversity conservation and rural livelihoods improvement. Rammapur, Harnawa and Janachetana BZCFs were selected from Bardiya district, whereas Shree Krishna and Santi Batika BZCFs were chosen from Banke district. Participatory Wealth Ranking, discussions with committee members, direct observations, a questionnaire survey and a Key Informant's Survey were used during primary data collection, while other related published and unpublished materials were used as secondary data.

An Index of Relative Ranking (IRR) was used to determine the ranking value in different headings concerning the poor, women and disadvantaged groups (DAGs). Miller (1986) in his book stated that the Index of Relative Ranking (IRR) can be calculated by using following formula:

IRR= (R1S1+R2S2+————————+RnSn)/nr

Where, IRR = Index of Relative Ranking,
R1=Rank of 1st order,
S1= score of 1st order,
Rn = Rank of last order,
Sn = Score of last order,
n = Number of observation,
r = Total rank given to a particular attribute.

Results and discussion

Activities undertaken by Buffer Zone Community Forest User Groups (BZCFUG)

Every BZCF has its own constitution and operational plan (OP). Generally, the constitution describes the rules and regulations of the CFUG as an autonomous organization. Users participate in different forest management activities, viz. income generation activities, non-timber forest product (NTFP) cultivation, infrastructure development and the group's mobilization after the handing over the buffer zone community forests.

Firewood and timber for house construction are the main forest products provided to all members from the BZCF. Representation of the poor, women and disadvantaged groups in forest products collection was comparatively high (e.g., leaf litter collection, ground grass collection and fodder collection) because they had to depend up on the day-to-day collection in the BZCF for these minor activities. For major activities in the BZCF, one member of each household has to voluntarily be involved during the collection of firewood and sharing of benefits according to the quantity needed for each household (proportional basis). Even though almost all the BZCFUGs had different income generation activities such as NTFP management, nursery preparation, and special programs for the poor, DAGs and women, mentioned in their OP, they have not conducted any such programs systematically as yet. However, Rammapur BZCFUG was found to be a model among the BZCFs of Bardia National Park.

Natural capital

One of the main objectives of the BZ Program is the conservation of the BZ forest in collaboration with local communities and the sustainable supply of the forest products (timber, fuel wood and forage), to help minimize the pressure on park resources. The communities have been directly involved in planting on barren land and protection of the degraded natural forest. BZCF has been

able to improve the living standard of the poor and the dalits as a formation of natural capital. People used to spend more time collecting firewood, fodder and leaf litter. Time (65%) has been saved by the users after the BZCF Program.

Water sources

The Karnali and Babai rivers are the perennial river systems that flow through the park. There are many seasonal rivers and streams like the Orai river, Gumnaha Nala, Ambasa Khola, Khauraha Khola, etc., that are draining through park area between Karnali and Babai rivers (RBNP, 2006). BZCF can contribute to serve the sources of water at the upper Siwalik regions. The construction of Siwalik hills in the park has helped to provide the local people with a steady source of water for irrigation.

Wildlife species

The community-managed forest has become an additional habitat for wild animals. The animals prefer to graze on new shoots of grasses in the community forest. The community reported that the trend of sighting wild animals have been gradually changing for last few years. They also reported sighting of some common species during the meeting.

Table 1: Trends of wildlife sightings in the study area (group discussion, Sept 2006)

S.N	Sighting trends	Rammapur BZCF	Harnawa BZCF	Janachetana Women BZCF	Shree Krishan BZCF	Santi Batika BZCF
1	Abundant before, but decreasing now	Blue bull, Vulture, Monkey, Rhinoceros	Blue Bull, Vulture, Rhinoceros	Vulture, Monkey, Cattle Heron	Vulture, Eagle, Jackal, Rhinoceros	Vulture, Cattle, Heron
2	Present before but has now disappeared		Rat, Bear, Sarus crane	Eagle, Fox	Sarus crane, Fox	Blue bull, Sarus crane, Crow
3	Not reported in past, but sighted nowadays	Common Birds Asian Elephant, leopard	Common Leopard, Elephant	Common Leopard	Leopard, Common Birds	Common Birds

Human capital

The literacy status was analyzed in different BZCFs. There is a substantial difference in the literacy rates among different groups. The overall literacy status was 58%, which was higher than the national literacy rate.

Awareness activities, managerial training and income-generating activities were supported by the BZ Program. The awareness activities included workshops, observation visits, and seminars to enhance knowledge and skills on conservation and community development. The managerial training was organized for the office bearers for the better management of the CBOs. They have frequently received training on bookkeeping, leadership, cooperatives, forest management, etc. There was zero or minimal representation of the poor, women and disadvantaged groups before the BZCF Program. This is the situation at present and we can assume that the marginalized poor, women and disadvantaged groups will take part in different awareness raising programs and income-generating activities.

Social capital

The decision making process of user groups is usually on a consensus basis. About 84% of the households are members of UGs and a majority (51%) of the members always attend meetings.

regularly. The degree of participation is highest among the rich and lower among the poorest class.

Physical capital

It was found that 87% of houses in the study area had thatched roofs and 13% had permanent roofs, including the masonry type. There was a decrease in dependency on rainfed irrigation systems with an increase in pump-set boring installations by 2006. The buffer zone program supported 62 pump-set boring installations as a productive investment in the study area over a period of 11 years.

Financial capital

A saving/credit scheme has been established through the co-operative management Biodiversity Conservation Fund (BCF) and other small scale funds have been initiated through the buffer zone forestry program. The poor and DAGs has gotten higher access (86% and 80%) to soft loans. Thus, the financial capital has improved after the buffer zone forestry program.

Table 2: Showing the livelihood strategies evolved during the group discussion

S.N.	Activities	Year 1995 (before formation of the Buffer Zone Program)	After the Buffer Zone Program (at the time when conducting research)
1.	Forestry	• Over-extraction and utilization • Govt. managed protection • Less effective protection	• Plantation, protection, management and optimum utilization • Community-managed protection system • More effective protection
2.	Sources of fuels	Fuel wood (100%)	Fuel wood (80%), alternate energy-biogas, solar heater (20 %)
3.	Relief for wildlife victims	Informal (only for human injuries)	Established endowment fund (compensation for livestock damage, loss and human injuries)
4.	Wildlife chasing	• Wildlife hunting • Making noise to scare animals • Traditional tower (over the trees)	• Wildlife conservation • Making noise • Trench construction • Solar fencing • Tower construction
5.	Agriculture	Cereal crops (paddy, wheat, maize), traditional/local cash crops (mustard, lentil)	• Cereal crops (paddy, wheat, maize and also their improved varieties) • Vegetable farming • Menthe cultivation
6.	Social capitals	• Traditional (Kulopani chaudhary, Badhghar) • Meeting as per need • Collective actions for social activities occasionally	• Formal memberships in CBO • Organizational development • Regular meetings • Regular collective actions for social activities

7.	Health facilities	Local healers, District health centre	Local healers in the village
8.	Financial capitals	• Loan from landlord • Formal bank • High interest rate (up to 60% from landlord)	• Loan from landlord • Formal bank • CBO managed co-operatives • Low interest rate (maximum 20% from CBOs)
9.	Livestock	• More cattle • Grazing rather than stall feeding • Local varieties	• More buffaloes • Stall feeding rather than grazing • Improved breeds
10.	Awareness/co-ordination	Co-ordination meeting with park officials	• Co-ordination meeting with park officials • Networking meeting with other line agencies
11.	Technical support	• Veterinary office • Agriculture office	• Village specialist (veterinary, agriculture)

(According to the field survey, 2006)

Index of Relative Ranking

Table 3 reveals that score of biodiversity conservation was the highest (0.9) and was ranked first. The enlisted actions had the smallest value (0.42). One of the main reasons why are they more knowledgeable on biodiversity is that they have participated in formal or non-formal workshops/ trainings organized by WWF/TAL, SAGUN-CARE, DNPWC/NP, etc.

Table 3: Activities, calculated IRR, result and ranking value

S.N	Activities	Calculated IRR	Result	Ranking
1	Meetings & assemblies	0.80	Active	Third
2	Plantation Program	0.43	Fair	Fifth
3	Skill development activities	0.82	Active	Second
4	Biodiversity conservation	0.9	Active	First
5	NTFP management/IGAs, pro poor focus Program	0.53	Good	Fourth
6	Others	0.42	Fair	Sixth

Index of Perceived Availability (IPA)

An Index of Perceived Availability was used to check the people's perception in different headings. IPA value was compared to the highest (1) and lowest (0). The higher the value, the higher the perception toward the asked statement. The questionnaire was used in different economic strata of the users with in purposed BZCFs and the IPA value is summarized below:

Table 4: Index of Perceived Availability

S.N.	Activities	IPA value	Perception
1	Participation of the poor, women and dalits in meetings has increased after BZCF program.	0.65	High
2	Poor, women and DAGs not able to handle the executive body of BZCF	0.21	Low
3	Better to reduce poverty through income generation activities	0.8	High (Remarkable)
4	Representation of the poor, women and DAGs in buffer zone committee is more effective than in others	0.51	Medium
5	"There is a linkage between biodiversity conservation and rural livelihood improvement in the buffer zone of Bardia NP" Is it possible or true?	0.84	High (Remarkable)
6	We must promote eco-tourism in BZCF	0.7	High
7	Creation of employment specially for targeted groups (Local people)	0.9	High (Remarkable)
8	Skills, knowledge and attitude for smoothly running the BZ committee	0.5	Medium
9	Are you interested to be a executive committee member?	0.53	Medium

Livelihood Analysis

The common physical capitals have equal access by all, but it was different in the case of private physical capital. House type (permanent) and ownership, land holding, livestock holding, annual income and literacy status are found to be critical assets distinguishing the poorest and richest classes. The poorest have relatively less access than the richer classes.

Except for human capital, the richest class has the highest access on four assets, whereas the middle class has the highest access on human capital since they have access to literacy level, training and leadership quality.

The rich have the highest access in all assets except group funds and forest resources. This is because of the availability of alternative sources of forest resources to them and the fact that they do not depend much upon the group fund, which is a small amount. However, the poorest class has greater access to the group fund and forest resources since they are more dependent on those activities. In fact, while the poor people have highest access to forest resources and the group fund, the middle class has higher access than the poor to remaining activities which are related to their livelihood assets.

Conclusions and recommendations

The increasing trend of alternative energy use (25%), stall-feeding practice (increased by 50%) and participatory protection of the BZ forest are helping to meet the conservation strategies adopted by the Program. Establishment of a relief fund and biodiversity fund provided opportunities to give immediate help to wildlife victims and soft loans for poor entrepreneurs respectively. Overall, the physical capital has effectively increased. The increase in physical capital through the construction of village roads, schools and health posts has equal access by all. BZCF is serving as an extended habitat to the wild animals and the poorest of the poor people have the highest access to forest resources. Thus, the natural capital has improved

under the BZ Program. More than 60% of the members always attend the user group meetings and 70% of the poorest now have the opportunity to participate in awareness programs and IGA training. Moreover, there is a strong decision making role for the poorest in the meetings. So, the human capital has improved. A saving/credit scheme has been established through the co-operative management Biodiversity Conservation Fund (BCF) and other small scale funds have been initiated through the buffer zone forestry program. The poor and DAGs have gotten higher access (86% and 80%) to soft loans. Thus, the financial capital has improved after the buffer zone forestry program.

On the basis of the research the following recommendations have been made:

- Provision of a crop insurance mechanism should be implemented in human/wildlife conflict areas. Barriers will reduce human and livestock entry into the park and wild animal entry into the village. The barbed wire fence at the boundary of the park along the settlement should be maintained. The boundary of the park and BZCF along the settlement can be fenced with bio-fences, electric fences and game-proof fences to reduce the damage caused by wild animals to the life and property of the villagers.
- Representation of the poor, women and DAGs in any resources is a vehicle for change in community development. Therefore, quota provisions and pro-poor activities should be designed and implemented to empower them for the streamlining of the forest development program.
- Biogas can be a good alternative to reducing the local dependency on the BZCF for the collection of fuelwood. It will help to reduce the use of dung cake and also will help to enhance the health status of people and save time.
- It was found that the CFUG in the area was very active and was carrying out useful initiatives to motivate and mobilize the local community toward conservation and management of their natural resources together with wildlife conservation inside the park. Therefore, the management system of BZCF should be further boosted by providing economic, institutional and moral support by the park and donor agencies so as to develop a well institutionalized local stewardship in conservation.
- A saving/credit scheme should be promoted through community-managed cooperatives. Soft loans should be provided through co-operatives to the selected potential entrepreneurs for IGA.

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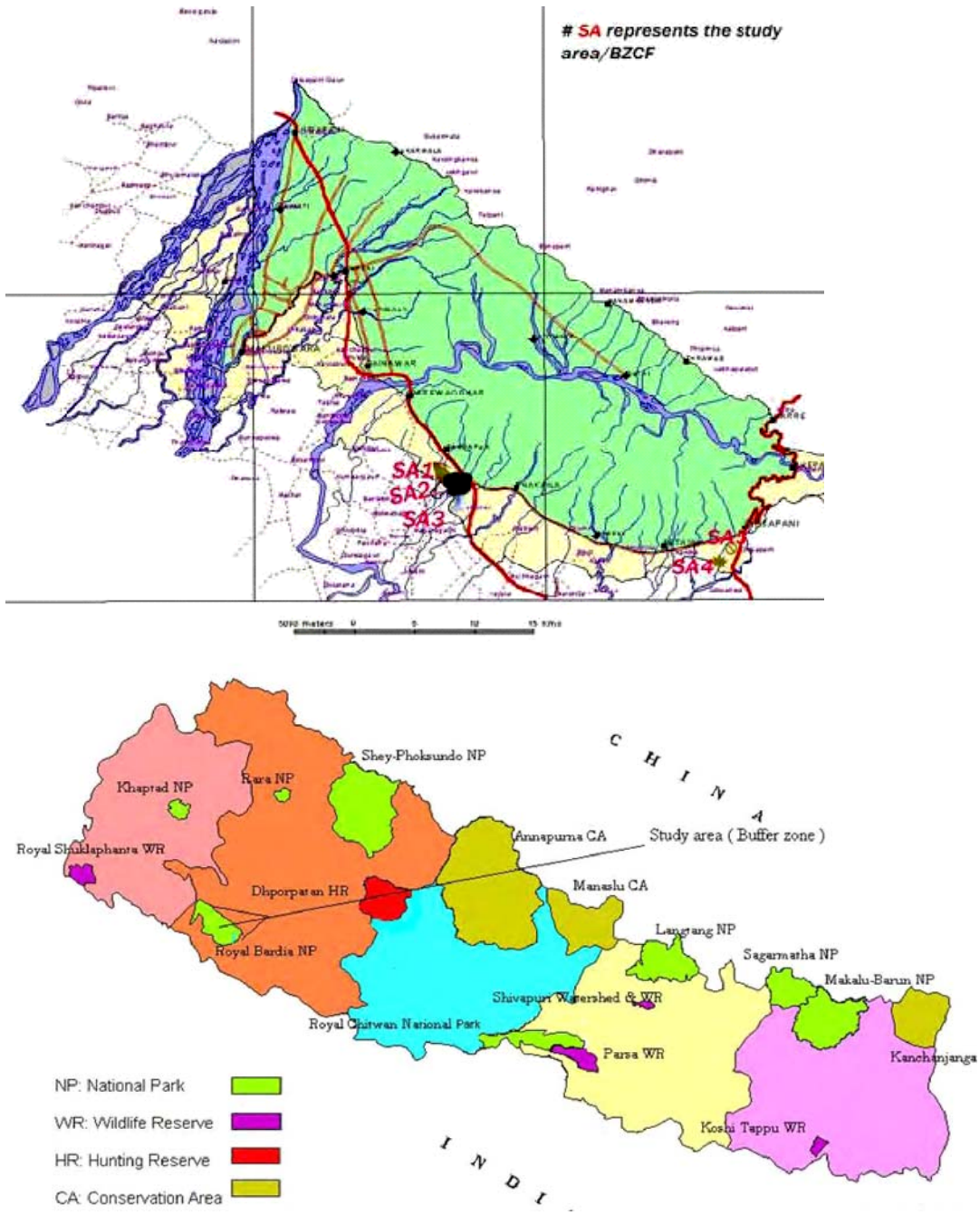
Annex 1: Map of the study area



CONSERVATION PRIORITIZATION FOR THE WILD TIGERS IN THE BANGLADESH SUNDARBANS

by Mohammed A. Ashraf

This breeding female faces a bleak future unless conservation efforts prioritize identifying and safeguarding the potential source-sink structure of the Sundarbans (Photo: Ashraf Mohammed)

Introduction

Tiger *(Panthera tigris)* is the largest sympatric vertebrate in the felid guild and is facing unprecedented anthropogenic threats in its native wild lands across South and Southeast Asia (Seidensticker, 1997). This charismatic mega-carnivore is a globally endangered species despite the concerted international conservation initiatives over the past several decades to safeguard its dwindling population size across its range nations. Due to its sheer magnificence, mischievousness, and awesome power, the tiger magnetized global attention and became a hallmark species for *ex situ* conservation initiatives across the continents. People around the globe often enjoy visiting zoos, which hold tigers, and many zoos have now adopted the tiger as its priority species for promoting *ex situ* wildlife conservation outreach and education programs with particular focus on schoolchildren as the major target group. Sadly, *in situ* wild tiger conservation initiatives remain disproportionately lacking in terms of scientific and socio-political interventions despite the consensus among civil societies and governments in tiger range countries to protect this species and its habitats. The Sundarbans mangrove ecosystem in Bangladesh is one of such habitats that became a global priority for wild tiger conservation in the 21st century. This paper attempts to place conservation priorities for the free-ranging wild Bengal tigers *Panthera tigris tigris* in the context of the Sundarbans by integrating the modern science of wildlife and landscape ecology.

Sundarbans tiger ecosystem

Double the size of the state of Delaware (USA), the Sundarbans is the only mangrove ecosystem in the world where ecological and evolutionary processes have allowed large obligate mammals such as the tiger to adapt to various stochastic and deterministic pressures. No other big cats have managed to adapt to the harsh ecosystem like mangroves by the tropical sea. For example, jaguar (*Panthera onca*) occupies the dense tropical forest ecosystem in South America; lions (*P. leo*) and leopards (*P. pardus*) are found in the vast expanse of the savanna-cum-forest ecosystem in Africa and the mountain lion (*Felis concolor*) makes it home in the temperate ecosystem in North America. All these species have adapted to fit into specific niches in order to survive and breed, but none of them developed mangrove-specific adaptation mechanisms. This puts wild tigers into the forefront considering their superb adaptation mechanism and ecological and behavioral resiliency to survive and successfully breed in the Sundarbans mangrove wetland and thus the Sundarbans have become a topical ecological unit for international conservation research and intervention. With an area covering 6,017 km^2 in Bangladesh (the remaining ~4,000 km^2 lies in West Bengal state of India), the Sundarbans is one of the largest deltaic ecosystems with mega-biodiversity significance (Chowdhury, 2004). It has been designated as a Ramsar site (Convention on Wetlands of International Importance) for its high ornithological value. UNESCO (United Nations Educational, Social and Cultural Organization) earmarked a portion of this mangrove ecosystem as a World Heritage Site due to its "outstanding universal value to all the people of the world." The Sundarbans was also entered as a Global 200 Biodiversity Hotspot as a priority conservation area on earth (Sarat, 1999). Tigers remain the central contributing factor for the Sundarbans to receive such high honors of international designations. The World Wildlife Fund (WWF) and Wildlife Conservation Society (WCS), USA declared the Sundarbans a high priority tiger conservation landscape (TCL) where long-term tiger conservation investment is best. The TCL designation gives better hope for the tigers to survive providing any conservation action programs integrate modern wildlife science-based tiger research backed up by WWF-WCS TCL protocols. This paper is a brief attempt to introduce the scientific know-how and the way forward to set out ecologically valid tiger conservation management priorities. The preliminary objective of such a priority must focus on identifying the prime habitats for the tigers in the Sundarbans so that a long-term viable breeding population can be ensured.

Ecological framework for the tiger conservation

Scientific studies of tigers under the modern conceptual statistical framework started with American biologist George Schaller in the early 1960s (Schaller, 1967). His pioneering work in Kanha National Park in India was the major breakthrough in the sense that prior to Schaller's work, much of the knowledge of wild tigers was based on the anecdotal evidence of colonial hunters' accounts. His seminal publication **The Deer & the Tiger** remains the fundamental backbone for the graduate biologists who wish to venture into tiger ecology research in the tropical belt.

Major advancements of tiger ecology and conservation research followed between 1970 and 1980 under the Smithsonian Tiger Ecology Project in Chitwan National Park in Nepal (Sunquist, 1981; Smith, 1993).

During the 1990s, long-term ecological studies were pioneered by Indian biologist Ullas Karanth in Nagarahole National Park in India. Karanth pioneered the camera-trap/capture-recapture modeling method to estimate population density of wild tigers and substantially improved our current knowledge base pertaining to the demographic, behavioral, ecological and allelic parameters of the wild Bengal tigers in the Indian subcontinent (Karanth & Sunquist, 1992, 1995, 2000).

Armed with these new scientific knowledge, WWF and WCS (with funding support from the National Fish & Wildlife Foundation's Save The Tiger Fund, USA) delivered a scientifically authentic blueprint for a wild tiger conservation

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action plan in 1997. This groundbreaking *Framework for Identifying High Priority Areas and Actions for the Conservation of Free Ranging Tigers* is the culmination of 50 years of dedicated and laborious scientific studies undertaken by a handful of wildlife scientists devoted to safeguarding the dwindling wild tiger population across its range nations. The framework introduced a new ecosystem-based tiger conservation approach integrating the geographic information systems (GIS) utilities as one of the fundamental conservation tools to delineate the best heterogeneous ecosystems holding the highest probability for the tiger's long-term survival under the current and future threats.

Another pioneering component of the WWF-WCS framework was the holistic integration of ecological, demographic, behavioral and genetic differences of tigers in a variety of wild areas that best represents the range of ecological conditions in which they live. (Karanth and Nichols, 2002). This modern framework was also a significant breakthrough and departure from the traditional taxonomy-based putative sub-species conservation management approach which fails to recognize that tigers are uniquely defined by their ecological and demographic parameters. The framework's principles and applications were based on sound science of wildlife biology and landscape ecology; the disciplines in which satellite imagery, remote sensing and GIS are fundamental components and hence, made a significant contribution to the formulation of the tiger conservation framework. The framework identified seven high-priority tiger conservation landscapes (TCL) where the chances of long-term conservation are the best. Statistical evidence suggests these TCLs pose the highest probability for the long-term survival prospects for the breeding tigers, earmarking these habitats as Level I Tiger Conservation Units (TCU) (Wikramanayake,1998).

Sundarbans under eco-political context

The Sundarbans is one of the seven identified high profile TCUs where tigers are expected to find safe breeding grounds. Therefore, tiger conservation action and priority settings in the context of Sundarbans not only need to parallel the WWF-WCS framework, but also must focus on identifying the best breeding habitats with the potential to sustain a long-term source-pool for the tigers. Sadly, much of these new ecological advancements surrounding tiger conservation are not utilized by the Bangladesh Forest Department (FD) which is the central government organization involved in conservation and protection of biodiversity in Bangladesh. Most of the conservation research regarding Sundarbans tiger remains ad-hoc, reflecting the traditional paw-print- (also known as pugmark) based annual census. These censuses have no scientific validity and thus very few studies pertaining to Sundarbans tiger have been published in peer-reviewed scientific journals (Karanth, 2003). One of the fundamental setbacks to spearheading standardized sampling-based tiger surveys is largely rooted in the administrative and bureaucratic mindsets of the FD structure. Despite the optimistic reports presented at international tiger conferences, the truth is that wild tiger numbers in the Sundarbans are declining and so far scientifically standardized tiger population estimates and monitoring programs have not been emphasized. Bangladeshi biologist Monirul Khan pioneered the scientifically valid camera-trap capture/recapture modeling method to estimate the wild tiger numbers in the Bangladesh Sundarbans (Khan, 2007). Khan's estimation suggests there may be approximately 200 tigers in the Sundarbans, where they which they live in a density of 3.7 per hundred km^2. In contrast, research conducted by Forest Department (FD) for the past several decades regularly reported that tiger numbers were increasing and the FD's recent estimation reflects double the figure of Khan's estimation. Regardless of the eco-political debate surrounding tiger numbers, it is evident that without the formulation of science-based conservation priority against the backdrop of the WWF framework and Khan's recent estimation, tigers in the Sundarbans may not survive this century and beyond.

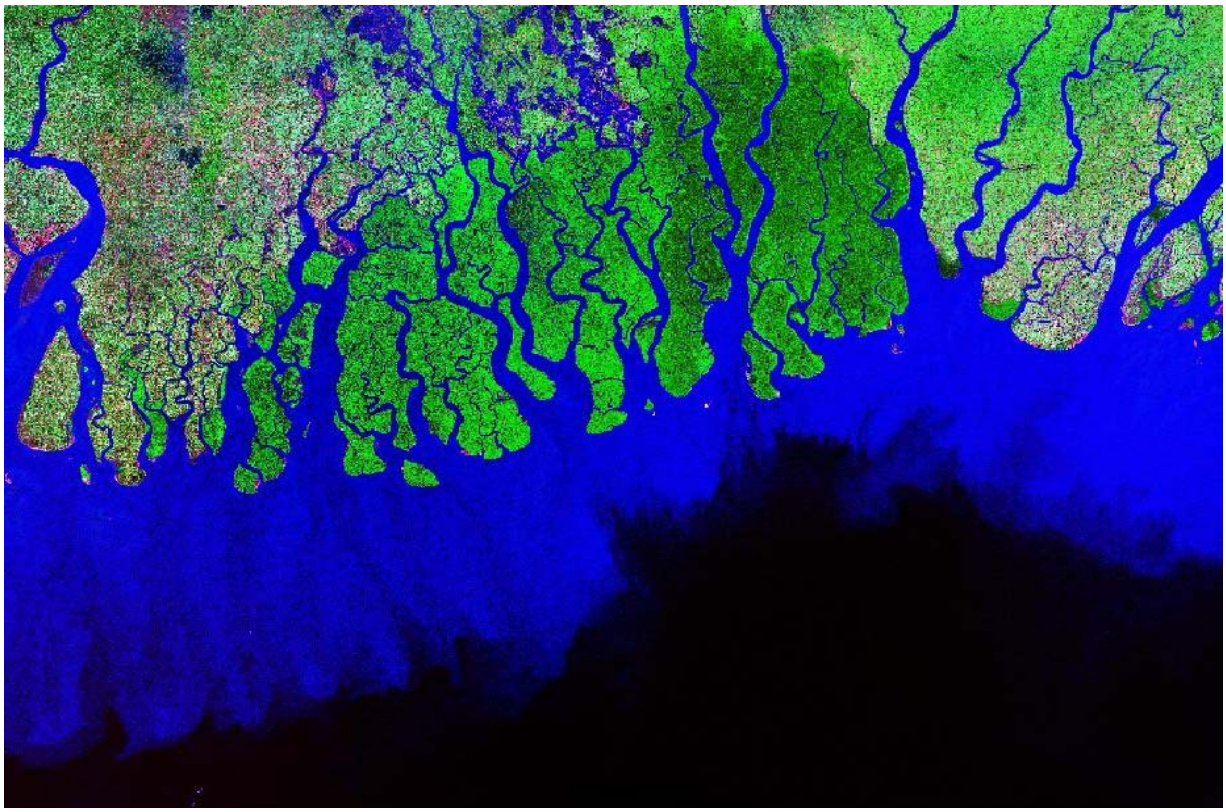
Ecological know-how and the way forward

The basis of tiger conservation priority settings in the context of Bangladesh Sundarbans requires the holistic integration of two major elements. Firstly, the keystone-umbrella species concept applied to the tiger needs to be taken into account in priority action and policy framework. The

keystone or umbrella species concept is often used and applied by conservation biologists as a basis for wildlife conservation and protected area management in large geographical landscapes. In the face of limited funding, knowledge and time for action, conservation efforts often rely on shortcuts for the maintenance of biodiversity. The keystone species concept proposes a way to use species requirements as a basis for conservation planning and the concept has recently received growing attention. A keystone species is defined as a species whose conservation is expected to confer protection to a large number of naturally co-occurring species. This concept has been proposed as a tool for determining the minimum size for the conservation areas, selecting sites to be included in protected area networks, and setting minimum standards for the composition, structure and processes (ecological and evolutionary) of ecosystems (Roberge & Angelstam, 2004). Therefore, the health of the Sundarbans ecosystem in terms of its biological and genetic diversity and the ecological and evolutionary processes significantly depends on conserving a healthy population of breeding tigers. In other words, tigers act as an ecological litmus paper to detect any negative changes of the overall health of Sundarbans ecosystem.

Secondly, the tiger conservation action priorities in the Sundarbans context needs to incorporate a landscape-based conservation approach with the addition of remote sensing and GIS as fundamental technical components. Landscape ecology considers vegetation as a mosaic of patches of vegetation with unique landforms, species composition and disturbance gradients and focuses on parameters such as patch sizes, patch shapes, patch isolation, interspersion (adjacency of various land-uses/land-cover), juxtaposition (relative importance of adjacent patches), fragmentation, patchiness, etc. All these parameters have a direct bearing on the status of biodiversity within the forest ecosystem. The spatial analytical capabilities of GIS allow quantifying all the above parameters with the remote sensing-based vegetation type map (Nichol, 1975). GIS and landscape-based tiger conservation priority settings have direct management implications in the long run. For example, protected areas (commonly known as wildlife sanctuaries) constitute approximately 24% of the total area of the Sundarbans. These wildlife sanctuaries are well protected from any kind of anthropogenic interventions and thus relatively good quality habitats are designated as World Heritage Sites (Chowdhury, 2004). It is likely that these pristine sanctuaries have the potential to hold healthy breeding sub-populations of tigers and may be acting as a demographically robust source pools. Wild tigers that disperse from the source pool to nearby habitat patches known as sinks increase the probability of long-term persistence, particularly pronounced in fragmented ecosystems where the GIS component of landscape ecology plays a crucial role in designing the landscape for managing the source-sink dynamics and the meta-population structure it forms. The principles of conservation biology dictate that protecting the breeding population as a source pool is absolutely indispensable for maintaining the larger population and at present our knowledge is limited pertaining to the source-sink dynamics and the potential transient corridors for tigers to disperse from source pool to sink, thus putting GIS into the forefront to appraise and design the Sundarbans landscape for ecologically validating any tiger conservation action priorities. This kind of study has already been successfully carried out to mathematically identify a system of potential dispersal corridors and strategic transit refuges for wild tigers by using Landsat 7 ETM (Enhanced Thematic Mapper) and GIS utilities in the Terai Arc Landscape, one of the top priority TCLs along the Himalayan foothills in Nepal (Wikramanayake, *et al.*, 2004). By using the GIS-based model, wildlife biologists are able to make recommendations about off reserve land management to increase dispersal potentials for breeding tigers from the source pool through transit corridors to sinks.

Although the study on Nepal's tigers is based on 30 years of long term ecological data sets, the potential to integrate landsat imagery and GIS tools to answer fundamental questions such as how the spatial and temporal distributional parameters of the tigers in the Sundarbans relates with the currently designated protected areas and whether there is a need to increase the areas of these wildlife sanctuaries is becoming increasingly important for serious carnivore biologists. At



Remote sensed digitized image of Sundarbans Tiger Landscape is available free-of-charge from the Earth Resources Observation & Science Center (EROS) of USGS

present, knowledge pertaining to the tiger's range patterns and the potential dispersal corridors from its breeding source pool to its adjacent reserve forest, also knows as buffer zones (sinks), is unknown, but remote sensing and GIS-based field surveys hold enormous potential to cost-effectively answer these ecologically vital questions with better timeliness. Source and sink dynamics for managing wildlife populations is now recognized as an important concept in conservation biology and the correct application of this concept against the backdrop of GIS in wild tiger population management in Bangladesh is necessary for tigers to survive this century and beyond.

In good quality habitat patches the source is not necessarily extinction-prone, but rather generates a healthy reproductive surplus, whereas in the relatively unsuitable habitat patches the sink may go extinct in terms of the absence of periodic immigration from the source habitat (Groom, 2006). Identifying the source-sink has direct implications on wild tiger conservation in the Sundarbans. For example, several studies and theoretical models revealed that a small proportion of the total population may be located in the source habitats but are responsible for managing the entire population of any particular ecosystem. Pulliam (1988) showed that as little as 10% of a meta-population may be found in source habitats and still be responsible for maintaining the 90% of the population found in sinks. Such relationships hold enormous power for effective and ecologically sound policy and conservation decisions, particularly for iconic and large vertebrate endangered species such as the wild Bengal tigers of the Sundarbans. To place the source-sink idea in a better perspective, and more importantly in the context of the Sundarbans tigers, some elaborations are required. Twenty-four percent of the total area of the Sundarbans is internationally designated as wildlife sanctuaries or critical habitats as mentioned above. Until recently, critical habitats were defined as places where a species was most common. Source habitats, however, are defined by ecological, and more importantly, by demographic characteristics as such habitat-specific fecundity success rate and survivorship and not by the population density of the animal (Groom, 2006). Therefore, source habitats for the

tigers in Bangladesh Sundarbans could easily and mistakenly be overlooked if conservation actions focus priority on the areas where tigers are most common (e.g., wildlife sanctuaries) rather than where they are most productive. Given the limited financial and logistic resource availabilities in Bangladesh, the keystone-species conservation approach and GIS tools that are backed up by ancillary data (e.g., landsat imagery) can play a vital role in identifying productive breeding source pools. These should be the areas where the research priority should be for preserving the tigers in Sundarbans.

Conclusion

This paper attempts to explain the wildlife science-based tiger conservation pathway that integrates the keystone-umbrella species concept, landscape ecology and geographic information systems as major components to effectively devise wild tiger conservation priorities for the Bangladesh Sundarbans. The Bengal tiger is the national icon of Bangladesh, with high cultural, aesthetic and spiritual value even for people with little or no interest in biodiversity conservation. With an improved government institutional framework, the tigers of Bangladesh have recently entered into the statistically rigorous and conceptually unified sampling-based conservation regime. There is hope that the Bangladesh government will positively react to this scientific advancement pertaining to the tigers of the Sundarbans.

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PLANT AND BUTTERFLY INTERACTIONS FOUND IN THE MID ELEVATION FORESTS OF PACHAMALAI HILLS, EASTERN GHATS, TAMIL NADU

by V. Nandagopalan and V. Anburaja

Introduction

Butterflies have important ecosystem roles, including pollination, and they are useful in studies of population and community ecology (May, 1992) as indicators of ecosystem health because they are very sensitive to changes in microclimate and habitat (Erhardt, 1985). Many species are strictly seasonal (Kunte, 1997), and their population dynamics are generally considered to be governed by environmental factors. In India, butterflies have been documented since the turn of 19th century (Williams, 1938). The biological diversity encompasses species diversity, richness and genetic resources in a mutually interacting community of a given habitat. Insects are the major components of animal diversity in terms of number of species in most of the habitats and ecosystems. Their removal or loss can cause negative effects in the ecosystem as they play a crucial role in the maintenance of ecosystem stability and diversity (Ananthakrishnan, 1988).

Along with plants, they constitute the major food of higher animal species. Among insects, butterflies are treated as indicators of the status of the ecosystem and have been considered as important mega-species. Living organisms are not uniformly distributed all over the habitats, but are limited to those areas where the species-specific ecological requirements are available. This is one of the major factors governing the distribution of animals in various habitat types (Balakrishnan and Easa, 1986).

Diversity of insects in an area depends primarily on the availability of mixed plant species, which constitute their major food resources (Mathew and Rahmathulla, 1993). Knowledge of phylogenetic relationships among the species comprising a rapid radiation has proved invaluable for detailed investigations into the processes and patterns of their diversification. There are still relatively few studies aimed at understanding the mechanisms of radiations for invertebrates, even in popular groups such as butterflies which feature prominent model-organisms in evolutionary biology (Boggs *et al*., 1954).

Insects comprise more than half of earth's diversity of species (May, 1992). Healthy biological communities depend upon insects as pollinators, seed dispersers, herbivores, predators and prey. Butterflies are generally regarded as

one of the best taxonomically studied groups of insects (Robbins and Opler, 1997).

Any group of phytophagous animals must draw its food supply from those plants that are available in its topographica1 and ecological range (Dethier, 1954). For instance, the butterflies are primarily a tropical group, and therefore there is a relatively greater utilization of primarily tropical than of temperate families of plants. The choice of oviposition site by the imago is also important. Many adult butterflies and moths lay their eggs on certain food plants with great precision as stressed by Merz (1959), but mistakes have been recorded (Dethier, 1959). In such cases, the larvae either have to find an appropriate plant or perish. There is an obvious selective advantage in oviposition on suitable plants, but inappropriate choices can be overcome by movement of the larvae. Furthermore, larvae feeding on herbs often consume the entire plant, and then must move, even if the adult originally made an appropriate choice. Larval choice therefore plays an important role in food plant relationships. An excellent review of a long series of experiments pertinent to this subject has been presented by Merz (1959); much of the following is based on his account. The condition of a given larva often has an effect on what foods it will or will not accept.

Chemical factors are of great general importance in determining larval food choice. In the first place, potential food sources are probably all nutritionally unbalanced to some extent (Gordon, 1961). The exploitation of a particular plant as a source of food thus involves metabolic adjustments on the part of an insect. These render the insect relatively inefficient in utilizing other sources of food and tend to restrict its choice of food plants. Secondly, many plants are characterized by the presence of secondary metabolic substances. These substances are repellent to most insects and often may be decisive in patterns of food plant selection. It has further been demonstrated that the chemical compounds that repel most animals can serve as trigger substances that induce the uptake of nutrients by members of certain oligophagous groups (Thorsteinson, 1953). The presence of such repellent compounds may be correlated with the presence of the nutrients. Both odor and taste seem to be important. The chemical composition of plants often changes with age, exposure to sunlight, or other environmental factors and this may be critical for phytophagous insects (Dethier, 1954).

In terrestrial ecosystems, insects represent more than 70% of the fauna and also play an important role in the food chain for the natural balance. Insects are extremely important components of the bio-indicators of the world (Jana *et al*., 2009). Butterflies are potentially useful ecological indicators of urbanization because they are easily surveyed, and they are sensitive to changes in microclimate, temperature, solar radiation, and the availability of host plants for ovipositing and larval development (Fordyce and Nice, 2003). Increased urban features, including roads, buildings and mown lawns, correspond with decreases in butterfly species richness, diversity and abundance (Pocewicz *et al*., 2009). Urbanization is also associated with habitat degradation, including decreased plant species diversity, reduced water quality, and increased air and soil pollutions (Garg *et al*., 2009). The reductions in the amount and quality of the natural habitat associated with urban development negatively affect the natural biodiversity (Malagrino *et al*., 2008).

India has more than 1,400 species of butterflies, 330 of them in the Western Ghats alone, and of which 37 are endemic (Kunte, 2000). They are one of the important food chain components of the birds, reptiles, amphibians, spiders and predatory insects; they are sensitive to habitat and environmental change and act as health indicators of an ecosystem. Concern for butterfly conservation is growing apace as more and more people are becoming interested in these lovely insects, which, essentially, do no harm to the human race.

Study area

The present study on plant – butterfly interactions was carried out around Pachamalai hills, Eastern Ghats. The study mainly done in the areas of Gangavalli, Uthambium and Manmalai hills range and the major portion of forests is recognized by the Forest Department under the reserve forest (Topographical map of Tamil Nadu (No.581/11)

Survey of India, Chennai). All these ranges lie between latitude 78° 29' 20" East and 78° 42'40" East and longitude 11° 17' 44" North and 11° 28' 40" North.

Plant sampling

Field visits were organized during every season to overcome the identification problem by collecting the specimens in their flowering stages. Random enumeration of the species was made. The new unidentified specimens were preserved as a herbarium collection and identified later by referring to specimens at the Southern Regional Centre, Botanical Survey of India, Coimbatore and Rapinat Herbarium and Centre for Molecular Systematics, Tiruchirappalli, Tamil Nadu. The taxonomic identification was made following Bentham and Hookers system of classification as reported by Gamble (1935), Mathew (1982, 1983, 1988, 1996, 1998) and Pallithanam (2001).

Butterfly sampling

Belt transects: To determine butterfly interactions with plant species, the transect walk method was followed. Sampling was carried out in two rounds, one between January and March and the second between April and May. Twenty-five transects measuring 300 m each, were randomly marked for sampling. Each transect was surveyed four times, twice in each round. All butterflies seen within twenty meters on either side of the transect were recorded. Transects were walked between 10:00 hrs and 13:00 hrs, which corresponds to the peak activity period for most butterfly species. The sampling duration for each transect lasted between 45 to 60 minutes. Most butterflies were identified to the species level using (Kunte, 2000). Individual butterflies that could not be identified in flight, were caught using a butterfly net, identified and released.

Observations and results

Aerva sanguinoletha is a member of Amarathaceae and provided the nectar for the butterfly *Castalius rasimon* (Figure – 1), this plant reached a height up to 50 cm and produces flowers during March – May. *Leucas aspera* is a member of the Laminaceae. It's flowering period peaks during November – February and it reaches up to 50 cm in height. This plant supports various butterflies like *Borbo cinnara* (Figure – 2 & 7), *Junonia almanac* (Figure – 3), *Acraea violae* (Figure – 4 & 9), *Danaus chrysippus* (Figure – 5), *Ixias Marianne* (Figure – 6), *Pachliopta hector* (Figure – 8, 14 & 16) and *Papilio demoleus* (Figure – 10 & 15). *Stachytarpheta indica* reach a height of up to 60 cm and it provides nectar for two butterfly species i.e., *Borbo cinnar* and *Pachliopta hector.* This plant peaks in flowering during the months September – March. *Sarcosteman intermedium* is a leafless member of Asclepiadaceae that grows up to 250 cm in height It's flowering period is July – September. It supports the butterfly *Borbo cinnara* with its nectar. *Tridax procumbens* is a herbaceous form of Asteraceae with the head inflorescence. It reaches a height of up to 30 cm and produces flowers in peak between February and June. *Acraea violae* is one of the butterflies which feeds on the flowers of *T. procumbens.* A common weed plant, *Parthenium hysterophorus*, provides the nectar for the butterfly *Papilio demoleus*. This plant reaches a height of up to 75 cm. Flowering peaks during November – March. *Notonia grandiflora* supports *Hypolimas misippus* (Figure – 11) with its nectar. It reaches a height of up to 250 cm and flowering peaks during February – May. *Tarenna asiatica* provides nectar for *Neptis hylas* (Figure – 12) and grows up to 150 cm. Flowering peaks during December – April. *Pavetta indica* supports the butterfly *Euploea core* (Figure – 13). It reaches a height of up to 300 cm and flowering peaks during the months May–August. O*xystelma esculentum* provides nectar for the butterfly *Pachliopta hector*. This plant reaches a height of up to 200 cm and flowering peaks during September – February (Table - 1).

Most of the butterfly species collect the nectar from the plant *L. aspera* i.e., 41 % of the butterflies depend on *L. aspera* for their nectar and 11% of butterflies need *S. indica* for their nectar. The rest of the butterfly species depend on *A. sanguinoletha, N. grandiflora, O. esculentum, P. hysterophorus, P. indica, S. intermedium, T. asiatica* and *T. procumbens*. Each plant species supports 6% of the butterfly species. All the plant species found in the study area except for *L.*

Figure – 1
Host Name : *Aerva sanguinoletha*
Butterfly Name : *Castalius rasimon*

Figure – 2
Host Name : *Leucas aspera*
Butterfly Name : *Borbo cinnara*

Figure – 3
Host Name : *Leucas aspera*
Butterfly Name : *Junonia almanac*

Figure – 4
Host Name : *Leucas aspera*
Butterfly Name : *Acraea violae*

Figure – 5
Host Name : *Leucas aspera*
Butterfly Name : *Danaus chrysippus*

Figure – 6
Host Name : *Leucas aspera*
Butterfly Name : *Ixias Marianne*

Figure – 7
Host Name : *Stachytarpheta indica*
Butterfly Name : *Borbo cinnara*

Figure – 8
Host Name : *Sarcosteman intermedium*
Butterfly Name : *Pachliopta hector*

Figure – 9
Host Name : *Tridax procumbens*
Butterfly Name : *Acraea violae*

Figure – 10
Host Name : *Parthenium hysterophorus*
Butterfly Name : *Papilio demoleus*

Figure – 11
Host Name : *Notonia grandiflora*
Butterfly Name : *Hypolimas misippus*

Figure – 12
Host Name : *Tarenna asiatica*
Butterfly Name : *Neptis hylas*

Figure – 13
Host Name : *Pavetta indica*
Butterfly Name : *Euploea core*

Figure –14
Host Name : *Leucas aspera*
Butterfly Name : *Pachliopta hector*

Figure – 15
Host Name : *Leucas aspera*
Butterfly Name : *Papilio demoleus*

Figure – 16
Host Name : *Stachytarpheta indica*
Butterfly Name : *Pachliopta hector*

aspera and *S. indica* support 48% of the total butterfly species (Diagram - 1).

Discussion

Plant – butterfly interactions were observed in the Pachamalai hills, Eastern Ghats of Tamil Nadu and discussed below. Butterflies collect nectar from various plants in various seasons. The plant species *Aerva sanguinoletha* flowers in March – May and the butterfly *Castalius rasimon* comes to collect the nectar. *Leucas aspera* produces flowers during November – February and it supports many butterflies such as *Borbo cinnara, Junonia almanac, Acraea violae, Danaus chrysippus, Ixias Marianne, Pachliopta hector* and *Papilio demoleus. Stachytarpheta indica* produces the inflorescence in September – March, attracting butterflies like *Borbo cinnara* and *Pachliopta hector* to collect nectar. It was also observed that some butterfly larva were also found on the leaves of the same plant. The leafless twiner *Sarcosteman intermedium* produces flowers in July – September. The butterfly *Borbo cinnara* takes the nectar from this plant. *Tridax procumbens* produces flowers between the February and June. The butterfly *Acraea violae* is one of the butterflies which collects the nectar from the head inflorescence. The plant *Parthenium hysterophorus* provides the nectar for the butterfly *Papilio demoleus*. *Notonia grandiflora* supports *Hypolimas misippus* during February – May. *Tarenna asiatica* provides nectar for *Neptis hylas* during December – April. *Pavetta indica* supports the butterfly *Euploea core*. *Oxystelma esculentum* provides nectar for the butterfly *Pachliopta hector* and its flowering peaks during September – February.

Flower nectar is a primary food source for most butterflies. Butterflies take nectar from a wide variety of annuals, perennials, shrubs, trees, vines and herbs. In general, the more of a nectar flower that is in bloom, the more likely butterflies will be to select it for its nectar. Massed nectar flowers provide a large area of color or a strong scent that will attract the butterflies.

TABLE - 1: Plant-Butterfly Interactions Found in Pachamalai hills.

S. No.	Host plant	Butterfly name	HOP (cm)	Altitude found (MSL)	POF
1.	*Aerva sanguinoletha* (L.) Blume	*Castalius rasimon Fabricius*	50	400 - 550	March - May
2.	*L. aspera* (Willd.) Link	*Borbo cinnara* Wallace	50	350 – 600	November - February
3.	*L. aspera* (Willd.) Link	*Junonia almanac* Linnaeus	50	350 – 600	November - February
4.	*L. aspera* (Willd.) Link	*Acraea violae* Fabricius	50	350 – 600	November - February
5.	*L. aspera* (Willd.) Link	*Danaus chrysippus* Linnaeus	50	350 – 600	November - February
6.	*L. aspera* (Willd.) Link	*Ixias Marianne* Cramer	50	350 – 600	November - February
7.	*Stachytarpheta indica* (L.) Vah.	*Borbo cinnara* Wallace	60	450 - 600	September – March
8.	*Sarcosteman intermedium*	*Pachliopta hector* Linnaeus	250	350 - 600	July - September
9.	*Tridax procumbens*	*Acraea violae* Fabricius	30	350 – 650	February – June
10	*Parthenium hysterophorus* L.	*Papilio demoleus* Linnaeus.	75	750 - 1000	November – March
11	*Notonia grandiflora* Wallich ex DC.	*Hypolimas misippus* Linnaeus.	250	500 - 700	February – May
12	*Tarenna asiatica* (L.) Kuntze.	*Neptis hylas* Moore	150	550 - 800	December - April
13	*Pavetta indica* L.	*Euploea core* Cramer.	300	500 - 650	May - August
14	*L. aspera* (Willd.) Link	*Pachliopta hector* Linnaeus	50	350 – 600	November - February
15	*L. aspera* (Willd.) Link	*Papilio demoleus* Linnaeus.	50	350 – 600	November - February
16	*Stachytarpheta indica* (L.) Vah.	*Pachliopta hector* Linnaeus	60	450 - 600	September – March
17	*Oxystelma esculentum* (L.f.) R.Br.	*Pachliopta hector* Linnaeus	200	350 - 450	September - February

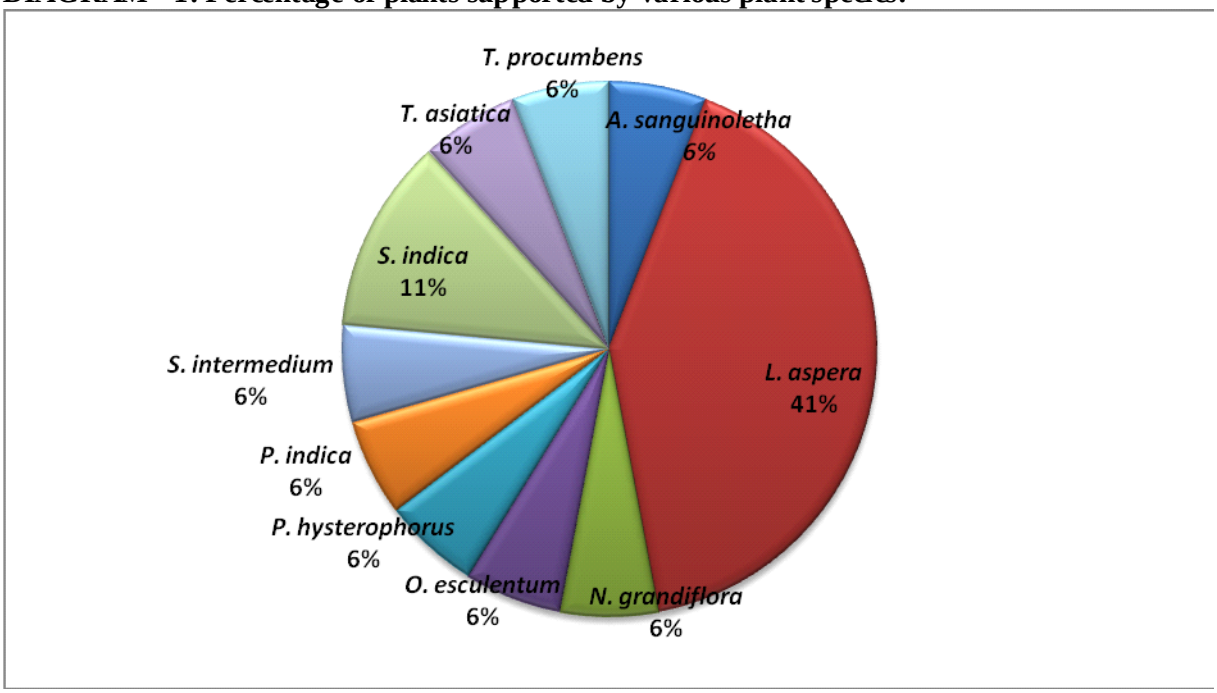
HOP – Height of the Plant, POF – Phenology of Flowering, MSL – Mean Sea Level.

Most of the butterfly species were found on *Leucas aspera* because it is found in cultivated fields, scrub jungles and wastelands. Flower opening was observed in the early morning (0200–0330 h). *L. aspera* produces 0.66 ± 0.09 µl of nectar per flower with a nectar sugar concentration of 28.60 ± 2.68 %. The nectar contains glucose, fructose and sucrose. The sugar analysis revealed that sucrose, glucose and fructose were the main components in the three species *Leonotis nepetifolia* (L.) R. Br., *Leucas aspera* (Willd.) Link and *Orthosiphon thymiflorus* (Roth) Sleesen. The ratio of glucose/ fructose was more than one in all nectar samples. The glucose/fructose ratio was maximum in *L. aspera* and minimum in *L. nepetifolia*, whereas the fructose/glucose ratio was maximum in *L. nepetifolia* and minimum in *L. aspera*. The

TABLE - 2: Some of larvae of butterflies and their hosts

S. No	Host plant	Butterfly larva	HOP	MSL	Appearing month
1.	Lemon tree	Lime butterfly	300	350 - 650	May – July
2.	Lemon tree	*Papilio demoleus*	300	350 - 650	May – July
3.	*Stachytarpheta indica*	*Papilio demoleus*	60	450 - 600	September - November
4.	*S. indica*	Lime butterfly	60	450 - 600	September - November

DIAGRAM - 1: Percentage of plants supported by various plant species.



percentage of sucrose was higher in *L. aspera* than in *O. thymiflorus. O. thymiflorus* had greater a concentration of glucose than the remaining two species (Shrishail *et al*., 2011).

In India, the monsoons govern the distribution of butterfly communities (Tiple & Khurad, 2009) to a large extent. It was reported that butterflies are good responders to changes in the environment (Krishnakumar *et al*., 2008). The relationship between butterflies and climate is complex, involving all four stages of the insect's life cycle. Food habits among species (Kitahara *et al*., 2000) also influence the relationships between climate and butterfly diversity and abundance (Southwood, 1975).

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CHECKLIST OF WATERBIRDS IN ANGUL DISTRICT, ORISSA, INDIA

by Rudra Narayan Pradhan, Himanshu Shekhar Palei and Hemanta Kumar Sahu

Introduction

A status survey of waterbirds in important water bodies of Angul, Athamallik division and Satkosia Gorge Sanctuary was conducted in joint collaboration with the Forest Department, the Post-graduate Department of Wildlife and Conservation Biology, North Orissa University, Takatpur, Baripada and the Nature Environment & Wildlife Society (NEWS). The survey was conducted during January 2012 in different ranges of these divisions.

Angul district is situated in the central part of Odisha. There are many important water bodies which attract migratory, local migratory and resident birds. During this survey a total of ten water bodies were covered, out of which four areas were surveyed in Angul and Athamallik division and two areas in Satkosia Gorge Sanctuary. The water bodies covered in different ranges of Angul, Athamallik division and Satkosia Gorge sanctuary include the Mahanadi River (MR), Sisupather Dam (SD), Manjore Dam (MD), Laupal MIP. (LMIP),Lunahandi Sagar Site (LSS), Athamallik (A), Derjanga Irrigation Reservoir (DIR), Samal Barrage (SB), Rengali Reservoir (RR), Nalco Ash-pond (NA)

Methodology

A direct visual count (with binoculars) was employed and where possible an actual count was taken. Where there were a large number of birds, an estimate (up to the nearest 100 individuals) was made. Birds were identified following Grimmest *et al.* (2001) and their status following Ali and Ripley (2001).

Results and discussion

It was found that the Mahanadi River and Sisupathar Dam had the maximum number (18) of waterbird species and Athamallik water body had 6 species. The detailed distribution of waterbirds is given in Table 1.

Migratory birds were found in 10 areas, local migratory birds in 6 areas, and resident birds in all the areas. Mahanadi River and Sisupather dam hosted a greater number of birds in comparison to other areas because of the fact that this area was easy to locate from the air and because of the complete absence of poaching, hunting or trapping. It also falls under Satkosia Tiger Reserve. In other areas like the Derjanga Irrigation Reservoir, Rengali Reservoir, Samal Barrage, Manjore dam and Laupal dam the submerged vegetation was more luxuriant, which attracted more migratory birds. The area of Mahanadi River and Sisupather dam is more similar to the other dams covered during our survey; hence, a greater number of birds were sighted. These areas are open and are easy to locate from the air. The Athamallik water body is situated near the foothills of Panchadhara and the total area is smaller in comparison to other water bodies. It is difficult to locate from the air and this may be the reason that no significant birds were located. But a detailed systematic study has to be made to establish any relation to the findings.

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Table 1. Distribution of waterbirds in different water bodies of Angul District, Odisha.

Common Name	*Scientific Name*	Sites									
		1	2	3	4	5	6	7	8	9	10
Indian Pond Heron	*Ardeola grayii*	v	v	v	v	v	v	v	v	v	v
Cattle Egret	*Babulus ibis*	-	v	v	v	v	v	v	v	v	v
Little Egret	*Egretta garzetta*	v	v	v	-	v	v	v	-	v	v
Intermediate Egret	*Mesophoyx intermedia*	-	v	-	-	-	-	v	-	v	v
Ruddy Shelduck	*Tadoma ferruginea*	v	-	-	-	-	-	-	-	-	v
Little Grebe	*Tachybapyus ruficollis*	v	v	-	v	v	-	v	-	v	-
Asian Openbill	*Anastomus oscitans*	v	v	-	-	-	-	v	-	-	-
Little Ringed Plover	*Charadrius dubius*	-	-	v	-	v	v	v	v	v	-
Little Cormorant	*Phalacrocorax niger*	v	v	v	v	v	-	v	v	v	v
Red-crested Pochard	*Rhodonessa rufina*	-	-	-	-	-	-	-	-	v	-
Black-winged Stilt	*Himantopus himantopus*	-	-	-	-	-	-	v	-	-	-
Indian River Tern	*Sterna aurantia*	-	v	-	-	-	-	-	-	-	-
Pied Kingfisher	*Ceryle rudis*	v	v	v	v	v	v	v	v	v	v
Ruddy Kingfisher	*Halcyon coromanda*	v	-	v	-	-	v	v	-	v	-
Stork-billed Kingfisher	*Halcyon capensis*	v	-	-	-	-	-	-	-	-	-
White-breasted Kingfisher	*Halcyon smyrnensis*	v	v	-	-	-	-	-	-	v	-
Great Cormorant	*Phalacrocorax carbo*	-	v	-	-	-	-	-	v	-	-
Common Sandpiper	*Actitis hypoleucos*	v	v	v	v	-	-	v	v	v	-
Northern Pintail	*Anas acuta*	-	v	-	-	-	-	v	-	-	-
Red-wattle Lapwing	*Vanellus indicus*	-	v	-	-	v	-	v	-	v	v
Common Hoopoe	*Upupa epops*	-	-	-	-	-	-	v	-	-	-
Lesser whistling Duck	*Dendrocygna javanica*	v	v	-	-	-	-	-	-	-	-
White-breasted Waterhen	*Amaurornis phoenicurus*	v	v	-	-	–	-	-	-	-	-
River Lapwing	*Vanellus duvaucelli*	v	v	-	-	-	-	-	-	--	-
Yellow-wattle Lapwing	*Vanellus malabaricus*	v	v	-	-	v	-	-	–	-	-
Black-crowned Night Heron	*Nycticorax nycticorax*	v	-	-	-	-	-	-	-	-	-
Greatstone Plover	*Esacus recurvirostris*	v	-	-	-	-	-	-	-	-	-
Indian Skimmer	*Rynchops albicollis*	v									

1-Mahanadi River; 2- Sisupather Dam; 3-Manjore Dam; 4-Laupal M.I.P.; 5- Lunahandi Sagar Site; 6- Athamallik; 7-Derjanga irrigation Reservoir; 8- Samal Barrage; 9- Rengali Reservoir; 10-Nalco Ash-pond

FOREST NEWS

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FORESTERS CONVENE IN ROME FOR COFO AND THE THIRD WORLD FOREST WEEK

The twenty-first session of the Committee on Forestry (COFO) and Third World Forest Week were convened concurrently 24 – 28 September 2012, at FAO Headquarters in Rome, Italy. The events were well attended, with more than 600 registered participants from 120 countries.

Major COFO agenda topics featured discussions on the state of the world's forests; translating the outcome of Rio+20 into action; strengthening forestry's cross-sectoral linkages; experiences of the International Year of Forests; programme priorities for FAO in forestry; Forest Resources Assessment Strategy; enhanced work on vegetation fires; and findings of the Strategic Evaluation of FAO forestry work. Formal COFO sessions were complemented by several events organized as part of World Forest Week, which served to engage a wider spectrum of participants than traditional plenary events with formal prepared interventions.

World Forest Week events included 56 seminars, technical sessions, panel discussions, "share fair" events, briefings, information sessions, etc.

Bilateral meetings were held with various country delegations, including China, Japan, Indonesia, India, and the Philippines, and discussions were held with many FAO HQs forestry staff to coordinate activities.

Among the recommendations made by COFO, of particular relevance for Asia and the Pacific, were the following:

- Support countries in enhancing the contribution of forests and forest products to economic development, including establishing an enabling environment for small forest-based enterprises, broadening the range of forest products, and educating the public on the benefits of forest products.
- Seek ways to maximize forests' contribution to greening the economy; work on cross-sectoral communication and collaboration; and further develop the content of the sustainable forest management (SFM) toolbox to support countries in implementing sustainable forest management.
- Support countries in:
  - promoting the important role of forests in maintaining the productivity of agriculture and natural resources, enhancing forestry and agriculture linkages across sectors, and strengthening policies and agencies to improve food security;
  - achieving development goals for wood energy, especially in relation to the formulation, implementation and monitoring of targeted and holistic wood energy policies, compiling reliable data and information on woodfuel production and consumption, and facilitating technology transfer and training on wood energy;
  - strengthening governance mechanisms and integrating forest issues into key environmental and land use policies at all levels, including through implementation

of the *Voluntary Guidelines on the Responsible Governance of Tenure of Land, Fisheries and Forests* and by hosting and supporting the Forest and Farm Facility;
  - strengthening cooperation at regional levels to promote sustainable forest management.
- Promote the sustainable management of trees and forests through an integrated approach across the landscape (including more cross-cutting and inter-departmental work within FAO), by collecting and documenting cases of effective integrated natural resources management.
- Cooperate with partners, including through the Global Partnership on Forest Landscape Restoration, to support action towards achieving the Bonn challenge, targeting the restoration of at least 150 million hectares of degraded forest lands by 2020.
- Support national efforts to strengthen the financial basis for sustainable forest management, including by developing an enabling environment for investment in the sector, demonstrating the multiple values and benefits arising from public and private investment in sustainable forest management, introducing new revenue streams, and more effectively accessing international financial mechanisms.
- Increase support to the development of improved tools and mechanisms for enhanced financing of the forestry and rangelands programme(s) in member countries in the Near-East Region, including South-South cooperation.
- Implement the Global Forest Resources Assessment Long-Term Strategy and prepare a set of voluntary guidelines on national forest monitoring.
- Strengthen the FAO fire management programme, propose a coordination mechanism among UN agencies and programmes, and develop a set of international guidance tools for managing wildfire-related risks at the landscape level.
- Take into account the recommendations of the strategic evaluation of FAO's forestry programs and activities.
- Explore opportunities for greater cooperation among the FAO Committees on Agriculture, Forestry and Fisheries.
- Provide information to member countries outlining the intended steps for strategic planning over the next nine months and clarify how work on forests will be budgeted (the Committee emphasized the need for an adequate forestry budget in FAO under the emerging strategic planning process).
- Implement the recommendations of the Regional Forestry Commissions (RFCs), making full use of inputs from the regions to identify synergies and ensure a strategic approach to forestry work.

The COFO report is available now at the COFO website: http://www.fao.org/docrep/meeting/026/me988e.pdf

Mr. S. Appanah, RAP National Forest Programme Adviser, presenting elements of the Asia-Pacific Forest Policy Think Tank during the "Speed Geeking" Share Fair event at World Forest Week.

Excerpts from the Speech by Mr Eduardo Rojas-Briales, Assistant Director-General, FAO Forestry Department at the Opening of the Third Forest Week

Good Morning!

Rio+20 has set a "green" pathway for the coming decade. Despite an apparent lack of visibility of forests due to a deliberate cross-cutting approach, the most important issues discussed at Rio+20 are, in fact, very closely related to forests. The challenges humankind is facing on food security, energy supply, climate change, land degradation and water availability can only be solved in a comprehensive and interrelated way. Given their cross-sectoral nature, these challenges will not be solved by forests alone, but nor can they be faced without the active consideration of forests and the people who live and work in them. Let me recall that the Collaborative Partnership on Forests' contribution to the Rio+20 process, which was developed just a year ago, fits exactly with the eventual outcome of Rio+20.

The era of isolated environmental, social and economic approaches to sustainability is over; today, the three pillars must be integrated. Long-term approaches have gained momentum, and increasing attention is being paid to the rights of future generations, including on the burning issue of public debt. Never has global debate been so near to core forest issues as it is now. Indeed, multifunctional forest management is the most advanced, broadly applied integration of the three pillars of sustainability of any discipline. In 2013 we will celebrate 300 years of the first conceptual definition of Nachhaltigkeit ("sustainability" in German) by Carlowitz, a true contribution of the Enlightment that set the foundation for modern forestry and forest science. Facing and solving the above-mentioned, interrelated challenges will contribute significantly to human development, the slogan of this COFO. Frequently in the past, the global forest community has been called on to respond mono-thematically to issues, on the basis of social trends ranging from wood to energy, land, food, biodiversity, rural employment and climate change. The forest community has always been reluctant to follow these fashions, since forests are such a long-lasting resource and foresters tend to take a long-term view. But our insistence on keeping a global, balanced perspective on forests, regardless of fashion has often been misunderstood by mainstream actors.

Landscape approaches are increasingly being advocated. Resilience is also a concept gaining attention. But, in order to ensure social resilience, the natural resources that sustain life need to be in a reasonable shape if they are to function as an effective prevention strategy, as shown by recent mega catastrophes such as the floods in Pakistan and the tsunami in SE Asia. Finding the optimum balance of land use to sustainably increase the provision of goods and environmental services is critical if the planet is to cope with a global population of 9 billion by 2050 and if all people are to achieve an adequate standard of living.

No international organization has a better comparative advantage to integrate all non-urban land uses than FAO. The Organization's new strategic framework, with your valuable guidance, will enable us to unlock the full potential of FAO in all the areas of its mandate. In an environment where increasing attention is being given to social issues, integrative land-use approaches are key for rural people. As an example of such integration, FAO is arranging an International Conference on Forests and Food Security in May 2013, which you are all warmly invited to attend.

However, cross-cutting work is not easy. It requires a wide range of skills, including in negotiation and information-gathering. It requires reliable information on the contribution of forests to other sectors, and it requires an effective social architecture. In direct conventional economic terms, forestry is very weak: forests cover 31% of the world's land area but contributes just 1.5% to the global GDP. The fact that the value of informal revenue and non-cash income in forests, and their

role as resilience-related safety nets, is little known weakens forests in national debates. And forests have an increasing number of interphases with other sectors and human activities that deserve attention in order to assure long lasting sustainable arrangements, including financial implications. In striving for greater recognition, the forest sector is up against many much bigger sectors used to taking mono-functional approaches and with higher concentrations of economic agents. It will be extremely difficult, therefore, for forests to get a balanced deal.

The idealised view that rural landscapes are formed by an harmonic mixture of fields and forests is quite misleading at the global level. In fact, specialisation on the basis of land productivity is the prevalent situation. Forests are generally found in remote, mountainous and climatically harsh areas, with poor soils that can sustain only low population densities. Forestry is the main, or better said the last, endogenous economic support of a vast area of the world, and is located at the beginning of a value chain while providing vital environmental services.

The only way the challenges facing forests can be overcome is by improving forest communication and strengthening the civil society architecture related to forests. Public forest services, although key in operational terms, will hardly be able to do all that needs to be done on their own. The International Year of the Forests was an exciting opportunity to strengthen capacity in forest communication and this should not be allowed to fade into oblivion. As you know, FAO is supporting member countries to both improve forest communication and strengthen the civil society architecture, and we can only implore donors to understand that investment in the hardware of forests requires a corresponding investment in its software.

Thank you for your attention!

WANGARI MAATHAI AWARD 2012-10-26

Narayan Kaji Shrestha has won the first-ever Collaborative Partnership on Forests Wangari Maathai Award for his outstanding contribution to forests.

The award was established this year to honor the life and work of the late Kenyan environmentalist Maathai, a champion of forest issues worldwide and the first African woman to win the Nobel Peace Prize.

Dr. Shrestha is recognized as one of the main architects of the community forestry movement in Nepal, which he has spent three decades promoting and which has contributed significantly to restoring forest resources in the country.

He guided early attempts to create a more participatory approach to community decision-making, reaching out to women and low-caste villagers and initiating the country's first user-managed community forestry group.

More than one-quarter of Nepal's forests are now protected by community forestry user groups.

In addition to influencing legislation, Dr Shrestha provided leadership to the national organization that later became the Federation of Community Forestry Users in Nepal and continues to be a guide and mentor to many practitioners and leaders involved in participatory resource management.

"Dr Shrestha's work captures the spirit of Wangari Maathai,"said FAO Assistant Director-General, Forestry, Eduardo Rojas Briales. "His vision, courage, commitment, intelligence and praxis is recognized though this award."

Dr Shrestha received the USD 20,000 award at a ceremony at FAO headquarters in Rome during the FAO Committee on Forestry and 3rd World Forestry Week meetings.

FOCUS ON EFFECTIVE FOREST REGENERATION

Prepared by Michelle Hutchins, Australian Youth Ambassador for Development

Given the rapid ongoing loss of biodiversity and the negative global impacts of climate change, there is an urgent need for cost effective and efficient forest restoration and rehabilitation on a massive scale. The high cost of traditional forest restoration and rehabilitation strategies is a serious constraint to addressing this need, especially for developing countries with limited financial resources. It is in these contexts that assisted natural regeneration (ANR) deserves attention, particularly as ANR is a low-cost approach to forest restoration and rehabilitation. Other benefits of using ANR include restoring biodiversity, enhancing ecosystem services and sequestering carbon to help mitigate climate change.

The Philippines has been using the ANR forest technique in varying forms for nearly 30 years. A three-year FAO-funded project, "Advancing the Application of Assisted Natural Regeneration (ANR) for effective low-cost forest restoration" involved application of ANR in three project sites in the Philippines. As a result of the success of this project, FAO funded an additional project, "Applying ANR for restoring ecosystem services in Southeast Asia," involving the establishment of ANR model sites in Cambodia, Indonesia, Lao PDR and Thailand (TCP/RAS/3307).

After years of practical application and policy-level mainstreaming of ANR in the Philippines, a study tour to the Philippines was a key component of the regional TCP/RAS/3307 project enabling participants currently implementing ANR in their respective countries to have a timely opportunity to learn from the Philippines experiences.

The ANR Study Tour was organized 7-9 August 2012, in Danao, Bohol, Philippines, with 28 participants attending from government agencies and NGOs from Cambodia, Indonesia, Lao PDR, Thailand, Philippines and Singapore. The study tour was organized by the FAO Regional Office for Asia and Pacific (FAO-RAP) and the Bagong Pagasa Foundation (BPF), Philippines. Additional support was provided by Department of Natural Resources and Environment, Philippines (DENR) and the Municipality of Danao, Philippines.

The study tour was a key component of the regional project. It enabled participants to share lessons learned, discuss the challenges and successes they are currently experiencing whilst implementing ANR at their model sites, and afforded an opportunity to encourage possible further implementation and up-scaling of ANR across the region.

The objectives of the study tour were to:

- Enable participants from Cambodia, Lao PDR, Indonesia and Thailand to learn practical skills in regard to ANR application from the Philippines;
- Promote the application of ANR method for restoration of forest ecosystem services;
- Share lessons learnt, challenges and successes with implementation of ANR;
- Build regional collaboration and networks with the country participants, Philippine government and NGO's; and
- Inspire and motivate participants of the benefits of ANR, encourage further implementation and discuss opportunities for up-scaling ANR across the region.

Key outcomes of the study tour included strengthening of the regional ANR network, suggested improvements for the training manual, identification and elaboration of the next steps to promote greater uptake of ANR, including improving awareness raising and communication strategies for foresters, policy/decision makers and other stakeholders. FAO-RAP also used the ANR Study Tour as an opportunity to thank the Municipality of Danao for its outstanding efforts in promoting ANR. The local government legislative body of Danao (Sanggunian Bayan) passed an ordinance declaring Danao as the first

"ANR municipality" in the Philippines. Mr Patrick Durst (FAO-RAP) presented Municipal Mayor Gonzaga with a plaque in recognition of their support of ANR.

Mayor Gonzaga receiving plaque from Patrick Durst

Site conditions at project start up

Site conditions after 5 years of ANR

PROMOTING UNDER-UTILIZED INDIGENOUS FOOD RESOURCES FOR FOOD SECURITY AND NUTRITION IN ASIA AND THE PACIFIC

Prepared by Patrick B. Durst

Everything from soup to nuts was literally on the table for the Regional Symposium on "Promotion of under-utilized indigenous food resources for food security and nutrition in Asia and the Pacific," convened 31 May – 2 June, in Khon Kaen, Thailand. The 130 participants from more than 30 countries eagerly dove into symposium discussions with the same enthusiasm as they demonstrated in sampling the wide array of under-appreciated and under-utilized indigenous foods on order for the introductory food exhibition. Discussions during the symposium focused on how such foods could be more effectively promoted to enhance food security and nutrition in the Asia-Pacific region.

Background

Modern food systems have evolved to be highly dependent and focused on only a handful of staple foods, meat and fish, leaving a vast array of traditional and indigenous food resources to be under-appreciated and under-utilized. But, while these foods are largely neglected by mainstream research, extension, and food security programs, many are highly nutritious, environmentally friendly, and culturally important.

With rapidly expanding populations, a diverse and broad-based approach to meeting food needs is required. This signals the importance of assessing the full range of plant and animal food resources for their potential contributions to food security. However, wider use of many traditional and indigenous foods is constrained by lack of nutritional information, lack of widespread knowledge on production practices and requirements, a negative attitude toward traditional indigenous foods (often considered "foods for the poor"), policies that fail to recognize and promote the important roles of these foods in food security and health, and lack of advocates to champion traditional and indigenous foods. Once lost from common usage, traditional and indigenous food systems are extremely difficult or impossible to recreate.

With these considerations at the forefront, FAO and Khon Kaen University endeavored to highlight the great potential and importance of traditional and indigenous foods. The symposium was organized in a multi-disciplinary approach, drawing upon resource persons and perspectives from agriculture, forestry, fisheries, plant genetics, food production and marketing, nutrition, food safety, rural development, ethobotany, anthropology, and more.

The symposium was jointly organized by the FAO Regional Office for Asia and the Pacific and Khon Kaen University, with support from the National Research Council of Thailand, Japan International Research Center for Agricultural Sciences, and a number of other sponsors.

The objectives of the symposium were to:

- raise awareness of the potential roles and values of under-utilized indigenous food resources in contributing to dietary diversity and household food security;
- share experiences and lessons learned in past and ongoing efforts, and to enhance partnerships and networking among stakeholders at all levels; and
- identify policy options and strategic actions for the promotion of under-utilized indigenous food resources in Asia and the Pacific, including evidence-based research.

Working groups focused on identifying the main challenges in achieving greater use of currently under-utilized foods, key knowledge and

information gaps, roles of local/traditional knowledge, research needs, roles of various stakeholders, policy needs, networking opportunities, and recommendations for future action.

Outcomes of discussions

A wide range of challenges were identified in relation to efforts to promote and develop under-utilized food resources.

Under-utilized *wild* food resources

- Over-harvesting of foods from the wild;
- Lack of documentation of traditional/ indigenous knowledge in management of wild species (identifying/selecting, harvesting, consuming);
- Sustaining wild foods in the face of increasing market demand;
- Lack of scientific evidence on value of wild plants (nutritional as well as other properties);
- Lack of clear ownership, tenure and access rights over wild food resources;
- Difficulty in delineating boundaries for benefit sharing;
- Lack of management plans for sustainable wild food harvest;
- Lack of agronomic data and information for various wild foods;
- Resistance from high-level policy makers and lack of political support for promoting under-utilized foods;
- Lack of certification and traceability systems for wild foods;
- Lack of consumer awareness on the value of indigenous foods;
- Risk of indigenous communities losing control over resources and intellectual property with commercialization of under-utilized foods; and
- Low prices for producers and collectors.

Under-utilized *farmed* food resources

- Low yields and high costs of production;
- Limited research and development support;
- Indigenous varieties are being lost due to climate change and industrialization;
- Inconsistent processing procedures and lack of quality control;
- Food safety concerns;
- Lack of certification standards for many foods;
- Lack of appreciation/recognition of foods by consumers;
- Small market demand; and
- Supermarkets cautious to market neglected foods or support commercialization.

A lengthy list of recommendations were put forward by the symposium, including the following:

Policies and strategies

- Strengthen intellectual property rights through better documentation and validation;
- Document traditional and indigenous knowledge and management practices;
- Develop sustainable management plans for under-utilized wild food resources;
- Engage policy makers in promoting indigenous foods and work to integrate under-utilized indigenous foods into government policies and programs;
- Develop legal instruments and codes of conduct for exploitation of wild indigenous foods;
- Develop/revise standards for under-utilized foods (GAPs, CODEX, etc.);
- Ensure/protect harvest rights of local communities;
- Use a balanced approach in domesticating wild food resources to safeguard benefits for local collectors of wild resources;
- Provide incentives to individuals who are maintaining genetic resources in situ and on farm;
- Promote safe and efficient processing technologies and value addition;
- Integrate issues of under-utilized food resources into the education curriculum;
- Develop joint programs and partnerships among government, private sector and NGOs to promote under-utilized foods;
- Recognize and support indigenous people who are dependent on production of indigenous foods.

Research

- Validate and screen indigenous foods (linking science with traditional knowledge);

- Identify the status of indigenous plant and animal food resources (e.g., endangered, rare, threatened, abundant, etc.);
- Research ecological implications of overharvesting wild species;
- Develop improved propagation techniques and technologies for domestication of wild food resources;
- Establish databases/references for different food species (using images, scientific names and their availability in different agro-ecological zones);
- Assess and validate the nutritional content of varieties and species; and
- Research allergic agents of different indigenous foods.

Advocacy

- Use Internet knowledge repositories;
- Link to media (provide stories on benefits of indigenous foods and effective utilization);
- Develop effective marketing strategies for under-utilized foods and build consumer awareness of the value of such foods;
- Promoting under-utilized foods through food festivals, diversity fairs, food competitions, food tasting events, etc.; and
- Work for the designation of an "International Year of Underutilized Food Resources."

Partnerships and networks

- Enhance regional networks of partners to share knowledge, information and research findings;
- Promote public-private partnerships for promoting under-utilized foods;
- Strengthen networking using Internet and web-based tools (ICT) and online platforms for exchange of information;
- Encourage exchange visits, North-South and South-South collaboration, joint research and educational programs;
- Support collaborative efforts to conserve genetic resources and promote germplasm exchange; and
- Support exchanges among scientists, technicians, researchers and others.

For more information, please contact: Nomindelger.Bayasgalanbat@fao.org The meeting documents for the symposium can be accessed at: http://www.fao.org/asiapacific/rap/home/meetings/list/detail/en/?meetings_id=650&year=2012

ANOTHER AWARD FOR FAO LEASEHOLD FORESTRY PROJECT IN NEPAL

Prepared by Simmithiri Appanah and Govinda Kafley

Introduction

President Theodore Roosevelt once said, "Far and away the best prize that life has to offer is the chance to work hard at work worth doing." That remained the driving force for the FAO Team working on Leasehold Forestry in Nepal. But yet again, the Project has been recognized with an award by the Government of Nepal, making this initiative perhaps the most recognized in the development field in Nepal. The best part of the awards is the fact that these awards were given to the villagers directly involved in improving the environment while raising their livelihoods.

FAO has been providing technical assistance (TA) for the Leasehold Forestry and Livestock Programme (LFLP) in Nepal, with funding support from the Government of Finland (GCP/NEP/062/FIN). In addition to providing technical backstopping to LFLP, the project has been piloting leasehold forestry in an integrated way in four districts of Palpa, Nawalparasi and Tanahun. This is in addition to work being carried out by the

Government of Nepal in other districts through an IFAD Grant. Leasehold forestry, an extension of Community Forestry of Nepal, involves providing extremely impoverished households with a small piece of state forest for the twin objectives of: i) raising their household income through increased forest and livestock production; and ii) ensuring the forest area is rehabilitated. The project builds the capacity of group members for developing and strengthening their community institutions, developing agroforestry on the leased lands, and carrying out income generating activities including livestock (especially goat) rearing. The project also facilitates the development of linkages between groups and various other agencies and development partners to support them in an integrated way.

Project intervention

The sites where the Project is piloting LFLP work are as following:

- The Kauledanda Leasehold Forest Intergroup is in Jhirubas, a remote, hilly village in Palpa district. Its inhabitants are mainly Magars, with some Dalits and Thakuri. Most of the women cannot speak in the Nepali language, and only communicate in local Magar language. The people have been practicing shifting cultivation, which has lead to forest degradation and various environmental problems. The challenge here was to motivate local farmers to abandon shifting cultivation in favour of perennial cropping, with adoption of leasehold forestry as one option.
- The Hupsekot Leasehold Forest Intergroup is located about 60 km from Parasi, the headquarters of Nawalparasi district. Most of the people residing here are from the Magar community. They are lagging behind economically, and their main source of income is from agriculture, livestock rearing and wage labour. Shifting agriculture predominates in the mid-hills of the region.
- The Amdanda Leasehold Forest Intergroup is in the Tanahun district, within walking distance from the Mugling-Narayanghat highway. The area was initially covered with forests of Shorea robusta, Schima wallichii and other associated species about 50 years ago. But with increasing population pressure, the forests were destroyed by shifting cultivation. It has been a challenge for the Department of Forests and local people to restore the lost forests.

The Project started piloting leasehold forestry in Nawalparasi and Palpa districts in 2010. Up to now, the project has formed 19 Leasehold Forestry User Groups (LFUGs) involving 227 households with 247 hectares of leased lands in Jhirubas (Palpa district) and 16 LFUGs involving 181 households with 185 hectares of leased lands in Nawalparasi district.

The Amdanda cluster (Tanahun district) has three LFUGs that were formed in 2007 by the District Forest Office under LFLP. There are 21 households managing about 14 hectares of LF lands in Amdanda cluster. The cluster has been supported with seeds and seedlings for plantations, together with technical inputs by the Project.

Results

Under Leasehold Forestry treatment, land previously under shifting agriculture has begun to change; in Amdanda of Tanahun, following five years of intervention, the leased plots are covered with forage grass and tree species are springing back. Forage grass like molasses (*Melinis minutiflora*), stylo (*Stylosanthes guianensis*), napier (*Pennisetum purpureum*), broom (*Thysanolaena maxima*), dinanath, forage peanut (*Arachis pintoi*), Setaria (*Setaria* spp) have been introduced. Tree fodder species like tanki (*Bauhinia purpurea*), bakaino (*Melia azadirach*), *Leucaena leucocephala*, and *Ficus* spp. were likewise planted.

Under the protection of the Leasehold Forestry, several native species like sal (*Shorea robusta*), chilaune (*Schima wallichii*), barro (*Terminalia belerica*), and saj (*Terminalia tomentosa*) are emerging from root stock and coppices.

The leased forest lands have started producing forage and fodder. Broom cultivation has started giving income to the farmers. In Jhirubas Palpa, farmers have sold brooms which earned them more than NRs. 0.5 million (US$5,780) in 2011. Similarly, farmers of Hupsekot have also sold

Figure 4: Fodder and Forage plants inside Leasehold Forest, Amdanda, Tanahun

brooms for about NRs. 0.4 million (US$4,624). In Amdanda, on average, each household gets 250 headloads (each headload weighs approximately 30 kg) of forage/fodder per year. This supply has saved users' time, as previously they had to go to national forest areas for these products.

Increased forage/fodder production in leased plots has supported the farmers for livestock rearing, especially goat rearing. Further, with improved investment and training in livestock health, goat production has accelerated. Farmers are beginning to earn extra income, bringing in cash over a short period. This remains the cornerstone of the project – poor farmers are dependent on quick income, and forestry projects have rarely provided such an opportunity.

Following the formation of the LFUGs, they are now in a position to access to additional resources from a variety of other sources. Government and Non-government agencies have supported the farmers in different activities. In Jhirubas and Hupsekot, a total of NRs. 3.2 million (US$36,994) has been pooled from other agencies like the District Development Committee, Village Development Committee, Women Development Office, District Soil Conservation Office, Ministry of Energy, and the Alternative Energy Promotion Centre (AEPC). These organizations have supported various activities like NWFPs cultivation, local electrification (5 kilowatts in Hupsekot), drinking water, small irrigation projects, vegetable farming, toilet construction, solar panel installation, bee keeping, and other income-generating activities.

Recognition of the intervention

The work has since its inception been receiving several commendations and awards. They are:

- In 2010, just six months after implementation, the Kauledanda Leasehold Forest Intergroup (Palpa district) was awarded the "Mountain Development Award 2010" that included a certificate and cash prize of NRs 200,000 (US$2,312) by the Ministry of Forests and Soil Conservation;
- In 2011, Hupsekot Leasehold Forest Intergroup of Nawalparasi district was the co-winner of the Mountain Development Award 2011, and received a certificate of appreciation and a cash prize of NRs 100,000 (US$1,156);
- In 2011, Mr. Narayanan Dev Bhattarai, Project Team Member, received a certificate and cash prize of NRs 5,000 for his work in developing leasehold forestry in the Western Regional Directorate of Forests;
- In 2012, Amdanda Leasehold Forest Intergroup of Tanahun district was awarded the "Environment Conservation Award 2012" with a cash prize of NRs 25,000 (US$289) and a certificate by the Ministry of Environment, Science and Technology.

It is interesting to note that the award in 2012 was for technological development. The Project has developed a model for replacing shifting cultivation with community forestry approaches. This model is ideally suited for rehabilitating the heavily degraded midhills of Nepal. The earlier awards were for efforts to reduce poverty among forest-dependent communities through innovative approaches adopted in the leasehold forestry model. The overall benefit of all these recognitions is that now Leasehold Forestry approaches are being adopted by other local governments throughout Nepal. All the Team Members and LFUGs behind this initiative deserve to be congratulated.

IMPROVING PEOPLES' LIVELIHOODS IN CAMBODIA THROUGH COMMUNITY FORESTRY

Prepared by Jeevanandhan Duraisamy, FAO, Cambodia

Cambodia has approximately 10.7 million hectares of forest, covering 58.9 percent of its land area. It is the 30th largest tropical forest in the world and the 13th most forested country. Cambodia covers an area of 181,035 square kilometers. The Mekong River dominates its geography, but in the center is the Tonle Sap Lake, which is rich in biodiversity.

The forests of Cambodia vary from province to province, but include evergreen, semi-evergreen (west and northwest), deciduous (northeast), swamp, mangroves and bamboo forest. There are also re-growth and plantation forests, as well as open forest types including evergreen shrub land and dry deciduous shrub land.

However, the extent and quality of Cambodia's forest has declined in recent decades. Considerable areas have been degraded due to logging, forest fires, land-grabbing, encroachment and intensified shifting cultivation. Between 2002 and 2005/6, Cambodia lost about 379,485 hectares of forest, averaging about 0.8 percent a year. As a consequence, Cambodia has been classified as a "high forest cover, high deforestation" country.

The rural economy is dominant in Cambodia and the majority of the rural populations are subsistence farmers; 75 percent of these depend on access to natural forest resources for essential products, energy and food. Forests also provide supplementary income and employment. A rough estimate based on limited data sources suggests that forest resources account for 10-20% of household consumption and income resources for roughly one-third of the population.

While forests have substantially provided the basis for rural livelihoods, they have also been a source of conflict and exploitation. The Khmer Rouge used the forests for cover, and its resources to finance their activities in the 1970s; thus, in the 1980s forest resources were used to finance restoration work.

The National Forest Programme (NFP) and Community Forestry (CF)

The creation and implementation of the National Forest Programme (NFP) shows the willingness of the RGC to achieve sustainable forest management. Through the NFP Facility, FAO provided support to the reformation of the 2010-2029 NFP. FAO's NFP Facility support helped the government to identify a strategy for utilizing and protecting unmanaged forest areas, while also forwarding a poverty alleviation strategy to meet Millennium Development Goals.

The NFP was created under the guidance of the Forest Law 2002, the Independent Sector Review (ISR) 2004, the Technical Working Group on Forest and Environment (TWGFE) 2004, and the Cambodian Millennium Development Goals (1&7). During the creation of the NFP, input was given from International Development Partners such as: FAO, DANIDA, DFID, GTZ, ITTO, JICA, NZAID, and World Bank.

The Operational Framework of the NFP consists of six implementation programmes, one of which is community forestry. These programmes will be complemented by shorter term (5 year) rolling plans and detailed one-year action plans.

The six programmes are as follows:

- Forest Demarcation, Classification and Registration
- Conservation and Development of Forest Resource and Biodiversity
- Forest Law Enforcement and Governance
- Community Forestry Programme
- Capacity and Research Development

- Sustainable Forest Financing

Community Forestry Programme in NFP has three sub-programmes:

- Community Forest Identification and Formalization
- Community, Institutional and Livelihoods Development
- Community Forestry Development Support

The community forestry program meets NFP objectives in many ways. CF aims at managing permanent forest estates in a sustainable way. All CFs will be permanently demarcated and registered as public land; multi-purpose forest management will take into account biodiversity conservation and environmental services; CF will allow public participation in decision-making and if mobilized, they can protect the forest through considerable human resources; CF modalities can enhance socio-economic development. This programme will develop effective models and tools for supporting communities for sustainable forest governance and management, utilization, marketing and benefit distribution. Furthermore, CF contributes to mitigation of climate change through forest conservation.

At this point in time, the first 7 steps to formalizing CF have been completed and the steps to completing the legalization process are underway. Sub-programme 2—Community, Institutional and Livelihoods Development—is the most important phase in the CF Programme and will thus be the main focus.

Role of FAO in community forestry in Cambodia

Community forestry has gradually developed, since the mid 1990s, through small pilot projects supported by the government, and international and national non-governmental organizations (NGOs), which have demonstrated that community forestry has considerable potential to protect the forests and enhance their productivity and capacity to support rural livelihoods, while at the same time stabilizing critical watersheds and ecosystems.

The establishment of CF began approximately in 1991. To date, there are 377 community forests with 347,740 hectares established; in addition, there are 13 potential areas with 20,203 hectares to be established.

FAO's most successful CF project can be found at the heart of Cambodia—the Tonle Sap Great Lake. This project was recognized at the national level as the foundation project for community-based natural resource management in the country. Central to the productivity of the Great Lake is the extensive forest and associated vegetation surrounding the lake. This unique seasonal forest provides habitat and food for numerous fish species and supplies the nutrients that support an exceptionally high fish population within the lake. As the lake has long been the main source of sustenance and survival for the millions of people that live around its shores—and even on its waters—in 1992, with the widespread clearing of flood forest vegetation, and the associated threat to fish productivity in the lake, the government sought donor support to investigate and develop management options.

In 1993, the Government of Belgium funded and FAO implemented the first project, "Restoration and Preservation of the Inundated Forest Ecosystems of the Tonle Sap and Downstream Areas", which then resulted in the formulation of the "Participatory Natural Resource Management in the Tonle Sap Region" in 1995. FAO was designated the executing agency while the counterpart agencies responsible for project implementation were the Ministry of Agriculture, Forestry and Fisheries (MAFF), the Ministry of Environment (ME) and the Ministry of Rural Development (MRD).

Phase I's overall objective was "to introduce and promote environmentally sustainable integrated natural resource management strategies which aim to improve the socioeconomic well being of the inhabitants of the Tonle Sap inundated forest ecosystem". The overall emphasis of Phase I was on data collection, field trials and capacity building of forest staff. It thus provided a solid foundation for Phase II.

Phase II was the implementation phase. The emphasis was on development and implementation of community-based natural resource

management over a wide area within a variety of environments. By the end of Phase II, 70,000 hectares of inundated forest and 20,000 hectares of upland forests were under community protection and management by some 180 villages. The last phase, Phase III, represents the consolidation phase with the emphasis on establishment of both community fisheries and community forestry within Siem Reap. By 2003, the project assisted 116 villages that were organized into 10 community fisheries organizations.

The project effectively developed a sustainable programme for community-based natural resource management in Siem Reap province. Numerous organizations sent staff to see and learn from what was being done in Siem Reap.

Community forestry has advanced considerably since the start of the project in 1995. Community forestry in Siem Reap continued to develop throughout the second phase while, during the final phase, the emphasis was on communication and extension, and management planning and implementation. The project established 40 community forestry sites in Siem Reap province, involving 79 villages and covering more than 20 000 hectares. All activities were integrated within the commune, district and provincial planning framework. When the document was written, there were 50 outstanding requests for assistance to develop community forestry within the province of Siem Reap.

Present project

Given the success of FAO's CF projects in Siem Reap, it is timely to apply lessons learned to communities in the northeast. The present project, "Enhancing Community-Based Forest Management & Utilization for the Improvement of Rural Livelihoods in Cambodia" is funded by the Spanish Agency for International Development Cooperation (AECID) with the Forest Administration (FA) and Ministry of Agriculture, Forestry and Fisheries (MAFF) as partner agencies.

This project will also run parallel with another one undertaken by the Regional Community Forestry Training Center for Asia and the Pacific (RECOFTC), which is supporting other CF developments in Ratanakiri and Kratie.

The primary beneficiaries of the project will be the rural populations of Mondulkiri, Kratie, Stung Treng and Ratanakiri provinces. These communities will benefit from increased tenurial security and formal recognition of forest management rights and improved livelihoods through enabling enhanced production and marketing of timber and NTFPs. Most importantly this will lead to the protection and management of forest land and biodiversity.

Currently, FAO is assisting the FA with the final steps of the legalization process—there are a total of 11 steps to be completed in the formalization of CF. These steps are needed in order for the community to best manage the forest, commercialize forest products legally and to maintain tenure over the land:

Community forestry challenges

There are several challenges in the implementation of the National Community Forestry Programme (NCFP) in the regulation/institutional framework and issues in socio-economic and costs areas:

- High costs in CF establishment. CF development is undermined by severe lack of financial resources (underfunded and unsustainably funded). CF relies heavily on the support of foreign donors and NGOs.
- Limited access to forest resources by the forest-dependent communities and stakeholders is exacerbated by lack of clear guidance and criteria for the identification of 'potential CF areas'.
- After 15 years (length of CF agreements), tenure security is not guaranteed. Add this to the many CF organizations that are not fully recognized and that leads to the de-motivation of many communities.
- Weak collaboration and support from institutions on NCFP implementation; need to improve capability and uniformity of their understanding and approach.

NEW RAP FORESTRY PUBLICATIONS

ASIA-PACIFIC FORESTRY WEEK: NEW CHALLENGES - NEW OPPORTUNITIES
A summary of events of Asia-Pacific Forestry Week 2011
RAP Publication 2012/11

Significant amounts of time and energy went into making Asia-Pacific Forestry Week 2011 a dynamic, interactive and participatory event. The goal was to build on the success of the initial forestry week by expanding and diversifying further. Representing all dimensions of forestry, more than 1,000 participants from governments, non-government organizations, research institutions, regional and international networks, UN agencies, universities and colleges attended the meeting. Seventy-five organizations were involved in the week, the majority supporting one or more of the 40 partner events that covered topics as diverse as governance, forest nutrition and communications, through to REDD+, forest regeneration, forest modelling and empowerment and human rights in forestry.

"Asia-Pacific Forestry Week: New challenges – new opportunities" is a summary of events and provides a synthesis of discussions held during the event. As so many activities took place simultaneously during the week, it is hoped that the report will allow APFW2011 participants to learn more about parallel sessions that they were unable to attend, and for those who missed APFW 2011, the report provides useful information about the new opportunities and challenges that were discussed.

COMMUNITY GUIDELINES FOR ACCESSING FORESTRY VOLUNTARY CARBON MARKETS
RAP Publication 2012/16

The impacts of climate change are many and varied, and hard to predict with great accuracy. However, one impact is beyond doubt; the climate change debate has brought forests to the forefront of the international development agenda. Forests have acquired a new value as one of the planet's most important stores of carbon, thus helping to ensure that levels of atmospheric carbon dioxide,

the most abundant greenhouse gas, are kept below critical levels.

As with all newly-appreciated values, new markets are not far behind. Carbon markets allow forest owners to gain recognition and financial compensation for the work they do to keep the forests in place, and to manage them sustainably. Since the 1990s, this market has steadily taken shape, growing from simple, scattered beginnings to become a genuinely new financial innovation – the forestry Voluntary Carbon Market, or forestry VCM.

Forest owners, however, have generally not been the first to understand the potential of this new market. It operates along completely different lines from conventional markets for timber and other forest products. It is similar to other types of Payment for Ecosystem Services (PES), but at the same time it is more regulated and more objective than watershed protection or biodiversity conservation. It is a complex concept, and there is a very real risk that forest owners may surrender the potential benefits of this new market to other, better-informed actors.

FAO engaged the services of Silvestrum VoF to produce guideless to help smallholders and local communities in the Asia-Pacific region to access the forestry VCM. Their aim is to create a more even playing field so that these grassroots stakeholders, and the groups that work on their behalf, can make the most of the potential benefits, and avoid the dangers, of this new market.

FAO ASIA-PACIFIC FORESTRY CALENDAR

29 October - 2 November 2012. ***24th Session of the International Poplar Commission***. Dehra Dun, India. Contact: http://www.fao.org/forestry/ipc/en/

31 October 2012. ***FAO BEFS ASEAN Project Inception Meeting***. Bangkok, Thailand. Contact: Beau Damen, Bio-energy Consultant, FAO Regional Office for Asia and the Pacific, 39 Phra Atit Road, Bangkok 10200, Thailand; E-mail: Beau.Damen@fao.org

19-30 November 2012. ***Code Reference Group Meeting and stakeholder provincial meeting and field trip for the GCP/PNG/003/AUL "Promoting sustainable forest management by developing effective systems of forest planning, monitoring and control in Papua New Guinea***. Port Moresby, Madang, Lae and Kimbe, Papua New Guinea. Contact: Roger Steinhardt, FAO Regional Office for Asia and the Pacific, 39 Phra Atit Road, Bangkok 10200, Thailand; E-mail: Roger.Steinhardt@fao.org

26 November - 7 December 2012. ***UNFCCC COP18***. Doha, Qatar. Contact: UNFCCC Secretariat, E-mail: secretariat@unfccc.int.

29 November - 30 December 2012. ***Establishing an East Asia Office for the Asia-Pacific Forest Invasive Species Network***. ***APFISN Plenary Meeting***. Bangkok, Thailand. Contact: Patrick Durst, Senior Forestry Officer, FAO Regional Office for Asia and the Pacific, 39 Phra Atit Road, Bangkok 10200, Thailand; E-mail: Patrick.Durst@fao.org

02 December 2012. ***Forest Day 6.*** Doha, Qatar. Contact: g.ginanjar@cgiar.org

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

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

- East Asian forests and forestry to 2020 (RAP Publication 2010/15)
- Forests beneath the grass: Proceedings of the regional workshop on advancing the application of assisted natural regeneration for effective low-cost forest restoration (RAP Publication 2010/11)
- Forest policies, legislation and institutions in Asia and the Pacific: Trends and emerging needs for 2020 (RAP Publication 2010/10)
- Report of the Asia-Pacific Forestry Commission Twenty-third session (RAP Publication 2010/09)
- Asia-Pacific forests and forestry to 2020. Asia-Pacific Forestry Sector Outlook Study II (RAP Publication 2010/06)
- Forest law enforcement and governance: Progress in Asia and the Pacific (RAP Publication 2010/05)
- Forest insects as food: humans bite back. Proceedings of a workshop on Asia-Pacific resosurces and their potential for development (RAP Publication 2010/02)
- Strategies and financial mechanisms for sustainable use and conservation of forests: experiences from Latin America and Asia (RAP Publication 2009/21)
- Asia-Pacific Forestry Week: Forestry in a changing world (RAP Publication 2009/04)
- The future of forests: Proceedings of an international conference on the outlook for Asia-Pacific forests to 2020 (RAP Publication 2009/03)
- Re-inventing forestry agencies. Experiences of institutional restructuring in Asia and the Pacific (RAP Publication 2008/05)
- Forest faces. Hopes and regrets in Philippine forestry (RAP Publication 2008/04
- Reaching consensus. Multi-stakeholder processes in forestry: experiences from the Asia-Pacific region (RAP Publication 2007/31)
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- Trees and shrubs of the Maldives (RAP Publication 2007/12)
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- What does it take? The role of incentives in forest plantation development in Asia and the Pacific (RAP Publication 2004/27)
- Advancing assisted natural regeneration (ANR) in Asia and the Pacific (RAP Publication 2003/19) - 2nd edition
- Practical guidelines for the assessment, monitoring and reporting on national level criteria and indicators for sustainable forest management in dry forests in Asia (RAP Publication: 2003/05)
- Applying reduced impact logging to advance sustainable forest management (RAP Publication: 2002/14)
- Trash or treasure? Logging and mill residues in Asia-Pacific (RAP Publication: 2001/16)
- Regional training strategy: supporting the implementation of the Code of Practice for forest harvesting in Asia-Pacific (RAP Publication: 2001/15)
- Forest out of bounds: impacts and effectiveness of logging bans in natural forests in Asia-Pacific: executive summary (RAP Publication: 2001/10)
- Trees commonly cultivated in Southeast Asia: an illustrated field guide - 2nd edition (RAP Publication: 1999/13)

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