Nagao Natural Environment Foundation

NEF Newsletter

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Nagao Natural Environment Foundation

Founded in 1989, the Nagao Natural Environment Foundation (NEF) is a non-governmental organisation dedicated to promoting nature conservation in developing countries. Since its establishment, the ***Research Grant Scheme*** has supported researchers from research institutions mainly in the Asia-Pacific region. A total of 289 research projects in 24 countries have been awarded grants during this period (as of January 2009). Meanwhile, the ***Scholarship Scheme*** has given support to a total of 2,794 students in eight countries in Asia (as of January 2009).

In September 2007, the NEF reviewed its schemes in order to contribute to nature conservation more effectively. In addition to the original Research Grant and Scholarship Schemes, we extended our support to include the intensive production of scientific work and filed activities under a new scheme called the ***Comprehensive Programme for Conservation Research and Activities.***

Comprehensive Programme for Conservation Research and Activities

- **Research Grant Scheme**
  - Research Grant Programme
  - Small-scale Research Grant Programme
  - Conservation Activity Programme
  - Publication Programme
- **Scholarship Scheme**
  - Scholarship Programme
  - Exchange Programme

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Comprehensive Programme for Conservation Research and Activities

Basic study on the aquatic fauna and flora and conservation activities participated in by local residents in the Mekong-Chao Phraya Region

The NEF has conducted its new scheme 'Comprehensive Programme for Conservation Research and Activities,' since 2006. The NEF facilitates scientific research and conservation activities by sponsoring local scientists and conservation groups in four countries in the Mekong-Chao Phraya region. These countries are Thailand, Lao PDR, Cambodia and Vietnam.

In the research component of the programme, the NEF is implementing the 'Basic study on the aquatic fauna and flora and conservation activities participated in by local residents in the Mekong-Chao Phraya region.' This is a five-year project to piece out the current status of fauna and flora in the Mekong-Chao Phraya region (the area comprising the drainage areas of the Mekong and Chao Phraya Rivers). Teams of researchers from the NEF and local institutions in the four countries are conducting research on aquatic organisms in cooperation with local residents. In particular, the project focuses on the aquatic environment nearby local residential areas (e.g., paddy fields, irrigation canals, small tributaries, swamps, etc.) as the organisms inhabiting said environments can be largely influenced, and in many cases threatened, by human activities. The NEF aims to improve local residents' consciousness in respect to biodiversity in these habitats by involving them in the research activities.

Research

The primal objective of this section is to investigate the current status of fish fauna in the Mekong-Chao Phraya region in cooperation with universities and research institutions in Thailand, Lao PDR, Vietnam and Cambodia. The research teams conduct field surveys on fish fauna and collect various data (e.g., data on collecting locality, habitat and local names for fishes) together with voucher specimens. Photographs of fishes are taken immediately after collection in order to record colouration when fresh. Specimens obtained during the surveys are stored in the collection rooms of the respective institutions/ universities that participated. The data of specimens and photographs obtained will be compiled as a database of the Mekong-Chao Phraya fishes.

A summary of activity in 2008 is as follows.

1. Annual meeting
   From 8 to 10 March 2008, the first annual meeting for the research section of this project was conducted at Siem Reap, Cambodia. The main objectives of this meeting were:

   (1) to share the information on activities conducted by the participants countries;
   (2) to share advanced techniques and knowledge for future project activities; and
   (3) to provide the opportunity to communicate among the participant researchers.

   Two or more participating researchers attended from each country. They presented an outline and results of the activities in their own countries in 2007, and discussed technical problems, etc. A field trip to the Great Lake (Lake Tonle Sap) and the surrounding area was also conducted during the meeting.

2. Field surveys
   As in the prior year, extensive field surveys were conducted in 2008. These surveys, investigating the current status of fish fauna were carried out periodically (for ca. 1 week every 1-2 months) in all four countries. The research sites of each country in the period from April 2008 to March 2009 are as follows:

(1) Thailand: lower reaches of Chao Phraya basin from Ang Thong Province to Nakornsawan Province; Omkoi watershed, Ping River of Chao Phraya basin in Chiangmai Province and Tak Province; and Mun River drainage (Mekong basin) in Ubonratchathani Province and flooded forests in Rasi Salai Province.
(2) Lao PDR: Mekong basin of Savannakhet Province.
(3) Vietnam: lower reaches of Mekong delta, including Vinh Long, Soc Trang, Tra Vinh, and Ben Tre Provinces.
(4) Cambodia: Mekong basin in Rattanakiri Province and Tonle Sap Lake, including its tributaries.

At the research sites, researchers collected fishes from various habitats using several types of fishing gear, such as hand nets, seine nets, casting nets, trawls and traps. The team received the help of local fishermen who possess invaluable knowledge of their local environment. GPS was used to obtain detailed geographical data for each site and the local names of fishes were recorded. The same fishes were also obtained from the fish markets. The fishes were fixed in 10% formalin for subsequent preservation, while photographs were taken for at least some of the specimens before fixation in order to record their colouration when alive or fresh.

3. Collection building

The fish specimens obtained in this project were fixed and preserved in collection rooms at their respective institutions. After identification, the specimens were registered with respective catalogue numbers, appropriately bottled with 75% ethyl alcohol, and systematically arranged in the collection rooms. Various data accompanied with specimens (e.g., collecting locality, GPS data, habitat, date and time, collecting method and name of collector) are recorded in registration books and computer databases. In the case where the institutions lacked an appropriate facility for storing specimen collections, the NEF contributed to the building or refurbishing of a room.

Although identification of the collections is ongoing, at least 425 species, belonging to 70 families and 19 orders, have been sorted. The most species-rich order is the Cypriniformes (158 spp., 37.2% of total), followed by the Perciformes (115 spp., 27.1%) and the Siluriformes (65 spp., 15.3%). About 380 species were photographed when fresh or alive. Of these fishes collected, there are several specimens with new discoveries in respect to taxonomy and/or biogeography. The results will be compiled in NEF publications and published in scientific journals.

Future plans

The specimens obtained in this project are being appropriately preserved in the facilities of the participating institutions as research resources, such as reference collections and vouchers with the results of this project, and as materials for various derived studies in the future. A database of fish images that presents the colour of the fishes when alive or fresh is useful for identification and research on, e.g., intraspecific variations. Detailed distribution maps of fishes based on the GPS data will contribute to the conservation activities in this region. The data on local names will be helpful when selecting standard local names for the respective fish species in each country. These will be presented in various NEF publications, such as scientific articles and reference books (e.g., pictorial books and/or identification guides), and will contribute to a better understanding of the distribution, taxonomy and species diversity of fishes in the Mekong-Chao Phraya region. It is also expected that the outcomes will be used in future policy making for sustainable resource use and development in the region. (Koichi Shibukawa)

Conservation Activities

Japan Wildlife Research Center

'Mizube-no-sachi' Nature's blessing of food for the living things around riparian areas

Introduction

Various kinds of riparian wildlife species are gathered and consumed as everyday food by local people in the Mekong Basin. This is true even around Vientiane, the capital city of Lao PDR. In this area, people enthusiastically gather various wildlife species, such as water mimosa, water clover, dragonfly larvae, crickets, grasshoppers, shield bugs, tadpoles, frogs and small fishes. These creatures are consumed locally and are also sold in the markets together with farm products. The reason why the people gather these creatures is, of course, not because of a food shortage. As well as ease in collection, people are traditionally attracted by these creatures' unique flavours and/or tastes. Environmental conditions have been well-preserved there for long term, and thus, people still enjoy the variety of food materials from the bounty of nature.

As the general term for the riparian wildlife consumed by people, we here call it 'Mizube-no-sachi,' the Japanese term meaning 'nature's blessing of food for the living things around riparian areas.'

Despite their abundance and importance, the species diversity of 'Mizube-no-sachi' has not been studied thoroughly. In order to understand the current status between 'Mizube-no-sachi' and local residents, we are conducting the research activities presented below.

Water clover growing beside rice

Local market in Dong Makai

One of the Mizube-no-sachi, 'Look Houa.' Mixed aquatic organisms which are used for soup

Research activities and achievements

The research started from 2007 around Vientiane. In the first year, we surveyed the 'Mizube-no-sachi' found in local markets. Through the survey, we found that many kinds of wildlife are consumed as everyday food by local people. In the second year, we conducted field surveys accompanied by

local people. We visited many places with various habitats, e.g., paddy fields, irrigation canals, ponds and shrubs. All of these areas are nearby the living space of villagers. Based on interviews with the villagers, we recorded various data on every edible wildlife species, including local names, seasons of collecting, edible regions of respective creatures, methods for cooking and habitats. Voucher specimens and respective photographs were taken as well. As a result, more than 50 plant species and 20 families of insects, 3 species of frogs and 4 species of crustaceans were recorded as the 'Mizube-no-sachi' in the research area.

Through this survey, we were impressed with the richness in species diversity of the 'Mizube-no-sachi' in this area. We could also recognise that the local people were properly distinguishing edible species. However, some confusion or misunderstandings about species recognition were observed. For example, two insect groups, predaceous diving beetles and water scavenger beetles were regarded as a single group showing sexual dimorphism, viz. male and female of single species. In another case, some plant species were confused and referred to together as a single vernacular name, because they are used for the same purpose.

Approach to wise use of nature

We believe that the most important key to nature conservation is to raise the awareness of local people about the 'wise use of natural resources'. Without it, bans do not work for nature conservation. Of the villagers, adults know a lot about the wildlife that they live with. Children are always playing in the fields with great interest in the wildlife they see. To sensitize such local people to the wise use of their nature, we would like to provide a field guide book on the 'Mizube-no-sachi' in the area containing interesting photographs and their legends in the local language. We hope that the field guide can be a clue to the sustainable use of the natural resources, even by local people who have little opportunity to receive good education.

Secondary nature conservation

There are two categories of nature, namely primary nature and secondary nature. Primary nature is non-modified nature, which keeps the original state without maintenance conducted by humans. To the contrary, secondary nature is a concept of nature that is modified and maintained by human activities, such as paddy cultivation and irrigation. In secondary nature, if it is balanced well, human beings can obtain a lot of benefits, including 'Mizube-no-sachi' and wildlife can reproduce. This well-balanced secondary nature should be a model of the 'wise use of nature.' In the case of Japan, secondary nature was established when paddy cultivation technology was introduced about 3,000 years ago. However, it has rapidly been disappearing within the last 60 years by reason of rampant development, hyper-intensification of agribusiness and the intensive use of pesticides, etc. It can be suggested that Japan is a negative example for other countries. We hope that this 'Mizube-no-sachi' research project will help recipient countries to find the best way to conserve their precious nature and resources. (San'ei Ichikawa)

An environment of secondary nature around paddy field in Mekong Basin

Network of Asian Rural Communities

Technical cooperation project on sustainable utilization of rice-field ecosystems (SURE)

A rice-field does not only supply rice to the people in Laos, but also creates a unique ecosystem that supplies various aquatic organisms as an important nutrient source to the people. The present technical cooperation project aims at (1) making a scientific list of aquatic organisms living in the rice-field ecosystem, (2) understanding the current situation in utilization of aquatic organisms by the people, and (3) developing appropriate methods and building the human capacity needed for education and an awareness raising campaign on the sustainable utilization of rice-field ecosystems.

The target area comprises 20 villages selected in the Naxaithong District, 35-50 km north from Vientiane. The Namxouang Aquaculture Development Center (NADC), under the Department of Livestock and Fisheries, the Ministry of Agriculture and Forestry, implements this project with the financial support of the NEF and technical support from the Japan Wildlife Research Center (JWRC). The Center for Environment and Development Studies at the National University of Laos and student volunteer groups at the university also participate in this project. Activities included in the project are (1) the collection of aquatic organisms in and around rice-fields by school children at primary schools of target villages, (2) scientific identification of collected aquatic organisms, (3) education of primary school children on the conservation of rice-field ecosystems, (4) interview surveys of the villagers on the situation of rice cultivation and the utilization of aquatic organisms, (5) preparation of various materials for education and awareness raising campaigns on environment protection, and (6) training primary school teachers in education methods for environmental conservation and the sustainable use of rice-field ecosystems.

Collection of aquatic organisms in a rice field by school children

From June 2007 to August 2008, project activities were conducted at 16 villages. At each target village, twenty primary school children collected aquatic organisms in rice fields, irrigation canals, reservoirs and marshes in the village. Collected samples of aquatic organisms contained 28 fish species belonging to 13 families, many species of insects including water scorpions, pond skaters, water bugs, grass hoppers, crickets, ladybirds, calico bugs, larval and adult forms of dragonflies, larval and adult forms of diving beetles, etc., and snakes, frogs, crabs, shrimps, leeches, snails and bivalves. In addition, many kinds of aquatic and submerged plants were collected. University students and NADC staff entertained primary school children, after the collection of aquatic animals, by playing games and dancing, and showed them Kamishibai, a storytelling material using several cards with illustrations, to teach the importance of rice-field ecosystem conservation to their lives.

The interview survey of villagers has revealed that about 80% of villagers are engaged in rice cultivation, and some of them are using agricultural chemicals that may affect the richness of aquatic organisms in rice-field ecosystems. Villagers catch aquatic organisms in and around rice-fields, mainly for familial consumption, as often as 240 days a year. The amount of collected organisms reaches 75kg/household a year. All of the fishes and most of other animals collected in the project, except for some snakes and leeches, are consumed by the villagers. Some of the plants growing in the rice fields are also consumed by the villagers.


Interview survey

Various materials for education and awareness raising campaigns on the conservation of rice-field ecosystems have been prepared. T-shirts and notebooks indicating the importance of rice-field ecosystems have been prepared by NADC and distributed to primary school children. Posters showing the life cycles and illustrated catalogues of aquatic animals have been prepared by JWRC biologists, and a series of Kamishibai explaining the importance of environmental protection in rice-field ecosystems has been prepared by university students. Two seminars on education methods for environmental conservation and the sustainable utilization of rice-field ecosystems were organised inviting primary school teachers at target villages.

The present project is conducted in a lowland suburban area situated in the Vientiane plain. It is hoped that the same kind of activities will be conducted in upland remote areas for comparison of rice-field ecosystems with lowland areas. (Hiromu Ikenoue)


Teacher training


Training by JWRC

Stefan Ottomanski

Conservation awareness activities with student groups

In this second year of our Conservation Awareness Activities, the NEF provided continued support for student volunteer groups engaged in nature conservation.

In 2007-08, support was given to four student groups in Laos, Cambodia and Thailand, to venture out of their campus and into communities, and carry out environmental awareness educations with children in village primary schools. These were more general activities that were largely left up to the students themselves to decide. This year, after a comfortable working relationship had been established with the groups, the NEF is sharpening its focus more toward the conservation of freshwater aquatic ecosystems.

In rural Laos, Cambodia and Thailand, one doesn't have to travel far to find healthy freshwater ecosystems. Within a few paces of most rural households is a pond, rice field or other watery domain, each with a rich assembly of creatures within. These ecosystems are also complex, surprisingly resilient, and provide excellent 'living classrooms' for teaching the fundamentals of biology, ecology and biodiversity - the baseline of all environmental conservation.

These 'neighbourhood ecosystems' are integral features of the landscape in Indochina and closely connected with the livelihood and local culture. Many of the creatures within are well known to the people of the region. Fishes, crabs, shrimps, aquatic insects and frogs are regularly caught for consumption. Others, especially some of the small and cryptic creatures are less well known, but are equally important to the ecosystem as a whole. There are countless animals and plants ranging from microscopic to gigantic. Many of these species, by changes in their presence or absence, can serve as early warning indicators of chemicals, pollution or other man-made environmental threats.

Icebreaker game at primary school in Vientiane, Laos

Student group volunteers dramatizing a lesson on aquatic ecology in Danxang Village primary school, Laos.

The NEF is now working to mobilize conservation-minded students to venture out to primary schools to raise awareness of the importance of the rich biodiversity of these aquatic ecosystems. The project provides training and funding for the logistics of the activities. The students first learn about the basics of ecology and then prepare to share what they have learned with schoolchildren. The activities follow an activity plan template provided by the NEF, which involves a series of three or four activity visits to each of a number of primary schools. A typical activity usually begins with icebreaker games, followed by a dramatized or illustrated talk on the topic of the day. This is typically followed by a more interactive activity in which the children are given the opportunity to respond and express themselves. Then there is the all-important field activity, in which the children leave the classroom to collect and observe in a nearby water habitat. Some samples are then brought back to the classroom for drawing and further study. The activity ends with a presentation by the children of what they have seen, learned and experienced.

Plans for the coming year include facilitating linkages between the various student groups and compiling the groups individual activity plans into Activity Kits for other groups to use.

Team teaching

The volunteer students plan, prepare and carry out their lessons as a team, also practicing some group skills useful when they graduate. Group work continues in the classroom, offering more interactive learning, both with the numerous volunteer teachers and with each other.

Students and teachers from Pakse and Vientiane compile their ideas at planning workshop

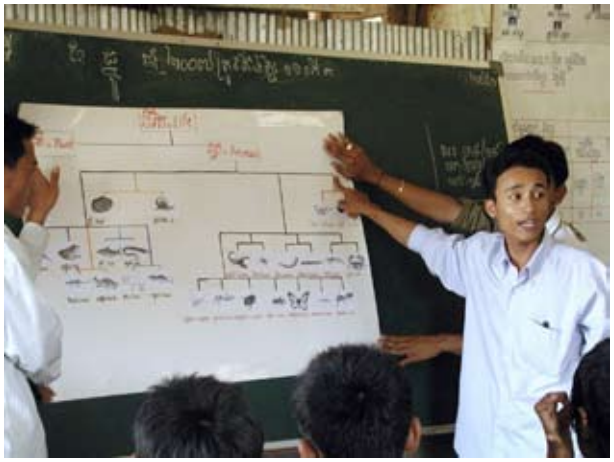
Preparing materials

Students are encouraged to prepare their own materials. The NEF is training the students in how to prepare more interactive activities, rather than the standard. Sengvilayvanh Singthavikhoune the student group leader in the Center for Environmental Development Studies at National University of Laos, Vientiane, shows some activity cards they have made for interactive activities in primary schools.

Teaching and showing how

From the outset, the volunteer students are challenged to become teachers and relate what they learn to primary school children. The turnaround time is sometimes quite fast; sometimes the students 'teach' what they have only just learned themselves, but the rapid and enthusiastic feedback from cheerful young faces spurs them on to learn - and teach even more.

Under construction: a dragonfly model for use in primary school classrooms. Vientiane, Laos



Student volunteers in Cambodia explaining some basic taxonomy

Students in Pakse, Laos, practicing a card matching game before applying it to their next primary school activity

Into the field

University students and children from Bakong Primary school in Siem Reap collect aquatic animals for their classroom activity. Like most primary schools in the region, the pond is one of the many rich aquatic ecosystems within a few minutes' walk from the school that offers a living field classroom to learn about ecology and biodiversity.

Collecting aquatic fauna with schoolchildren in Pakse, Laos

Up close

Many of the smaller aquatic animals are familiar to the children. However, they rarely get a chance to look closely at the different physical features that clearly distinguish one similar-looking animal from another. The use of a simple magnifying glass opens up a new world to the observer.

Children using lupes to see features of small aquatic animals for the first time

Drawing and presentations

Sketching from life, which forces the observer to look in close detail at features that might not be noticed, followed by a presentation, is one of the key activities. We found that most children can draw to a high level of detail once given some guidance. Finally the children talk about what they have learned and experienced in a presentation, which also provides useful feedback to the volunteers as to the effectiveness of their activities.

Drawing a water scorpion in Pakse, Southern Laos

Giving a presentation. Pakse, southern Laos

From student groups

Piseth Khin

He was one of the founding members of the Student Environmental Group set up at the instigation of the NEF at Angkor University, Siem Reap, Cambodia. He comes from a village on Tonle Sap Lake and remembers vividly the rich flooded forests of his childhood that have now mostly disappeared as Cambodia races toward development. A natural teacher, he applied his field experience and thirst for knowledge about the natural environment to the NEF activities, and took the lead in volunteer environmental awareness lessons in primary schools. Piseth recently graduated and is now undergoing on-the-job training for his new job at the Ministry of Environment in Phnom Penh.

Thipphachanh Soulinthone

"I am from Xokamnauy Village, Pakse District, in the southern part of Laos, and am now a 3rd year student at Champasak Agriculture and Forestry College (CHAFC). I am very proud to have the opportunity to work with the NEF project. I like to make people understand and to be aware of natural environment conservation, especially children who are important players in the future. We cannot exist without nature and we all need to understand the importance of conservation as well as using our natural resources. In our activities, we try to raise awareness of the importance of the diversity of plants and animals, especially small animals and insects, because without their existence humans cannot survive."

Noeum Kheoun

In the eyes of many of the student volunteers, the indiscriminate use of pesticides and other chemicals is one of the more visible threats to biodiversity. As the region moves toward development, traditional, biodiversity-friendly farming practices are being replaced by more intensive methods. Noeum Kheoun, a member of the Environmental Club at Angkor University, in Siem Reap, Cambodia, points out that the instructions on a bag of pesticide imported from Thailand are in a language that neither he nor the farmers can read.

Research Grant Scheme
Outlines of New Projects in 2008

Research Grant Programme

The breeding activities of the saltwater crocodile *Crocodylus porosus* in two river systems in Sabah, Malaysia

Research Grant Programme

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The saltwater crocodile, *Crocodilus porosus*, is a protected species in Sabah. Many major Sabahan river systems harbour populations of crocodiles. As with the case of many prolific egg-laying reptiles, survival from juvenile through breeding age depends significantly on the initial number of hatchlings, which in turn depends a great deal on the conditions of their nesting grounds. For such a long-living species, the destruction of nesting grounds and the subsequent loss of hatchlings will not have a sudden impact on the adult population size, but will rather demonstrate a very slow decline until the adult population becomes too old for reproduction or depleted by other factors. In many Sabahan river systems, these nesting grounds have not been identified or prioritised for protection in ensuring the long term survival, management and conservation of the species.

Objectives

The objectives of this study are:

(1) to study the breeding activities and the onset of breeding seasons of the saltwater crocodile in the western (Klias) and eastern (Serudong) parts of Sabah;
(2) to study the distribution of hatchlings and young crocodiles along the waterways after the breeding seasons;
(3) to compare the importance of the Klias and Serudong rivers for the reproduction of the saltwater crocodile based on the crocodile's distribution, size class and population structure and the number of hatchlings spotted during breeding seasons;
(4) to identify and map the nesting grounds of the saltwater crocodile in two selected Sabahan river systems based on the presence of hatchlings over a two-year period; and
(5) to make recommendations to the Sabah Wildlife Department on the management, protection and conservation protocols of the nesting grounds of the saltwater crocodile.

Methodology

Field studies will be conducted during the onset of hatching season (around November in Sabah) and the period will extend until the end of March. In the hatching season, surveys will be carried out monthly and the locations of hatchlings will be recorded. Hatchling detection will commence one month before and will end one month after the known hatching season in Sabah to allow for the detection of possible seasonal variations of the hatching season for different river systems. Outside the hatching season, surveys will be carried out bimonthly to obtain data on the distribution, size class and population structure of adult populations.

The crocodile surveys will be carried out using a corrected spotlight count method at night during low tide. It will be done during evening low tides when substantial parts of the mudflats are exposed and crocodiles can be easily spotted from their eye-shines. Once their eye-shines are spotted, they will be approached as close as possible to allow for total length (TL) estimation (and for positive identification of species – in the case of Klias, the status of the highly endangered false gharial, *Tomistoma schlegelii,*

is still unknown, although many villagers have claimed to have seen them over many years). Nesting grounds can be identified based on the location of hatchlings at the water's edge. Hatchlings take a few weeks to disperse from the point where the female guards them. The river banks immediately adjacent to these locations are the nesting grounds for female crocodiles. All the locations can be precisely marked using the Global Positioning System and can be mapped accordingly.

The locations of individual crocodiles will be recorded and used to generate the values for crocodile densities (crocodile/km) in each river. The hatchling distribution data will be analysed by incorporating the locations into the map of each river system, after which the nesting grounds will be determined. Ecological data will be analysed by making comparisons between river systems to determine the differences in distribution, size class and population structure that will lead to ranking the importance of each river system for crocodile reproduction in the wild.

Expected outcome

(1) Two-year data on the density of crocodiles in two selected Sabahan major river systems.
(2) Confirmation of a difference in breeding season between the east and west coast populations, giving a clearer picture for the life cycles of the saltwater crocodile in Sabah.
(3) Maps for the distribution of the important nesting grounds along the Klias and Serudong rivers based on two consecutive breeding seasons.

This project will provide practical information for the management and conservation protocols within those river systems and the maps will be important to launch other management measures on the populations, e.g., egg collecting for ex-situ hatching for farming or reintroduction programmes, by reducing hatching failures in the wild (an average of 60% egg mortality is estimated in the wild).

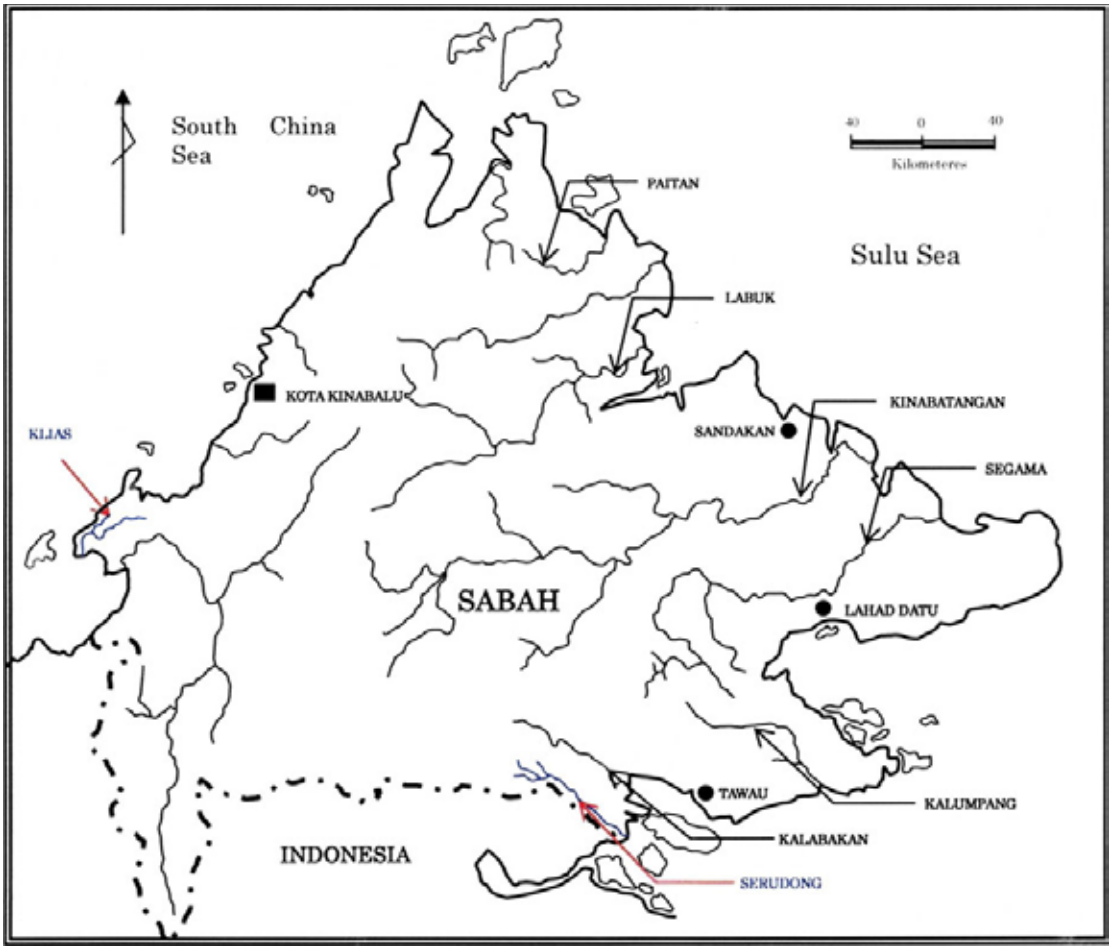

Figure 1. The map of Sabah showing the locations of Sabahan major rivers. The proposed study will concentrate data collection efforts in Sg. Klias and Sg. Serudong, marked in blue indicators and red arrows.

The potential benefits of forest retention in oil palm plantations for biodiversity conservation: conserving biodiversity may control rodent pest species (Muridae) through enhanced species interactions

Research Grant Programme

Henry Bernard
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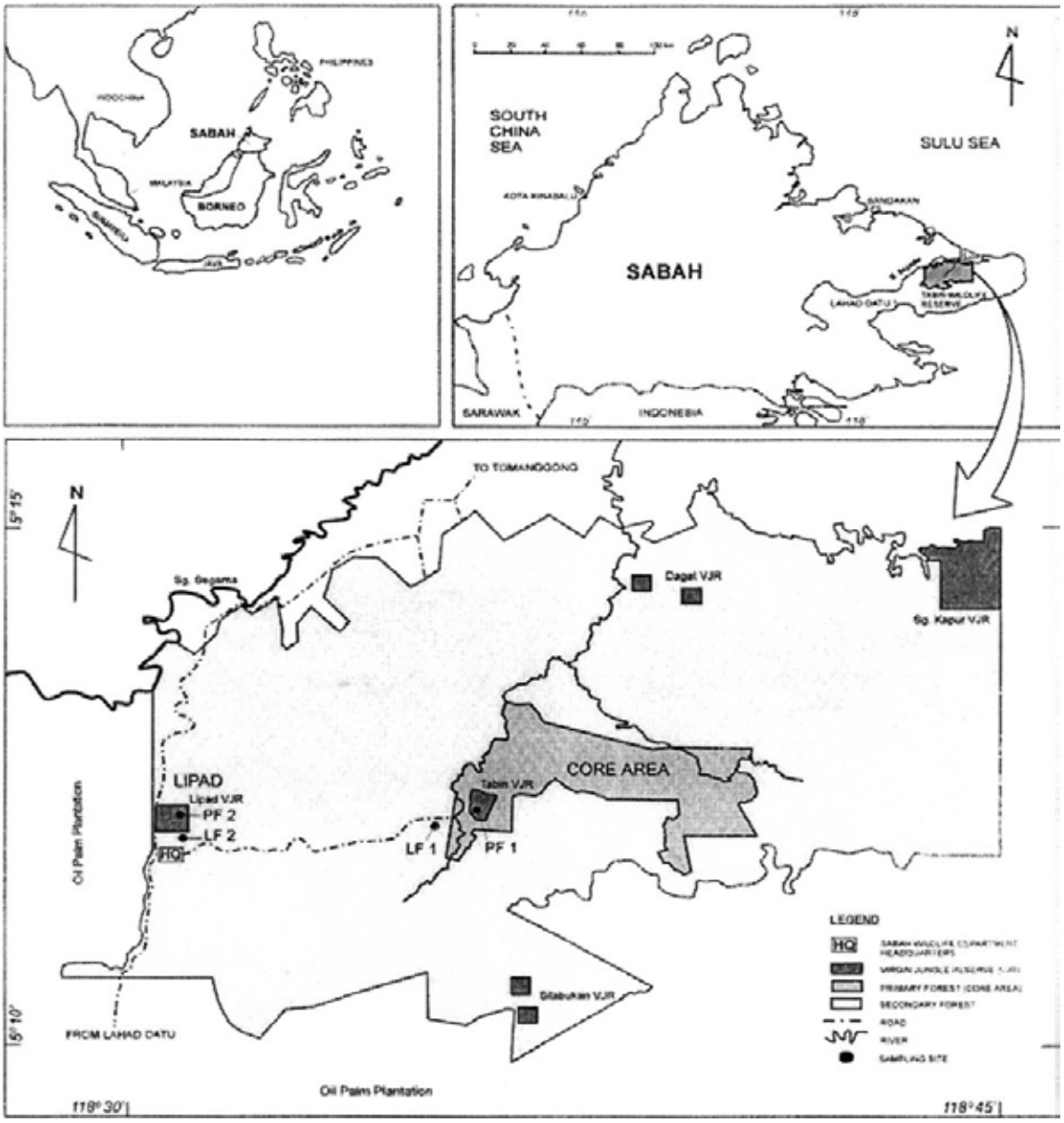
The few studies on small mammals conducted in plantation areas in Southeast Asia so far, do not yet provide a clear picture of what determined the occurrence and population density of various rodent species, especially in plantations of exotic crop species (Stuebing and Gasis, 1989; Buckle et al., 1997; Rajaratnam and Vaz, 1998; Bernard, 2003). The assessment of rodent populations conducted in 1994 in oil palm (*Elaeis guineensis*) plantations located adjacent to the western border of the Tabin Wildlife Reserve (TWR) in eastern Sabah, Malaysia, revealed an unexpectedly low number. During 22 months of intensive trapping in the oil palm plantations, only 49 rats were caught in an area of not less than 5,000ha (Rajaratnam and Vaz, 1998). In 1999, a trapping programme by myself with a trapping effort of 2,000 trap nights in young (one year after planting) and old (10-15 years after planting) oil palm plantations in the same region as that of Rajaratnam and Vaz's (1998) showed a similar trend with densities of rats estimated to be as low as 0.2-0.8 individuals/ha (Bernard, 2003). These results are in stark contrast to the situation in oil palm plantations in Peninsular Malaysia, where rats such as *Rattus tiomanicus* have been recorded in densities of as many as 250-500 individuals/ha (Wood, 1969). Rajaratnam and Vaz (1998) speculated that the evidently low populations of rats in oil palm plantations near Tabin was due to the predation of at least 17 species of rat predators, including wild cats, which rely on the forest at TWR as well as remnant forests within the plantation as a refuge and nesting sites. In Peninsular Malaysia, there is often no forest nearby or within oil palm plantation areas (Hafidzi, 1993). According to Rajaratnam and Vaz (1998), this finding suggests that if plantations are linked to existing forest reserves and sanctuaries, retaining pockets of forest within oil palm plantations could extend the habitat available to several species of wildlife, including important rodent predators such as wild cats. The presence of such wildlife in turn will benefit the oil palm plantations from reduced infestations by rodent pest species through continued predation of rats inside the plantations by the rat predators. While such interactions are known to occur in areas where oil palm plantations occur together with forests, it remains largely unknown how the various aspects of the landscape, such as distance from forests or the size of forest remnants, affects the predation on rats and consequent rat population densities.

In this research, I will carry out a study to test the hypothesis that forest fragments within a matrix habitat of an oil palm plantation located in the vicinity of a large forest reserve are beneficial for biodiversity conservation and that it is a useful approach in the management of rodent-pest populations in oil palm plantations. In particular, I will aim at investigating how the size and position of forest fragments may determine the diversity of rat predators utilizing the forest fragments and, in turn, how these predators will affect the diversity, assemblage dynamics and population densities of various species of rodents.

Forest fragments within large scale oil palm plantation



Location of the study sites in oil palm plantations and Tabin Wildlife Reserve in eastern Sabah, Malaysia (Bernard, 2003)

Objectives

The specific objectives of this study are:

(1) to assess the species compositions, richness and diversity of animals utilizing forest fragments within oil palm plantations;

(2) to study the effects of area size and degree of isolation of forest fragments within oil palm plantations on the patterns of species compositions, richness and diversity of animals utilizing the forest fragments;

(3) to study the variations in community structure and population dynamics of the small mammal fauna in oil palm plantations at varying distances from large tracts of natural forest habitats and at varying distances to forest fragments; and

(4) to provide useful information to oil palm plantation managers on how to contribute to biodiversity conservation within plantation areas.

Methodology

In order to address the objectives of this study, forest fragments of at least three different sizes (small, medium and large; each with three replicates) ranging from approximately 0.5 to 5ha within oil palm plantations and three degrees of isolation (near, intermediate, far; with three replicates) ranging from 100m to > 1.5km in distance from the forest of TWR will be selected for this study. To record which animal species utilize the forest fragments, to what extent and under which conditions of fragment size and degree of isolation, three methods will be employed: (1) direct observation by sightings; (2) indirect observations, through circumstantial evidence of animal presence such as foot prints, feeding signs and other field signs; and (3) camera trapping. To study the small mammals (mainly rats and mice) within the oil palm plantations at different distances from TWR, live trapping will be conducted on systematically sampled transects.

Expected outcome

The results of this study will be published as scientific papers in international journals in the fields of tropical biology and conservation. They will be also presented at local, national and international seminars and conferences. In this way, it is hoped that the information derived from the study could be utilized by oil palm plantation managers to promote biodiversity conservation in forest fragments within oil palm plantations and at the same time benefit from such management strategy in terms of controlling the population of rodent pest species inside the plantation. During this project, one and two local students will be trained at the Ph. D (or M. Sc.) and B. Sc. level, respectively.

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Influences of dhole *Cuon alpinus* on population and distribution of banteng *Bos javanicus* in Baluran National Park, Indonesia

Research Grant Programme

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This study will focus on the influences of dholes (*Cuon alpinus*) on the population size and distribution of banteng (*Bos javanicus*) in Baluran National Park (BNP), Indonesia. Banteng are wild cattle native to South and Southeast Asia and the flagship species of BNP. Banteng and dholes are both classified as endangered species by the IUCN Red List. The number of banteng from 1970 to 1996 in BNP ranged from 150 to 200 individuals. In 2002, regular observations in grazing areas estimated the minimum number of banteng was 101 individuals. In 2003, only 47 animals were observed through regular observations. In line with the decreasing number of banteng, the relative abundance of dhole was increasing and evidence of high predation was found. In 2004 and 2005, banteng monitoring was not conducted because of a lack of funds. The results of our recent monitoring, however, showed a dramatic decline of banteng. In 2006, concentration counts were conducted and only 15 banteng were observed. Based on the demographic data of banteng in 2002 and 2003, population modelling with VORTEX predicted that banteng would be extinct in 35 years.

We have provisionally concluded that dholes are responsible for the banteng decline, based on some indicators such as a bias of sex ratio toward males (under normal pressure of predation, the sex ratio is biased toward females), a very low proportion of young banteng and migration of banteng to closer habitats (forests) to avoid dholes. The preliminary survey showed that some banteng migrated to the managed forest outside the park. Some limitations of the previous monitoring, however, prevented us from making recommendations for the conservation of banteng and dhole.

Location of Baluran National Park in Java (the green area with a black spot)

Objectives

The objectives of this research are:
(1) to identify the current distribution of banteng and dholes;
(2) to estimate the current total population size and population structure of banteng and their predator (dholes);
(3) to investigate the influence of dholes on the banteng population;
(4) to investigate influence of dhole occurrence on banteng distribution; and
(5) to identify the role of managed forests on maintaining a viable population of banteng.

Methodology

(1) Survey of banteng and dhole populations

To survey banteng, a combination of direct and indirect observations will be conducted. Direct observations include regular monitoring from a tower in the grasslands and concentration counts at waterholes and in rivers. Regular observation will be conducted every day in the morning and in the afternoon. Concentration counts will be conducted in November, when there is no water available in

the forest. Data recorded through these observations include group size, composition of group, age class and sex of animals. The relative density of banteng will be estimated with an indicator count along transect lines located systematically over the research area. Indicators counted include tracks and dung. All locations of these indicators will be determined using GPS. Monitoring the population with line transects will be conducted in the rainy season, when banteng leave clear and measurable foot prints. The jaws of dead banteng will be collected, photographed and analysed to estimate the age of the dead animals. Cementum annuli analysis will be conducted to estimate the age of older animals, because, for older animals, this method is more accurate than an analysis of the structure and growth pattern of the teeth. To survey dholes, regular monitoring from the tower and indicator counts will be conducted. Data collected will include the number of animals and groups, as well as the size of the groups. Den locations will be searched and determined using GPS. The relative density of dholes will be estimated using indicator counts. The estimated number of banteng and dholes will be compared with the past data to understand the trend of population growth.

(2) Distribution of banteng and dholes

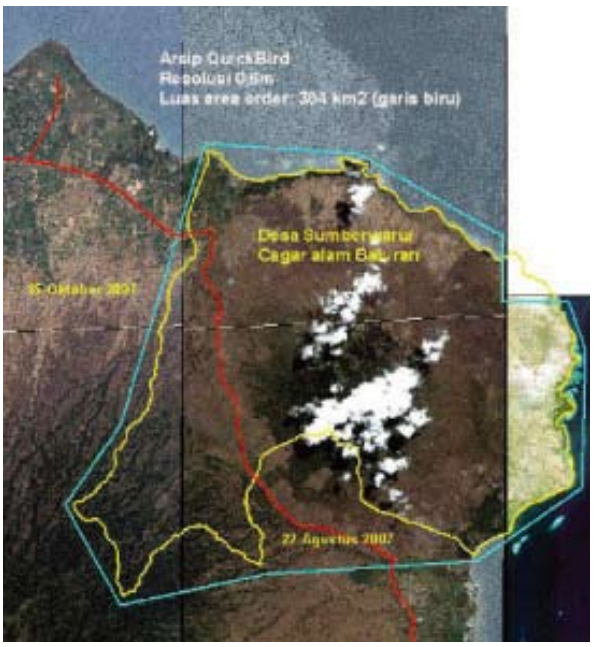
Landsat 7 from 2007 will be processed and interpreted to produce a digital map of the research area. All locations of the animals, their tracks and their dung will be determined using GPS and their UTM will be recorded. Based on these data, the spatial distribution of the animals will be analysed and digital maps will be produced. To identify the distribution change of banteng, the current distribution will be compared with that in 2002, when banteng were still abundant in BNP. To identify if banteng are avoiding dholes, the map of banteng distribution will be overlaid with that of the dholes. The relative density of banteng in the park will be compared with the density in the managed forest to approximate the importance of this area as a banteng refuge.

(3) Predation on banteng by dholes

Predation on banteng by dholes will be investigated through direct observations, interviews with park rangers and scat analysis. All scat around settlements, where domestic dogs are common, will be omitted from analysis. The diet of dholes will be inferred from identification of hard parts from prey eaten and recovered in faecal remains. The frequency with which a particular prey species occurs among the collection of scat will describe the average diet. Hairs recovered from faecal matter will be identified using reference samples. A minimum of 300 scat samples will be analysed.

Expected outcome

The outcome of the project will be the recommendation to solve the conservation conflict between banteng and dholes. Based on these findings, a better species management plan can be made, which in turn is expected to enable the co-existence of both species. In addition, we will investigate the role of the managed forest surrounding the park on the conservation of banteng. If a significant number of banteng live in this area, we can propose that this area be classified as a high conservation value forest and collaborative management with the forestry industry can be initiated.



Proposed research area that consists of national park and managed forest area. The blue line is the border of the research area. Total size of the research area is 384km^2. The red line is a main road.

Distribution pattern and geographical variation of stag beetles (Coleoptera: Lucanidae) in Java

Research Grant Programme

Woro Anggraitoningsih Noerdjito
Zoological Division, Research Center for Biology, Indonesian Institute of Sciences, Indonesia

Indonesian stag beetles (Coleoptera: Lucanidae) live in an extensive habitat and show various behaviours. In Java, most of the stag beetles are forest inhabitants, now almost restricted in conservation areas. Adult stag beetles are mainly nocturnal and at least some of them are nectar feeders, while the larvae feed on rotten wood. Of about 800 species of the coleopterans family Lucanidae, as many as 16 genera and 136 species are known in Indonesia. Museum Zoologicum Bogoriense, established in 1894 in Bogor, West Java, has preserved about 130 identified stag beetles species, mostly collected before 1930 from various sites in Indonesia.

Based on my research during the last five years in West Java and old collections by the Dutch, I have described 36 stag beetles species of Java. There are no recent collections from other areas that are considered to have many species of stag beetles in Central and East Java, however. Collections from those areas will be vital to acquire information on the distribution pattern and geographical variations of stag beetles in Java.

In this project, extensive study on the distribution and geographic variations of stag beetles will be conducted in selected areas of Central Java (Mount Slamet and the surrounding forest areas) and East Java (Mount Argopuro and the surrounding forest areas). This study is expected to complete data and information that will fill the gaps in our knowledge in the distribution patterns and geographical variations of stag beetles in Java.

Objectives
The primary objectives of this research are to acquire information on species diversity, distribution pattern and the geographical variation of stag beetles in Java.

Methodology
Stag beetles will be collected using Malaise and Light traps. Traps will be set-up in various habitats (secondary, primary and plantation forest) at altitudes from 500m asl to the top (if possible). Light traps will be installed for two consecutive nights at 18:00 to 24:00 at each study site. If possible, active collection by breaking rotten wood will be performed to find the species that are not active during the day and are not attracted by artificial light. The positions of the traps and the specimens collected will be recorded by GPS device to identify the distribution pattern and mapping of stag beetles species. Statistical analysis to understand species richness and the diversity of stag beetles will be conducted using appropriate software. Specimens obtained in this study will be housed in the Museum Zoologicum Bogoriense.

Expected outcome
By conducting this research, it is expected to complete information and data that will be vital for complete documentation of the distribution patterns and geographical variations of stag beetles in Java. The results of these studies will be published as scientific papers. A field guide on the stag beetles of Java is also planned for publication.

Assessment of bat diversity within Vinh region, North-Central Vietnam

Research Grant Programme

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Vietnam has been recognised as a key country for bat studies and conservation. The known bat fauna of Vietnam is clearly diverse. Remarkably, several species new to science have been described in the country. During the recent decades, a number of bat surveys were undertaken but none have been done in the Vinh region of North-Central Vietnam. Considerably, whilst containing a variety of natural habitats, the Vinh region has received little attention from scientists.

In order to promote the study and conservation of bats in the Vinh region, this project seeks to determine species diversity, population structure and their distributions within the region; to study their ecology and echolocation behaviour; and to assess the principal threats to the bat population for urgent and long-term conservation of the threatened species.

Field surveys are carried out for capturing bats using various types of field equipment, comprised of mist nets, harp traps, canopy nets and flap traps. Impermanent markers are also applied to avoid recapturing bats during study periods and to record their activity frequency. In necessary cases, observation and bat counting are carried out during daylight with the supplement of electronic torches, binoculars, video cameras and night version cameras. Captured bats are identified to species based on external morphology, measurements and visible characters of dentition. Selected individuals are collected and treated as reference materials with the approval of the Institute of Ecology and Biological Resources (IEBR) and properly catalogued at the Department of Zoological Museum of IEBR. For identification, external measurements are taken from the captured bats including the specimens in the field and cranial and dental measurements are done under a microscope at IEBR. All external and cranial data are measured following the standard categories in a range of international publications.

An echolocation study is also an important task of the project. The echolocation signals of captured individuals are recorded in different situations including handheld, resting and flying in their natural habitats. The recorded signals are then analysed using the custom made sound analysis software, Batsound 3.1 Professional. A variety of echolocation parameters are measured, including the frequency of the constant-frequency element, bandwidths of the signals, signal duration, pulse interval and duty cycle, etc.

For a complete assessment of the taxonomic status of bat species, tissue samples are taken from all examined individuals at every study area and preserved in 95-100% alcohol. They are available for analyses to the international scientific community. A subset of the tissue samples will be sent to the Canadian Centre for DNA Barcoding, Biodiversity Institute of Ontario (University of Guelph, Guelph, Ontario, Canada) to provide genetic confirmation for the taxonomic identifications made in the field.

This project aims at a series of productions. They encompass comprehensive results on the bat fauna of the Vinh region, which includes the species composition together with relevant information; detailed recommendations for conservation; various publications (reports, presentations, keys to the bat fauna, papers published in national and international journals, etc.); and classification of the key sites for bat conservation and further studies in the future.

Websites comprising scientific records of the known species (materials, systematic descriptions, echolocation behaviour, reproductive biology, distribution, etc.) will be designed and 'World Wide Web'/ Internet connected during and after the project periods.

Research on the population status and conservation of endangered ornamental plant species in Armenia: tulip (*Tulipa* L.), iris (*Iris* L.), snowdrop (*Galanthus* L.), poppy (*Papaver* L.), pink (*Dianthus* L.), primrose (*Primula* L.)

Research Grant Programme

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There are 3,500 plant species in the small territory of Armenia. The bulbous, tuberous and perennial ornamental plants are among the most beautiful and very vulnerable species. These include the following taxa that are in the scope of this study: tulips (*Tulipa sosnowskyi, T. florenskyi, T. confusa*), irises (*Iris grossheimii, I. elegantissima, I. lycotis, I. reticulata*), snowdrops (*Galanthus artjuschenkoae, G. alpina*), poppies (*Papaver bracteatum, P. pseudoorientale*), pinks (*Dianthus libanotis, D. parviflorus, D. callocephalus, D. subulosus*) and primroses (*Primula amoena, P. cordifolia, P. woronowii, P. komarovii*). Although the habitats of many of these plants are being disastrously reduced, no special surveys on the state of these species have been made since 1970. Thus, it becomes very important to investigate the real state of every highly ornamental taxon and to make its status more precise. It is very urgent to implement strict protective measures for these plants.

The main goal of this study is to investigate the recent distribution and current status of separate populations of tulips, irises, snowdrops, poppies, primroses and pinks, while developing recommendations for conservation. In the framework of the project, the following activities will be carried out:

(1) To obtain information on the recent distribution and current state of the populations of tulips, irises, snowdrops, poppies, pinks and primroses during field trips.
(2) To investigate the taxonomic range, morphological variability and ecological, biological and phenological characteristics of these taxa in Armenia.
(3) To distribute the printed materials among the conservation organisations (reserves, forestry, inspections of nature protection), schools, the local communities in the Lori, Vayots Dzor, Sjunik and Ararat regions, all of which will allow an increase of public awareness in these regions.
(4) To publish a series of scientific articles and leaflets with colour photos.
(5) To realize ex situ conservation of the endangered species of tulips, irises, snowdrops, poppies, pinks and primroses (the collection of seeds for propagation ex situ, taking care of seedlings and young plants for scientific investigations and further reintroduction into nature).

Objectives

(1) To carry out special investigations of the recent state and area of distribution of separate populations of tulips, irises, snowdrops, poppies, primroses and pinks, revealing in reality what part of the previous area still remains in order to work out real protection measures.
(2) To carry out detailed investigations concerning the taxonomic position of the taxa and their morphological, ecological, biological, phenological peculiarities and characteristics in order to choose proper methods of conservation
(3) To reveal major threats for the taxa
(4) To develop recommendations for conservation

Methodology

The research will be conducted in the Lori, Vayots Dzor, Ararat and Sjunik regions of Armenia. The data will be collected and analysed in the following ways:

(1) Specimens housed in the herbarium of the Institute of Botany of the Armenian National Academy of Sciences will be investigated in order to collect morphological data and data on the previous distribution of the species and compose the routes of field trips.
(2) Recent scientific literature for the precise definition of the taxonomic status of the relevant species will be surveyed.
(3) Field trips in four regions of Armenia will be conducted in order to investigate morphological variability and the phenological, taxonomic, ecological and biological peculiarities of the species. It also aims to reveal major threats, to collect seeds for ex situ conservation and to define recent distribution and the current state of the species.
(4) Data on the biology, phenology and adaptation abilities of the species and the possibility of their reintroduction into nature will be collected.

Expected outcome

(1) The current distribution of populations of tulips, irises, poppies, primroses and pinks will be revealed.
(2) Detailed investigations concerning the taxonomic range, morphological variability, ecological, biological and phenological characteristics will be carried out.
(3) A GIS database will be created.
(4) Recommendations for the conservation of the species will be developed.
(5) For ex situ conservation and propagation, seeds will be collected and planted on plots at the Institute of Botany of the Armenian National Academy of Sciences.

Inventory of swallowtail butterflies (Lepidoptera: Papilionidae), their host plants and parasitoids at several national parks in Sumatra, Indonesia

Research Grant Programme

Dahelmi
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Among many tropical countries with high biodiversity, Indonesia is known as the country with both the richest fauna (121 species) and the highest species endemism (53 species) of swallowtail butterflies in the world. Sumatra holds high biodiversity, yet its biodiversity is threatened by rapid deforestation. Despite their protected status, some national parks are under severe threat of deforestation due to a lack of support from local governments and communities. The high pressure on tropical forest ecosystems has caused a high rate of biodiversity losses on an unprecedented scale. Many studies indicate that increasing land-use intensity leads to biodiversity loss, including insect species such as butterflies.

Butterflies have a variety of resource needs, principally food, but also sites for thermoregulation and egg-laying. The food requirements of larvae and adults are quite different: larvae are phytophagous on one to several host plant species, whereas adults feed largely on nectar. Swallowtail butterflies are among the best-studied insect groups. They are highly sensitive to habitat disturbance and have been used commonly as an indicator taxon for ecological research. Many Southeast Asian butterflies are endemic to the region and face the grim prospect of global extinction if current levels of deforestation continue.

In spite of the rich fauna of swallowtails, species composition, host plant utilized and life history information of butterflies are important not only for conservation planning, but also for the promotion of ecotourism. One of the criteria used for the inventory of environmental preservation areas is taxonomic biodiversity (number of species). To gather basic data for conservation, I plan to investigate the swallowtail butterflies in seven national parks of Sumatra.

The objectives of this research are:
(1) to survey species diversity (species composition) and the distribution of swallowtail butterflies in seven national parks of Sumatra, Indonesia;
(2) to examine host plants utilized by larvae;
(3) to examine the life history of immature stages for several selected species; and
(4) to examine parasitoids fauna attacking the immature stages for selected species.

Methodology

For the collection of butterflies, the areas to be visited include seven national parks, specifically Batang Gadis, Siberut, Kerinci Seblat, Bukit Tiga Puluh, Bukit Dua Belas, Tesso Nilo and Way Kambas. The principal areas visited are forest interiors, urban habitats and forest gaps. Collections are made ten days (maximum) for each national park excluding Kerinci Seblat National Park (about 30 days). Due to weather conditions, the surveys will be conducted from January to September, particularly during the dry season.

Butterfly sampling will be conducted by the following three methods:
(1) Hand netting
Two observers walk together at a steady pace along the routes and all swallowtail butterflies within approximately 5m on both sides will be captured with a hand net. All swallowtail butterflies that are seen in this radius will also be recorded. Surveys are conducted between 10:00 a.m. and 13:00 p.m. local time, corresponding to peak activity and only during periods of full sunlight.

(2) Baited traps
These traps (bait trays) are placed particularly on moist ground or near rivers. They are baited with a mixture of rotting fruit/rum and rotting meat/faeces and animal scraps. Butterflies visiting the traps are collected by hand net.
(3) Binocular observation
Butterflies flying within 10m from the observer are observed using binoculars. Observations are made along the transects (routes).

Every specimen trapped or netted is identified to the species where possible. Photographs of specimens will be taken to aid in identification and for a comparison to the reference collection in the Museum Zoology Bogor. The distribution of two potential resources for adults, that is, host plants for oviposition sites and flowering plants as nectar sources will be examined. Along of the route of butterfly collections, host plants are observed and collected within the areas 5m on both sides of the route. The distribution of nectar plants will be examined along the routes during the butterfly survey.

Eggs of swallowtail butterflies are collected along with the leaf material, incubated in the laboratory and observed daily for development through various stages. The time and success rate of egg hatching, larval and pupal development and adult emergence are recorded. The dates of hatching, larval molt and adult emergence are recorded daily to determine the developmental times.

To obtain parasitoids, the eggs, larvae and pupae of swallowtail butterflies will be collected from the field, particularly at Taman Nasional Kerinci Seblat. They are reared in the laboratory under room temperature. Each egg and larvae is isolated in a plastic cup with leaves of host plants and thereafter they are reared singly until emergence. The same procedure will also be applied for pupae. Eggs, larvae and pupae attacked by parasitoids are collected and kept in a vial containing alcohol 70%.

Expected outcome
(1) To contribute to the biodiversity data base of national parks of Sumatra.
(2) To use butterflies as surrogate information for the overall biodiversity values.
(3) To provide some suggestions for the effective implementation to achieve conservation goals and enhance both the participation of local communities and their conservation.

1. Siberut
2. Batang Gadis
3. Kerinci Seblat
4. Tesso Nilo
5. Bukit Tiga Puluh
6. Bukit Dua Belas
7. Way Kambas

Small-scale Research Grant Programme

Population status and habitat preference of lesser adjutant *Leptoptilos javanicus* in Nepal

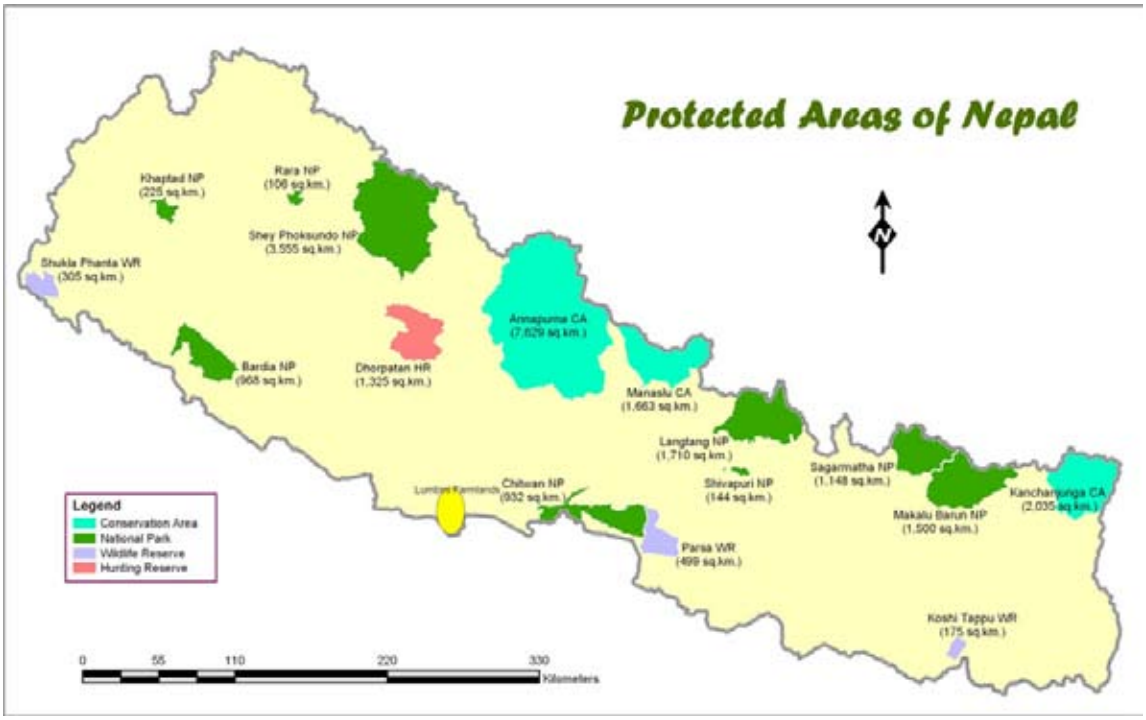
Small-scale Research Grant Programme

Laxman Prasad Poudyal
Institute of Forestry, Tribhuvan University, Nepal.

Introduction

Of the nineteen species of the stork family (Ciconiidae) worldwide, the lesser adjutant (*Leptoptilos javanicus*), a colonial tree nesting species, is distributed in India, Indonesia, Cambodia, Nepal, Sri Lanka, Bangladesh, Myanmar, Laos, Malaysia, Brunei, Vietnam, Thailand and Bhutan, with a world population about 6,500-8,000 individuals (BirdLife International, 2008). In Nepal it inhabits the riverbeds, floodplains, paddy fields, swamps, lakes and forest pools of the Chitwan and Bardia National Parks and their buffer zones, the Suklaphanta, Parsa and Koshitappu Wildlife Reserves and their buffer zones, the Jagadishpur and Ghodaghodi lakes, Lumbini farmlands and Mai Valley, Barandabhar, Nawalparasi, Dang Deukhuri and Urlabari forests (Baral and Inskipp, 2005). It is listed as vulnerable in the IUCN Red List (IUCN 2007) and endangered in Nepal's threatened category (Baral and Inskipp, 2004) because of its declining population due to habitat loss and degradation, hunting and disturbances (BirdLife International, 2001).

Lesser adjutant at Chitwan
(Photo credit: Hem Subedi)



Project areas of Nepal

A study on the population status and habitat preference of this species in Nepal has been started. The tentative project completion date is December 2010. It is anticipated that the outcome of this project will help to develop management plans to conserve this threatened species in its natural habitats.

Study area

This study is going to be carried out in three Important Bird Areas of central lowland Nepal.

(1) Chitwan National Park (27°28'N 84°20'E) was set up in 1973 as Nepal's first national park. This is a World Heritage Site and lies in central southern Terai. It is characterized by tropical and subtropical forests. Roughly 70 percent of the park vegetative cover is Sal (*Shorea robusta*) forest, a moist deciduous vegetation type of the Terai region. The remaining vegetation types include grassland 20%, riverine forest 7% and Sal with Chir pine 3%.

(2) Barandabhar Forest (27°40'N 84°10'E) ranges from 2-7km in width and stretches from Chitwan National Park in the south to Mahabharat in the north. It contains Sal forest, riverine forest, mixed forest, shrubs and wetlands. Beeshazari Lake, a Ramsar site, lies within the forest corridor.

(3) Lumbini Farmlands (27°29'N 83°17'E) encompass a large rural area where agriculture is the main land use (68%) followed by forest (21%). There are plains in the south and dry Bhabar and Churia Hills to the north. A number of perennial and seasonal rivers and streams including the Telar, Tinau, Sundi and Dano river systems flow through the area.

Methodology

(1) Population status

Counting the nests: Nest searching was attempted in mid October but the trail and fire line maintenance inside the park area was in progress and will be completed by the November. I will start this work in December 2008. The counting unit will be apparently occupied nests meeting two criteria: (1) young seen in the nest and (2) at least one adult present around the nest. Individuals will be counted directly with the help of binoculars/telescopes. The colonial trees will be identified and the height and diameter will be measured.

Counting the feeding areas: Individuals will also be counted in the feeding areas during the summer season (May-July) and will be compared with the nesting count.

(2) Habitat preference

The habitat preference (HP) will be determined by a comparison between the proportions of habitat use with the proportional availability of habitat type within the study area. Neu's method describes the formula as the following (Bibby et al. 1998).

$$\text{Proportion of habitat use} = \frac{\text{Number of birds observed in individual habitat}}{\text{Number of birds observed in all habitats}}$$

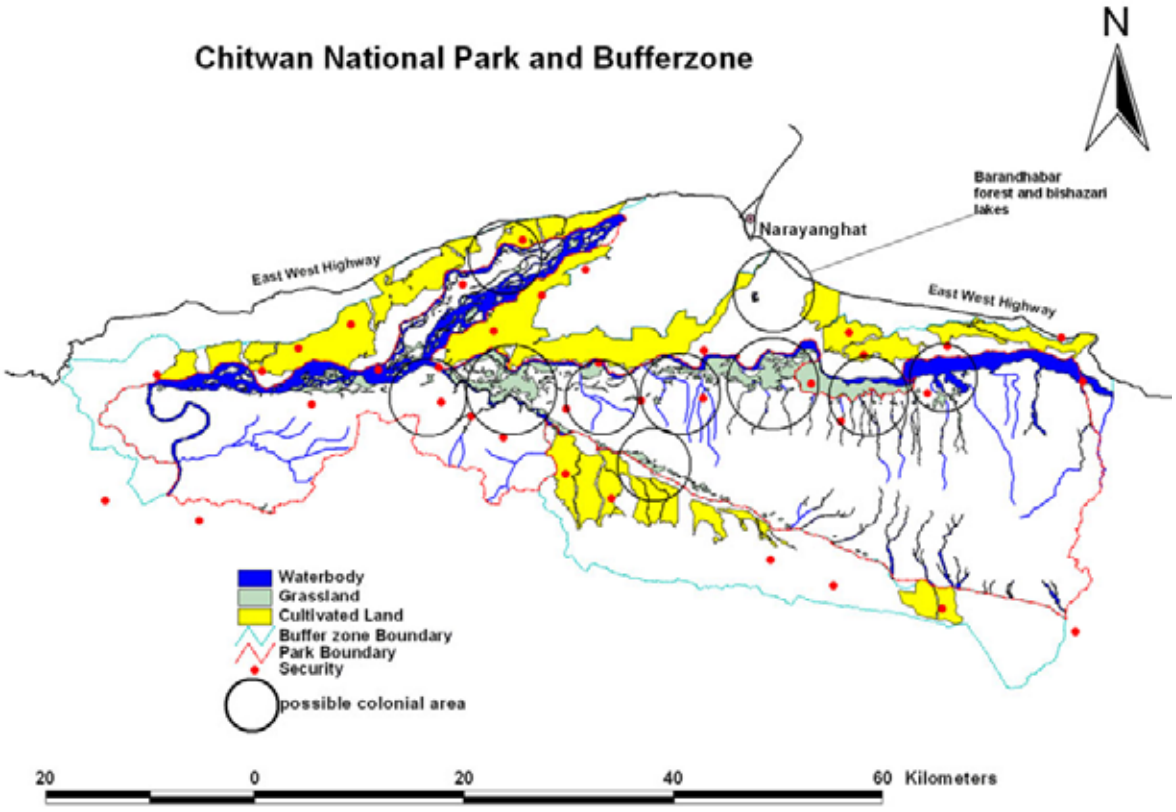
$$\text{Proportion of habitat availability} = \frac{\text{Area of individual habitat type}}{\text{Area of total habitat available}}$$

$$\text{Habitat Selection Index} = \frac{\text{Proportion of Habitat use}}{\text{Proportion of Habitat Availability}}$$

If the selection index is greater than 1, then the habitat is preferred; otherwise the habitat is not preferred by the lesser adjutant.

Results and discussion

Four individuals of lesser adjutant were observed in the Rapti riverbed near Paridhap on 14 October 2008 during the drive from Sauraha to Paridhap. From a discussion with local people and naturalists, a review of literature and a short visit to the buffer zone in mid October, I identified possible colonial areas in and around Chitwan National Park and Barandhabar forests (See Map). They are the Dumaria, Bahapur, Padampur, Ghatgain, Sukibhar, Beeshazari and Nanda lakes, Bhimle, Lamital, Kuchhkuchhe, Chapparchuli and Khagendramalli. These areas will be confirmed through field visits in December-February 2008/09. Work will be continued in other proposed areas as well and publicized after the completion of the project.



Adjutant colonial areas

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Survey of otters in Pokhara Valley lakes of Nepal

Small-scale Research Grant Programme

Gandhiv Kafle
Wetland Friends of Nepal, Nepal

Three species of otters are known to occur in Nepal: Eurasian otter (*Lutra lutra*), smooth-coated otter (*Lutra perspicillata*) and Asian small-clawed otter (*Aonyx cinereus*) (de Silva, 2006; Thapa, 2003). These otters, which are nocturnal and rarely seen, are very unfamiliar to the people of Nepal. Research on otters is very limited and much of the otter's status is unknown. Due to a lack of awareness, a lack of research and a lack of concern from authorities, otter populations are declining. Currently they are facing immense pressure on four fronts: degradation and loss of riparian habitat, poaching for their pelts, disturbance by human activities; and their feeding behaviour brings them into direct conflict with fishermen, who see otters as competitors for fishing. As a result, they are surviving in fragmented populations in isolated areas (Thapa, 2003). The lack of awareness among the local community on otter conservation has increased the threat to otters.

The Eurasian otter has been found in Begnas and Rupa lakes, as well as the West Seti basin in the Pokhara Valley (de Silva 2006). A recent preliminary study by Bhandari and Dhruba (2007) using participatory methods showed that local fishermen noticed three species of otters in Rupa Lake, but the species names have not been confirmed. On expert consultation, it is speculated that these species could be smooth-coated otters, Asian small-clawed otters and Eurasian otters in this geographical range. But this information needs to be confirmed through systematic study using standard methods. Further, information on the distribution, habitat utilization and population trends of otters are not available in the Pokhara Valley lakes.

This study is proposed for the systematic survey of otters in the Pokhara Valley so as the resulting baseline information can form a good basis for further in-depth studies and conservation initiatives. The study will address one of the research priorities of the IUCN/SSC Otter Specialist Group to fill the information gap about otters in Nepal and South Asia. The study will involve, make aware and empower the local community for otter conservation and habitat management for the sustainability of conservation efforts.

Objectives

The project aims to achieve the following objectives:

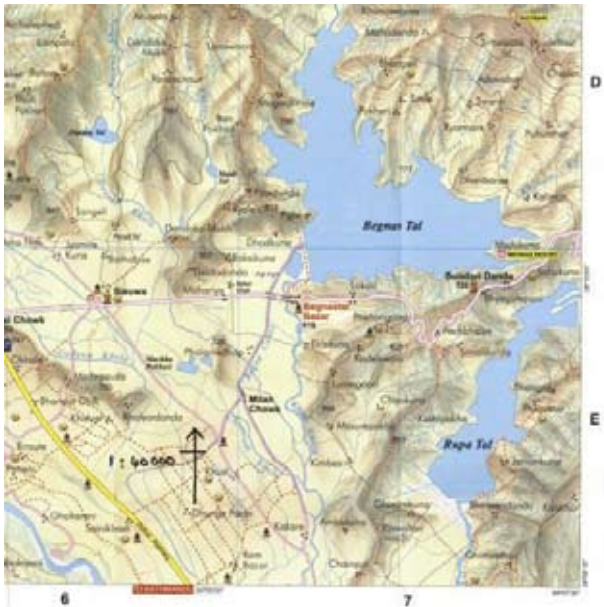
(1) to identify the otter species in and around the lakes of the Pokhara Valley;
(2) to determine the distribution and habitat utilization pattern of otter species in and around the lakes of the Pokhara Valley;
(3) to estimate the population density trends of otters in the Pokhara Valley;
(4) to identify the causes and modes of conflicts between fishpond owners and otters around the lakes of the Pokhara Valley; and
(5) to create community awareness and a functional network for otter conservation in the Pokhara Valley among fishpond owners.

Methodology

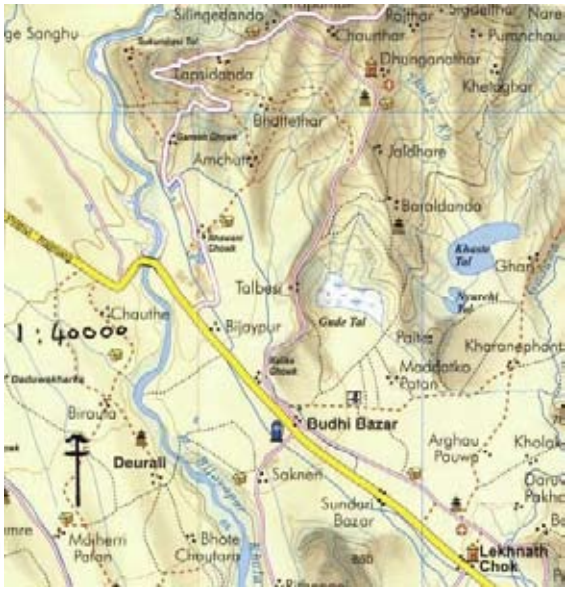
The standard surveying and monitoring methods recommended by the European Section of the IUCN/SSC Otter Specialist Group and written by Reuther et al. (2000) will be used in this research.

Expected outcome

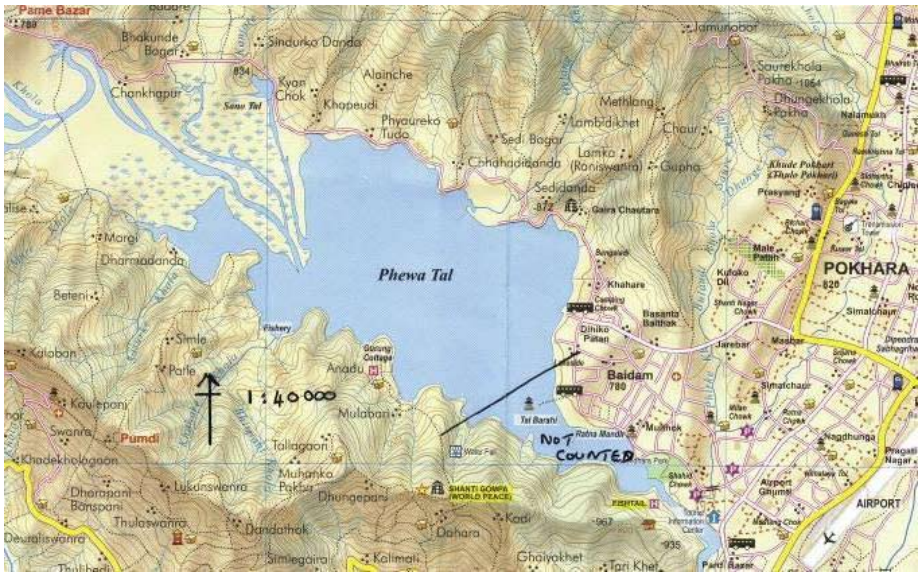
The status of otters and their distribution will be identified in and around eight lakes of the Pokhara Valley. Educational materials on otters such as a GIS distribution map, checklist and informative leaflets, will be available. Causes and modes of conflicts between otters and fish-pond owners and possible resolution methods will be identified. It is expected that the public, as well as fish pond owners, will come to know the importance of otters for maintaining ecosystem health and will start changing their negative perception of otters to a positive one. An Otter Conservation Network is expected to be functional in the Pokhara Valley.



Begnas, Rupa and Dipang lakes



Khaste and Neureni lakes



Phewa Lake

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Positional behaviour and habitat use of Tonkin snub-nosed monkey *Rhinopithecus avunculus* in Khau Ca area, Ha Giang Province, Northeastern Vietnam

Small-scale Research Grant Programme

Quyet Khac Le
Faculty of Biology, Hanoi University of Science, Vietnam National University, Hanoi, Vietnam

The Tonkin snub-nosed monkey (*Rhinopithecus avunculus*), restricted to a small area in Northeastern Vietnam, is considered one of the 25 most endangered primates in the world (Mittermeier et al., 2007). The goals of this project include documenting the positional behaviour repertoire of adult male and female *R. avunculus* and to relate the positional behaviour of this species to the tree species profile and forest structure in the Khau Ca area of Ha Giang Province, Northeastern Vietnam. This is the largest known population of this species and consists of more than 70 individuals (Le, 2007). This project will not only provide the first quantitative analyses of the positional behaviour and habitat use of *R. avunculus* in the wild, but will also identify preferred habitat characteristics for this critically endangered species, information that will help shape forest rehabilitation, and expansion plans in the Khau Ca area.

Map of Khau Ca

Objectives

The following are the specific objectives of this study.

(1) To quantitatively and qualitatively characterize forest types and forest structure in the Khau Ca area.

(2) To determine the positional repertoire (pattern of locomotion and posture) of *Rhinopithecus avunculus* in the Khau Ca area.

(3) To describe how *R. avunculus* uses the forests in the Khau Ca area through measurements of the frequency of use of different parts of the forest and assessment of the types of substrates preferred by *R. avunculus*.

(4) To determine what the relationships between locomotor and postural behaviours and substrate types are for *R. avunculus*.
(5) To assess whether or not there are particular aspects of the physical habitat that are not used by *R. avunculus* and may constitute unsuitable habitat for them.

Methodology

(1) Habituation

From 2005 to present, we have been working on habituating *Rhinopithecus avunculus* in Khau Ca. During field work, the principal investigator (PI) and field assistants follow *R. avunculus* at least five days a month. At the moment, *R. avunculus* in Khau Ca are semi-habituated, permitting PI to observe their positional behaviours more than 30 hours a month.

(2) Behavioural data collection

Study animals will be observed using binoculars and when possible PI will collect focal animal data on positional behaviour and on the substrate including size, orientation, rigidity and canopy height. In this study, data collection will focus on adult males and females. The unit of observation is a positional sequence, which will be composed of a series of locomotor and postural bouts. A locomotor bout occurs when an animal moves to displace its centre of gravity by more than one body length. While an animal is moving, any change in gait, substrate size or substrate orientation signals a change of locomotor bout because locomotion is likely to differ on supports of different size or orientation. Postural bouts will be scored when an animal is stationary or not displacing its centre of gravity by more than one body length. Displacement of the centre of gravity by less than one body length will be classified as a shift in posture.

(3) Habitat data collection

Four one-kilometre long phenological transects and 15 20x50m plots were established in Khau Ca in 2005 and phenological data were collected from December 2005 to December 2007. Two new transects and 10 plots will be established in 2008. Data will be collected following previously developed protocols (Le et al., 2007; Covert et al., 2008).

(4) Data analyses

Positional behaviours will be studied within the context of broader behaviours (feeding, foraging, travel, social behaviour and other behaviours) to better understand the context of positional strategy. It will also be summarized and compared in the form of frequencies, rates or durations of behaviours. Analysis will consist of summary statistics, two sample comparisons of behaviours and substrate types between habitat types and individuals and analyses of variance among habitats and individuals. The nature of the behavioural data collection (lack of independence between positional behaviours) demands the use of non-parametric statistics.

Expected outcome

(1) At least 200 observational hours of positional behaviour and habitat use of *Rhinopithecus avunculus* in the Khau Ca area of Ha Giang Province.
(2) Publications based on findings of positional behaviour of *R. avunculus* submitted to peer-reviewed journals.
(3) Recommendations for enhancing habitat quality of *R. avunculus* in Khau Ca.

This project will contribute to the conservation of *Rhinopithecus avunculus* in several ways. First, this study will place an immediate and continuous human presence in the Khau Ca area, directly helping to protect the monkeys from hunting and human impact. Second, data on tree and habitat preference will provide essential information for the continued development of conservation strategies in Khau Ca and the development of a project that seeks to expand the habitat of *R. avunculus* at this site through reforestation and forest rehabilitation. Third, the hiring of local assistants will further develop the capacity of local assistants, permitting their participation in future research and/or conservation

initiatives and a better understanding and appreciation of biodiversity conservation among the stakeholder communities.

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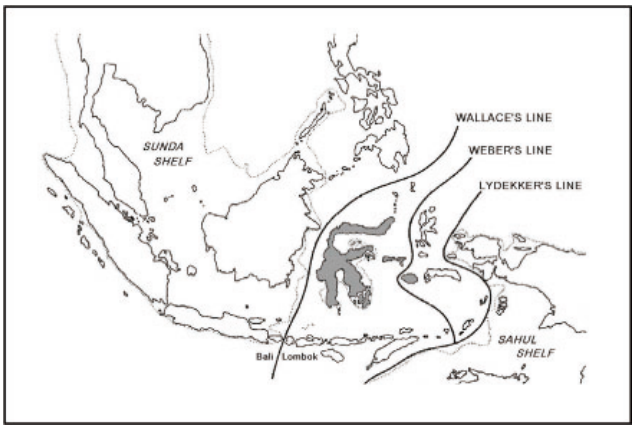
Conservation Activity Programme

Educational programmes on conservation of 'babirusa' species, *Babyrousa* spp., and their natural habitats in Sulawesi

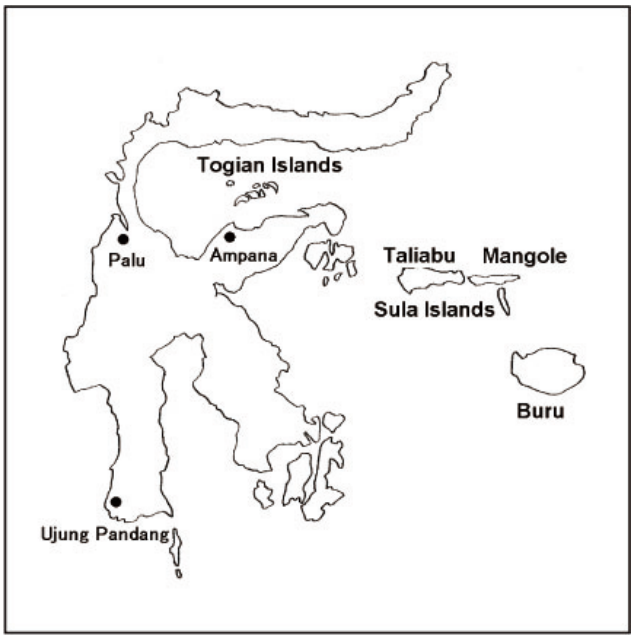
Conservation Activity Programme

I Wayan Balik
Yayasan Babi Rusa, Indonesia

The most remarkable of endemic mammalian species in Sulawesi, Indonesia, is the babirusa (*Babyrousa* spp.). They are members of the family Suidae, having unique morphological characteristics of their upper canines that penetrate the skin of the snout and curve toward the forehead. Although protected under an enactment of the Indonesian wildlife law in 1931, the conservation status of the babirusa is alarming because of a combination of the following factors: low level of enforcement of control; high levels of hunting or trapping pressure; habitat degradation and their small litter size. As the result, these species have been included in Appendix I of CITES since 1982. A recent report indicates 500 individuals of Togian babirusa (*Babyrousa togeanensis*) as the population size, showing the necessity of effective conservation efforts.



Indonesia



Sulawesi and neighboring islands
Sulawesi has shape that looks like the character of K. Palu is a capital city of Central Sulawesi. Togian Islands National Park Office is in Ampana.

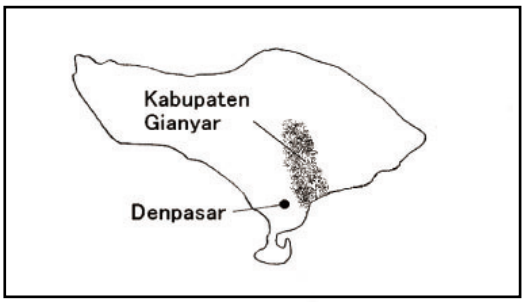
It is obvious that the main reason of population degradation of the babirusa is from human activities inside and outside of its natural habitat. In this project, therefore, I will contribute to the educational campaign inside and outside of its habitat, especially on the Togian Islands in Central Sulawesi, which is known as the Togian babirusa's habitat and also in the Gianyar district on Bali, which is known as a place trading in 'babirusa skulls,' in order to block the illegal activities.

Objectives

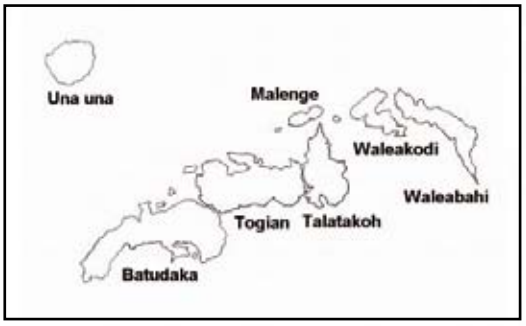
The objective of this project is to present educational services using original educational materials created by Yayasan Babi Rusa in order to facilitate co-existence between humans and wild animals, especially babirusa in situ and ex situ. I believe that the local community can act as realistic managers of nature conservation to create the ideal situation in the habitat.

Implementation sites

For the first year, I will carry out awareness campaigns at schools and in community halls in Kabupaten Gianyar (Central Bali), Bali Province, Indonesia, although this district is not the natural habitat for the babirusa. The reason why the district was chosen is as follows. Based on the Indonesian government policy of the domestic transmigration from Jawa and Bali (high human-population density area) to Sulawesi (low density area) since the 1960s, a lot of Balinese people, especially from the Gianyar district moved to Central Sulawesi, which is an important babirusa habitat. Due to their lack of educational opportunities, the knowledge of the immigrants about the wildlife conservation law, the importance of biodiversity and the vulnerability of the babirusa have been quite limited. As the result, the immigrants not only aggressively deforested the area to develop paddy fields, coffee and cacao farms, but also hunted the wild pigs, including the endangered babirusa, to eat 'pork' in Central Sulawesi. Sadly, the 'skulls of the male babirusa' they hunted in the forest have been sold to outsiders. As it is, some successful immigrants have brought 'babirusa skulls' to Bali and then the skulls have been sent to souvenir shops for domestic and international tourists. There is no doubt that the knowledge about conservation issues of the Balinese people who reside in Bali is also limited. In a word, Balinese people are 'potential babirusa-consumers, with no feelings of guilt.' Therefore, I will positively offer Balinese people scientific information on the babirusa, in order to block the 'babirusa skull business in Bali.'



Bali



Togian Archiperago
Togian babirusa (*Babyrousa togeanensis*) inhabits Batudaka Island, Togian Island, Talatakoh Island, and Malenge Island within Togian Islands.

For the second year, campaigns will be carried out on the Togian Archipelago, an important habitat of the Togian babirusa (*Babyrousa togeanensis*), especially Malenge Island, Talatakoh Island, Togian Island and Batudaka Island. The population size of this species is estimated at 500 individuals in the wild. Therefore, it can be said that this is also a high-priority activity.

Methodology

Considering local economics, sociology, law, religions and other human related subjects, several editions of brochures as educational materials will be created for this programme. Using these materials, I will make scientific presentations in a workshop style at schools and in community halls. After the presentations, follow-up activities using questionnaires will be carried out in order to evaluate our activities. These programmes will be conducted by Yayasan Babi Rusa, supported by stakeholders such as some local volunteers, scientists, specialists from the Indonesian Ministry of Forestry, the Natural Resources Conservation Centre and the National Parks, hoping to establish a human network for my babirusa conservation strategy.

Expected outcome

Although Togian Island National Park was created in 2004, the concept of natural environmental conservation is still poorly understood among the local people. Therefore, this educational programme will help them better understand Indonesian government policy. Additionally, they will have an opportunity to learn about babirusa biology. Furthermore, through this educational programme, it is possible to create a human network appropriate for babirusa conservation.

Another activity site, the Gianyar district, is on Bali Island for the Hindu people who are familiar with the wild pigs. Therefore, as a good result of the proposed activity in the Gianyar district, I expect that Balinese people may become helpful and effective supporters for the babirusa conservation within Indonesia. Additionally, our educational activities will help to block the 'illegal trade of babirusa skulls in Bali.'

Rhinoceros conservation awareness project

Conservation Activity Programme

Deepa Paudel
Partnership for Rhino Conservation, Nepal

Rhinoceros unicornis (hereafter referred to as rhino), categorized as an extinction-threatened (CITES/ Appendix-1) and vulnerable (IUCN/Red-data list 2008) species, is the main sensitive animal of Chitwan National Park's ecosystem. The population status of this species is on the verge of extinction worldwide and Chitwan is ultimate habitat in Nepal. Rai Village of the Lother buffer zone area in the Chitwan National Park is one vulnerable site as the rhino's habitat, but the poor deforest the area for firewood, fodder and income generation because they are generally unaware about the ecosystem and ecology. The ethnic Rai people, inhabitants and real users of park resources from ancient times, are economically and financially poor, educationally illiterate and deprived of facilities. They are not in a position to educate their children and their daily lives are intertwined with park resources. People do not know about legal policies and punishments for poaching. The major threats in this village are community unwillingness (a low awareness level), illiteracy among women, poverty, poaching and habitat loss, etc.

The main objective of this project is to minimize these threats to rhino conservation. The specific objectives are:
(1) to create awareness among villagers about the rhino, its habitat, environment and nature conservation;
(2) to conduct capacity building and community based livelihood strengthening activities;
(3) to reduce the pressure on the rhino habitat and protect it; and
(4) to encourage poor children to join school.

Under these objectives, we will perform various activities in the Rai Village, as follows: school teaching of topics on the ecosystem and ecology; environmental education for women; schooling programmes for poor children; fodder and fuel-wood species plantation programmes in waste and community land; rhino conservation street performances by small children; conservation rallies; the extensive installation of information; livelihood training (home gardening and fishery); interaction programmes about legal policies and punishments for poaching.

By conducting this project, the following outcomes are expected.
(1) People will start to participate and take responsibility for rhino and nature conservation.
(2) Illiteracy will be decreased.
(3) The awareness level will be increased.
(4) Deforestation and resources destruction activities will be minimized.
(5) Poor children will be educated and people will start to send their children to school.
(6) Destruction based income generation will be minimized.

Publication Programme

Publication of 'A handbook on cave classification for the Philippines'

Publication Programme

Armida Pullo Andres
Protected Areas and Wildlife Bureau, Department of Environment and Natural Resources, Philippines

Caves are considered fragile ecosystems with significant ecological, historical, cultural, archaeological, paleontological, aesthetic and socio-economic values. The Philippines is blessed with over 1,500 caves distributed nationwide. Caves are deemed crucial to the conservation of biodiversity. They provide habitat to some of the country's endangered animals, which are yet to be described and are protected by existing networks of protected areas. Only a few caves presently have protected area status. Bats found in caves represent 20% of the currently known species of Philippine mammals with at least 23 species found only in the country and nowhere else (Alviola, unpublished). Without protection of their cave habitat, the Negros bare-backed fruit bat *Dobsonia chapmani* will remain critically endangered.

One of the strategic approaches to stem the tide of destruction of Philippine caves, as provided in the National Caves and Cave Resources Management and Protection Act of 2001, is the institutionalization of a system of cave assessment and classification. A Cave Classification and Manual was issued in February 2007 through the DENR Administrative Order No. 2007-04 to ensure that caves undergo detailed assessment to establish their values and are classified according to their most beneficial use or uses and protection requirements. The guidelines and the corresponding manual on cave classification are the result of collaborative efforts and the sharing of resources and experiences among governmental and non-governmental organisations involved in cave conservation and management.

The present handbook intends to highlight the procedural guidelines and the manual for the Philippine cave classification system. The procedural guidelines and the manual are the products of years of field testing and iterative consultations led by the Protected Areas and Wildlife Bureau and the Gaia Exploration Club.

The handbook is divided into the following sections: a special section highlighting the link between cave and nature conservation; the approved guidelines on cave classification; the manual detailing the steps and technical requirements for assessing and classifying caves; and appendices that provide important forms and reference materials to help interpret and complete the classification process. The targeted users are government and non-governmental organisations involved in cave conservation and management. These include the members of the cave coordinating agencies, concerned local government units, the caving community, including the local communities residing near caves and land owners who have caves within their private properties.

Research Grant Scheme
Progress of the Projects in 2007

Research Grant Programme

Research on snow leopards in Mongolia for their conservation

Research Grant Programme

Bariushaa Munkhtsog
Institute of Biology, Mongolian Academy of Sciences, Mongolia

Introduction

The snow leopard (*Uncia uncia*), a highly charismatic species, is recognised as 'very rare' by Mongolian fauna law, registered in the Red Data Book of Mongolia and is classified by the IUCN Red List as Endangered. Mongolia is one of the key range states for the snow leopard, with over 100,000km² of habitat. The snow leopard population is estimated at about 1,000 (or about 20% the world population) in this area. However, it has been declining due to the depletion of its habitats, wild ungulate populations owing to competition with increased livestock and open water sources and illegal hunting of snow leopards, either for their fur or in retribution for the killing of livestock.

This research is aimed to provide concrete and reliable data for making the snow leopard ecological status clear, especially the density, movements, home range sizes and habitat use. Such information is indispensable for the effective implementation of the Nature Conservation Strategy in North-East Asia.

Methodology

(1) Research area

In the initial plan, the Tsagaan Shuvuut Strictly Protected Area was selected as the research area. This reserve, located in Uvs Province, in the western part of Mongolia, covers an area of 22,000 hectares. However, our preliminary reconnaissance survey revealed that the satellite collar did not work at this site because there were no areas covered by the satellite system. As a result, we re-selected Baga Bogd Mountain in Uvurkhangai Province as a pilot area for the study. It is located 630km southwest of Ulaanbaatar, the capital of Mongolia.

Baga Bogd Mountain

Snow leopard habitat in Baga Bogd Mountain

(2) Collecting data

The Remote Access Satellite Sensor Link (RASSL) Tracking Collar, which enables tracking and monitoring in real time via satellite, is used. The RASSL Tracking Collar acquires a GPS location with a certain interval (2 hours), and transmits that data via the Northstar Satellite System in real time to a web site, where the information is displayed graphically on a zoomable mapping application, and also in a tabular format that can be downloaded for use in a GIS system. In addition, camera traps including three Marif Digital Camera Traps, which are equipped with Olympus digital camera and a passive infra-red sensor, are set in the study area. Individual snow leopards are discriminated by photos taken by the camera traps.

Author in the field

Collared snow leopard

Snow leopard in the trap

Captured snow leopard

Preliminary results

(1) Density

Two field trips were made to Baga Bogd Mountain. Sign surveys suggest that the density of snow leopards in this region is very low. The assumed density in the region is much lower than that in other regions, such as the Tsagaan Shuvuut Protected Areas in western Mongolia.

(2) Home ranges and their spacing pattern

A 3-4 year old male of snow leopard was collared on 21 September, 2008 in Baga Bogd Mountain. The cat was 42kg in weight and had a total body length of 210cm, including the tail. Although data for determining the home range size of this male is now being accumulated, this specimen mainly inhabited the Ust, Hanh and Chatsarganat valleys of Baga Bogd Mountain and stayed several days in each valley.

Status survey and conservation of key bird species on the Con Dao Islands, Vietnam, including Chinese crested tern and Nicobar pigeon

Research Grant Programme

Hung Manh Le
Institute of Ecology and Biological Resources, Vietnam

Introduction

The Con Dao Islands of Ba Ria Vung Tau Province are known to support many key species, providing part of an important habitat within the South China Sea ecosystem. However, due to the territorial disputes in the South China Sea, the status of many species has been poorly studied. While there is high demand for the conservation of the islands' biodiversity, the lack of detailed information on the status of key species, especially birds, has been a constraint in taking appropriate conservation measures.

The key bird species of the Con Dao Islands include a number of colonially nesting seabird species. The Chinese crested tern *Sterna bernsteini*, a critically endangered species, is possibly found on the islands. In addition, the islands are the only place in Vietnam where the globally near-threatened Nicobar pigeon *Caloneas nicobarica* has been recorded, although there have been no records of this species for over half a century. As the bird species of the Con Dao Islands are currently threatened through hunting, disturbance and the introduction of alien predators, such as rats, cats, dogs, goats and civets, there is an urgent need to assess the status of these species and evaluate the threats to them. Working with park managers and NGOs is vital in taking the suitable action necessary to address the critical conditions of the bird species of the islands.

Great crested tern and bridled tern at Trung Island

Brown booby at Trung Island

The present project is intended to assess the current status of birds of the Con Dao Islands. We are collecting data for the conservation of the Chinese crested tern, Nicobar pigeon and nesting seabird species, including great crested tern *Sterna bergii*, bridled tern *Sterna anaethetus*, roseate tern *Sterna dougallii*, brown noddy *Anous stolidus*, red-billed tropicbird *Phaethon aethereus*, masked booby *Sula dactylara* and brown booby *Sula leucogaster*.

Results

The field surveys have been implemented during 2007 and 2008. The surveys have been carried out on seven different islets within the Con Dao district including Con Son, Bay Canh, Trung, Tre Nho, Tre Lon, Ba and Troc. Six nesting seabird species have been recorded in large numbers, including the great crested tern (5,500 birds), bridled tern (7,000), black-naped tern *Sterna sumatra* (800), roseate tern (500), brown booby (70) and brown noddy (150). Trung Island has been identified as the most important nesting site for the great crested tern, bridled tern, brown booby and brown noddy. Tre Nho Island is the best place for the black-naped tern, while Troc Island is the best place for the roseate tern.


Trung Island: the most important island for nesting seabird


Nicobar pigeon at Tre Nho Island

The other key species recorded during the survey is the Nicobar pigeon (globally near-threatened) and at least 26 birds have been recorded and distributed on four different islands: Con Son, Bay Canh, Tre Lon and Tre Nho. Two nests have been recorded on Tre Nho Island. This is the first officially confirmed recording of the Nicobar pigeon for over half a century in Vietnam, qualifying Con Dao National Park as a new Important Bird Area.

One of the main purposes of our field surveys was try to find the possibility of the globally critically endangered Chinese crested tern on Trung Island, but we have failed to find the occurrence of this species during the last surveys. However, it is difficult to approach the island and conduct surveys there during the breeding time (avoiding the eggs and disturbing birds), preventing us from having more opportunities to find the species.

The main threats for nesting seabirds and other key bird species on Con Dao National Park include egg collecting by local people during the breeding season (mostly on Trung Island) and the invasion of alien species such as cats and rats (Tre Nho Island). Thousands of eggs of the bridled tern and great crested tern were collected by local fisherman when we surveyed on July 2007 on Trung Island. Our survey team had to spend at least two hours to return all of the eggs back to the nests. Another serious threat is the release of one domestic cat on Tre Nho Island, this cat is now out of the control of forest guards and freely lives in the wild. The main food for this cat during the breeding season is the eggs and juvenile birds breeding on the island, including the bridled tern, black-naped tern and pied imperial pigeon.

Discussion

Con Dao National Park has been identified as the only remaining site for the aforementioned key seabird species within Vietnam. The following efforts should be done in order to protect these species' populations: 1) patrols to prevent the local boatmen from collecting the eggs during the breeding time; 2) education efforts should be carried out to raise the awareness of local communities about the importance of the species (with a particular focus on the local fisherman; 3) control the alien species; and 4) more surveys and efforts should be undertaken in order to find the globally critically endangered Chinese crested tern and to carry out detailed studies of other nesting seabird species.

Our second year project will continue field surveys on identified islands within the national park, setting up a monitoring programme for key bird species and conservation efforts to raise the awareness of the local community.


Eggs of bridled tern and great crested tern collected by local fishermen

The highland herpetofauna of the Meratus Mountainous Range, South Kalimantan: a preliminary survey to determinants of diversity and biomass

Research Grant Programme

Irvan Sidik
Museum Zoologicum Bogoriense, Research Center for Biology, Indonesian Institute for Sciences, Indonesia

Background

The island of Kalimantan represents a zoogeographic region of wetlands and upland transition (Inger, 1966) and is probably the richest island in the Sunda Shelf for herpetofauna diversity – 254 reptiles (24% endemic) and approximately 100 amphibians are known (Mackinnon et al., 2000). It is known to be more diverse than both Sumatra (217 reptiles and 70 amphibians) and Java (173 reptiles and 36 amphibians). On the contrary, Sabah and Sarawak occupy only one-third of Kalimantan but these Malaysian regions hold the larger number of species in herpetofauna, comprising 259 reptiles and 150 amphibians (Inger and Stuebing, 1997; Stuebing and Inger, 1999; Lim and Das, 1999). In addition, the level of endemism is much greater, especially at the higher elevations.

In this project, we conduct fieldwork to inventory herpetofauna in South Kalimantan. The Meratus Mountain Range in the South Kalimantan Province is chosen as the study site. This mountainous area contains diverse natural environments, including lowlands, marshes and lakes that provide suitable habitats for herpetofauna. However, data on herpetofauna in the Meratus Mountain forest are lacking. So, this fieldwork aims also to gather data on the distribution, relative abundance and biomass of herpetofauna.

Figure 1. Meratus mountainous forest along South of Kalimantan Province

Methodology

(1) Study site

The Meratus Mountain Range is mostly covered by primary tropical rain forests with the high peak (1,892m) of Gunung Besar. The following two study sites are for collecting specimens: Malaris, located at 2°47'44.20"S, 115°29'40.40"E, and about 26km from the Kandangan District, the capital of the Hulu Sungai Tengah Regency; Emil Baru, located at 3°2'51.10"S, 115°34'4.00"E, and about 50km from the Kandangan District. Both of these areas are under the threat of large-scale illegal logging activities around their boundaries.

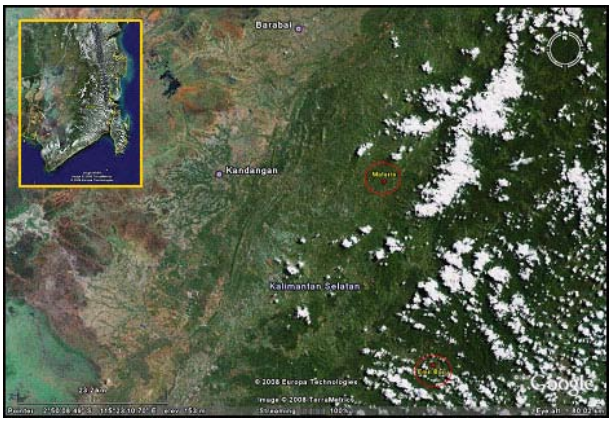


Figure 2. Study site at Malaris and Emil Baru forest

(2) Collecting specimens

Two types of sample collection are employed in order to obtain data on herpetofauna as broadly as possible. First, night-time collection is conducted, particularly for amphibians (some reptiles) along streams. Headlamps are used to scan near streams or riverbank areas. Second, day-time collection is conducted primarily for reptiles. All reptiles and amphibians are collected by cruising within the tree buttress areas. Shaded areas behind/under rocks and holes in dead trees are carefully examined in order to search for some reptiles and amphibians with cryptic habits. Skin sheds and eggs are also collected.

For quantitative analysis, we employed the line transect method for each type of vegetation. Drift fences with pit-fall traps were used every 200 meters from above sea level. At least 10 drift fences of 50 x 50m² were set up for three days in each location and about 50 plastic buckets were used inside the fences as pit-fall traps. All reptiles and amphibians caught were identified, photographed and measured in the field. Unidentified specimens were kept for further examination in the museum. All specimens obtained were deposited at the Museum Zoologicum Bogoriense.

Preliminary results and perspective

In March and April 2008, fieldwork was conducted for a total of 48 days, containing 26 night-time and 22 day-time collections, in Malaris and Emil Baru. During this period, 26 species of amphibians and 16 species of reptiles were recorded. The species comprise: 8 toads, 13 frogs, 4 tree frogs and 1 caecilian in Amphibia; and 2 agamids, 1 cat-eyed gecko, 2 geckos, 3 skinks, 1 varanid (seen only, no voucher specimen available) and 7 snakes in Reptilia.

This is a two-year project, conducted in 2007-2008. It will document the species diversity of reptiles and amphibians found in the Meratus Mountain Range along with database development, contributing to future biological and ecological research and the future conservation of nature in the Meratus Mountain Range. Also, it will help better understanding of the taxonomic status of reptiles and amphibians in this region. The results of this research are going to be published as scientific papers and as a field guide of reptiles and amphibians of Meratus Mountain Range.

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Phoxophrys sp.

Pareas carinatus

Dendrelaphis caudolineatus

Aeluroscalabotes sp.

Polypedates leucomystax

Pedostibes rugosus

Ichthyophis sp.

Megophrys sp.

Ansonia spinulifer

Mabuya sp.

Conservation of *Trichechus manatus manatus* in suitable habitats in Panama

Research Grant Programme

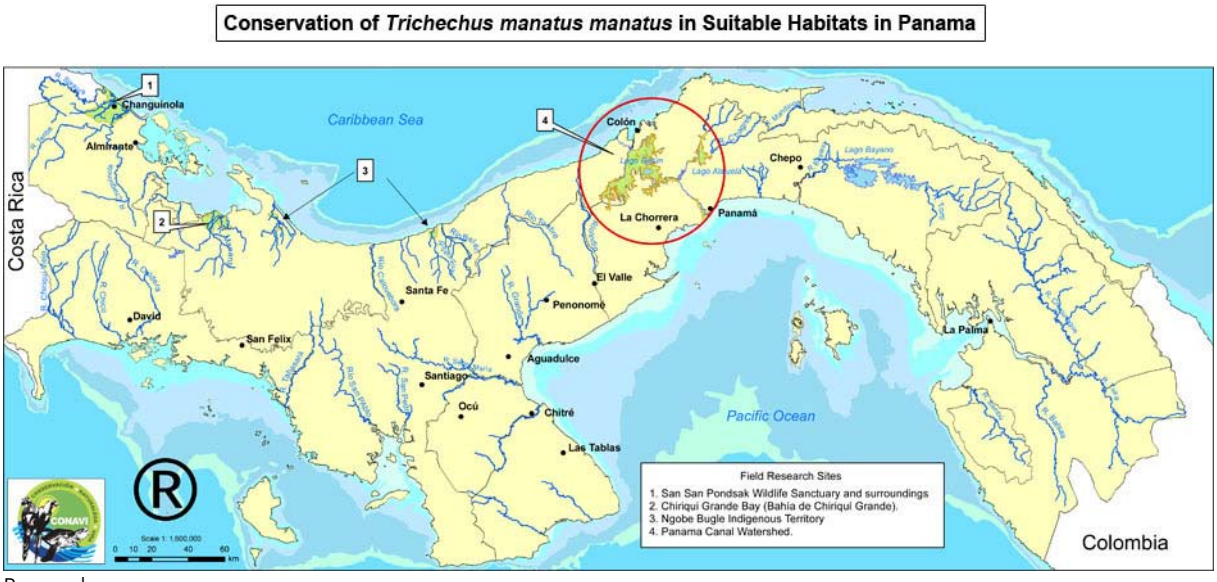
Lenin Riquelme
Fundación Conservación, Naturaleza y Vida, Panama

Introduction

Threatened by the destruction of its habitat, accidental deaths and poaching, the Antillean manatee *Trichechus manatus manatus* is listed as 'vulnerable' by the IUCN Red List and as 'threatened with extinction' in CITES. Though it has the largest range of all Sirenia, most of its habitat is fragmented and available information for the Central American stock is rather scarce. An ongoing study on its status has been conducted in Panama between mid-2004 to late-2006, in an effort to protect the species' habitat, with support from the Van Tiehnhoven Foundation for Nature Conservation (the Netherlands) and the Rufford Small Grants for Nature Conservation (UK). Recent outcomes include the designation of the Jugli-Damani lagoon, a major manatee habitat, as a protected area and Ramsar Site.

Female manatee and her calf

In the present project, Fundación CONAVI is conducting a survey to understand the current status of the Antillean manatee population in Panama. During 2007 - 2008, research has focused on the eastern portion of Bocas del Toro province, specifically in the San San, Changuinola and Sixaola River systems, where manatee counts have been highest in the past. The lower San San, Sixaola and Changuinola River systems recharge aquifers that provide water for human consumption and use in the nearby banana plantations. The geomorphology of this area is characterised by coastal plains and lowlands formed by the accumulation of sand in coastal bands. The hydrological areas are defined by the Río Changuinola (with a basin of 2,810 sq km) and the Río San San and these rivers flow into the Caribbean.



Research map

This project is aimed at encouraging effective conservation by means of:

(1) knowing the number, status, distribution and habitat use of the Antillean manatee in the study area;
(2) tagging and tracking five manatees for individual health studies and finding out usual moving patterns;
(3) assessing their condition and that of their main feeding and gathering areas; and
(4) systematising local people's knowledge, experience and observations on manatees in the study area.

Dumping of agricultural runoff San San River

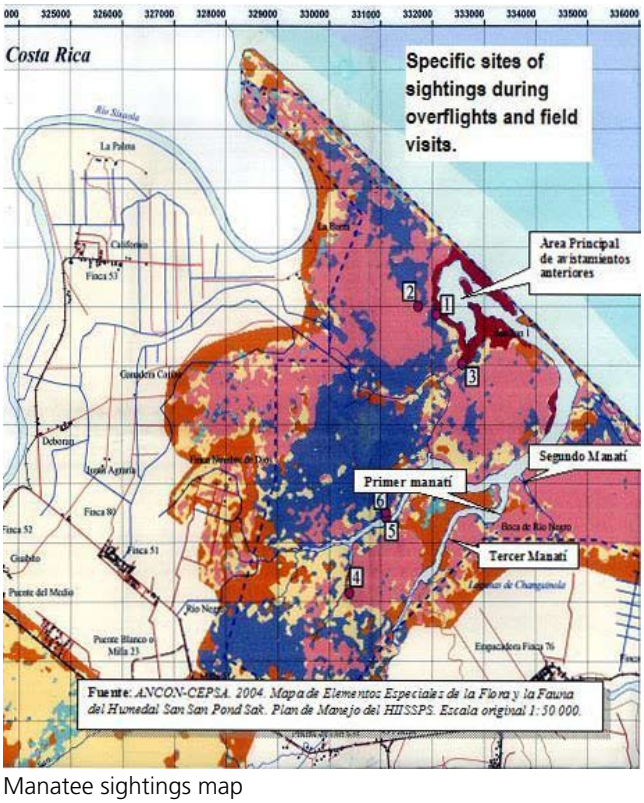
Methodology

Research methodology consists of aerial survey overflights, interview surveys, the use of Geographic Information Systems (GIS), on-site assessment of suitable habitats and tagging. Nine two-hour overflights were conducted, 3 in December 2007, 3 in February 2008 and another 3 in April 2008, all focused on the San San Pondsak Wildlife Sanctuary and adjoining wetlands--San San, Negro, Sixaola and Changuinola Rivers, Changuinola lagoons and Soropta Cove, all located in the province of Bocas del Toro.*1 Ground assessments were conducted at the San San River and the lower watersheds of the Sixaola and Changuinola Rivers and the adjoining coast. During recognaissance, the team relied on local wooden and fibreglass boats as a means of transportation to detect the main spots where manatees gather, feed or reproduce, determine the different types of vegetation they consume and conduct interviews in hard-to-access areas. Interview surveys were conducted among fishermen and dwellers living on the nearby waterways and aircraft pilots who make daily flights in the area.

*1 The lower Sixaola River marks the boundary between Panama and Costa Rica, thus manatee populations found in this river might be wrongly counted as separate populations.

Results and discussion

The number of manatees sighted was quite significant as compared with the latest survey, conducted in 1987. Mou Sue´s 1987 survey provided a total of 42 manatee sightings in 13 overflights within the same area in 8 months, with a rate of 81.8% probability of sighting a manatee during an overflight. The present survey recorded 49 sightings in 6 overflights in 3 months with a 100% probability rate. In terms of reproduction, the present study found a frequency of 18.3%, as compared with 11.4% in the 1987 study. The San San, its tributary the Negro River and its man-made channels seem to be the main manatee habitat in the area; the largest single sighting took place at 'La Olla,' near the mouth of the San San, where gatherings of 13 and later 9 individuals was found. It seems manatees migrate up river taking advantage of high tides, entering the Negro River and its intricate web of



Manatee sightings map

Mouth of the San San

Lagunas de Changuinola

channels where they can feed on freshwater macrophytes, mainly water hycinth (*Euchornia crassipes*) and water lettuce (*Pistia stratoites*) and Guinea grass (*Panicum maximum*). They move down river to La Olla where they can feed on black (*Avicennia germinans* L.), red (*Rhizophora mangle* L.) and white (*Laguncularia racemosa* L.) mangrove. Agrochemical runoff continues being dumped in the San San, but we found no indication manatees are staying away from those areas. Surprising sightings took place within the Changuinola River system: its lagoons offer excellent habitat for manatees despite the large number of populated sites found along its banks and the general use of this water course for garbage disposal. The research team sighted a gathering of 9 individuals in Quebrada Lagarto, a stretch of water within the Changuinola lagoons.*2

Despite local boatmen´s assertions that manatees are uncommon within the Soropta Channel because it is too narrow and shallow, 11 individuals where sighted. The high number of manatees sighted could be the result of increased water flow from heavy rains and flooding in recent months that have widened the channel and improved its quality as manatee habitat. Quite possibly, these man-made channels could hold the largest number of manatees in Panama. Soropta Cove, rich in seagrass meadows and coral reef protection is the only marine area where manatees were found. The team sighted 3 separate adults that seemed to be feeding on the cove´s turtle grass (*Thalassia testudinum*) patches and the mangrove stands. Soropta Cove and other seagrass-rich coastal areas might serve not only as feeding grounds but also allow for manatees to move between river and channel systems.

No sightings were made at the Sixaola River. It´s mouth marks the southern tip of the Gandoca-Manzanillo Wildlife Refuge that protects the lowlands of the southern Caribbean coastal region of Costa Rica. Manatee sightings in the area are scattered and include 1 in 1982 and 3 in 1990 at the coastal Gandoca Lagoon (Vasquez R. 1993 in litt.); an aerial survey in July 1991 yielded 2 sightings just north of the mouth of the Rio Sixaola (Reynolds et al. 1995). It seems this manatee population living in Costa Rica´s Gandoca Manzanillo area probably comprises a maximum of 6 and a minimum of 3 individuals connected to manatee populations living in contiguous habitats in the San San Wildlife Sanctuary within Panama (Jimenez 1998; MINAE/PNUMA 2001).

Currently, the research team is making use of Geographic Information Systems (GIS) to produce precise, digitised maps, plotting geographically referenced data sets: location of manatees, distribution and density of fresh water macrophytes, sea grasses and mangrove stands, boat traffic patterns, location of run-off water discharges, current and proposed development sites and so forth. Tagging and tracking equipment is expected to arrive in December 2009, so this research component may be started. Overflights and field surveys will be conducted in the Panama Canal Watershed in 2009.

*2 In 1963, 9 manatees where taken from this area and translocated to the Panama Canal area, giving origin to that particular population.

Landscape of research area

Manatee habitat mangrove area

Manatee habitat rio Negro

Manatee habitat San San River

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Inventory of vespid wasps (Hymenoptera: Vespidae) in the north-western part of Vietnam

Research Grant Programme

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Institute of Ecology and Biological Resources, Vietnam Academy of Science and Technology, Vietnam

Introduction

Wasps of the family Vespidae, consisting of more than 4,000 species worldwide, are distinguished in all the zoogeographical regions (Goulet and Huber, 1993). Four of six vespid subfamilies are distributed in the Oriental region including Vietnam. They are a solitary wasp subfamily Eumeninae (potter wasps), the largest subfamily in the Vespidae, and three social wasp subfamilies, Stenogastrinae (hover wasps), Polistinae (paper wasps) and Vespidae (hornets and yellow-jackets). The vespid wasps are beneficial insects in that they attack caterpillars and other insects including many pests to feed their young (Richter and Jeanne, 1985; Goulet and Huber, 1993) and such foraging habits allow them to be, at least potentially, effective predators of insect pests in biological control programmes (Iwata, 1967; Gould and Jeanne, 1984). In addition, because they are at the top of the food-web of terrestrial arthropods (or even animals) as well as pollinators of many plants (Kojima, 1993; Carpenter and Wenzal, 1999), vespid wasps may play important roles in an ecosystem, and thus they can be good bio-indicators for environmental conditions.

Vietnam is expected to harbour very diverse biota, not only because it spreads widely from the subtropics or warm-temperate climate in the north to the tropics in the south, but also because the northern part is on the eastern slope of the Himalayas, one of the centres of biological diversity. This should also be the case for the vespid wasps and especially the north-western part of Vietnam is believed to be one of the areas with the richest vespid faunas in the Oriental region. However, the social wasp fauna in the north-western part of Vietnam has only been briefly studied, with 12 species recorded in literature. Furthermore, any information on eumenine wasp fauna is yet unavailable. Moreover, the vespid species in this region are very poorly represented in existing collections.

Polistes sagittarius attaching a catepilla

Objectives

The main objective of this research is to clarify the vespid fauna in the north-western part of Vietnam. Its specific objectives are:

(1) to describe new taxa, and to produce identification keys for all new and known species of the Vespidae in the north-western part of Vietnam; and
(2) to conduct a species-level systematic inventory of vespid wasps, which will allow us to assess species richness in the area, and to contribute to more general biogeographical and phylogenetic studies.

Methodology

Laboratory research is conducted based on the specimens housed in the Institute of Ecology and Biological Resources, Vietnamese Academy of Science and Technology (VAST), Hanoi. Field research on vespid wasps is also carried out in and outside the following five national parks and national reserves in the north-western part of Vietnam, which represent typical ecosystems in the area: Hoang Lien Son proposed National Park (Lai Chau Province); Muong Nhe National Park (Lai Chau Province); Muong Fang (Dien Bien Province); Sop Cop National Park (Son La Province); Ta Sua proposed National Park (Son La Province); and Pa Co National Park (Hoa Binh Province). Malaise traps, aerial nets, light traps and nest collection are used to efficiently collect the vespid wasps. Adult morphology, except for male genitalia and colouration, are examined under a stereoscopic dissecting microscope with a drawing tube. Male genitalia and larvae are handled with appropriate methods and observed based on the specimens preserved in glycerine or mounted specimens under stereoscopic dissecting microscope.

Malaise trap was set up in forest in Copia, Co Ma, Son La

Author was collecting wasps by light trap in Pa Co, Mai Chau, Hoa Binh province

Results

(1) Establishing reference library

Access to scientific references published outside the country is generally difficult in Vietnam. This is true especially in the case of references for potter wasps (Eumeninae), taxonomy and biology because no one but me has worked on the vespid wasps in Vietnam. During first six months of this project (May – October 2008), I succeeded in obtaining about 20 references on the vespid subfamily Eumeninae, mainly from the reference collection of Dr James M. Carpenter (American Museum of Natural History, New York, USA). Many other references will be sent to me by Dr Carpenter later. Then I will establish the reference library necessary for conducting my research.

(2) Field work and examination of specimens obtained

Two field trips were conducted at the north-western part of Vietnam, viz. Copia (Son La Province) and Mai Chau (Hoa Binh Province). We spent 15 days in Copia and 12 days in Mai Chau. Nearly 400 specimens of vespid wasps in four subfamilies were collected, including wasps in 9 nests. In addition, about 200 VAST specimens of vespid wasps collected from many localities in the northern part of Vietnam were examined. The examination revealed that these specimens are assigned to at least 35 species, belonging to the following genera (the number of species of respective genera are in parenthesis): *Provespa* (1) and *Vespa* (6) of Vespidae; *Polistes*, (5) *Ropalidia* (5) and *Parapolybia*

The author and colleague in Copia, Co Ma, Son La province, at elevation of 1,400m

(3) of Polistinae; *Eustenogaster* (1) of Stenogastrinae; *Zethus* (2), *Calligaster* (1), *Labus* (1), *Pseumenes* (1), *Eumenes* (3), *Delta* (2) and *Antepipona* (4) of Eumeninae. In addition to these species, there are some unidentified species of the genus *Polistes* of Polistinae and many species of Eumeninae. Efforts should be continued in the future.

Polistes sp. (subgenera Polistella) in their nest

Ropalidia sp. in their nest

Parapolybia varia in their nest

Conservation research for the critically endangered Banggai crow *Corvus unicolor* and undescribed montane birds in the Banggai Islands, central Sulawesi, Indonesia

Research Grant Programme

Mochamad Indrawan
Indonesian Foundation for the Advancement of Biological Sciences, Indonesia

Introduction

This project is part of long-term research and conservation endeavours on native birds on remote islands around the central-eastern peninsula of Sulawesi. The work began in 1991 (Indrawan et al., 1993, 1997), and is being developed as a comprehensive conservation endeavour. In the Togean Islands, located off the northern coast of the central-eastern peninsula of Sulawesi, two new species of birds have been described through the fieldwork beginning in 1996 (Indrawan, 2004; Indrawan and Somadikarta, 2004; Indrawan et al., 2006a, 2006b, 2008). These findings will establish Togean as an endemic bird area according to the BirdLife International criterion (Stattersfield et al., 1998).

Banggai Islands, the target area of the present study, is located off the southern coast of the central-eastern peninsula of Sulawesi. Together with the Sula Islands to their west, the Banggai Islands are already known as an endemic bird area, harbouring numerous range-restricted species (Stattersfield et al., 1998). Narrow endemics found in these island groups include: Sula megapode *Megapodius bernsteinii*, slender-billed cicadabird *Coracina schistacea*, red-and-black thrush *Zoothera mendeni*, henna-tailed rhinomyias *Rhinomyias colonus*, helmeted myna *Basilornis galeatus* and Banggai crow *Corvus unicolor*.

Of these endemic birds, the Banggai crow had not been seen in the field by scientists for a long time since its original description in 1900. This bird, described from an unspecified locality of the 'Banggai, Sula Islands' (Hartert, 1919), was known only by two specimens kept at the American Museum of Natural History, New York, until its recent rediscovery made by our team from Peleng (the largest island in Banggai Islands). It was first seen in 1991 by us, and our subsequent expeditions confirmed its occurrence in the area from 2004 to 2008 (including the present study). Judging from our preliminary surveys, the Banggai crow appears to be forest dependent, surviving mainly in the western montane of Peleng and remains critically threatened. Further comprehensive research is clearly needed for conserving this rare species appropriately.

Although our previous studies in the montane range of the Banggai Islands were limited, some undescribed taxa, hitherto known only from this area, have been discovered, as well as 'cryptic' taxa with uncertain taxonomic positions owing to a lack accurate information including vocalization, morphology, behaviour and DNA sequence. These findings reveal that the potential for biodiversity study in the Banggai Islands has not yet been sufficiently explored.

The objective of this project is to study the population status, ecology and taxonomic status of little known birds in the Banggai Islands, some of which are threatened and unknown to science. The ultimate goal is to establish justification and local support for establishing protected areas.

Methodology

Field expeditions, interviews with local people and focused-group discussions are implemented to gather information on the montane avifauna of this region. Considering the importance of developing the scientific capacities of local researchers, the activities are conducted in collaboration with local

researchers as much as possible. The field expeditions are concentrated mainly in the higher altitudes (500-900m above sea level) on the mountainous western half of the Peleng Island of the Banggai Islands. Comparative studies, e.g., surveying similar ecosystems in the mountain ranges of the eastern peninsula of mainland Sulawesi, are carried out. A limited number of specimens are collected in a judicious manner, and deposited at Museum Zoologicum Bogoriense for further taxonomic studies. Local knowledge is gained through interviews with local farmers and hunters recruited as our guides. Local knowledge will be tapped to find models for the establishment of protected areas for conservation of the montane species.

Preliminary results

Research collaborations are being developed with an active group from Palu (the capital of Central Sulawesi province), namely Celebes Bird Club (CBC). Back in 2004, one of the CBC members joined our team's survey, establishing the rediscovery of the Banggai crow. In October and November 2006, CBC conducted their own expedition to Peleng Island, and managed to locate a lowland distribution of the Banggai crow in the central part of the island.

In collaboration with CBC, two specimens of Banggai crow were secured and deposited at Museum Zoologicum Bogoriense, becoming first collection housed in an Indonesian institution. With the help of Prof Somadikarta and Prof P. Rassmussen, these specimens are being studied in detail by members of the team from CBC and our group. In the field, we also managed to capture, measure and release another specimen of the Banggai crow (Fig. 1).

We also studied about altitudinal distribution of the endemic birds. With the likely exception of Sula megapode, most of the endemic birds were found from the area at 500m above sea level or higher. The extension of altitudinal range records of these endemic birds is good news for the conservation of small islands such as Peleng and Banggai. The Sula megapode had been locally extinct from the highland distribution area onward 10 – 20 years ago.

The red-and-black thrush, which is rare and considered as 'near-threatened' by IUCN in 2007, was also found in western Peleng. Indigenous knowledge from local people indicated that the bird was a forest dweller and breeds only seasonally. This bird was described in 1939 based only on one specimen from an unknown locality in the Banggai Islands, and, in 1991, a total of three birds on two occasions were observed on Taliabu Island of the Sula Islands. The present occurrence represents the fourth example for the species since its original description.

Although this study concentrates on birds, we also documented the presence and habitat of endemic mammals and reptiles, including the Peleng Island tarsier *Tarsius pelengensis* ('data deficient' according to IUCN in 2007; Fig. 2), and the recently described flying lizard from the Banggai Islands, *Draco rhytisma* (Fig. 3).

Figure 1. Banggai crow in the forest habitat (photo: Frangky Masala/ IdOU - Indonesian Ornithologists' Union)

Figure 2. Peleng Island tarsier, one of the first photos of the endemic primate (Mochamad Indrawan & Yunus Masala)

Figure 3. The flying lizard, *Draco rhytisma*, in Banggai Island (Frangky Masala)

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Phylogenetic analysis for selected genera of mosses in Mt Kinabalu: its implication to their phylogeography and systematics

Research Grant Programme

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Introduction

Mount Kinabalu, the highest mountain in Southeast Asia, is one of the four hot spots of moss diversity in Malaysia (Tan and Iwatsuki, 1999). This mountain supports 360 taxa of mosses (Tan and Iwatsuki, 1999) which is about 62% of the 582 taxa reported from Sabah (Suleiman et al., 2006).

In addition to the prominent diversity of mosses on Mt Kinabalu, allopatric and sympatric distribution of congeneric species has been recorded along elevational gradients. Little is known about what are the causes for these distribution patterns. It is of interest whether present-day populations of mosses are relicts from a warmer/cooler time (Late Plestocene) or whether they are from recent colonization and speciation events. Also, the uplift of Mt Kinabalu in the late Pliocene era might have also formed present-day distribution and diversity of mosses.

A view of Mt Kinabalu taken from Mt Trus Madi

This study therefore focuses on obtaining genetic data from three selected genera of mosses, namely *Dicranoloma, Campylopus* and *Pogonatum*, from Mt Kinabalu. These data is used to update and improve current systematics of the genera in Sabah. In addition, genetic data from some congeners were collected from other mountains in Sabah. The molecular data is analysed in order to solve the phylogeography and the possible speciation events of mosses in Mt Kinabalu.

Dicranoloma havilandii, an endemic species of Mt Kinabalu

Campylopus umbellatus

Sporophytes of *Pogonatum neesii*

Research objectives

The objectives of this research are:

(1) to update the systematics of *Dicranoloma*, *Campylopus* and *Pogonatum*; and

(2) to discover the phylogeography and evolutionary biology of mosses of Sabah, with an emphasis on Mount Kinabalu.

Methodology

(1) Fieldwork

Sampling of mosses have been carried out on Mount Kinabalu (4,095m), Mt Alab (1,800m), Mt Minduk Sirung (1,900m), Mt Trus Madi (2,600m), Mt Lucia (1,200m), Mt Lumaku (1,950m) and Mt Tambuyukon (2,588m) between October 2007 and September 2008. The mosses were collected along existing trails on each mountain. Several samples from each species were collected at different elevations within their distribution range. Each sample was collected at two points along elevational gradients that were approximately 200-300m above sea level apart. The coordinates of all the sampling points were recorded.

On the summit of Mt Minduk Sirung with a mountain guide

(2) DNA analysis

Three to five samples from each fresh specimen of *Dicranoloma*, *Pogonatum* and *Campylopus* species were separated in eppendoft tubes immediately from the fields and preserved at -80ºC in a freezer. DNA was extracted from each sample using a Dneasy plant mini kit (QIAGEN) or following Tsubota et al. (2005)'s extraction method. In the present stage, PCR was carried out for nrITS genes (subsequently, PCR will be done for another three genes, namely, atpb-rbcL, rps4 and trnL-trnF). The PCR primers and programmes follow that of Grundmann et al. (2006).

Mossy forest on Mt Trus Madi

The DNA sequences were aligned using the ClusterW Multiple alignment inside the BioEdit Sequence Alignment Editor, version 7.0 (Hall, 1999), then subsequently were checked and adjusted manually using the same programme.

The phylogenetic relationships for the selected mosses were analysed using neighbour-joining (NJ) and maximum-parsimony (MP), with PAUP*4.0b10 (Swofford, 2002). For MP, gaps were included as a fifth character state and each character is given equal weight. Five hundred bootstrap replicates were carried out, with ten replicates of a heuristic search with a random addition sequence at each bootstrap replicate. Branches were swapped under the tree bisection-reconnection (TBR) algorithm. For NJ, gaps are treated as missing data. In addition, MrBayes 3.1 for Bayesian Inference analysis and TCS 2.1 for network clade analysis were also used.

Preliminary results and discussion

Forty and 11 ITS sequences for *Dicranoloma* spp. and *Pogonatum macrophyllum*, respectively, have been obtained. The genetic variations (nrITS) among this widespread species were hitherto unknown as there was only one ITS sequence recorded in GenBank (based on a 14 October 2008 search in GenBank, http;// www.ncbi.nlm.nih.gov). The highest intraspecific variation of among *Pogonatum microphyllum* populations in Sabah is only 0.7%. Thus, the phylogenetic relationships among the population in the mountainous area in Sabah could not be constructed based on the genetic data from the ITS gene (Figure 1).

In contrast to *Pogonatum macrophyllum*, intraspecific ITS gene variations in *Dicarnoloma* spp. were relatively higher. With the exception of *D. havilandii*, the genetic differences between the population for *D. brevisetum*, *D. braunii* and *D. assimile* were 1.8%, 0.8% and 1.0%. There was almost no genetic variation among populations along elevational gradients (3,000 – 3,300m) for *D. havilandii*, a species endemic to Mt Kinabalu.

For most of the *Dicranoloma* spp., the monophylies of the morphology-based taxonomic units were supported by genetic data (Figure 2). However, there are some morphologically doubtful specimens (tentatively named *D. brevisetum*; see the red arrow in Figure 2). Although these specimens are provisionally identified as *D. brevisetum* following the keys in previous literature, they have some characteristics (e.g., the absence of a stem central strand) that fit the description of *D. braunii*. Thus, we suspect the doubtful '*brevisetum*' might be a hybrid between the aforementioned two species.

Future efforts

(1) To obtain sequences from other *Pogonatum* species and compare the genetic variations between species.
(2) To investigate the morphology and ecology of the typical *Dicranoloma braunii* and *D. brevisetum* and the doubtful *D. brevisetum*.
(3) To investigate the genetic diversity of *Campylopus* spp.
(4) Adding more genetic data from the different genes in the analysis.

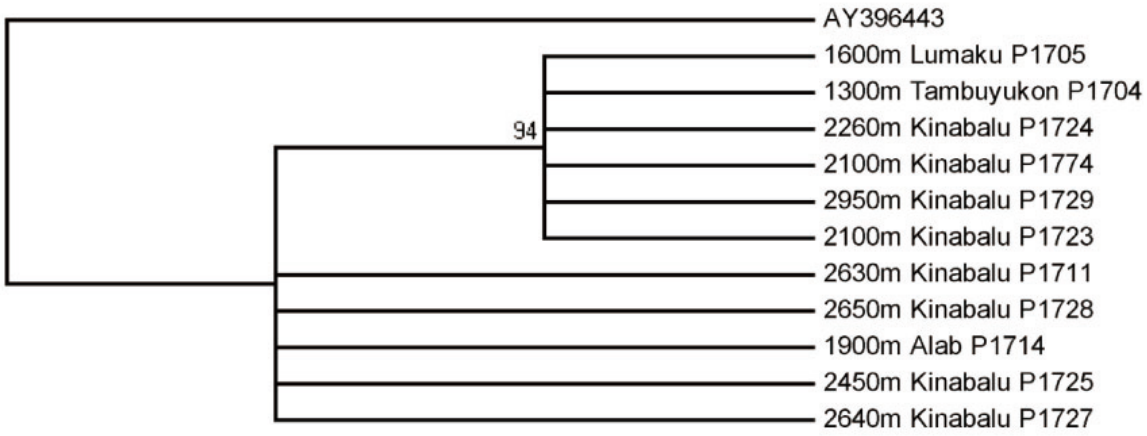

Figure 1. Phylogenetic tree of the *Pogonatum macrophyllum* inferred from the nuclear ITS genes. Phylogenetic analysis was performed with Bayesian method using K81uf evolutionary model. Posterior probabilities are noted on the branches.

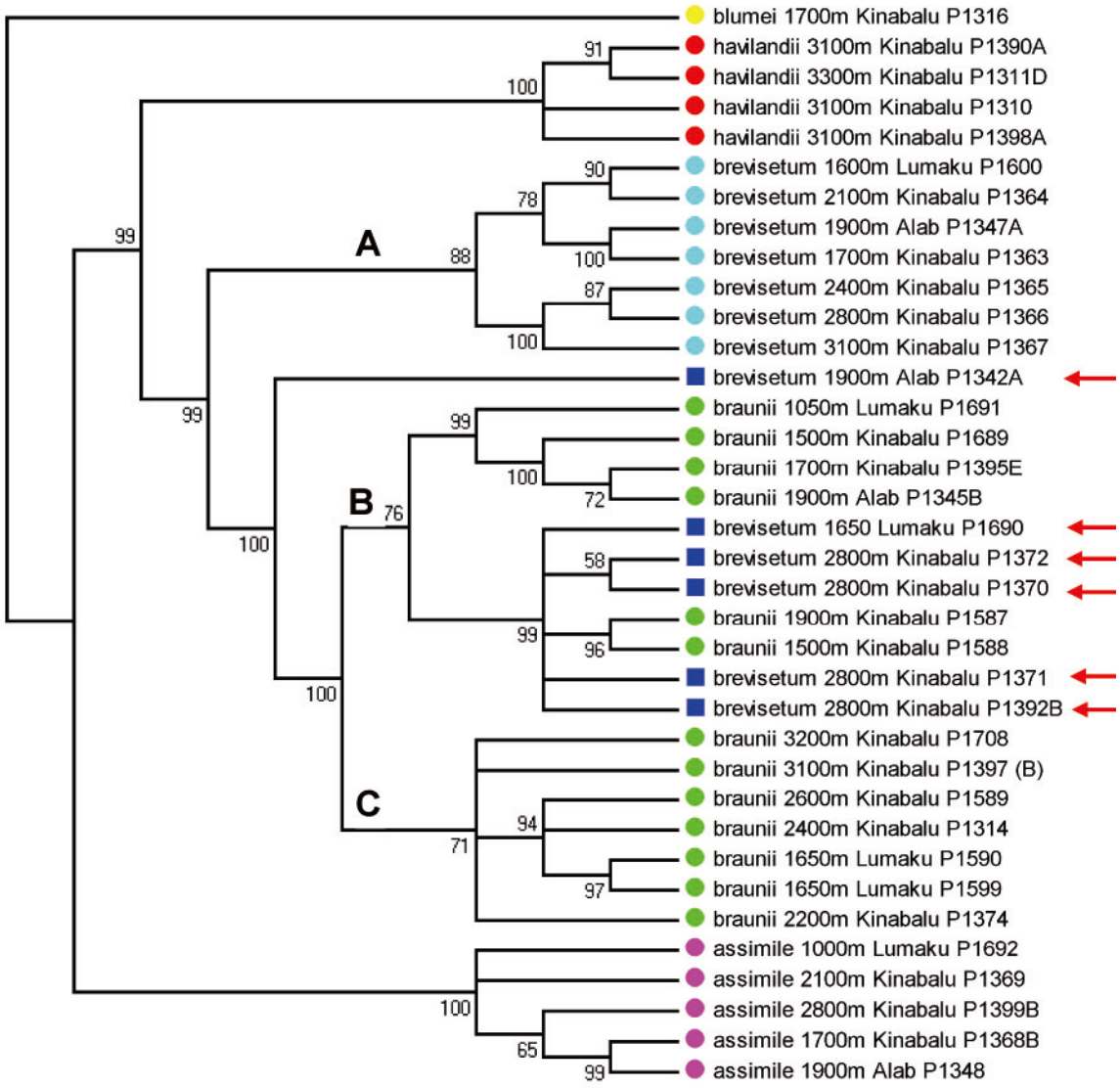

Figure 2. Phylogenetic tree of the five *Dicranoloma* species inferred from the nuclear ITS genes. Phylogenetic analysis was performed with Bayesian method using HKY+G evolutionary model. Posterior probabilities are noted on the branches.

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Assessing the impacts of tropical forest modification and fragmentation on biodiversity and ecosystem functioning using dung beetles as the focal taxon

Research Grant Programme

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Habitat loss and fragmentation are rapidly modifying tropical forest ecosystems, causing dramatic changes to biotic communities. More than any other terrestrial ecosystem, the vitality of tropical forests depends on the web of ecological interactions among species. This research was designed within the scope of developing theoretical and empirical frameworks for evaluating the impact of habitat modification and fragmentation on biological diversity. Conservation importance of the study arises from the need to understand the responses of biotic communities to the modification of natural habitats, in order to predict and mitigate further biodiversity loss. The focal taxon of dung beetles are a proven indicator for measuring biodiversity disturbance and interactions between anthropogenic disturbance and community structure due to their high morphological and functional diversity, abundance and ecological role in dung removal.

During the first six months of the project, we assessed dung beetle diversity and abundance, together with the efficiency of dung removal, in primary forests, secondary forests, home gardens and tea plantations in the lowland wet zone of Sri Lanka. We collected standard environmental and habitat variables from the sampling locations in each plot for habitat comparison. Dung beetles were identified up to morpho-species for the preliminary analysis. Preliminary data analysis was carried out using suitable statistical methods to establish the sampling completeness and to assess compatibility with the hypotheses. To evaluate the suitability of dung beetles as an indicator species, we compared dung beetle diversity and abundance data with those of amphibian and butterflies from the same habitat types. According to the results, dung beetle abundance, species assemblages and the proportions of functional groups differed markedly between habitats. The trends in species diversity could be better interpreted once the beetles are taxonomically identified.


Two Scarabaeus beetles rolling a dung ball


One of the sampling sites in a tea plantation

There was a positive correlation in beetle density and the proportion of dung removed. Results suggest that the dung removal function is affected by the change of land-use through altered community structure. We are also exploring the ecological traits that make species vulnerable to habitat degradation.

The study was successfully presented at the annual meeting of Scarab-Net, organised by the American Museum of Natural History in New York in September, 2008. At the meeting, we sought collaboration for the taxonomic work, since facilities are not available in Sri Lanka. As a result, a team of taxonomists will be visiting Sri Lanka by the end of this year to conduct a training workshop.

The first of the planned outreach programmes will be held in November, 2008 in Sinharaja MAB reserve. We are collaborating with Sabaragamuwa University of Sri Lanka, the University of Colombo and the Ministry of Environment and Natural Resources in organising this field training workshop for undergraduate students.

We aim to continue sampling the wet zone this year. Several suggestions from the feedback obtained at the Scab-Net meeting will be incorporated in the research.

Setting a trap in the Sinharaja Forest Reserve

Research assistant and field assistants setting a pitfall traps in a home garden

Enoka sorting a sand trap in the dry zone

Small-scale Research Grant Programme

The diversity of fungi (Agaricales and Hyphomycetes) in West Java

Small-scale Research Grant Programme

Dewi
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Introduction

Biodiversity research is one of the high priorities of the Indonesian Government. Glaringly absent from all published accounts of Indonesian biodiversity, however, are estimates of fungal diversity. Along with other microorganisms, the fungi of Indonesia have received little attention from the scientific community. Historical literature, exsiccati and recent fungal collections from the region suggest, however, that the mycota of Indonesia are as equally diverse as higher plants, although mostly undocumented. Java is a careening ecological disaster, either as a result of high population or high pollution. Under the enormous pressure of the population and high pollution, deforestation is progressing at a frightening pace. The few remaining areas of primary forest that support a large variety of fungi are primarily in national parks and reserves or on inaccessible mountain slopes. The fungi of these few primary forest must be documented soon before declining forests result in declining fungal diversity. One can predict a similar pattern of diversity loss as a result of poor air quality in Java, particularly on ectomycorrhizal and hyphomycetes taxa primarily near population centres.

A fascinating fungal world encompasses a wide range of fungi, from unicellular fungi to multi-cellular, as well as aquatic to terrestrial and from open fruit body to enclosed fruit body. Under this situation, research will delimit only two kinds of fungal taxa. Order Agaricales represents enclosed fruit body fungi with various colours and large sizes. Most of it plays an important symbiotic row with trees in forming ectomycorrhiza. While Hyphomycetes represents open fruit bodies with a tiny size, they are the most frequently isolated fungi and play a major role as decay fungi in the mycoflora of the air and the soil.

Objectives

The objectives of the research are to fill the gaps in our knowledge of Indonesian fungi, to document the diversity of Agaricales and Hyphomycetes from West Java and to enhance the number of fungal collections in Herbarium Bogoriense.

Location

Several sites in West Java will be sampled during the course of this survey. They were selected based on the presence of relatively undisturbed primary forests and their potential to support a wide diversity of fungi. Nearly all collecting sites were reforested regions on the slopes of volcanoes and access is controlled by the Ministry of Forestry as part of the National Park and Reserves Systems. They are Ujung Kulon National Park in Serang City, Province of Banten, the most extensive undisturbed lowland rainforest and swamps in Java; Mt Halimun National Park in Sukabumi City, Province of West Java, one of the low-land forests left in Java; Bogor Botanical Garden in Bogor City, Province of West Java, the historical centre for mycology in Indonesia, the Botanical Garden served as the original source for many fungal specimens; Mt Gede Pangrango National Park and Cibodas Botanical Garden in Cianjur City, West Java, the slopes of Mt Gede and Mt Pangrango, the Cibodas region is the type locality for numerous Indonesian Agaricales and is one of the most extensive undisturbed primary forests in Java and the Haurbentes Nature Reserve in Bogor City, Province of West Java, an artificial Dipterocarpaceae forest

that is well known for its mycorrhizal trees, which associate with many mushrooms. It is expected many fascinating mushrooms will be encountered during the fieldwork.

Methodology

The project management plan involves the collection, description, identification, preservation, curation and documentation of specimens of Agaricales and Hyphomycetes in West Java.

Expected outcome

At this moment there is very little information concerning the Indonesian Agaricales and Hyphomycetes and Indonesia is still a black spot for mycologial exploration. Through this project, the encountered species are expected to help other mycologists who currently work on the biogeography pattern of Agaricales and Hyphomycetes in the world and several questions concerning the biogeography can be answered. Specifically, what are the distribution patterns of Indomalaysian and Australasian Agaricales and Hyphomycetes and how do they correlate with the distribution pattern of their host or host substrate?

The red panda *Ailurus fulgens* in Langtang National Park: an assessment of its conservation status

Small-scale Research Grant Programme

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Introduction

The red panda *Ailurus fulgens* is an 'endangered' species that is fully protected under Nepalese law. Its distribution is restricted to the Himalayan foothill regions of Nepal. Due to the increase in forest fragmentation caused by human land use, red pandas are facing pressure for their survival. Unless a comprehensive study of the population status and existing threats is conducted, no reasonable management recommendation and conservation action plan can be established.

This study concentrates on an assessment of the red panda in Langtang National Park. This comprehensive project includes population surveys through the direct sighting and indirect sign survey method following the contour line perpendicular to the elevation gradient, an analysis of socioeconomic factors and site-specific conservation measures and the development of community outreach/participatory programmes. The project will also assist the authorities concerned of the Government of Nepal in formulating effective management plans for the conservation of the red panda.

In this report, I have briefly described recent activities and outcomes. Recent activities are mostly related to interaction with park staff and locals and the first red panda survey conducted by the project.


Prime habitat of red panda in Langtang National Park

Study area

After communication with the park staff, I selected the Phedi–Ghopte area and Mangingoth area in Langtang National park as the first survey sites. Due to tough and steep cliffs and dense bamboo thickets, it seemed that there was a good red panda habitat in the Phedi-Thadepati area. A dense canopy with thick understory bamboo was characteristic of the Mangingoth area, which was comprised of *Abies spectabilis* and *Rhododendron* spp. as the dominant plant species.


Red panda in Langtang National Park

Methodology

The study area was divided into two blocks, viz. The Phedi-Ghopte block and the Mangingoth block. Due to the rugged terrain, I could not lay out the horizontal line transects in the Phedi-thadepati area and Mangingoth area. I walked slowly (0.4-0.8 km/hour) along the existing trails (mainly cattle paths) passing through different

habitats and altitudinal types (Pradhan et al., 2001) searching for signs of the red panda, recording signs of its absence or presence. The sign data will be used to derive an index of relative abundance, expressed as the proportion of the signs encountered to the survey efforts in the final report after being replicated over the field study. Where signs (droppings) were encountered, different parameters such as age of sign (categorized in 4 age groups, i.e., very fresh, fresh, old and very old), altitude, slope, substrate, vegetation structure, tree canopy, GPS reading and proximity to water source were recorded. These habitat parameters and the signs encountered have just been expressed as a percentage in this interim report.


Scat (dropping) of red panda

Results

(1) Phedi-Ghopte block

During the field survey, 36 dropping signs of the red panda were encountered, out of which 22% (n=8) were very old, 50% (n=18) were old, 22% (n=8) were fresh and 6% (n=2) were very fresh. Among these, 50% of the signs were found on trees followed by rocks (30.50%), logs (14%) and on the ground (5.50%). Droppings were found on *Butula utilis* (39%, n=7) followed by *Rhododendron* spp. (22%, n=4), *Juniperus recurva* (22%, n=4) and *Abies spectabilis* (17%, n=3). All the signs were found less than 100m from a source of water. 81% of the signs were found within 50m from a water source, while 19% were found between 51m and 100m. No droppings were found beyond the 100m periphery of the source of water. All the signs were found within the altitude range of 3,250m to 3,650m and the topographic slope from 25 to 40 degrees. Most of the red panda droppings (42%) were found under the open crown canopy followed by medium crown canopy (28%), closed crown canopy (19%) and dense crown canopy (11%). Altogether, 58% of the signs were found in the habitat with dense understory bamboo, while the remainder were found in medium understory bamboo.

(2) Mangingoth block

During the field survey in this block, 13 dropping signs of the red panda were encountered out of which 15.38% (n=2) were very old, 46.15% (n=6) were old, 23.07% (n=3) were fresh and 15.38% (n=2) were very fresh. Among these, 69.23% (n=9) of the signs were found on trees followed by rocks and logs (15.38%) and no signs were found on the ground in this block. Droppings were distributed equally on *Betula utilis* (33.33%, n=3), *Rhododendron* spp. (33.33%, n=3) and *Abies spectabilis* (33.33%, n=3). All the signs were found less than 150m from a water source. 46% of the signs were found within 50m of a water source, 30.76% were found between 51m to 100m and 23.07% of the signs were found between 101-150m, while no droppings were found beyond the 150m periphery of the water source. All these signs were found within the altitude range of 3,100m to 3,345m and the topographic slope from 23 to 35 degrees. Most of the red panda droppings were found under the closed crown canopy (46%) and medium crown canopy (46%) followed by dense crown canopy (8%). 62% of the signs were found in the habitat with dense understory bamboo while the remainder were found in sparse understory bamboo (23%) and medium understory bamboo (15%).

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Taxonomic study of the parasitic wasp genus *Pediobius* in Java, Indonesia

Small-scale Research Grant Programme

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Introduction

Pediobius is a large genus of the wasp family Eulophidae (Hymenoptera: Chalcidoidea), comprising more than 200 described species worldwide and distributed in all the zoogeographical regions (Hansson, 2006). The species of *Pediobius* are primary or secondary parasites for eggs, larvae and pupae of the other arthropods, e.g., insects of the orders Coleoptera, Diptera, Hymenoptera and Lepidoptera and spiders of the order Araneida (Bouček, 1988; Hansson and Nishida, 2002; Noyes, 2002). Some species of *Pediobius* have frequently been used as biological control agents for many insect pests.

Studies on the *Pediobius* of Java Island were started in the mid-19th century by Walker (1846), followed by Zehntner (1898), Girault (1917), Gahan (1922) and Ferrière (1933, 1940). Kerrich (1973) subsequently updated the studies on tropical and subtropical species of *Pediobius*, including the species from Java. Most recently, Purnamasari and Ubaidillah (2007) recorded 14 species of *Pediobius* from Java, and provided important information resources on parasitic wasp conservation in Indonesia. Nevertheless, there are no comprehensive taxonomic studies covering all Javanese species. The main objective of this project is to clarify the species diversity of Javanese *Pedibius* to have an accurate identification system. This is a fundamental study that is necessary for the future development of strategies for biodiversity conservation. In addition, the biological information obtained during this study will also contribute to establishing a biological control programme, which is important for enforcing sustainable agriculture in this area.

Materials and methods

This study is conducted based on the specimens collected during our field research in West Java (Sukabumi), Cental Java (Purwokerto) and East Java (Magetan) from 24 March to 6 April 2008, as well as the collection of Museum Zoologicum Bogoriense (MZB) and that collected by the Indonesian Institute of Sciences (LIPI) from 2002 to 2007; all of these specimens examined are now deposited in the MZB. The materials were collected mainly by sweep netting, but also using Malaise traps

Figure 1. Collecting parasitic wasp using sweep net

Figure 2. Collecting parasitic wasp using sweep net and aspirator

and yellow-pan traps, and also by rearing from hosts. The sweep nets and yellow pan traps and sometimes the Malaise traps were applied especially to habitats where *Pediobius* species diversity is presumed to be high (e.g., secondary and primary forests, forest edges, agriculture areas and grasslands). The specimens obtained were prepared by appropriate methods according to methods for wasp collection (Noyes, 1982). Specimens were mounted on rectangular cards and their external morphology and colouration were observed under a stereoscopic microscope. The morphological terminology follows Bouček (1988) and Gibson (1977).


Figure 3. Malaise trap


Figure 4. Yellow pan trap

Result and discussion

During this study, we examined more than 140 specimens of *Pediobius* wasps from Java. Our examination reveals that at least 17 species of *Pediobius* are recognised from Java although the identification of specimens is still continuing. Of these, three species, briefly accounted below (as *P.* sp.1, *P.* sp.2 and *P.* sp.3), were assumed to be new to science. The number of *Pediobius* species found in this study will be much higher than previous records.

***Pediobius* sp.1**

This putative undescribed species shows peculiar morphological features that make the species easy to identify. It resembles *Pediobius aspidomorphae* in general physiognomy, but the former can be distinguished from the latter in having shallow, dull and distinctly reticulated notaular pits, eyes without sparse short setae, and propodeum with sub-parallel submedian carina. The unique condition of notaular pits in this species is probably specialized within *Pediobius*, and it would modify the diagnosis of the genus.

***Pediobius* sp.2**

This putative undescribed species resembles *Pediobius anomalus*, re-described by Kerrich (1973) based on a single female specimen from the Philippines. Both species share a unique combination of characteristics, i.e., ocelli having fine keels running back from each ocellus and sideways from each lateral ocellus, notaular pits separated by a fine median keel and medially smooth scutellum with finely longitudinal striations on their sides. *Pediobius* sp.2 can be separated from *P. anomalus* by having the following characteristics: the groove from anterior ocelli to occipital carina being absent (vs. being present in *P. anomalus*); a sculpture on the anterior mesoscutum being strongly reticulate (vs. being finely striate); the anterior side of notaular pits being deeply impressed (vs. being parallel and shallow); the coxa and femur of the legs being blackish blue with a metallic tint, except for pale yellow tibia and tarsus (vs. blue green legs, with pale testaceous middle and hind parts of the tibia and dull stramineous tarsi).

***Pediobius* sp.3**

This species is hitherto known only by a single female from the West Java. *Pediobius* sp.3 is the smallest in size (1.47mm in body length) within the genus, and easily distinguished from the other congeners by having: frons, ocelar triangle and lower face under the toruly smooth and shiny; mesoscutum with a finely rugouse sculpture; no notaular pits; a convex scutellum with smooth and longitudinally reticulated surfaces at the anterior and posterior sides, respectively.

Figure 5. Dorsal view of *Pediobius* sp.1

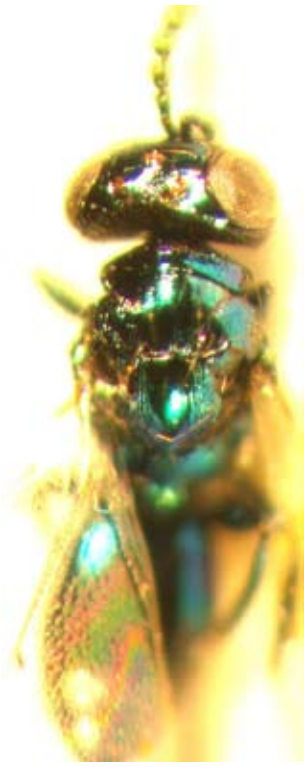

Figure 6. Dorsal view of *Pediobius erionotae*

Figure 7. Dorsal view of *Pediobius inexpectatus*

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The distribution and conservation status of Mt Uarges guereza and the de Brazza's monkey in Leroghi, Mathews Range Ndoto and Mt Nyiro forest reserves of Samburu, Kenya

Small-scale Research Grant Programme

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Although the northern part of Kenya is predominated by arid and semi-arid areas, there are six tropical forests found in the regions with higher elevations. Of these forests, four are found in Samburu. These four, namely the Mathews Range and the Leroghi, Ndoto and Mt Nyiro forests, are rich in biodiversity and receive a substantial amount of rain. These forests have, however, received marginal attention due to the remoteness of this area, the lack of security and the poor infrastructure, and the knowledge of their biodiversity has remained scanty.

Several endemic species of plants and animals are found here including Mt Uarges guereza *Colobus guereza percivali*, the only endangered subspecies of the *Colobus guereza*. It is endemic to Samburu and classified as 'Endangered' in the IUCN Red List on account of its limited extent of occurrence. No comprehensive on-the-ground field assessment of the species had been done to determine its distribution and conservation status prior to this study. Another example is the de Brazza's monkey *Cercopithecus neglectus*. Although the distribution of this species had been believed to be restricted to the western part of the country, its range was extended to Samburu, east of the Great Rift Valley, in a study concluded on February, 2007. The total population size of this species in Kenya is currently estimated at 1,000. However, recent research revealed that all the isolated populations are becoming significantly smaller at an alarming rate.


Leroghi Forest, Saanata peak where *Colobus guereza* are found


Iregi Mwenja, Samburu Kenya

Objectives

The primal aim of this research is to enhance the conservation and management of the populations of the endangered Mt Uarges guereza and the de Brazza's monkey in the Mathews Range and the Leroghi, Ndoto and Mt Nyiro Forest Reserves and the surrounding areas. Its specific objectives are:

(1) To assess the status, distribution and relative abundance of both the de Brazza's monkey and the Mt Uarges guereza in the Mathews Range, the Leroghi, Ndoto and Mt Nyiro Forest Reserves.

(2) To identify local threats and opportunities for conservation of the Mt Uarges guereza and the de Brazza's monkey throughout the Mathews Range and the Leroghi, Ndoto and Mt Nyiro Forest Reserves.
(3) To develop the capacity of eight local scouts and four research assistants with both forest and wildlife survey skills and with data collection methodologies.

Results

(1) Local threats

Generally, anthropogenic threats and their effects include fires caused by honey gatherers, hunters and pastoralists who burn the old grass at the beginning of the wet season in order to promote regeneration of young grass. Other threats are overgrazing in the plains and forest, cultivation in the forests, and over-collecting of firewood to meet the energy demand for the fast-growing human population. Mt Uarges guereza is also severely threatened by hunting for its skin by local people.

(2) Distribution and population status of de Brazza's monkey

During the survey started in April 2007, six groups of de Brazza's monkeys were recorded in the northern Mathews Range, in addition to the 24 groups recorded in the prior survey in 2006. Additionally, two groups were recorded in the southern parts of the Ndoto forest, although more groups are expected to be found there in an ongoing in-depth survey.

(3) Distribution and population status of Mt Uarges guereza

Mt Uarges guereza was found in substantial numbers distributed over the central and southern parts of the Mathews Range Forest. In the neighbouring Kirisia Hills and Leroghi Forest, this subspecies was last seen by the forest guards in 2006. It is now believed to take refuge in the dense and inaccessible part of the deep forest after two-decades of persistent poaching by local people who highly value its skin. In Mt Nyiro, this subspecies was last seen fifty years ago and is possibly extinct there. Two groups were recorded in the densely forested areas of south-eastern part of the Ndoto Forest.

Autecology and population study of *Myristica teijsmannii* Miq. (Myristicaceae or nutmeg family) in Sempu Island Nature Reserve and its predictive distribution in East Java, Indonesia

Small-scale Research Grant Programme

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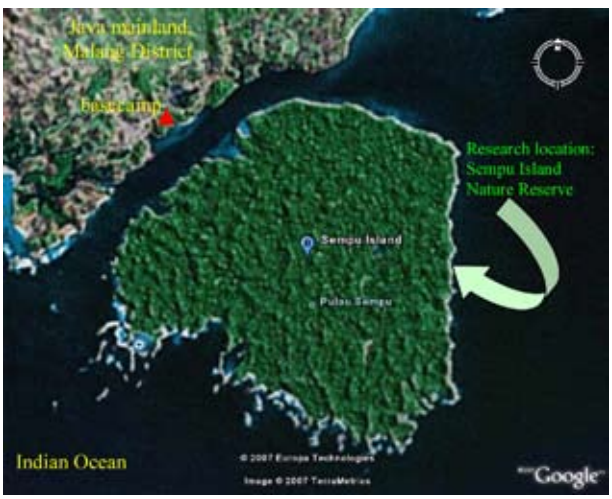
Introduction

Myristica teijsmannii belongs to Myristicaceae or the nutmeg family, a popular and important plant group in Indonesia as a medicinal and essential oil plant (Jansen et al., 1993) which also characterises tropical regions (Arrijani, 2005). In the past, this species was widely used as natural dye for its red resins, as a local medicinal plant and timber (Heyne, 1987) but is no longer used because of its rarity and synthetic chemical substitution.

Myristica teijsmannii is native to Indonesia and has been categorised as an endangered species at the EN B1+2C level according to the IUCN Red List of Threatened Species (IUCN, 2007) based on herbarium specimens data. Inhabiting lowland tropical mixed forest with an altitude of 50-1,000m above sea level (de Wilde, 2000), this species is considered rare and only reported from a few spots in East Java so far, which are Mt Wilis, Mt Anjasmoro, Pacitan to Mt Kawi and Sempu Island. However, information on the ecology and conservation biology of this species is very limited. Therefore, this ongoing research focuses on autecology and the population distribution of *M. teijsmannii*, because this species is still in the wild and understudied. It grows in tropical lowland areas with intensive threats and disturbances caused by human activities. Local people consume it without any efforts toward sustainable use.

Research location: Sempu Island Nature Reserve, Malang District, East Java Province, Indonesia

The Sempu Island Nature Reserve (SINR) is a suitable site to study due to its biological richness with three ecosystem types, viz. lowland tropical forest that covers most of the island, mangrove and coastal forest ecosystems with two freshwater lakes (Telaga Lele and Telaga Sat) and natural springs. SINR also has a significant role as a barrier island that protects the adjacent villages on the Java mainland from high tides such as Tsunami. Furthermore, no research concerning the autecology of plant species has been conducted there. The proposed research aims not only to determine the *M. teijsmannii* current population status and its ecological requirements in SINR, but also to predict its spatial distribution in East Java using geographical information systems (GIS).



Sempu Island Nature Reserve in more detail scale (Source: Google Earth July 2007)

The results will be very useful to support threatened plant conservation programmes, both locally and globally, as stated in Global Strategy for Plant Conservation by the CBD, Botanic Gardens Conservation International and UNEP (Anonymous, 2002). Conserving the species by preservation and restoration (cultivation) for its future consumption and utilization may give benefits to both local people and its sustainable use.

Objectives

The objectives of the research are:

(1) to study the habitat characteristics, ecological interactions and requirements including edaphic factors and climates and population structure and status of *Myristica teijsmannii* in the Sempu Island Nature Reserve; and

(2) to provide a predictive distribution of *M. teijsmannii* in East Java using GIS.

Methodology

The research is conducted in Sempu Island Nature Reserve (SINR), Sendangbiru Village, Malang District, East Java Province, Indonesia. It is divided in two phases. The first phase includes autecological study of *Myristica teijsmannii* in seven localities (Telaga Lele-Kiambang, Telaga Sat, Pasir Putih, Waru-waru, Air Tawar, Teluk Semut and Gua Macan), whilst the second phase will employ GIS work including fieldwork to check and validate the geographical distribution model of the species.

Southern end of Sempu Island

Vegetation analysis using a systematic parallel lines search (Cropper, 1993; Krebs, 1989) was used to determine the *Myristica teijsmannii* population status and interaction status between it and the other plants within communities, as well as edaphic factors, climatic condition and topography in SINR to result in determining factors for habitat preference of the existing population using statistical multivariate analysis. These determining factors will be analysed spatially using ArcView 3.2 software (ESRI) to predict the *M. teijsmannii* habitat suitability throughout East Java by extrapolating the ecological data obtained by the weighted overlay method.

Sempu expedition

Preliminary results

A total of 72 tree species were recorded within the quadrants where we studied. The overall diversity of tree species of SINR, determined by the H' or Shannon diversity index following Krebs (1989), is 5.07. The highest index was recorded in the Gua Macan locality (H'=4.64), whereas the lowest one was recorded in Teluk Semut (H'=4.08).

Myristica teijsmannii was widely distributed throughout SINR and found in all localities studied, showing the highest tree density. This means that the species is one of the most dominant plant species in SINR, together with *Pterospermum diversifolium* and *Pterospermum javanicum* (Table 1). This result indicates that *M. teijsmannii* grows well throughout SINR, providing good habitat for the species. Exclusively on Telaga Sat and Telaga Lele, *M. teijsmannii* ranked within the top five in IV and SDR on all research sites.

Table 1. Abundance parameters of tree species in Sempu Island Nature Reserve selected by the top ten density.

NO.	SPECIES	Abundance Parameter (%)			IV	SDR
		RF	RD	RDO		
1	*Myristica teijsmannii*	6.92	11.36	9.63	27.91	9.30
2	*Pterospermum diversifolium*	9.11	10.80	9.91	29.82	9.94
3	*Pterospermum javanicum*	6.92	8.59	9.42	24.93	8.31
4	*Terminalia bellirica*	4.55	3.88	5.10	13.53	4.51
5	*Drypetes ovalis*	3.10	3.74	2.16	8.99	3.00
6	*Acmena acuminatissima*	4.01	3.60	2.74	10.35	3.45
7	*Aglaia elliptica*	3.83	3.60	2.47	9.90	3.30
8	*Artocarpus elasticus*	4.55	3.60	6.55	14.71	4.90
9	*Vitex glabrata*	2.91	3.46	3.96	10.34	3.45
10	*Garcinia celebica*	3.64	3.32	2.44	9.40	3.13

RF: relative frequency; RD: relative density; RDO: relative dominance; IV: importance value; SDR: summed dominance ratio

Table 2. Importance value of *Myristica teijsmannii* in Sempu Island Nature Reserve

LOCALITIES	POSITION	ALTITUDE & SLOPES	FOREST ASSOCIATION	IVI
Telaga Lele	80 26'646" S 1120 42'339" E	50 – 102m asl 0 – 90%	*Pterospermum* (Sterculiaceae)	5.42
Waru-waru	80 26'020" S 1120 41'863" E	25 – 87m asl 0 – 43%	Myristicaceae-*Pterospermum*-Annonaceae-Euphorbiaceae	48.68
Telaga Sat	80 27'228" S 1120 42'173" E	30 – 65m asl 0 – 90%	Moraceae-*Macaranga*	8.28
Air Tawar	80 26'068" S 1120 4'557" E	40.5 – 84.7m asl 0 – 40%	*Pterospermum-Myristica-Garcinia-Artocarpus*	39.07
Gua Macan	80 26'159" S 1120 4'523" E	41 – 76.8m asl 0 – 27%	*Myristica-Pterospermum-Maranthes*-Annonaceae	29.62
Teluk Semut	80 26'300" S 1120 4'328" E	17 – 68.8m asl 0 – 15 and 90%	Euphorbiaceae-*Pterospermum*	26.41

The autecological study revealed that *Myristica teijsmannii* occurred from 17 to 102m above sea level on Sempu Island, and found only in the mid-forest with a slope preference of 0-8%. *Myristica teijsmannii* did not form pure communities in SINR, but usually found in small groups indicating clumped distribution. The population structure (classified using the diameter at breast height) appears to vary amongst localities, although younger plants tend to dominate (Figure 1). Young leaves and fruits of *M. teijsmannii* were favoured by two species of primates, namely *Macaca fascicularis* and *Trachypitecus auratus*.

A chemical and physical analysis was carried out on soil collected from 6 different localities in SINR. The results showed that the species generally prefers fine particles with silty loam to silty clay textured soils, with a neutral to slightly alkaline pH.

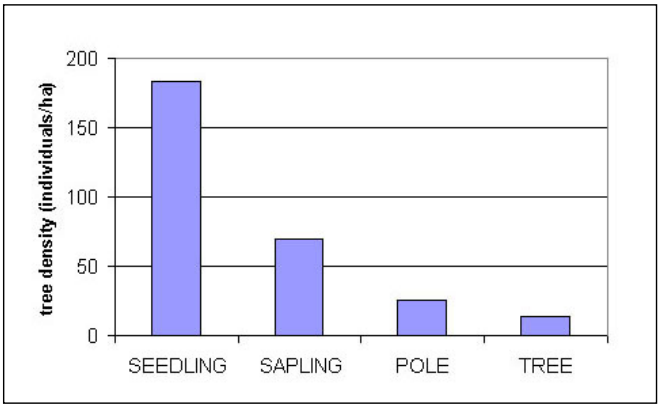


Figure 1. Population structure of *Myristica teijsmannii* by stage class at Sempu Island Nature Researve.

Expected outcome

This ongoing research will present a predictive distribution model of *Myristica teijsmannii* in Sempu Island Nature Reserve and East Java. This model could constitute a good tool for decision-making within the framework of applied biological conservation of endangered plant species in Indonesia, such as strategies for conservation, planning and forest/nature reserve management. In addition, the abundance and distribution data observed from fieldwork may give a contribution to the species' current conservation and rarity status released by IUCN.

Myristica teijsmannii fruits eaten by primates

Fruits of *Myristica teijsmannii*

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Diversity and distribution of dung beetles (Coleoptera: Scarabaeidae) across a habitat disturbance gradient in Lore Lindu National Park, Central Sulawesi, Indonesia

Small-scale Research Grant Programme

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Introduction

The deforestation of tropical forests and their conversion to human-dominated land-use systems such as agricultural land is one of the most important reasons for biodiversity loss. This is also true for Indonesia, which holds about 10% of the world's remaining tropical forest. However, the area covered by forest is decreasing rapidly and most provinces have already lost 80% or more of their lowland forest (MSPE, 1992). Dung beetles (Coleoptera: Scarabaeidae) are widely used as biological indicators for evaluating effects of habitat disturbance driven by human activities since they have proven to be particularly sensitive to habitat perturbation such as canopy forest loss (Davis et al., 2001), and human habitat modification (Shahabuddin et al., 2005). Furthermore they are ecologically important since their dung burial activity could maintain soil fertility (Omaliko, 1984) and plant regeneration through dung-seed dispersal activity (Andresen, 2003). Therefore, a reduced dung beetle population most likely results in a cascading and long-term effect throughout the ecosystem.

Objectives

The main objective of this research is to explore the diversity and distribution of dung beetles across a gradient of habitat disturbance in Central Sulawesi. Particularly, this study will investigate the response of dung beetles to different levels of habitat disturbance ranging from natural forest and agro-forestry systems to open cultivated areas in Lore Lindu National Park (LLNP). The data on species diversity and distribution of dung beetles in various habitat types will provide important information for improving habitat management aiming to maintain a high level of biodiversity also at the margin of the protected area and adjacent land-use systems.

Methodology

(1) Study area

The study area is located at the northern and western margin of Lore Lindu National Park (LLNP) in Central Sulawesi - Indonesia (Fig. 1). Lore Lindu National Park is a local biodiversity hotspot covering an area of 229,000ha and located southeast of Palu, the provincial capital of Central Sulawesi. In the first year the study was conducted at the northern part of LLNP. The study sites are located surrounding the village of Bobo (01°07'10.2" S - 119°59'40.2" E) in Palolo Valley situated between 800 and 100m above sea level. Dung beetle communities were studied in four habitat types: natural forest (NF), disturbed forest (DF), agro-forestry systems (cacao plantations with some shaded tree species, AF) and annually cultivated (maize fields, AC). For each habitat type, three site replications were selected.

Figure 1. Standing in front of the tree in natural forest

(2) Specimen collection and identification

Dung beetles were sampled in 50m² plots at all 12 sites using baited pitfall traps as described in Shahabuddin et al. (2005). At each site, 10 traps were set up along a 100m transect. Traps were baited with ca. 20g of fresh cattle (*Bos taurus*) dung collected from pasture land around the study sites. Trapped specimens were removed from the traps after two days and preserved in Scheerpelz solution. Traps were baited and exposed synchronously to dung beetles three times during February and April 2008. Later on, samples were identified in the laboratory with available identification keys (e.g., Bathasar 1963). Additionally, the reference collection of the Center for Biodiversity Research at Tadulako University and Zoological Museum of LIPI were used. Taxa that could not be identified were sorted to morphospecies.

(3) Habitat parameters

Several habitat parameters were measured (air temperature, moisture, canopy cover, herbs layer coverage and number of trees) and will be tested for their potential to predict changes in the structure of dung beetle ensembles.

Results

A total of 1,696 dung beetles were collected in the four-month period of specimen collection. Although identification is still in process, it has been recognised that they belong to 3 genus (dominated by genus *Onthophagus*) and 24 morphospecies.

In general, the abundance and diversity of dung beetles across habitat disturbances were not remarkably different. The total number of specimens recorded at the natural forest was lower compared to those in annually cultivated areas, while the total number of species was almost similar in all habitat types studied (Fig. 2). However, this study found a different response of dung beetles to habitat modification at the genus level (Fig. 3 and Fig. 4). While this study could not detect the response of genus *Aphodius* to habitat change due to their very small number of specimens, genus *Onthophagus* tend to be more adapted to habitat modification compared to genus *Copris* and *Aphodius*, since they are predominantly found in all habitat types studied. On the contrary, the abundance and number of *Copris* sp. reduced from natural forest to annually cultivated areas, which is an indication that this group of dung beetles was more sensitive to habitat perturbation.

Figure 2. Design of dung beetle trap

Figure 3. My field assistant collecting dung beetle at the cacao plantation

Figure 4. *Onthophagus limbatus*, one of the most abundant species collected from open cultivated area

Nevertheless, the response of dung beetles to habitat disturbance and their relation with the habitat parameters measured have to be analyzed further at the species level. Previous studies have shown that some species of dung beetles respond differently to changes of land-use type in Central Sulawesi (Shahabuddin et al. 2005). Therefore, during the second year of this research, dung beetles will be collected from the Napu Valley, located at the southern margin of the park (see Fig. 1) to get a more comprehensive picture regarding the response of dung beetle communities across habitat disturbance gradients and their distribution in Central Sulawesi.

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Study on the species composition of fish fauna in the upper reaches of the Nhat Le River, Quang Binh Province

Small-scale Research Grant Programme

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At approximately 189km in length and with a basin area of 4,080km², the Nhat Le River, including its two branches (viz. Long Dai and Kien Giang Rivers), is one of the longest rivers in Quang Binh Province. Since this is a long river with a variety of different environments, the species composition of fish fauna in the upper reaches of the Nhat Le River is expected to be quite different from that of its lower reaches. However, given financial and other constraints, such as the area's adjacency to the Lao border, research on fish fauna has been quite restricted in this area.

This is a two-year project that started in October 2007 and has conducted extensive fieldwork to explore the fish fauna in the upper reaches of the Nhat Le River System. We have periodically implemented sampling of freshwater fishes in this area with the assistance of the local people, as well as having recorded environmental conditions and the local name of each fish species. This study is expected to yield an extensive list of fish fauna in the area.

Preliminary results and discussion

In the first year of this project, we gathered the scientific articles necessary for the research and carried out three field surveys in the Long Dai River, one of the major branches of the Nhat Le River System, on a total of 20 days in February, May and September, 2008. A brief summary of these surveys is given below.

A total of 11 research sites in the upper reaches of the Long Dai drainage area, comprising four and seven sites in the Le Thuy and Quang Ninh Districts of Quang Binh Province, respectively, were surveyed. We used various types of fishing gear, such as hand nets, hook and lines, cast nets, and electro-fishing to collect fishes.

11 studied sites for 1st year

During the period, a total of 215 fish specimens were collected. These specimens were identified as 34 species, belonging to 28 genera, 14 families and five orders. Of these five orders, Cypriniformes is the most diverse order with 22 species. Sixteen species belong to the species-rich family Cyprinidae.

These fishes contain two threatened species, listed in the Vietnam Red Data Book on 2007: viz. *Anguilla marmorata* and *Anguilla bicolor pacifica* (Anguillidae). The first species is more abundant than the other one in the area. According to the local fishermen and some previous investigations, the diet of *A. marmorata* includes invertebrates and small fish. Like other species, the resources of this species have declined significantly during the last 20 years for a number of reasons, e.g., deforestation and an increase in the number of fishermen there.

Interviews were also produced to define the resource status of various fish species with high economic value in some research sites. Based on the results of interviews with 20 fishermen, some ecological and biological characteristics of the three species, viz. *Mastacembelus armatus*, *Onychostoma gerlachi* and *Spinibarbus denticulatus*, which play a significant role in the livelihood of the local people, were obtained. The results reveal that the habitats vary depending on species, and their reproduction seasons tend to be in the summer (March to May).

The number of fishes hitherto obtained by this research is quite small. This could be a result of destructive fishing. For example, the local fishermen catch fish using electro-fishing tools and small boards along the banks of slow flowing streams, especially in breeding grounds for many fishes. Serious pressure from fishery activities on the study area is continuously being felt, whereas there is no effort for fishing management. In the upper reaches of the river, forests have been rapidly destroyed and it may indirectly impact the aquatic environment, particularly the fishes.

Identifying in the laboratory

Acrossocheilus macrosquamatus

Mastacembelus armatus

Conservation Activity Programme

Field training on Sulawesi biodiversity for North Sulawesi high school biology teachers

Conservation Activity Programme

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Introduction

As a follow-up of the workshop on Sulawesi biodiversity and conservation curriculum for high school teachers in North Sulawesi held from 8 to 12 January 2007, we conducted the field training programme on biodiversity and its conservation for those teachers. This programme was held based on the recommendations of workshop participants who realized that they lacked certain knowledge with respect to local biodiversity and its use and conservation. They also recognised their responsibility in delivering these issues to their students through various learning methods such as local contents, infusion and the integration of local knowledge in school curricula. The lack of experience and knowledge with respect to local biodiversity leads to a constraint on the teachers' ability to implement education on local biodiversity and on-site teaching. Accordingly, it is necessary to conduct field training for biology teachers in North Sulawesi.

Objectives of this programme were:
(1) To deliver knowledge and experience on biodiversity of North Sulawesi to high school biology teachers of North Sulawesi; and
(2) To train the teachers' techniques in population monitoring.

These objectives are very important to conservation efforts for biodiversity in North Sulawesi. Biology teachers are one of key stakeholders who can bring messages of conservation to the young generation and can change the practice of eating bushmeat. This practice has become the highest threat to the wildlife of North Sulawesi. Furthermore, the result of this training gave the teachers the basic knowledge to construct curricula for their respective schools based on their local biodiversity and conservation.

Results and discussion

The project was conducted at the Tangkoko-Batuangus Nature Reserve on 8-12 biology teachers of high schools in North Sulawesi. This reserve is located near three other conservation areas, namely the Dua Sudara Nature Reserve, the Batuputih Ecotourism Area and the Batuangus Ecotourism Area, in the Bitung District of North Sulawesi. Tangkoko-Batuangus was chosen as the training location based on four reasons. First, it represents typical North Sulawesi biodiversity, including its ecosystem and species diversity. Second, it is considered as the most secure location for researchers and visitors for education purposes since it is relatively well-managed compared with the other conservation areas. Third, Tangkoko-Batuangus is close to the Batuputih Ecotourism Area, which has useful facilities such as research stations and camping grounds. And fourth, it has convenient access for reaching the Dua Sudara Reserve.

The contents of this training course comprise: (1) an outline of conservation areas, (2) a method for the management of conservation areas, (3) a method for the recognition of various kinds of ecosystems, (4) a method for identification and population surveys of birds and animals and (5) individual tasks in identification and population surveys on an animal species. Theory and practice about biodiversity and methods for its monitoring were brought by the participants.

On the results of the pre- and post-tests given in order to evaluate the degree of their understanding, considerable score improvement was recognised after the training course about Sulawesi biodiversity. The following secondary output is also expected in the future:

(1) Participants (teachers) will spread their knowledge and skills to their students in biology classes, and thus the ability of the students to appreciate the local biodiversity will be improved.

(2) Teachers are now familiar with the nature of these conservation areas, and, thus, they will be able to utilize them as resources for both field teaching and extra-curricular activities.

Participants felt that this programme provided them with valuable experience because it was the first time for them to learn the actual state of the local biodiversity. On the other hand, several requests to the Faculty of Mathematics and Natural Science, Sam Ratulangi University, were proposed. For example, they requested that this kind of training course would be conducted every year, involving students as well. They also asked the faculty to publish text books on local biodiversity and conservation. Furthermore, several teachers hoped that the faculty would be the central institution of local biodiversity, where every school can use it for studying about biodiversity.

Class activity

Looking through tarsier nest

Observation on bird

Observation on monkey activities

Resort head with wooden boat confiscated during patrol

Resting near hole fig

Raising awareness of local students and communities using raptor migration at Tam Dao National Park, Vietnam

Conservation Activity Programme

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Hanoi-Amsterdam Secondary and High School, Vietnam

Introduction

Tam Dao National Park has been identified as one of the most important raptor migration sites in North Vietnam, with many species of raptor using Tam Dao forest as their roosting or stop over area. The key raptor species migrating over Tam Dao include a number of globally vulnerable species such as the greater spotted eagle *Aquila clanga* and imperial eagle *A. heliaca*.

While the opportunity for the conservation of birds in Tam Dao National Park is high, the lack of educational programmes awareness-raising activities or detailed information on threatened species, especially raptor groups, means that appropriate conservation measures have not been taken.

Many of the raptor species are currently threatened by hunting, catching for pets and the destruction of habitats by local people who are living around the national park. The recent surveys show that individuals of many raptor species were caught by local people, including school students, during the last migration season. At least one imperial eagle has been recorded in the house of a local farmer living close to the national park last March, revealing that this situation is still continuing. There is therefore an urgent need to take action, and the main objective of the project is to raise awareness among local communities about the importance of raptors as this group plays an important role in the ecosystem and the food chain.

Different standard methods for educational conservation programmes, such as documents (posters, games, slide shows, films), as well as direct field observation, are used to raise awareness among local communities and school students. The project is carried out in three different communities and in schools situated at the most ecologically sensitive areas of the national park. The project will incorporate local staff of the Forest Protection Department (FPD), Tam Dao National Park and local community members. The results of the project will contribute to on-going conservation initiatives of organisations such as German Technical Zone (GTZ), FFI, and BirdLife. Although GTZ is currently carrying out their conservation project at Tam Dao National Park with technical support from BirdLife and FFI, no awareness-raising initiatives for birds have been implemented up until now.

Such awareness will be achieved through the implementation of this programme and presentation of the results to the local stakeholders, FPD, national park, schools and communities in identified sites, and NGOs.

Objectives

Objectives of this project are:

(1) to raise awareness among local communities and students of the importance of raptor species and wildlife;
(2) to build the capacity of local team members in wildlife educational programmes;
(3) to engage graduate and undergraduate students in scientific programmes;
(4) to produce recommendations for the conservation of raptor species and natural habitats in Tam Dao National Park;

(5) to distribute the results to conservation organisations with on-going activities in Tam Dao National Park (FFI, GTZ, Birdlife, etc.) in order to improve conservation management; and
(6) to use the results to develop a proposal for follow-on awareness-raising projects and conservation activities.

Methodology

(1) Project site

The project was conducted at two different communes and schools in Tam Dao town. Tam Dao town is located within Tam Dao National Park (21°21' - 21°42'N; 105°23'- 105°44'E), situated in the Lap Thach and Me Linh districts, Vinh Phuc province, Vietnam. Tam Dao National Park supports 21,982ha of natural forest and 1,351ha of plantation forest. The natural forest is of two main types, viz. lowland evergreen forest and lower montane evergreen forest. Tam Dao is one of the most important raptor migration sites in Vietnam.

(2) Awareness-raising programme

The local team members were trained in standard methods for building the capacity of local team members in wildlife educational programmes and engaging graduate and undergraduate students in scientific programmes. Films and slides about raptors and raptor migration will be shown, as well as posters depicting the raptor species. Talks will be given and games to teach identification of raptor species will be carried out at the designated places.

Raptor observation will be implemented at the identified raptor watch sites within the national park. On-location talks about raptor migratory species, migration routes, identification, the importance of raptors in the ecosystem and the food chain and how to account for raptor migration will be given to the participants along with posters.

Results

In the first six months of the project, the local team members were trained in the standard methodology, which will apply for whole project. The first two educational programmes, viz. indoor and outdoor programmes, were set up.

The first educational programme, the indoor programme, was carried out at Tam Dao town (one of the most important raptor watch sites in the north of Vietnam) with the joining of 60 students from secondary schools. This programme includes direct talks and poster and slide presentations on raptor species, showing the roles of raptors in the ecosystem, globally and national threatened raptor species, key raptor species in the study area, migrating and resident species, and the regional raptor migration routes. Games to identify the raptor species were set up and we divided the participants into four different small groups to join in the raptor identification competition, awarding the winners of the game with hats and books on Vietnamese birds. We also encouraged discussion about the typical characteristics of raptor species among the groups of school children.


Trained for group leader


In-house programme

The second programme, the outdoor programme, was implemented just after the indoor programme. Two experts from the Institute of Ecology and Biological Resources and the Vietnam Birdwatching Club were invited to act as guides for raptor identification in the field and provide up-to-date information about raptor research and conservation activities in Vietnam. A quiz was held by the experts and the winners (with the quickest answers) were awarded. The team members, experts and the local teachers engaged the school children in some other games and in a competition on methods for the sustainable use of natural resources and measures for the mitigation of the impact of human beings on wildlife.

These two educational programmes have been successfully implemented. Namely, the awareness of local school children was increased and all of the participating school children submitted a summary of these educational programmes. Some additional lessons were also given toward a better understanding of forthcoming programmes on the project.


Expert gave the guide in the field


Out-door programme

Scholarship Scheme

The Scholarship Scheme aims to promote the training of the future generation of experts in the protection of the natural environment. Currently, university students in six countries in the Asia region are studying at the undergraduate or post graduate level with NEF's support. In 2008, the NEF assisted 385 students. The Scholarship Scheme is operated with the cooperation of the NEF's local counterparts.

List of NEF Scholars in 2008-2009

Indonesia Undergraduate students (155)

University of Indonesia
Fika Afriani
Mariska Astrid Kusumaningtyas
Mulyati Dewi Aisyah
Nur Mutia Dewi
Suryani
Sutini
Rerin Santiana
Gita Rahayu Budiarti
Uswatun Khasanah
Asminatun
Dina Mariyanti
Anggi Puspa Nur Hidayati
Ayu Roossea Mustika Putri
Devri Ary Sinaga
Diana Agustina
Lina Herlina
Intan A. Pratiwi
Rika Prihatiningsih
Anjar Prianto
Sarah Albar
Nidya Sutanto
Eko Burhanuddin
Adhitia Pratama
Niarsi Merry Hemelda
Ratih Rimayanti
Januar Hakam
Aditya Bayu
Tiara Dewi
Kanardo
Febrial
Arifah Dinda

Assyafi'iyah Islamic University
Andam Dewi Melani
Dwi Widyanti Octavia
Hetty Jariah
Ridho Tahir
Sartika
Sapan
Syahrul Lail
Winanjar Restu
Septika Wijayanti
Dedi Rahman
Arif Saifudin
Fadlurahman
Dahliana
Adi Saputra
Sumarni
Nasron Azizah
Dieka Pertiwi
Didi Prasetyo
Nur Asiyah
Nur Aini
Risky Darmawan
R.A. Ayu Yekti N.
N. Elis Kuraisin
Siti Fatimah Zahra
Eka Zakia Setiawati
Nur Fitriani
Qurotul Aini

National University
Etika Sayekti Hidayati
Dessy Sulistya Ashari
Fratiwi
Maysyaroh
Neneng Mardianah
Shafa Noer
Dian Fajar Vitianingrum
Windrati
Melinda Octaviana Kuswandari
Rebina Urfhy Zen
Mursyidah
Nuzuki Atara
Abdurachman Syafiih
Devi Margareth
Dewi Andini Fitriani
Hesmi Rahmawati H.
Husnul Khotimah
Rima Paramita
Ririn Diah Ramadani
Siti Mardiyana Ulfah
Zahra Hanifannisa
Agnes Yuliana
M Arif Rifqi
Dyah R Sihwuladari
Dwi Winarsi
Hemansyah
Gabrilla
Nadia Maulida S
Muchida Fitri Lubis
Sharuk Nur Bani
Diky Wahyudi
Rizki Amelia
Siska Tri Suharti
Abigael S Q Renti

Pakuan University
Dian Sudianto
Enri Agus Setiani
Marlina
Mita Fajriah Ibrahim
Muhammad Ahyad
Nurdiyansah
Nur Laela Fadhila
Sanan Supriatna
Stephanie
Agustinus Sarira
Zulfikar Failasufi
Budi Triyanto
Intan Kusumaningrum
Aam Amaliah
Ayu Septina Prasanti
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Mila Setyani
Astri Anggraeni
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Ratih Nindyakiran A
Rahman Eri Pridana
Nevi Herhisa
Diva Kharisma Putera
Endah Susanti

State University of Jakarta
Daulat Yusuf Harahap
Fatyah Arfah
Fuji Setiawati
Lutfiyah
Muna Murnianjari
Mutia Hardhiyuna
Putri Kesuma Wardani
Supri
Listinayah
Maria Fajri
Evindika Tri Padarik
Nur Upik
Tinur Malasari
Afdini Rihlatul
Desy Permatasari
Norma Rahmawati
Sari Setyaningsih
Retno Dyah Kuntari
Siti Amanah
Wahyuningsih
Anis Mutirani
Febrina Ariyanti
Dina Silviana
Ria Amelia
Dita Monalisa
Ninda Hutami S
Irfanul Arifin
Mella Ferania
Dessy Widvanita
Diaz Sari P
Evi Kusumes Tuti
Dehhy Yumbar
Bramastho A
Suci Nurul L
Astriana Pertiwi

Philippines Undergraduate students (36)

Palawan State University
Antonette B. Bartolome
Analyn V. Omapas
Lanie A. Blanco
Eric James A. Magay
Rosalyne S. Ramos
Jenneferlyn B. Yap
Arvin A. Silverio
Brooks Ann O. Bermudes
Bryan Sonny S. Arlegui
Jagmis Cory P.
Jaztin Robert D. Altea
Roselle Apdon
Gerold Allen Argonoso
Neliza Bacani
Dorcas O. Besa
Jessa Mae Jagmis
Ma. Rose Christy B. Josol
Edgar Palmon
Joanna Mae B. Rolando
Darelle Kaye M. Cacho
Honey Rose O. Firmalo
Jessa Belle B. Garibay
Arnica L. De Guzman
Ebenezer C. Herrera
Winston G. Quinit
Alison Quirino
Erickson A. Tabayag
Florence S. Vicente
Allan Alleda
Cherry Lyn Jalover
Rizajane Pablico
Maria Retchie Pagliawan
Ken Tan
Joan Urquiola
Irish Villamor

Western Philippines University
Jonnie Asis

Postgraduate students (4)

Palawan State University
John Rex N. Jardinero
Jonas Tenefrancia
Lyca Sandrea Castro
Bienvenido Ollave

Myanmar Postgraduate students (20)

Dagon University
Kyaw Min Htay
Sao Mon Theint
Daw Khin Wai Hlaing

Defense Services Medical Academy
Thet Su Mar
Khaing Khaing Kyi

Sittway University
Daw Kay Thi

University of Forestry
Thida Swe
U Kyaw San
U Tin Myo Aung
Daw Cho Cho Win

University of Maubin
Aye Aye Min

University of Monywa
Khin Than Oo

University of Veterinary Science
U Tin Tun Aung

Yangon Institute of Education
Thanda Win

Yangon University
Wint Wint Tun
Sapai Min
Daw Min Min Htwe
U Kyaw Naing Oo
Daw Su Su Naing

Yezin Agricultural University
Daw Lay Lay Khaing

Undergraduate students (31)

University of Forestry
Aung Myint Myat
Khain Wut Hmone
Su Sandar Aung
Tet Nay Tun
Nwai Mon Mon Aung
Kay Zin Than
Kay Khine Lwin
Way Soe Zin
Thura Kyaw
Lat Mi Tin Win
Talun Hmone Htan
Htet Lin
Su Su Lwin
Paing Htet Oo
Phyo Zaw Hein
Myat Su Mon
Yadanar Zaw
Arr Kar Phyo
Ei Sandar Myint
Aye Myat Ko Ko
Arnt Myo Zaw
Kyaw Khaung Thant Zin
Nwai Nwai Aung
Phyo Wai
Su Yi Kyaw
Khin Zun Phyo
Khin Zaw Win
Shwe Yi Win Htet
Chan Pyay Zaw
Shwe Yi Phu Phu
Aung Kyaw Thu

Vietnam Postgraduate students (47)

Can Tho University
Le Diem Kieu

Hanoi Agriculture College
Nguyen Thi Bich Thuy

Hanoi Pedagogical University
Nguyen Thi Thuy Ninh
Dinh Minh Quang

Hue University of Sciences
Tran Thuy Hang
Le Thi Tran Nhi
Phan Tien Dung

Institute of Ecology and Biological Resources
Vu Tien Chinh
Nguyen Thien Tao
Pham Van The
Nguyen Anh Tuan
Duong Thi Hoan
Nguyen Manh Hung
Phan Xuan Binh Minh
Dao Thi Sen

Vietnam Forestry University
Le Thi Tuyet Anh
Pham Thanh Ha
Nguyen Van Thanh
Trinh Phu Thuan

Vietnam National University
Be Thi Ngoc Anh
Pham Van Bao
Nguyen Thanh Chinh
Truong Duc Cuong
Nguyen Anh Duc
Bui Thi Hoa
Nguyen Manh Hung
Lu Thi Ngan
Dinh Thi Hai Yen
Phan Thi Bao Chi
Nguyen Thi Hien
Nguyen Thi Hoa
Phan Quoc Toan
Le Thi Thanh Xuan
Nguyen Xuan Hoa
Nguyen Khac Son
Doan Viet Tien
Nguyen Xuan Vinh
Luu Hoang Yen
Ho Thu Minh
Pham Thi Hong Phuong

Vinh University
Hoang Thi Mai Anh
Hoang Thi Kim Dung
Nguyen Phuong Mai
Tran To Oanh
Dao Thi Hang
Nguyen Thi Thu
Do Van Toan

Lao PDR Undergraduate students (92)

National University of Laos
Somexay Savathna
Chanhphet Inthavixay
Sixiong
Phonesavanh Phonnaly
Teuanchai Xaisomeboun
Bounmy Lorlaithong
Somsouphanh Simmanivong
Khamsamone Phanthavilay
Panhyasook Keoleuxay
Philaylak Youtthasanty
Sengsouly Phaleukham
Laty Pangpaseuth
Phonesavanh Xayalath
Khaokeo Lorvanxay
Phouthone Samlanephanh
Toui Phommalin
Alounsak Xayasouk
Mengxiong Xaichui
Phommachanh Phothichanh
Santy Phiyadeth
Yileng Thaochoutheng
Phetsomphone Thammavong
Somphanith Si One Chanh
Ai la da Si boun heung
Lamnyong Bounthavong
HouaThor YouaYee
Vannasin Inoudom
Oulaivanh Chantjaloth
Maithor Laouyiajong
Yipheng Thayongyia
Souksakhone Chanpadith
Khamboui Soukhantha
Sisavath Phimmasone
Phaengta Bounthavangkham
Thipphaphone Phiengvilaivanh
Phetviengkham Onexaivieng
Kenemai Phengpaseuth
Bounhieng Sisavanh
Viengvilay Vanthanouvong
Chounnaphon Sibounheuang
Hongphakham Inthavong
Mong Xiong LaCheutouky
Maladda Chanh thi lath
Bair Khang Vang Toua
Khamphou Luanglath
Sadalat Thanongsack
Bousamai Boudthavong
Sauosavanh Phavilaivong
Phoummano Khammanivong
Thipphamala Manivong
Amphaychit Boutbouathong
Somphavanh Keobouasamay
Khankeo Phathong
Phanhthoudeth Pongpanya
Khamla Phetnavongxay
Thavone Khounsida
Songkane Somsavanh
Phouthone Phapho
Davanh Oulaythong
Xaisuvanh Phaxaisomebath
Khoun Thammavong
Somchanh Ouphanxay
Phaimany Xaiyasing
Bounphack Lorbreeryao
Phaivone Khounthavone
Yenpapha Vilavong
Khammanh Vongvansy
Vanpaseuth Phoutthavong
Palamy Changluexai
Vonesackda Phoudthavong
Soukphaphone Soudthalavong
Sivanh Vivanhxai
Bounhuong Yachongtou
Xaysavanh Khiaovongphachanh
Souksakhone Phanthoulak
Chanthala Vinthaxay
Chittana Bouasavanh
Sa phaou ngeuan Vongthavilay
Chanhhome Chanhthavisouk
Keovanpheng Sengdalavong
Nilaphai Taxo
Lidthisone Kettavong
Xaiyalarth Vongsavath
Silisack Dalavong
Nouxay Bounmixay
Soudaniame Inthisane
Viengsavanh Xomvimane
Annida Phongsavath
Nokpalinya Inthavong
Phengdy Vilayvong
Viengvilay Thongmanila
Bounhome Yengnuvong

NEF Student International Workshop

The NEF has held national and international workshops for NEF scholarship recipients since 2004, aiming to provide them with the opportunity of first-hand experience in the field and to promote exchanges between different cultures. This is the third international workshop and it was held from 10 to 16 February 2009 in Palawan, the Philippines, in cooperation with the City Government of Puerto Princesa and the Palawan State University (PSU) with the theme 'forging friendships toward environmental conservation.' This year, a total of 28 students on NEF scholarships representing four countries (Indonesia, Vietnam, Lao PDR and the Philippines) were invited to participate in the Workshop.

Prior to the Workshop, a student committee was organised by Filipino students and they were actively involved in preparation (e.g., planning and scheduling the programme) and the implementation of the Workshop under the supervision of Dr Lorna C. Gelito, Dean of the College of Science, PSU, Ms Rebecca Padilla, City Program Manager of the Puerto Princesa City Scholarship Office and Mr Stefan Ottomanski. Each of the committee members was responsible for different parts of the Workshop's operation. In addition, all participants began communicating with each other through the Internet and exchanged their ideas for activities in the Workshop programmes and its expected output.

Upon their arrival at Puerto Princesa, the capital city of Palawan, on 10 February, all participants were invited to a welcome dinner held by the Honourable Mayor Edward S. Hagedorn of the City Government of Puerto Princesa. The participants enjoyed food, cultural performances and conversations with friends and colleagues.

The opening programme of the Workshop was held in the morning of 11 February. It started with the national anthem of the Philippines played by the PSU Band and was followed by a welcome address from Mr Jessie A. Tabang, Assistant City Administrator of the Puerto Princesa City Scholarship Office and Prof Dr Yasuhiko Taki, President of the NEF. The following programme was a team building activity led by two facilitators (Ms Wenifreda J. Arcigono, Assistant Department Head II of Human Resource Management Office and Ms Maria Corazon B. Temonis, Tourism Operation Officer), both from the City Government of Puerto Princesa. It started with a lesson and discussion on the qualities of leadership and the characteristics of teamwork and the participants shared their ideas in their own words. Some of them seemed to be too shy to speak out in the beginning, but their shyness soon disappeared. Divided in three ethnically mixed groups, they carried out the assignments they were given and played games together. These activities helped break the ice among them and encouraged unity and teamwork.

After the team building activity, the participants started cooking and practicing performances for the last activity of the day, a cultural show. Lao and Indonesian foods were served at dinner. Everyone was surprised, but enjoyed the different tastes. That evening, the participants wore ethnic costumes and demonstrated dances and songs from their home countries, while the audience also learned and participated in the dances and songs.

Early in the morning on 12 February, the participants headed toward Sabang, where the Puerto Princesa Subterranean River National Park, or the Underground River, is located. The area has a limestone karst landscape with an 8.2km underground river flowing directly into the South China Sea and the lower part of the river is affected by tides. Furthermore, the area contains a full mountain to the sea ecosystem and important forests and represents a significant habitat for biodiversity conservation. Upon recognition of these features, the Park was designated as a World Heritage Site in 1999.

It was an approximately three hour trip to reach the Park from Puerto Princesa. At the mouth of the cave, a group of eight to ten took a small boat and went inside the cave with a guide. It was dark inside and a spotlight in front of the boat was the only means for visitors to see the natural formations of stalactites and stalagmites, including formations that looked like mushrooms, vegetables and animals. Insects were attracted to the light and swallows and small bats flew overhead. The guide explained the history of the cave and the river and provided information about the formations the visitors could see near the boat. While enjoying the cave tour, the participants were simply impressed by nature itself.

In the afternoon, walking through the Monkey Trail, the participants reached the Sabang River and joined the Mangrove Paddleboat Tour operated and managed by local volunteers. Guided by these volunteers, boats went along the river where old growth mangrove forests can be found. A yellow and black striped snake was on a branch as birds warbled away in the forest. As the participants were enjoying spotting wildlife and the boat ride, they learnt what roles the mangrove forest performs and how tourism is operated while conserving wildlife and its habitat. The volunteers also offered the participants one of the local delicacies, tamilok (shipworm), which can be found inside the deteriorated wood. That evening, the participants also saw how a Filipino traditional dish, lechón baboy, a roasted suckling pig that is cooked for special occasions in the Philippines, was prepared and cooked.

On the second day in Sabang, 13 February, after eating lechón baboy for breakfast, the participants visited an elementary school in Manturon Village for school activities. There were about 30 elementary students in a room. With a song and games, the participants led discussions to tell the students the importance of nature conservation and what people can do for the future. It was very impressive that the students were eager to learn from the participants and asked them many questions. The activity was carried out in Tagalog and all the participants enjoyed teaching the students and sharing what they had learnt at university.

Later in the afternoon, the participants left Sabang for the Palawan Wildlife Rescue and Conservation Center (PWRCC). Mr Ottomanski explained to the participants that the PWRCC had been established as the Crocodile Farming Institute (CFI) in 1987 with the assistance of the Japan International Cooperative Agency aiming to conserve the two species of crocodiles found in the Philippines, *Crocodylus porosus* and *Crocodylus mindorensis*, through captive breeding and the development of crocodile farming technology for the benefit of the Filipino people. Now as the PWRCC, it continues research on crocodiles and provides a refuge for wildlife seized from illegal poachers and traders. Besides the achievements of the CFI, he told the participants what difficulties the CFI faced through its projects and the participants discussed them. Guided by the PWRCC's staff, they toured its museum, hatchling house and nature park. A few participants had the opportunity to feed fish to mature crocodiles.

The Government of Puerto Princesa City held the citywide mangrove reforestation activity 'Love Affair with Nature' on Valentine's Day and the participants joined in. The event is held yearly in the coastal area to reforest degraded mangroves and raise public awareness on the ecological role of mangroves and other coastal ecosystems. The participants planted one or two mangrove seedlings with the thousands of volunteers gathered to celebrate the event. It was surprising that such a large number of conservation-minded people gathered and worked together for conservation.

The sixth day of the Workshop started with a presentation by each country. Either individually or in a group, participants shared activities that they are involved with or research that they are carrying out and also explained their culture and the natural environment in their home countries. The titles of the presentations and presenters were as follows:

Lao PDR
'Studies and present status of biodiversity in Lao PDR' by Nokpaliya Inthavong, Xaysouvanh Phaxaysombeth and Annida Phongsawat

Indonesia
'Sea turtle conservation in Indonesia' by Abigael Stivannya Queen Renti

Vietnam
'Biodiversity research in Vietnam and amphibian breeding station in Hanoi' by Nguyen Thien Tao

Philippines
'Philippine biodiversity' by Rizajane Pablico
'Palawan biodiversity' by Ma Retchie Pagliawan

The next activity was a discussion to wrap up the Workshop with five topics: activities of the Workshop programme; environmental conservation; culture; higher education; and future actions. Through the Workshop, the participants learnt that both similarities and differences were found in the culture and education in their countries. They also mentioned that their countries were facing the same or similar environmental conservation issues and clearly stated how they will work on those issues together as NEF students, or conservation conscious citizens, in their reports.

The NEF hopes that this Workshop enriched the knowledge and experiences of the participants and inspired their further interest in nature conservation.

The NEF would like to express its sincere appreciation to the City Government of Puerto Princesa, PSU and its staff and students for their enthusiastic efforts in making the Workshop successful, as well as to the individuals who helped with the participants' activities during the Workshop. (Tomoko Oizumi)

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