Nagao Natural Environment Foundation

NEF Newsletter

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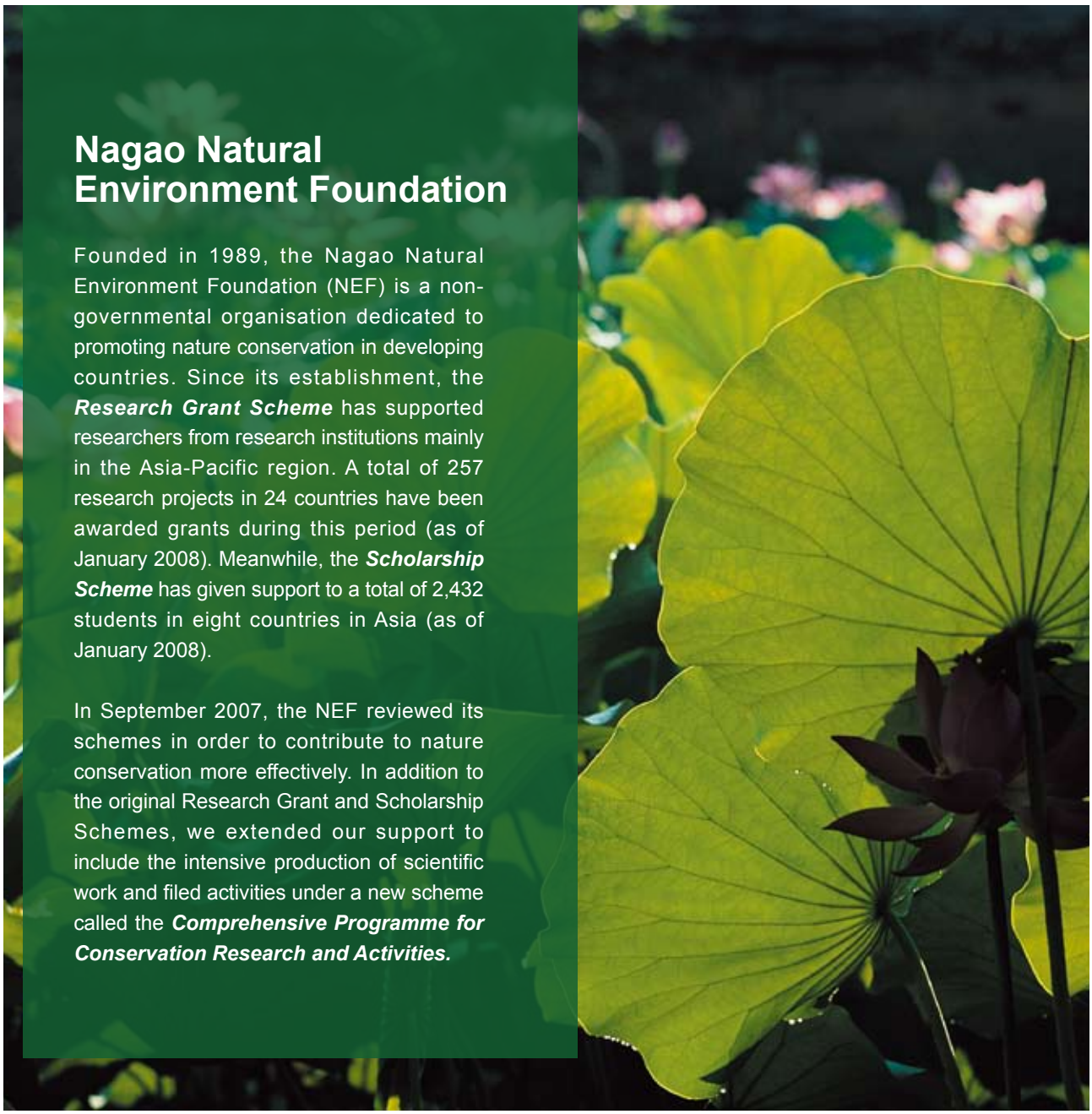
Nagao Natural Environment Foundation

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 257 research projects in 24 countries have been awarded grants during this period (as of January 2008). Meanwhile, the ***Scholarship Scheme*** has given support to a total of 2,432 students in eight countries in Asia (as of January 2008).

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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FEATURES - NEF Connections

Engaging People in Conservation – Education for a Better Future

Professor Datin Dr Maryati Mohamed and Dr Djunijanti Peggie are both distinguished entomologists who devote themselves to conservation education. While Dr Mohamed has been leading a group of professional biologists and ecologists as the Director of Institute for Tropical Biology and Conservation (ITBC) of the Universiti Malaysia Sabah, she has developed a university-wide environment programme for non-science major students. The NEF has cooperated with the ITBC since 2004 through the provision of scholarships to its master's students.

Dr Peggie, who has developed her career in butterfly systematics, recently concentrates her effort on educational publications for the Indonesian public. She believes that raising awareness of the public on nature will lead the Indonesian people to a sustainable future. NEF's Publication Programme supported her first book 'Practical Guide to the Butterflies of Bogor Botanic Garden' to be published in both English and Indonesian.

NEF conducted interviews with the two prominent scientists about their efforts in promoting conservation and how they view the future of their respective countries. Both had strong influence from their family and education on developing their interest in nature when they were young. They emphasised that support from colleagues who share their vision is an invaluable contribution to their success in their careers.
(NEF Interviewer: Yae Sano)

Prof Maryati Mohamed

Director
Institute for Tropical Biology and Conservatioin
Universiti Malaysia Sabah

NEF: Could you tell us how you have developed your career in conservation?

Mohamed: By training, I am an entomologist. I look at insects, in particular aphids, from a taxonomic point of view and study its ecology. When I was writing my doctoral dissertation on aphids, I began to understand that there were many different things in the world. There are over four-thousand species of aphids on earth, and they must have many and different important roles in nature. There must be reasons why there are so many different kinds of creatures and when we look at them very carefully, we find their different roles, such as being decomposers and pollinators. This amazing finding urged me to work on conservation. I simply felt that those small creatures must be conserved. It was from myself that I must look at conservation more than what I had been doing because what I had been doing was just being a taxonomist and ecologist.

I was quite lucky because I had great students who shared the same aspiration as mine. It was in the 1980s and 1990s and those students are now my staff working together with me. We share the same concern that, if we do not look after these small organisms and make people understand that they are important, they will be gone. This is how I started thinking about conservation.

My family also influenced me a great deal. Being a mother of seven children, I am concerned about future of them. I want them to share the same feelings that I have toward nature. It is interesting to see that young people may or may not be concerned with what is around them unless you give a chance to them to appreciate and make them understand. I think that there is a big role people like myself can play from understanding children, from understanding my students.

My education made another critical contribution to my career development in conservation. I went to Gajah Mada University in Indonesia for my first degree and the University of London for my doctoral degree. I was very lucky that my universities, in UK, Indonesia and also here, foresee that conservation will be a bigger issue for the 21st century and they have given me all the opportunities not only to be active in conservation at the faculty level but also at the national level or even at the international level.

NEF: What is the significance of conservation education at the university level in Malaysia?

Mohamed: If you ask me about the significance of conservation education here, it is very significant. Conservation in Malaysia at the university level is very important. You may think that, when young people enter university, they already have knowledge about the environment and they understand that they are responsible for conserving nature. Unfortunately, it is not so. Students we receive at the age of 19 or 20 are generally very academic-minded but they are not concerned about the environment very much. We have to train them in university to be aware of environmental problems, how we can contribute to conservation, and how we should prepare for the future. It is university that the first place where we really teach young people about the environment.

Education in secondary schools is generally very specific to a certain subject, such as science, history and geography. In short, education is compartmented whereas conservation is a very interdisciplinary subject. You do not have in the school where people teach the environment together with economics or social science. When they teach the environment, they only talk about air, water, plants and animals, but they do not make each topic interrelated and do not integrate different disciplines to see it is about human beings. The real concern is that human activities and human decisions to do something spoils the environment.

In the year of 2002 we had a very big meeting in Kuala Lumpur to discuss why our children and young people are not concerned about the environment, why environmental education in school is not sufficient. The Malaysian Education Department does not intend to have another course or curriculum to be added on top of all other subjects, such as history, geography, math, science. This is too much for the children so they said, 'let us just teach environmental science through a mixture of everything — a little bit in history, little

bit in geography, in English, and in math.' It is called across discipline. We, many of us, believe that it is not going to be effective.

One other character of education in Malaysia is that children are very examination-minded. They just want to pass exams. They are not given the time and environment to enjoy the subjects that they are learning. Even if schools have environmental education in curriculum, the only thing children want is to pass exams so they just try to remember everything but not to be absorbed into what they are learning. This is another reason why we think that when children reach the age of 18 or 19, they are not still aware of what is happening in the environment.

For the undergraduate level, we have made the university management understand that we must have environmental education even to non-science students. Because when we talk about conservation, it is normally for science people. But we must recognise that this is a problem of human and this is going to affect everyone's future. Here in UMS we teach non-science students conservation biology. We teach six modules and all deals with conservation. We have "The Environment and Conservation" which I teach myself with two other lecturers. We have a course called "Evolution, Distribution and Conservation" and we have a course on "Man and Animals" and "Man and Plants." Through all these courses, we try to raise awareness among future psychologists, historians, social scientists, economists and business managers that they are part of the environment. We give relevant information as much as possible. Whether they like it or not, no matter what they choose to do after university, all of them still have responsibilities over the environment. This is what we do at the undergraduate level in UMS.

But at the postgraduate level, I think it is very important to go into depth of conservation biology as main part of the postgraduate programme. This is why I think we must thank the Nagao Foundation for helping us. Here in Malaysia, as a developing country, people tend to look at natural things like plants and animals as materials for commercial products. People are very product oriented. It is important to develop industries, and applied science, such as biotechnology, can help the development. However, basic science is important at the same time to understand the natural environment where all of us live. But basic science, such as ecology, is not strong here and finding funds is not easy. If you do taxonomy or ecology, you are unlikely to get much funding. Even students agree that if they major in taxonomy or ecology, they do not get much funding. But if you choose biotechnology, nanotechnology or studies dealing with advanced materials or solar technology, you get funding. We are grateful that some organisations like the NEF are helping us to balance between applied science and basic science. Almost all of our students have been receiving NEF scholarships for them to pursue basic science related to conservation.

The funding problem can directly affect career choice of young generations. Say, biotechnology research can be given a quater million Ringgit but research on taxonomy can get only 60,000 Ringgit. I think among young people, they look at conservation as something too basic or boring thing to do while they look at biotechnology as very exciting and promising them jobs. We must understand that young people need security. If biotechnology gives them a job, then they all rather do biotechnology research afterwards. If you choose conservation biology what do you do after? Career path is also a problem, although we keep saying to students 'if you study conservation biology, that would help you wherever you go. If you decide to be a school teacher, you will be a good teacher with the knowledge of conservation biology.' That is what we are telling our students.

NEF: You say that financial support is important for students to pursue their study in conservation. Is there anything else that is a challenge in conservation education?

Mohamed: I think that awareness is a challenge. Awareness about conservation and about the importance of the environment to us has not really gone down to the grassroot level. I think this owes to the natural conditions of Malaysia. Malaysia is very fortunate. We do not have natural disasters, not like Japan. Japan has a lot of typhoons, tsunami and earthquakes, then you become so much aware of things happening in the environment. You are worried that one day the mountain in front of your house just will explode. Here in Malaysia we are casual with the environment because we do not have natural disasters. In such, people are bit too casual about the environment.

On top of that, there are some people who are thinking so much about profit making. The priority is given to making fast money by cutting down forests and planting oil palm in a very unsustainable way. We can cut down forests and we can grow oil palms but we must consider how to make it sustainable. I think human beings are given brain and heart to think and to make good decisions but some people are not using them well enough. We see that there are problems in Malaysia that awareness is not in the stage where it

makes all young people interested in nature and to conduct research on the environment.

Another challenge I can think of is that sometimes people involved in policy implementation are not cooperative. Our prime minister is very supportive of conservation. He is a religious person that is aware of our roles as a steward to look after the environment. But some people under him who are implementing public policies lack understanding or not capable of enforcement. That makes people in Malaysia a bit too relaxed and industries tend not to cooperate for conservation. They think that, if there are resources to be used, why not use now. This lack of awareness is one of the main challenges we are facing.

Social conditions could also be a challenge. Malaysia is a multi-racial or multi-ethnic country. Different groups of people see things differently. Maybe Chinese thinks conservation in this way, but Malay may think it in a different way and Indians may think differently. Maybe different group of people have knowledge from their different life style, which actually contribute to conservation, but maybe we do not know it well enough. The multi-ethnic characteristic in the heterogenous society of Malaysia could be one contributing factor and to me it is a challenge we must face besides lack of awareness.

NEF: What are the major career options for graduates from your institute?

Mohamed: Some of our graduates ended up with being wildlife officers, working at the Department of Wildlife and National Parks in Peninsula Malaysia. Many are working also at NGOs, like WWF. Some of them have become researchers, university lecturers and schoolteachers. Very few would be a journalist. This is where we are lacking – if there are more conservation-minded people becoming journalists, then they could actually turn the way people think about the environment. We do research and we publish in academic journals but in many cases information in scientific journals cannot be seen as useful from other sectors of society. If you have a journalist and his writing is good, the information can be translated into something useful to other sectors of society, such as private sectors, common people and children. Maybe we need to train our conservation biology students to become journalists.

NEF: How would you see the future of Malaysia from a conservationist point of view?

Mohamed: I am very positive about the future of conservation in Malaysia. I can give you an example, which is going to be happening very soon. During our lectures to our undergraduate non-science major students, we always tell them 'Look boys and girls, you must not use too much plastics because plastics spoil the environment. You must not use polystyrene as a container for your food.' We have been telling this maybe in the past six years. In terms of the number of students, it would be over 3,600 students. Now, this year, next months on the 8th of September, we are going to launch a university programme called '3Rs'- Reuse, Recycle and Reduce. This is proposed by students themselves. After having told the importance of the environment and waste problems, it went into them and they themselves are now forming a group to start the programme '3Rs' including placing dust bins for different kind of rubbish to be recycled. The students tell their friends how to use different dust bins. That is what students are now starting.

What I am trying to say here is that you have to cultivate the feeling of good environmental management in young people. If you force onto people, it may not work well. You must really start with young – this is what I realise from my experience with my own children and students. You must start when they are young and you must earnestly talk to them. I am always trying to understand how they look at the environment and how they perceive the environment. What I believe is that you must talk to them, you must always remind them, and you must get them to take action.

I have 140 students taking my course on conservation. Some people ask me 'What? 140? How are you going to manage the course?' but we have managed to take all of them to the field. Every week we bring a bus with 40 people to the field and we let them stay one night in the forest because it is important for the student to get to know nature. I tell the students that this is what we have now but, if we do not care for it, the forest will not last for long. For some people it is a boring job, if you repetitively have to have the same talk you may give up. I do not think this is a boring job. This is how you work with young students and children. You have to keep reminding them and, finally to your satisfaction, you will find that they themselves want to manage their life. So, I am very pleased that on the 8th of September they are going to say 'Yes! We stop using polystyrene for our meal packet.' They are going to boycott those disposable products, and they are going to use very good reusable container because throwing so many different things in the dust bin makes it difficult to manage the waste. Plastic are not biodegradable and our landfill is going to be problematic.

I am very optimistic. In the last six years I have been talking to young students about the environment, now they are taking action by themselves. This means, if we keep doing things, that we might change the next generation to be more considerate to the environment. But of course we cannot be optimistic too much and we have to keep trying. The move is slow but steady and continuous.

Dr Djunijanti Peggie

Researcher
Indonesian Institute for Sciences

NEF: Could you tell us how you have developed your career as an entomologist? How did you become interested in insects, especially butterflies?

Peggie: My interest in nature began way back in my early childhood. I grew up in Bogor. My family lived in the vicinity of the Museum Zoology Bogor and Bogor Botanic Garden. When I was little, I loved the exhibitions of Indonesian fauna in the Museum, and I often visited the Garden, which has great collection of flora. My parents also took their children to different places on weekends where they could enjoy nature. We liked to go to beaches, hills, mountains and other different areas. I am very grateful to my parents that they gave me the opportunities to expose myself to nature in my early childhood.

For my bachelor degree, I majored in biology at the Universitas Nasional in Jakarta. We had many field activities and I had a lot of fun exploring nature. I went to England for my master's degree and continued my one-year internship in the British Museum of Natural History. That was the time I really learned how to deal with butterflies from my supervisor, Dr Dick Vane-Wright, who is world's expert of butterflies. After spending one year in Indonesia I gained an opportunity to pursue my PhD in butterfly systematics at Cornell University.

When I think back, many people helped me develop my career. First, my parents affected me very much and they gave me freedom to choose what I wanted to be. They said 'It is your life. You can do whatever you think makes you happy and makes you satisfy.' They gave me options to choose. Second, my supervisors were very supportive of me developing professional skills and knowledge necessary to be a scientist. Now, my husband and children are very understanding of my job as a researcher and give me much support.

NEF: What made you to publish the 'Practical Guide to the Butterflies of Bogor Botanic Garden'?

Peggie: I was interested in nature very much when I was young but unfortunately I did not have good access to books to learn about nature. There was no book on nature available to the Indonesian public. In my high school, I joined the nature adventure club called 'Cobweb.' We went hiking to explore different places and I enjoyed doing it. We saw many interesting things in nature. But I must say that it was a shame that we had many curious things around us but we just did not know what they were. I mean, we just went around and said 'Oh, this is so nice and that one is nice too!' What we knew about butterflies was only that they were called *kupu-kupu* in Indonesian language.

Nobody had written simple books about Indonesia fauna or flora which the public had easy access. Research centres might have some scientific reports, but those were not available for the public. Even if they were, scientific papers are too difficult for most people, especially children and youth, to understand.

This is why I wanted to make simple books on nature for people to broaden their interests and knowledge. As an entomologist, I have been motivated to write books of butterflies. I thought it would be great for children and their parents to have access to reference when they see a butterfly and want to know what it is. I wanted this book to contribute to young generations so that they have more appreciation towards nature.

NEF: How long did it take you to collect the specimens used for the book?

Peggie: It took us about 10 months to collect specimens from different parts of the Botanic Gardens. We could have good coverage of butterflies in the area. I also took photographs of live butterflies. Then we processed and identified the specimens and it took us about two years to get all of the data ready for the publication.

NEF: What were the major challenges you had to face in the preparation of this book?

Peggie: For some species, it was hard to find information, mainly because I do not have access to publications, especially old literature, but in many cases the information I needed simply did not exist. For example, we do not yet know many things about butterflies yet, such as larvae and host plants. Perhaps not too many people had paid attention to such small creatures in Indonesia so I believe that it is part of my job to go to the field and collect information. We have to conduct fieldworks and find out what plants the butterflies lay their eggs on.

NEF: Could you tell us how this book has been used?

Peggie: I had hoped that the book would be used by more Indonesian people. People do not necessarily have to go to the Botanic Garden to see the butterflies, because many of the butterfly species covered in the book are common and can be found in their own terraces or backyards. The book is simple and self explanatory. When people see a butterfly, they can just open the book and see the name and check its biology. This is what I want them to experience. But it does not seem that the book is used in the way I expected. Somehow people's priority is given to other things. Although I have distributed about two hundred copies to schools, I have not received much response from them.

I had of course received nice compliments and appreciation from my colleagues and people who are already aware of wonder of nature. Some friends of mine who send their children to international school love the book and their children are so happy that they can identify butterflies using my book. It is great to hear that someone enjoys my book. On the other hand, I must say that my target is the Indonesian public and I truly hope that people in Indonesia can learn more about nature, particularly butterflies.

NEF: How do you see the future of conservation in Indonesia?

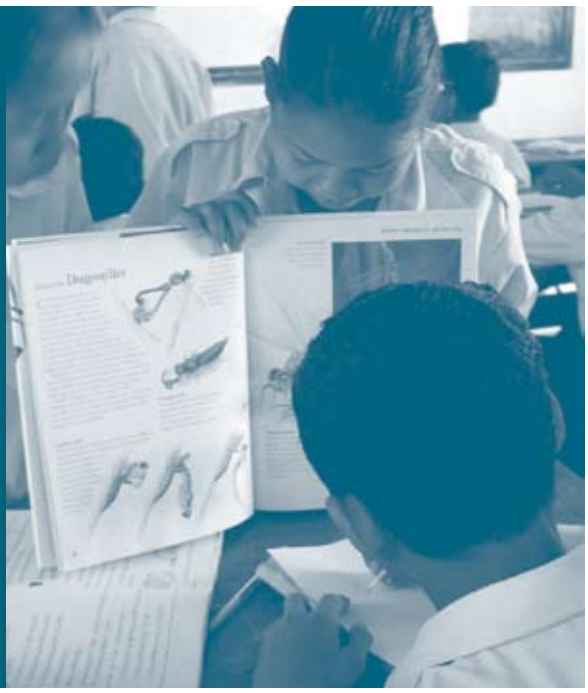
Peggie: I have to admit that it is a long way to go but we have to keep on trying to reach out to the Indonesian public and cultivate their interest and appreciation towards nature. I believe that all efforts that each of us can contribute to nature conservation. One of my contributions is producing books available for the public that help raise their awareness of nature.

When I see people do not show much interest in my book which I put so much effort for many years, it discourages me. I work hard collecting butterflies, taking photographs, and compiling all information together for publication. I enjoy my job a lot, but when I see people not using the book that I devoted so much my time and energy, the disappointment sometimes makes me feel all my efforts were not worth it. However, I believe that, like when I was young, my book will help someone understand the natural world. My husband says, 'You made the book available for the people here and how many of them use it now or later should not worry you too much. We know that it will help someone someday. That is great.'

I have also had a lot of encouragements from my former supervisors and colleagues. Thanks to them, I can keep up my spirit for producing practical guidebooks for people in Indonesia.

Dr Peggie presenting her book 'Practical Guide to the Butterflies of Bogor Botanic Garden' to former Minister of the Environment of Japan, Masatoshi Wakabayashi, at Indonesian Institute for Sciences

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.

As 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 of the drainage 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, such as paddy fields, irrigation canals, small tributaries, swamps, and so on, 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 of biodiversity in these habitats by involving them in the research activities.

Research

Fish fauna in the Mekong-Chao Phraya region is well-known for its great diversity. Nevertheless, our knowledge of their distribution and life history, for example, is quite limited and vague. There exists no comprehensive study of fish fauna based on empirical research in this region, and numerous taxonomic confusions, as well as a lack of adequate identification guides for Mekong-Chao Phraya fishes for non-taxonomists, make further ecological or biological research and conservation of the Indochinese fishes difficult.

The primary objective of this research 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 take data together with voucher specimens. Photographs of fish specimens are taken immediately after collection in order to record colouration. The data and photographs obtained will be compiled as a database of the Mekong-Chao Phraya fishes.

Participating organisations and/or researchers and their research areas are as follows:

Thailand

Six scientists, belonging to four universities, are involved as principal investigators. They are divided into three research teams for surveying different parts of the country, namely the central, eastern and northern areas of Thailand.

(1) Central area

The lower reaches of the Chao Phraya drainage are covered. Participating researchers are Dr Wichian Magtoon from the Faculty of Science at Srinakharinwirot University in Bangkok and Dr Prachya Musikasinthorn from the Department of Fishery Biology in the Faculty of Fisheries at Kasetsart University in Bangkok.

(2) Eastern area

The research team covers the middle reaches of the Mekong drainage in the eastern part of Thailand. Participating researchers are Dr Kanjana Payooha, Mr Chaiwut Grudpan, and Ms Jarungjit Grudpan from the Faculty of Agriculture at Ubon Rajathanee University in Ubon Rachathani.

(3) Northern area

The upper reaches of the Chao Phraya drainage are covered. The participating researcher is Mr Apinun Suvarnaraksha from the Faculty of Fisheries Technology and Aquatic Resources at Maejo University in Chiang Mai.

Lao PDR

A total of six researchers from two faculties, the Faculty of Science and the Faculty of Agriculture, at the National University of Laos in Vientiane are participating in this project. They are Mr Bounthob Prasaysombath, Ms Manichanh Nammanivong and Ms Viengkone Vannachak from the Faculty of Science and Mr Thonglom Phommavong, Mr Vannaphone Phoutthana and Mr Kham Phommachanh from the Faculty of Agriculture. In 2007, they conducted fieldwork in the mid-lower reaches of the Num Ngum River of Mekong drainage.

Cambodia

Scientists from the Inland Fisheries Research and Development Institute at the Fisheries Administration in Phunom Penh are participating in this project. Dr So Nam is responsible for the management of the research activities in Cambodia and his three staff members, Mr Chea Tharith, Mr Thack Phanara and Ms Chin Deth, join the team as the principal investigators. The team has started their field survey in different parts of the Cambodian Mekong drainage, including at Great Lake or Tonle Sap.

Vietnam

Researchers from the Faculty of Fisheries at Can Tho University are participating in this project. Dr Nguyen Thanh Phuong, the Dean of the Faculty, is responsible for the management of research activities. Mr Tran Van Viet and Ms Le Thi Ngoc Thanh join the team as the principal investigators. Three other staff members, Dr Nguyen Than Long, Dr Tran Dac Dinh and Mr Tran Xuan Loi, are also involved as advisors and/or technical assistants. The team conducts field sampling in broad areas of the Mekong delta in Vietnam.

Fieldwork – Lao PDR

Activities in 2007

1. Training seminar on fish taxonomy

From 1st to 8th April, 2007, a training seminar on fish taxonomy was held at Kasetsart University, Bangkok. This was a week long seminar in order for the research teams to learn the basic knowledge and techniques necessary for conducting subsequent research activities in the field and in the laboratory. A total of nine participants from the four countries attended and studied how to conduct field research on fish fauna.

The topics included methods of collecting fishes, identification, photography, fixation and preservation. The course was comprised of the following three main sessions: (1) lecture about the basic ichthyology and diversity of Indochinese fish fauna; (2) experimental field research on fish fauna in Ayuthaya; and (3) practice for identification, using fish specimens obtained during the field trip to Ayuthaya. The lecture and the other activities were conducted by Dr Prachya Musikasinthorn from Kasetsart University with the help of two Japanese ichthyologists invited by the NEF. This course was also a good opportunity for all the research teams to communicate and exchange their research plans.

2. Fieldwork

After the training seminar in Bangkok, extensive field surveys were begun in all four countries. Field surveys have been carried out periodically (for example, for 1-2 weeks every 1-2 months) in order to investigate the current status of fish fauna. At the research sites, researchers collect fishes from various habitats using several types of fishing gear, such as hand nets, seine nets, casting nets, trawls and traps. The teams receive the help of local fishermen who possess invaluable knowledge of their local environment. GPS is used to obtain detailed geographical data for each site and the local, or vernacular, names of fishes are recorded. Fishes are also complementarily obtained from the fish markets. As soon as they are collected, fishes are fixed in 10% formalin for subsequent preservation, while photographs are taken for at least some of the specimens before fixation in order to record their colouration while alive or fresh.

Training seminar

In conclusion, although time for the field surveys was limited, numerous fish specimens were collected and photographed in 2007. Of the fishes collected, there are several specimens with new discoveries related to taxonomy and/or biogeography. The results will be compiled in NEF publications and published in scientific journals.

A summary of activity in 2007 in each country is as follows:

Thailand

The three teams conducted fieldwork in the following areas:

(1) Central area team: Chao Phraya drainage from Pathumthani and Ang Thong Provinces;
(2) Eastern area team: Mekong River and its tributaries in Khongchaim to Phosai; and
(3) Northern area team: Upper reaches of Mae Cheam River basin, Chiangmai Province.

In the period between October and November of 2007, the teams carried out, collected and photographed at least 225 fish species.

Lao PDR

The area in the mid-lower reaches of the Nam Ngum River in Vientiane was selected as the research site. The area is comprised of a large reservoir (Nam Xouang Reservoir), swamps, small tributaries and the large-sized, slow-moving turbid main stream of the Nam Ngum River. During the six-days of fieldwork in November, at least 87 species of fishes were collected and photographed.

Vietnam

The area in the lower drainage of the Mekong River between An Phu and Can Tho was selected as a research site in Vietnam. A total of five expeditions were carried out from July to December and at least 111 fish species were collected and photographed.

Cambodia

The area in the middle reaches of Mekong drainage between Stung Tren and Kratie provinces was selected as a research site. At least 122 species of fishes were collected and photographed. In addition, many fish specimens were obtained through an auxiliary survey of the seasonal large-scale fisheries in the Tonle Sap River in late December.

3. Collection buildings

Fish specimens obtained in this project are fixed and preserved in collection rooms at their respective institutions. After identification, the specimens are registered in the collection and systematically arranged in each institution's collection facility. Their respective data (for example, locality, including GPS data, type of habitat, date and time, name of collector, and method used) are recorded in a registration book and a computer database. In cases where the institutions lacked an appropriate facility for storing specimen collections, the NEF contributed to the building or refurbishing of a room.

Future plans

Specimens obtained in this project are being appropriately preserved in the facilities of the participating institutions for 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 fishes' colour while alive or fresh is useful for identification and research on intraspecific variations in colour. Detailed distribution maps of fishes based on GPS data will contribute to the conservation activities in this region. The data on the vernacular 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 (for example, 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)

Collecting fishes using a casting net

Taking photos

Specimens

Yasuhikotakia caudipunctata - Cambodia

Conservation Activities

In 2006, the NEF began a new programme for conservation activities to be conducted in conjunction with the research activities. Like the research activities, the focus of the conservation activities is the freshwater ecosystems in the Mekong River region with a traditional history of human utilisation and their wise/sustainable use.

The program aims to increase public awareness of the existence, extent, and importance of the largely undocumented 'neighbourhood' biodiversity: essentially the ecology within, and in the vicinity of, bodies of water, such as the ponds, rice fields, canals, rivers and lakes that have traditionally been integral to the daily lives of so many people in the Mekong region.

The main approach employed is to mobilise organised youth, primarily student groups in universities, and to provide support and direction to these students in order to promote conservation awareness in rural communities. The students then visit and conduct activities in village primary schools.

In this first year, the main focus has been to identify and coordinate the student groups and to target the village communities they can visit, as well as providing logistical support. To date, four such groups have been established in Laos, Cambodia and Thailand.

In some instances, the groups already existed and the NEF provides support and direction for their activities. In others, the groups have been established from scratch. The kinds of activities vary from group to group, depending on their own fields of interest and level of experience. The NEF has increasingly been providing training and direction to steer the groups' activities more towards the conservation of biodiversity.

The NEF does not maintain a physical presence in the Mekong area, but instead coordinates activities electronically. Email, instant messaging, and cell phones, as well as digital photographs, are the main means of communication and reporting. The NEF has provided the student groups with digital cameras in order to record their activities and to regularly send photo-reports by Internet. The NEF is now expanding the role of digital cameras to not only record the activities themselves, but also to assist in the scientific gathering of data on biodiversity. 2008 will see this kind of student-run digital image-based survey carried out on a more expansive scale.

The most immediate objective is to bring the capacity of the student group activities up to the point where they can conduct more biodiversity-related activities, rather than general conservation awareness. The Cambodian group has begun moving in this direction. The Laos and Thai groups are expected to follow beginning next fiscal year.

In Cambodia, activities are concentrated in Siem Reap Province in the newly-established Angkor University. This university had no organised students groups, or even any form of conservation-related studies, whatsoever. The NEF soon found a group of young people willing to spend their spare time learning about conservation and helping rural communities. Initially, the students worked directly with local agencies and NGOs, visiting primary schools in and around the Tonle Sap Lake. The NEF then provided some initial training in biodiversity survey techniques, after which the students began experimenting with these activities in village primary schools.

In Lao PDR, the activities centre around Vientiane, and in two thrusts: One with organised student groups at the National University of Laos, at both the Dongdok and Nabong

Angkor University students conducting a briefing about the dragonfly life cycle after a field collecting exercise

Students of the National University of Laos conducting an awareness activity in a village primary school

Campuses, Vientiane, and the other with the staff of the Aquatic Development Centre in nearby Namsuang District.

The student groups focus mainly on raising awareness of general conservation issues. Students from both campuses conducted several joint workshop camps to train their members, after which they began paying weekly visits to primary schools in each of the 15 villages between their two campuses, conducting a range of general environmental awareness presentations and games.

Also in Vientiane, the NEF is conducting a separate activity with the staff of the Aquatic Development Centre in 20 villages in the Namsuang area. The activities focus specifically on more scientific documentation and on raising awareness of the diversity of freshwater organisms. Local schoolchildren are mobilised to gather specimens, and students from the National University of Laos assist in interviewing community members about their knowledge of the area and their usage of aquatic animals found in their rice fields, ponds, and other water bodies in their neighborhood.

The NEF has recently merged the two activities, with the university students visiting the Aquatic Development Centre in Namsuang, adding their awareness presentation experience to the Centre's more scientific activities, while at the same time learning some field information-gathering techniques they can apply to villages in their own activity areas.

In September 2007, a team of Japanese scientists from the NEF visited Vientiane and Siem Reap and provided basic training in survey techniques for the scientific monitoring of freshwater organisms. The training concentrated in the Aquatic Development Centre in Namsuang, Laos, and with the student group in Angkor University, Cambodia. The training has enabled the student group at Angkor University to begin a range of activities more focused on aquatic organisms, their diversity, and importance. Dragonflies are the main target category, and are being used and promoted as an indicator of general biodiversity and ecosystem health. The students are expanding their activities to nature photography, and the NEF has provided a number of digital cameras and on-going training in the cataloguing and identification of photographs of aquatic organisms.

As for the remaining activity venues, in Thailand the NEF is supporting a group of fishery students at Ubon Rajathanee University in order to conduct awareness activities, primarily related to the conservation of fish biodiversity, in the surrounding villages. Further south in the country, in Pakse in Champasak Province, the NEF is assisting a small student group at the Champasak Agriculture and Forestry College to work with nearby communities. To date, their focus has been mainly on teaching more sustainable integrated farming methods on the grounds of the primary schools. (Stefan Ottomanski)

Schoolchildren in Cambodia catching and learning about dragonflies in Siem Reap, Cambodia

Children in Pakse, southern Laos learning more sustainable integrated farming under direction of students from Champasak College of Agriculture and Forestry

Research Grant Scheme

Outlines of New Projects in 2007

Research Grant Programme

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

Research Grant Programme

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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 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 bird species of the islands.

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 *S. anaethetus*, roseated tern *S. dougallii*, brown noddy *Anous stolidus*, red-billed tropicbird *Phaethon aethereus*, masked booby *Sula dactylara* and brown booby *S. leucogaster*.

The project provides training opportunities of field techniques for students, local staff of the Forest Protection Department (FPD) within Con Dao National Park and local community members. The results of the project will contribute to the ongoing conservation initiatives of organisations such as Fauna and Flora International, World Wide Fund for Nature and BirdLife. The information generated by this project will be used to formulate management plans for both the forest and for threatened and rare species of birds and to assist with the planning of guided tours on the Con Dao islands. The results of this research will be presented for the purpose of raising awareness of the local stakeholders, FPD, schools in identified sites, NGOs and the scientific community.

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. When a species becomes locally extinct in a forest fragment, the functional roles played by that species are also lost. This loss of ecosystem integrity leads to ecosystem decay and causes a cascade of local species extinctions. While a number of studies document patterns in the effects of fragmentation on species diversity, few have addressed the process of how habitat disturbance causes the extinction of species performing vital ecosystem functions and the subsequent effects on ecosystem processes.

Important for nutrient cycling and seed dispersal, the recycling of vertebrate dung is one of the least understood ecosystem processes. This study will examine the patterns, causes and functional consequences of altered dung beetle biodiversity due to forest degradation in the biodiversity hotspot of Sri Lanka. With its rich biological diversity and the high levels of anthropogenic habitat disturbance, Sri Lanka provides an opportune study site. Their high diversity and abundance, integral role in dung removal, and ecological/behavioural/morphological diversity make dung beetles an ideal focal taxon for measuring biodiversity disturbance and interactions between anthropogenic disturbance and community structure.

Through this study, we will assess how the species diversity, abundance and community assemblages of dung beetles vary across the climatic and topographic zones of Sri Lanka in undisturbed and modified habitats. We will identify species (for example, body size) traits that may influence species' sensitivity to habitat disturbances, and correlate dung beetle response parameters with habitat characteristics. Finally, we will examine whether changes in dung beetle communities resulting from disturbance translates into significant functional consequences.

This project will be a pioneering study on biodiversity and ecosystem functioning in Sri Lanka, and the first ecological study on the country's dung beetle fauna. This will contribute much to the scientific understanding of habitat disturbance and its impact on biodiversity.

Objectives

The alteration of natural landscapes by humans is the primary cause of global biodiversity loss across all major taxonomic groups, and is expected to increase in severity over the coming decades as human populations continue to grow exponentially (Reid *et al*., 2005; Sodhi *et al*., 2007). Understanding the response of biotic communities to the modification of the natural habitat is essential for predicting and mitigating further biodiversity loss (Balmford and Bond, 2005).

The primary objective of this research is to study how and why biodiversity and community structure is changing in response to habitat disturbance resulting from tropical forest disturbance, and how these changes affect critical ecosystem processes. We aim to achieve the objective by studying dung beetles (Coleoptera: Scarabaeidae: Scarabaeinae), widely recognized as a useful focal taxon for describing and monitoring spatial and temporal patterns of biodiversity.

Developing theoretical and empirical frameworks for evaluating the impacts of habitat modification and fragmentation on biological diversity has long been a focus of ecology and conservation biology (Tilman, 1999; Fahrig, 2003). Since dung beetle species are known to show response to various kinds of disturbance (Spector and Ayzama, 2003; Horgan, 2005), we will also investigate their utility as indicator species to evaluate habitat modification and fragmentation in Sri Lanka.

Direct contribution of the research

(1) Global level

This research and the resulting publications will be a valuable contribution toward understanding the impacts of tropical deforestation and modification on biodiversity

and ecosystem functioning around the globe. This study differs from the other published research by the comparison of several habitat categories across a geo-climatic range. It is also the first study on the impacts of habitat disturbance on biodiversity and ecosystem functioning in Sri Lanka.

(2) Local level

The forest cover in Sri Lanka has diminished from 76% to less than 20% today and is still decreasing. As a global biodiversity hotspot, most of the vertebrate groups are threatened, and the status of most invertebrates is still not known due to data deficiency. There is an urgent need for the conservation of biodiversity to minimize further degradation.

The rate at which this required knowledge is accumulated is being vastly outpaced by even more rapid decline of biodiversity. Conservation decision-making requires scientific studies that will facilitate the identification and evaluation of the existing forest fragments and also disturbed areas of conservation importance. Research on ecosystem functioning is a challenging new field of science yet still in its infantile stage in Sri Lanka. The identification and valuation of ecosystem services are essential in conservation decision-making.

Finally, the dung beetles of Sri Lanka have not been studied in over 70 years. There have been no published studies from Sri Lanka on the taxonomy of dung beetles since the 1931 contribution of G.J. Barrows in "Fauna of British India." The ecology of Sri Lankan dung beetles remains unstudied. By addressing all three of the above issues, this research will be extremely valuable to conservation scientists and policy-makers.

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

Research Grant Programme

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Threatened by its habitat destruction, accidental deaths and poaching, the Antillean manatee *Trichechus manatus manatus* is listed as 'vulnerable' by the IUCN 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 (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.

Antillean manatee
Trichechus manatus manatus

The proposed project is aimed at encouraging effective conservation by means of (1) knowing the number, status, distribution and habitat use of *Trichechus manatus manatus* in Panama; (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.

San San Pondsak River - Manatees' habitat

The proposed project will conduct research for two years using such methods as aerial surveys; GIS; field interview surveys; tagging of individuals and strategic planning, making possible to track the same individuals over many years; conducting health assessments; collecting samples of genetic material; and monitoring reproductive condition and environmental factors in their habitat. Among other things, the research will yield a database on the species' status in Panama including their numbers, feeding, reproduction areas and usual moving patterns . Additionally, it will yield an assessment of the environmental factors that affect the health of individual manatees and how these factors impact their behaviour and reproduction. The results of the study will: (1) provide reliable data to update the Regional Conservation Plan for the Antillean Manatee, a regional process led by the United Nations Environmental Program under the framework of the Convention for Biological Diversity; and, (2) support informed decision making and participation by park management authorities and community organisations leading to effective protection of the local stock.

Specific objectives

(1) To know the number, status, distribution and habitat use of Antillean manatees in the project area.

This study will be used as a 'control' for understanding the manatees' behavioural ecology prior to the rise of human disturbance and development and what behaviour changes, if any, take place when pressures increase. The resulting data might be used to declare new protected areas in Panama as critical habitats for *Trichechus manatus manatus*.

(2) To track individual manatees; recapture tagged individuals to conduct health assessments; collect samples of genetic material and monitor reproductive condition; and, at the same time, monitor environmental factors in their habitat.

Except for a few locations and reported observations, there is uncertainty as to what are the main gathering and feeding spots used by manatees. If regional and site management plans and actions are based on these data, they might allow populations to continue breeding and to provide the nucleus for the future recolonisation of other suitable habitats in Panama and adjacent countries.

(3) To determine the environmental factors that affect the health of individual manatees and how this impacts behaviour and reproduction and to foster the long-term preservation of these factors.

Ecological data is necessary for Panama's National Environmental Authority to understand which regulations should be enforced in order to guarantee the conservation of manatee habitats, particularly on the effects of water runoff and pesticide use from banana plantations, and the potential for designating new protected areas.

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

Research Grant Programme

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The island of Kalimantan represents a zoogeographic region of wetland 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). Although the Malaysian regions of the island, Sabah and Sarawak, occupy one-third of Kalimantan, and hold the larger number of herpetofauna (259 reptiles and 150 amphibians (Inger and Stuebing, 1997; Stuebing and Inger, 1999; Lim and Das, 1999), the level of endemism in the Indonesian region is much greater especially at the higher elevations.

The Meratus Mountainous Range in the South Kalimantan province 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. In this project we will conduct fieldwork to inventory herpetofauna in the area. Other data, such as distribution, relative abundance and biomass will also be recorded. The basic data on herpetofauna of the Meratus Mountainous Range collected in this study will contribute to future biological and ecological research and the future conservation of nature in this area.

The fieldwork will be conducted in the Gunung Meratus National Park, which is mostly covered with pristine tropical rain forest. The park contains a great number of amphibians and reptiles, while this area is also used as a release site for rehabilitated orangutans. However, large-scale illegal logging activities impose a serious threat to the wildlife of the park as the park's boundaries are poorly monitored.

Two types of sample collections will be employed in order to obtain reptiles and amphibians as broadly as possible. First, night collection will be conducted for particularly amphibians (and some reptiles) along small streams. We will use headlamps to scan near streams or riverbank areas. Detailed data on the position of each animal captured will be recorded according to the attached vegetation of each habitat type. Second, day collection will be conducted for reptiles (if possible, also for amphibians). Animals will be collected by cruising and searching vegetations within the tree buttress area, and careful examination will be conducted searching for any skin shed or eggs. Some reptiles hide behind (under) rocks or in the holes of dead bark.

For quantitative analysis, we will employ the line transect method for each type of vegetation. Draft fences with pitfall traps will be used at observation sites set every 200m from above sea level. At least 10 drift fences to enclose an area of 50m x 50m will be set up for three days in each location and about 50 plastic buckets will be used inside the fence as pitfall traps. All reptiles and amphibians caught will be identified, photographed and measured. In addition, the amphibians' sound will also be recorded. Unidentified herpetofauna specimens will be kept for further examination in the museum. All samples and specimens will be deposited at the Museum Zoologicum Bogoriense in Cibinong. DNA and sound analyses will be conducted at the MZB.

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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 (4,095m) is the highest mountain between the Himalayas and New Guinea. It is located in Kinabalu Park, a World Heritage site 83km to the west of Kota Kinabalu, Sabah, Borneo Island. Within c. 900km^2, a variety of vegetation types can be found on different geological formations within major elevational gradients, but without any geographical gap.

There are currently 582 species of mosses recorded from Sabah, northern Borneo (Suleiman *et al*., 2006) and more than half of them are found on Mt Kinabalu (Akiyama *et al*., 2001; Frahm *et al*., 1990). There are very few studies utilising a molecular approach on the mosses of Mt Kinabalu; previous studies were based mainly on morphological data.

Besides the prominent diversity of mosses in Mt Kinabalu, allopatric and sympatric distribution of congener species have been recorded along elevational gradient. Little is known about the causes of those distribution patterns. It is of interest whether present-day populations of mosses are relicts from a warmer or cooler time (Late Plestocene) or whether they are from recent colonisation and speciation events. In addition, it is possible that the uplift of Mt Kinabalu in the late Pliocene has also formed the present-day distribution and diversity of mosses.

Pogonatum sp. from Mt. Kinabalu

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

Objectives

This research project has the following aims:

(1) To update the systematics of *Dicranoloma*, *Campylopus* and *Pogonatum*.

(2) To discover the phylogeography and evolutionary biology of mosses of Sabah, with emphasis on Mt Kinabalu.

Methodology

(1) Sampling strategy

The sampling of mosses will be concentrated on Mt Kinabalu. In addition to this, congeners of the same genera will also be collected from Mt Tambuyokon (2,588m), Mt Trusmadi (2,600m), Mt Magdelena (1,400m), and Mt Lumaku (1,950m).

The mosses will be collected along the routes to the summit and other bryologically unexplored parts of the mountains. Several samples from each species will be collected at different elevations within their distribution range on Mt Kinabalu. The same species will also be collected at different elevation points on other mountains. Each sample will be collected at two points along an elevational gradient of approximately 200m to 300m asl apart. All the coordinates of sampling points will be recorded.

(2) DNA analysis

Fresh specimens of mosses will be stored directly in – 80°C before DNA extraction. The DNA will be extracted from

each sample by using DNeasy Plant Mini kit (QIAGEN). Then, PCR will be carried out for four genes, namely, gene atpb-rbcL, rps4, trnL-trnF and nrITS (Grundmann *et al*., 2006). The PCR primers and programs follow that of Grundmann *et al*. (2006).

Electropherograms will be checked and corrected by eye, should any reading errors been made by a Genetic Analyser. The DNA sequences will be aligned using the ClusterW multiple alignment inside the BioEdit Sequence Alignment Editor, version 7.0 (Hall, 1999), then subsequently will be checked and adjusted manually using the same program.

Phylogenetic relationships for the selected mosses will be analysed using neighbour-joining (NJ) and maximum-parsimony (MP), with PAUP*4.0b10 (Swofford, 2002). For MP, gaps will be included as a fifth character state, and each character will be given equal weight. Five-hundred bootstrap replicates will be carried out, with ten replicates of a heuristic search with random addition sequence at each bootstrap replication. Branches will be swapped under the tree bisection-reconnection (TBR) algorithm. For NJ, gaps will be treated as missing data.

Expected outcomes

(1) Sytematics of *Dicranoloma*, *Campylopus* and *Pogonatum* will be updated by adding phylogenetic information.

(2) The phylogenetic data of *Dicranoloma*, *Campylopus* and *Pogonatum* may provide useful information for the inference of evolutionary patterns of the mosses along the slopes of Mt Kinabalu.

Mt Kinabalu

One of the peaks of Mt Kinabalu

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Small-scale Research Grant Programme

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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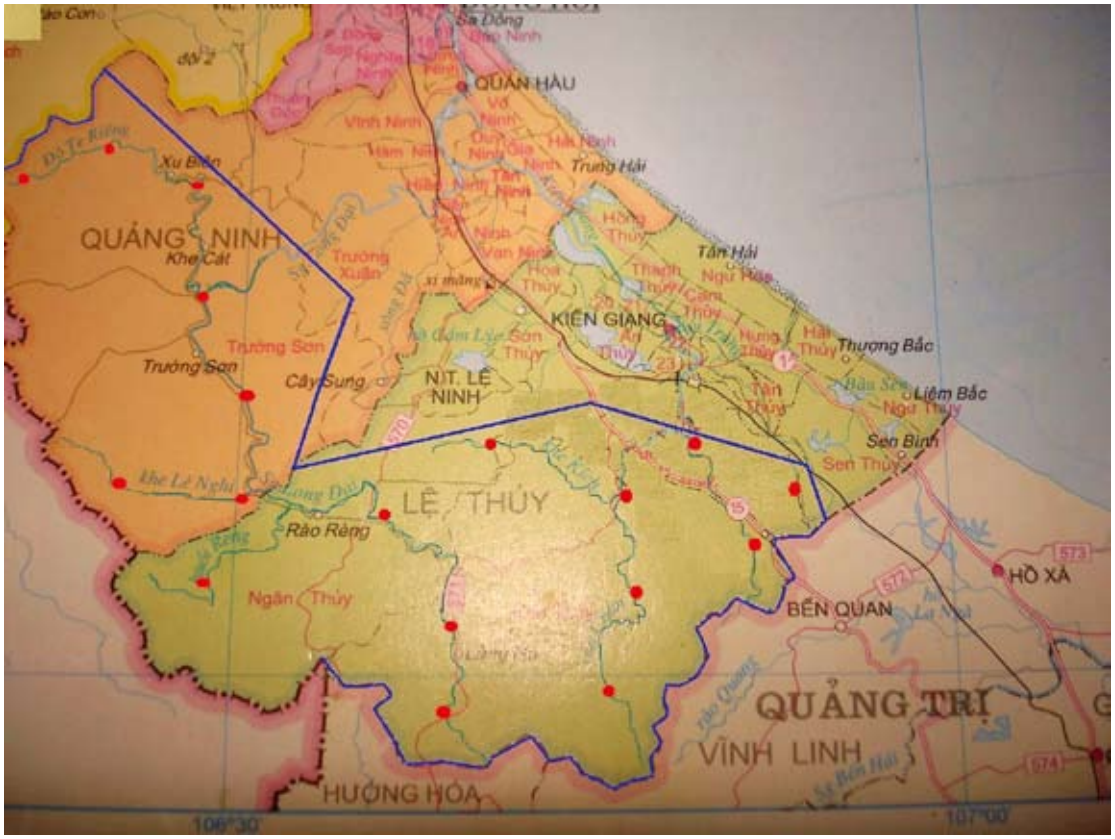
At approximately 189km in length and with a basin area of 4,080km^2, the Nhat Le River, including the Long Dai and Kien Giang Rivers, is one of the longest rivers in Quang Binh province. As long rivers contain a variety of different environments, the species composition of fish fauna in the upper reaches of the Nhat Le River is expected to be quite different from that of its lower reaches. However, given the financial and other constraints, such as the area's adjacency to the Lao border, only a limited amount of research has been conducted on fish fauna in that area to date.

In this study, we will undertake extensive fieldwork to collect fish fauna of the Nhat Le River. We plan to implement monthly samplings of fish at 16 sites in the upper reaches of the river over a period of two years, systematising local people's assistance with the sampling process. The location of each site, its environmental conditions and local name will be recorded, and specimens of fish will be fixed in formalin for species identification in the laboratory. This study is expected to yield an extensive list of fish fauna in the upper reaches of the Nhat Le River.



Study sites

Nhat Le River where the study will be conducted

The distribution and conservation status of the endangered Mt Uarges guereza and the de Brazza's monkey in forests of Samburu

Small-scale Research Grant Programme

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Background

Though Samburu district is found in a predominantly semi-arid region located in the northern part of Kenya, there are four tropical forests, namely Mathews Range, Leroghi, Ndoto and Mt Nyiro, which are rich in biodiversity and receive a substantial amount of rain. These forests have, however, received marginal attention and the knowledge of their biodiversity is poor. This is unfortunate for 'the lesser species' in a country like Kenya where all the attention is directed at the 'Big Five' — the elephant, lion, leopard, buffalo and the rhino as well as, among others, charismatic species such as the cheetah and giraffe. Rare and sometimes more-seriously endangered primates such as the Mt Uarges guereza have been completely overshadowed.

Mt Uarges *colobus* infant

The Mt Uarges guereza *Colobus guereza percivali*, endemic to Samburu, is currently the only sub-species of guereza colobus listed as endangered on the IUCN Red List, whereas the de Brazza's monkey *Cercopithecus neglectus*, previously thought to be restricted to the western part of Kenya, is endangered due to the rapid loss of its habitat. A new population outside the known range of the species in Africa, east of the Great Rift Valley, was reported in Mathews Range a few years ago. The first study on this satellite population carried out last year reported more sightings in the Leroghi and Ndoto forest.

Objectives

(1) To assess the status and distribution of both the de Brazza's monkey and the Mt Uarges guereza in the Mathews Range, Leroghi, Ndoto and Mt Nyiro Forest Reserves to help guide future conservation actions.
(2) To identify local threats to and opportunities for conservation of the Mt Uarges guereza and the de Brazza's monkey throughout the Mathews Range, Leroghi, Ndoto and Mt Nyiro Forest Reserves.
(3) To improve environmental awareness and change the attitudes and perceptions of people living in or near the Mathews range, Leroghi, Ndoto and Mt Nyiro Forest Reserves as well as other stakeholders of the four Forest Reserves.
(4) To develop the capacities of eight local scouts and four research assistants with both forest and wildlife survey skills and with data collection methodologies.

Methodology

General survey methods suitable for the collection of data on geographical distribution, estimating densities, assessing habitat and limited information on age and sex composition will be used. Local scouts will assist with the navigation and location of troops within the dense unexplored forests, while the research assistants will be responsible for animal observations and data recording.

Natural transects, such as river valleys (lagga), will be used as locations identified for detailed search in the majority of data collection. A team of at least two people, i.e. an observer and

a recorder, will be allocated to each transect. The team will walk at a speed of approximately 1km/h with frequent stops to listen and record after every 60 metres.

The information gathered will include the date, name of the area, duration spent (start and stop times), size and structure of the troop, activity, association with other species of animals, tree species, elevation, GPS coordinates, mode of detection, and any other remarks of significance. Each data sheet will represent one transect or one 'lagga', which is a sampling unit. Photographs will be taken along transects and 'laggas' to complement the data recorded.

Interviews will also be conducted to further complement the data collected from the field surveys. These will be in the form of short, semi-structured schedules targeting those people who have been into these forests and have seen either of the two aforementioned species.

The local scouts will be trained on basic primates' ecology and conservation so that they can create awareness to a wider audience in the different localities among the local Samburu community. The Principal Investigator will also hold meetings with locals to sensitise them on the importance of protecting biodiversity in their area.

Expected outcomes

(1) A GIS map, showing the distribution of all the troops of the endangered Mt Uarges guereza and the locally-endangered de Brazza's monkeys in the Mathews Range, Leroghi, Mt Nyiro and Ndoto Forest Reserves, will be produced.

(2) A scientific report on the distribution and conservation status of the endangered guereza *colobus* monkey in the Mathews Range, Leroghi, Ndoto and Mt Nyiro Forest Reserves.

(3) The changed attitudes and perceptions of people living in or near these Forest Reserves regarding the conservation of primates.

Mwenja at Leroghi

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

Small-scale Research Grant Programme

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The red panda *Ailurus fulgens* is an 'endangered' species that is fully protected under Nepal government 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 will include population surveys through the direct sighting and indirect sign survey method following the contour line perpendicular to the elevational gradient, analysis of socio-ecological factors and site-specific conservation measures and the development of community outreach/participatory programs. The project will also assist the authorities concerned of the Government of Nepal in formulating effective management plans for the conservation of red panda.

Objectives

The main objective of the study is to collect the basic information of red panda in Langtang National Park, North-Central Nepal; its specific objectives are:

(1) To collect data on the present distribution and status of red panda populations in the fragmented forests of Langtang National Park;
(2) To identify the survival threats to these populations; and
(3) To conduct community outreach and conservation education programs for local people and schoolchildren.

Methodology

(1) Reconnaissance survey

The reconnaissance survey on the red panda will be conducted during a field visit. Discussion with local people, herders and park staff will be helpful for the identification of the potential areas of the red panda.

(2) Sign survey

For estimating the population status, red panda abundance indices will be studied using different line transects/trails along with the corresponding elevational gradients. The number of elevational lines in each area with an elevational interval of 100m above the 2,600m elevation will be surveyed (for example, for direct sighting and indirect signs such as droppings and eaten bamboo) following contour lines at right angles to the elevation gradients. The frequency and number of signs, GPS coordinates, elevation and microhabitat characteristics will be recorded following the study done by Williams (2004) and Pradhan *et al.* (2001). All the droppings found will be categorised in different groups and size will be assessed so as to estimate the age of each red panda according to Yonzon (1989).

(3) Habitat evaluation

Data on landscape and habitat parameters will also be collected from a circular, 10-meter radius plot every 100 meters during the transect walk and at each location where signs are encountered. Canopy height, canopy cover, ground cover, dominant tree and shrub species and their phenological state will also be recorded at every sampling point. Data will also be collected on the degree of encroachment by people, grazing pressure and logging.

(4) Questionnaire survey

A few selective questionnaires will be prepared to interview the villagers and herders to evaluate the status of Red Panda and level of poaching. The questionnaires also will enable assessment of the people's attitude towards the Red Panda and the likelihood of success of new conservation initiatives.

Community outreach education and public information

Outreach and conservation education programmes explaining the importance of wildlife will be launched, aimed especially at different schoolchildren. Printed materials including posters and stickers will be used to popularise the importance of the red panda. The school programmes and leaders meetings will be conducted with an introduction of red panda and its role in the ecosystem.

Programme initiators will request to present local views and experiences about the conservation.

Expected outcomes

The proposed study will provide:

(1) The present distribution and status of the red panda in Langtang National Park;
(2) The habitat preference by the red panda;
(3) The attitude of the local people towards the red panda;
(4) The threats pertaining to the red panda; and
(5) Recommendations for the conservation measures and other related activities in the area.

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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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The deforestation of tropical forests and their subsequent conversion to human-dominated land-use systems, such as agricultural land, is one of the most significant causes of biodiversity loss. This is also true for Indonesia, holding about 10% of the world's remaining tropical forests. However, the area covered by forest is decreasing rapidly and most provinces have already lost 80% or more of their lowland forest (MSPE, 1992). This also counts for Sulawesi where the deforestation rate has reached nearly 190,000ha/year (Holmes, 2000), and almost all lowland forests below 400m asl have been lost (FWI and GWF, 2002 cited in Waltert *et al*., 2004).

Dung beetles (Coleoptera: Scarabaeidae) are widely used as biological indicators for evaluating the effects of habitat disturbance driven by human activities, as they have proved to be particularly sensitive to habitat perturbation, such as canopy forest loss (Davis and Sutton, 1998; Davis *et al*., 2001) and human habitat modification (Shahabuddin *et al*., 2005). Several environmental variables, such as elevation (Lobo and Halffter, 2000), soil and available dung type (Doube, 1991) and season (Hanski and Krikken, 1991), affect their diversity and distribution. Furthermore they are ecologically important since their dung burial activity could maintain soil fertility (Omaliko, 1984), increase plant yields (Miranda *et al*., 2001) and dung-seed dispersal activity promotes plant regeneration (Andresen, 2002; 2003). Therefore, a reduced dung beetle population most likely results in a cascading and long-term effect throughout the ecosystem.

Lore Lindu National Park (LLNP) in Central Sulawesi is one of the core areas for the protection of the biodiversity of Wallaceae (Myers *et al*., 2000). Generally, forest habitats in the interior of LLNP are still relatively undisturbed while the margins of the park are characterised by a mosaic of near-primary forests, degraded forests, forest gardens and plantations of cacao, coffee, maize and paddy rice as the most important crops. Although the forest conversion has strong negative effects on biodiversity (Watt *et al*., 1997; Lawton *et al*., 1998), some agroecosystems including traditional agroforestry systems, such as cacao and coffee cultivations established under the diverse layers of forest trees, can maintain a relatively high portion of tropical biodiversity (Reitsma *et al*., 2001; Harvey *et al*., 2006). Therefore, natural resource management should also include its conservation efforts outside protected areas.

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. In particular, this study will investigate the response of dung beetles to different levels of habitat disturbance ranging from natural forest, agroforestry systems to open cultivated areas in 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 at both the margin of the protected area and adjacent land-use systems.

This study aims to address the following research questions:
(1) How forest conversion to land-use systems at the margin of LLNP affects the diversity and structure of dung beetle ensembles; and whether the diversity of dung beetles inhabiting natural forest is significantly higher than those in land-use system (agroforestry systems or annual cultures).
(2) How significant the contribution of agroecosystems is to the total (regional) diversity of dung beetles.
(3) What habitat variables will be the best predictors for explaining differences in dung beetle assemblages between land-use types.

The expected outcomes of this study are as follows:
(1) Data on biodiversity, particularly of the species diversity and distribution of dung beetles in LLNP;
(2) A brief description of dung beetles fauna collected in the study area; and
(3) Habitat management strategies to maintain high biodiversity at the margin of the conservation area and its surrounding land-use systems.

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

Small-scale Research Grant Programme

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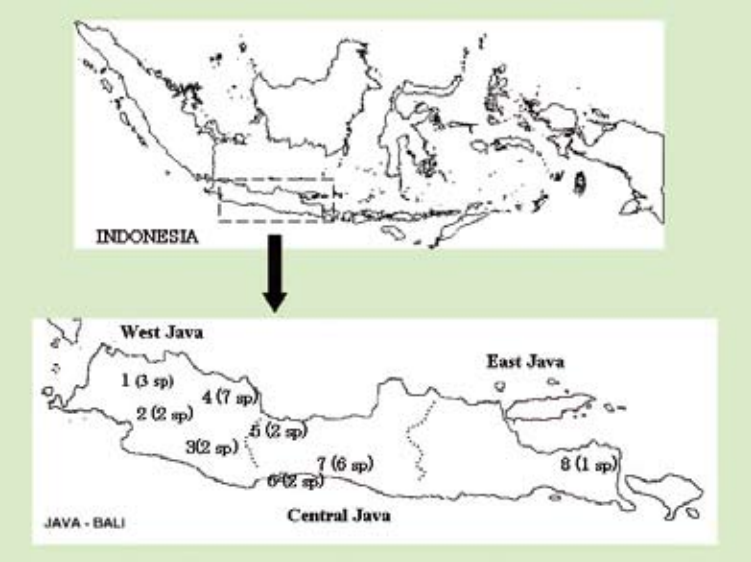
Pediobius WALKER is a large genus of Eulophidae (Hymenoptera : Chalcidoidea) containing more than 200 described species worldwide and distributed in all the zoogeographical regions (Hansson, 2006), though only a small number of species have been recorded from Southeast Asia. The species of *Pediobius* are entomophagous, attacking other arthropods, and five insect orders and spiders (Araneida) have been recorded so far, along with their hosts (Bouček, 1988). Some species have frequently been used as biological control agents for many insect pests; for example, *Pediobius foveolatus* (Crawford) used to control the soybean beetle pest *Epilachna varivestis* Rohwer in Mexico (Holko, 2006), the Philippines (Vargo and Schreiner, 2000) and China (Schaefer *et al*., 1986). The main objective of this project is to clarify the diversity of *Pediobius* fauna in Java to have an accurate identification system. This is important for future development of strategies for biodiversity conservation. The biological information obtained from this study will also contribute to establishing a biological control program, which is important for enforcing sustainable agriculture that can support the Indonesian people.

The specific objectives of this project are three-folded:

(1) To study the diversity of *Pediobius* fauna in Java, focusing on species recognition of Javanese species;
(2) To provide an updated list of the *Pediobius* species occurring in Java-Indonesia; and
(3) To provide basic biological information to a biological control program of insect pests of crops in Indonesia and for making further important steps towards the conservation and management of nature.

The major sources of the materials used in the present study are the collection of Museum Zoologicum Bogoriense (MZB), and the Indonesian Institute of Sciences (LIPI). Laboratory work will be conducted in the Entomology Laboratory at the Research Centre for Biology-LIPI. The field collection research will be carried out in various habitats from western through eastern parts of Java. The areas where sampling will be conducted include:
(1) West Java: Sukabumi;
(2) Central Java: Purwokerto; and
(3) East Java: Magetan.
The above are areas with high ecological pressure, areas lacking biological data on and availability of described *Pediobius* species, and areas of agricultural importance.



Locations and the number of described *Pediobius* species collected on Java
1. Bogor (3 species); 2. Sukabumi (2 species); 3. Garut (2 species); 4.Ciamis (7 species); 5. Purwokerto (2 species); 6. P. Nusakambangan (4 species); 7. Merapi Jogjakarta (6 species); and 8. Meru Betiri Jember (1 species).

Conservation Activity Programme

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

Conservation Activity Programme

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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 will conduct the proposed field training program on biodiversity and its conservation for those teachers. This field training is based on the recommendations of workshop participants who realised that they lack certain knowledge with respect to local biodiversity, its use and conservation. They also recognise their responsibility in delivering these issues to their students through various learning methods such as local contents, infusion and integration of local knowledge in school curricula. This lack of experience and knowledge with respect to local biodiversity is becoming 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. This training, planned from December 2007 to February 2008, will be conducted within the Tangkoko-Batuangus Nature Reserve. This particular area was chosen as the training site as it is relatively well-managed compared with the other conservation areas and is representative of the various ecosystems and biodiversity of North Sulawesi.

Objectives of the training are:

(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 will give the teachers the basic knowledge to construct curricula for their respective schools based on their local biodiversity and conservation.

The project will be conducted at the Tangkoko-Batuangus Nature Reserve. This reserve is located near three other conservation areas, namely the Dua Sudara Nature Reserve, the Batuputih Ecotourism Area and the Batuangus Ecotourism Area, located in Bitung District of North Sulawesi. Tangkoko-Batuangus was chosen as the training location based on several reasons. First, it represents 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. Third, its location is close to Batuputih Ecotourism Area, which has useful facilities, such as research stations and camping grounds. Finally, it has convenient access for reaching the Dua Sundara Reserve.

Research Grant Scheme

Progress of the Projects in 2006

Research Grant Programme

The population status, harvesting and the trade of blue tree fern *Cyathea contaminans* (WALL.) COPEL in Indonesia

Research Grant Programme

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Introduction

Cyathea contaminans is a tree fern species belonging to family Cyatheaceae, which generally grows in the mountain forests of Indonesia. People in local communities have utilised *C. contaminans* for a long time due to its economic value. The major use of its tree trunk is as a material for creating artwork, such as in statues, poles for decorating luxurious houses or hotels, and in making flower vases. The trunk is also used as an excellent medium for orchid cultivation (Holttum, 1963; Sastrapradja *et al*., 1979). Furthermore, it has been reported that the smooth hairs, found on the base of its stalk, were used as traditional medicine on Java island (Sastrapradja *et al*., 1979).

Since 1975, when all genus of Cyatheaceae were listed in CITES Appendix II, international communities have given notice to the use of Cyatheaceae, particularly with respect to its trade and sustainability. In accordance with the international requirements, the harvesting, domestic transporting and exporting of *C. contaminans* are controlled by the Directorate General of Forest Protection and Nature Conservation (PHKA) as the CITES Management Authority. The annual national quota is set under the Decree by the Director General of PHKA. The Provincial Offices of the PHKA (for example, the BKSDA) issue harvest permits up to the quota assigned to the province. Permits for domestic transport are also issued by the Provincial Offices, according to the annual quota and with reference to harvest permits. However, neither the implementation of these required permits, nor the effectiveness of obtaining such permission, nor the corresponding law enforcement consequences for violations of the trade have ever been assessed. The purpose of this research is to investigate the population status of *C. contaminans* in Indonesia and to gather information on its trade, such as its harvest and transport.

The specific objectives of this research are:
(1) to assess the population status of *C. contaminans* in the wild in certain regions where the annual quota was regulated. These regions are the provinces of North Sumatra, West Sumatra, Jambi, Lampung, South Sulawesi and West Sulawesi;
(2) to investigate the techniques employed by local people for harvesting *C. contaminans*;
(3) to collect data on its international trade, including information on varieties of products, market prices, and market routes; and
(4) to analyse the profile of exporters of *C. contaminans*, including their profit-sharing systems.

Research methods

The research was carried out from March 2006 to June 2007. Site data collection was conducted from June to November 2006 in the following six provinces: North Sumatra, West Sumatra, Jambi, Lampung, South Sulawesi and West Sulawesi. Data on the populations of *C. contaminans* and its harvesting, as well as the climate and topography of its habitat were collected through image analysis, field observation and survey, direct measurement and literature study. Interviews were conducted with exporters in West Java, Banten, and North Sumatra provinces in March and May 2006 and January 2007.

Data Analysis was conducted in the following procedures:
(1) Identification of Vegetation Index

A GIS technique was used to produce accurate maps of species distribution. The Normalised Difference Vegetation Index (NDVI) values were derived from Landsat images and used to identify the electromagnetic reflectance of vegetation by differentiating the vegetation greenness spectral to the other spectral objects based on the characteristics of Landsat's near-infrared band sensor. The following mathematical equation was used to obtain NDVI:

NDVI = (Near-Infrared – Red)/ (Near-Infrared + Red)

A positive value of the NDVI indicates a vegetation

object, whereas a negative value indicates other object, such as soil. Since the NDVI value differs depending on vegetation types, it is useful for distinguishing vegetations from images (Oindo, 2001 cited in Sotomayor, 2002).

(2) Analysis of *Cyathea* traders

Cyathea traders can be divided into three groups; namely harvester, collector and exporter. A simple analysis was conducted to examine their business operation with their associated cost, examining the different stages of processing—from the supply of raw material by a harvester and collector to exporters.

(3) Non-detriment finding assessment

A set of the IUCN Guidelines developed by the IUCN Species Survival Commission was used for a non-detriment finding assessment for *C. contaminans*. According to the IUCN Guidelines, all parameter scores were presented in a radar diagram to determine whether the trade is non-detriment to the survival of the species.

Results and discussion

The NDVI values of the species were between 0.1 and 0.2, although values differed for all six provinces. Interpretation of the image, GIS outputs and data of the species density were combined to estimate the population (Table 1).

The study results revealed that most populations of *C. contaminans* were located in North Sumatra, West Sumatra and West Sulawesi provinces. Large-scale exploitation for export is ongoing in five provinces, namely South Sulawesi, North Sumatra, Lampung, Jambi and West Sulawesi, while exploitation for domestic use occurred in North Sumatra and West Sumatra. The population status of *C. contaminans* in the six provinces is categorised as reduced and still decreasing. In particular, exploitation in Lampung and South Sulawesi provinces is detrimental to the wild population of *C. contaminans*. Unsustainable exploitation, land conversion, and the low level of control over species management are responsible for the critical status of the species.

The analysis of traders revealed the following characteristics. All groups of *Cyathea* traders, namely harvester, collector and exporter, have a close relationship with each other in the chain of the trade, though regulations are stricter for exporters. Harvesting techniques used by harvesters generally include fibre root skinning, felling of trees, and root excavation using traditional tools. The harvesting of *C. contaminans* is not a main livelihood for harvesters and collectors. There are nine exporters registered at the CITES Management Authority. Two of them are not active after 2005 and only seven produce *Cyathea* products. From 1996 to 2005, the total amount of *Cyathea* spp. products exported was 18,419,822 kilograms wherein *C. contaminans* was mainly used as a material. These products are exported to Taiwan (83.7%), Japan (12.8%), Korea (0.5%), Denmark (0.4%), China (0.3%), Germany (0.2%) and Venezuela (0.1%).

For the sustainable management of *C. contaminans*, the following actions must be taken immediately: (1) data collection on biological information and inventory of the species; (2) conservative quota establishment; (3) enforcement of harvesting control; (4) monitoring of trade; and (5) education and raising public awareness.

Table 1 Estimation of *C. contaminans* populations in six provinces

No.	Province	Estimated areas of distribution			Estimated population (Individual)		
		Pixels	Extent (ha)	Seedlings	Saplings	Poles	Trees
1	North Sumatra	61,852	5,566.68	94,633.56	100,200.24	356,267.52	97,416.90
2	West Sumatra	62,464	5,621.76	251,854.85	239,486.98	158,533.63	32,606.21
3	Jambi	12,996	1,169.64	95,325.66	38,598.12	92,986.38	11,111.58
4	Lampung	2,304	207.36	1,555.20	2,073.60	1,555.20	0.00
5	South Sulawesi	3,698	332.82	3,328.20	3,993.84	5,990.76	1,331.28
6	West Sulawesi	27,380	2,464.20	58,401.54	54,212.40	78,115.14	49,284.00
Total		170,694	15,362.46	505,099.01	438,565.18	693,448.63	191,749.97

Note: 1 pixel is equal to 0.09ha

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Avifauna diversity and its conservation in the Kangean Archipelago

Research Grant Programme

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Introduction

Studies on avifauna of the Kangean Archipelago have been carried out since the 19th century. Even now, the lists of Kangean birds published by Vorderman (1892), Hartert (1902) and Hoogerwer (1962; 1963) have continued to serve as an important information resource. Although surveys conducted by de long *et al*. in 1982 and Nurwatha in 1996 updated knowledge on the diversity of Kangean birds, no ornithologist had visited the islands for research for approximately 10 years. Given the status of the Kangean Archipelago as a secondary area of restricted-range species (BirdLife International, 2003) and the long paucity in avifaunal research, it is important to carry out a study on Kangean birds. The present study will serve both to elucidate the current situation of avifauna diversity in the Kangean Archipelago as well as to gain basic knowledge on conservation and biodiversity management of the area.

Methodology

(1) Study sites

I visited five sites comprising different types of habitats during the March-April and August-September 2007 surveys. Gunung Talangkobeto (natural forest), Tembayangan (natural and teak forest), G. Moncong (natural forest) are located at the central ridge of Kangean Island, whereas others, Aingkokap (natural forest), Jukong-jukong (teak forest), Patapan (mangrove/beach forest), and Cangkramaan (open area and mangrove), are located at a lower elevation. During the last days of the survey, I visited Saobi Island in the southern part of the Kangean Archipelago, which is characterised by its open area (paddy field) and beach forests.

A view from the top of Gunung Moncong, Kangean Island

(2) Methods

I applied two methods in order to obtain a comprehensive list of birds, namely general surveys and mist-netting. For general surveys, I searched for birds in a range of terrestrial habitats. Bird records were collated from line transects and point observation at vantage points in different habitats (Bibby *et al*., 1998; Allen *et al*., 2006). At each habitat type, ten mist-nets were set up. For each taxon and gender, one specimen was collected and genetic samples were taken. Duplicated birds were banded before release. In order to obtain local information I conducted interviews with local people by showing pictures of birds to them.

Results and discussion

A total of 65 species was recorded during my fieldwork. The areas richest in species included Gunung Talangkobeto, Tembayangan and Gunung Moncong. Approximately more than 50% of birds were recorded in those areas and their surroundings. Some birds were found only in beach or mangrove forests characterised by a wide area of muddy beach or open area (seasonal paddy fields and cultivated land).

Of those, two species were newly recorded for the island of Kangean: arctic leaf-warbler *Phylloscopus borealis* and changeable hawk-eagle *Spizaetus cirrhatus*. Subspecies endemic to Kangean, namely the red-breasted parakeet *Psittacula alexandri kangeanensis*, Javan frogmouth *Batrachostomus javensis longicaudatus*, greater goldenback *Chrysocolaptes lucidus kangeanensis* and green-billed malkoha *Rhopodytes tristis kangeansis*, were also encountered. In Saobi, orange-footed scrubfowl *Megapodius reinwardt* was recorded. This species is from the Wallacean area and only its mound had been previously found in Gunung Talangkobeto of Kangean Island.

The numbers of birds found in this study were much lower than previous records. According to the list of E.

Hartert (1902), a total of 76 species were present, including some migratory birds. The difference of the survey season could account for the difference in the number of species observed. Additionally, apart from a migratory kingfisher, sacred kingfisher *H. sancta*, certain migratory seabirds were not observed in the present study. This indicates that the Kangean Archipelago is an important stepping-stone for migratory birds. Other possible reasons for the lower number of species recorded include that some birds were inadequately sampled or that they were inconspicuous. Nevertheless, several species that were absent from the observation, such as black-winged kite *Elanus caeruleus* and long-tailed shrike *Lanius schach*, may indicate that impoverishment of avifauna is ongoing, as these species are commonly seen in open areas on the Continent.

The survival of the birds of Kangean, especially that of the forest birds, was mainly threatened by habitat degradation, caused in particular by illegal logging. In the past, illegal logging used to occur only at teak plantations. However, now, as big stands are becoming scarce, some local people thrust into natural forests to produce timbers. This will have a detrimental influence on species that have a specific niche, such as woodpeckers, and species that are dependant on fruiting trees due to the loss of older trees.

Arctic leaf-warbler *Phylloscopus borealis*

Javan frogmouth *Batrachostomus javensis longicaudatus*

Greater goldenback *Chrysocolaptes lucidus kangeanensis*

Red-breasted parakeet *Psittacula alexandri kangeanensis*

Green-billed malkoha *Rhopodytes tristis kangeansis*

Orange-footed scrubfowl *Megapodius reinwardt*

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Ecological studies on dugong population and its environments in Malita, Mindanao

Research Grant Programme

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Introduction

Dugongs have been listed as vulnerable to extinction since 1982 by the World Conservation Union (IUCN, 2004). Dugongs are animals that are very difficult to rear in an aquarium, and as such, only few dugongs have been reared in captivity in the world (Mukai, personal communication). Therefore, conservation of the species in their natural habitat is of importance.

The Philippines is one of the 43 countries in the Indo-Pacific where dugongs can be found (Marsh, 1993). While dugongs were previously found in herds along the coast of the Philippines, most of the remaining dugongs in the country are found in Palawan (Kataoka *et al*., 1995), where population studies on these marine mammals are concentrated.

A photo of dugong taken 1054AM on April 15, 2007

Project site from top of tower facing north

Along the west coast of the Davao Gulf in Southern Mindanao, regular sightings of dugongs are reported and documented, particularly along the coast of New Argao in the municipality of Malita, Davao del Sur, Philippines (Lucero, 2005). Dugongs have a particular time of appearance, with the most frequent observations being from between times 09.00h–11.00h and from 14.00h–16.00h. From 2002 to 2006 at least five dugongs (four adults and one calf) were accounted dead along the west coast of Davao Gulf. Unpublished reports revealed that viable population of dugongs were observed along the east coast of Davao Gulf, particularly in the municipality of Governor Generoso (Dagondon, personal communication).

Among the areas of research geared towards the conservation of these endangered marine mammals are: (1) the identification of important dugong habitats and anthropogenic sources of dugong mortality; (2) the identification of direct and indirect threats to dugongs and their habitat; and (3) development of a monitoring program focusing on both populations and habitats of all scales (Management Program for the Dugong in the Northern Territory of Australia 2003-2008; WWF-SSME, 2003). Observing marine mammals, such as whales, dolphins and dugong, is gaining in popularity with many people and it is perceived that dugong watching can bring some kind of healing or therapeutic effect. This suggests that dugong watching has a remarkable potential as an object of ecotourism. The data and information that will be derived from this study will provide the basis for decision-making regarding the

Daily Monitoring of dugong is done from the observatory tower.

protection of important and critical areas in Davao Gulf, thereby providing natural refuge for dugong and enhancing the success of watching dugongs in the wild.

Research objectives

This study aims to estimate the population and occurrence of dugongs and assess the quality of seagrass habitat used as feeding ground in the particular study area. Specifically, it aims to (1) develop a population estimate of dugong in the area; (2) assess the status of seagrass beds in terms of species composition, species fed by dugong, percent cover and biomass which are utilised as feeding habitat of dugong; and (3) to assess the water quality of the area and its vicinity.

Methods

The study is conducted in New Argao, Malita, Davao del Sur, Mindanao, Philippines located between 06˚23'08"N, 125˚37' 14"E and 06˚21'52"N, 125˚38'11"E. Three stations have been established within the 2.7km coastal stretch of the area. To estimate the dugong population, daily visual observation and monitoring of dugong occurrence are conducted from 0600AM to 0500PM from an observatory tower located on the shoreline. Observations are conducted simultaneously from three stations, with one observer assigned per station.

To assess the quality of the seagrass habitat, data are gathered quarterly for one year (March 2007, June 2007, September 2007 and December 2007). Line transect and quadrant methods are employed in collecting data through SCUBA and skin diving. Manta tow is also conducted and GPS is used in mapping seagrass beds. Production potential is determined through seagrass biomass and determination of percent cover. Seagrass grazing by dugong is also assessed, involving a marking method and vegetative harvesting of the seagrass within the feeding trench.

Furthermore, quality of water in the vicinity is also assessed for microbial coliform count.

Preliminary results

From April 2007 to September 2007, the number of dugong observed during the day ranged from one to eight. The largest herd observed was three, comprising of two adults and a calf. Occurrence of dugong observations was highest during the sea state codes SS2 – SS3 of the Beaufort Scale.

The data for the first three quarters of 2007 revealed that seven species of sea grasses, namely *Halophila* sp., *Halophila ovalis*, *Halophila minor*, *Halodule uninervis*, *Halophila spinusola*, *Syringodium isoetifolium*, and *Enhalus acoroides*, were observed in the study area. The *Halophila* species, which dominate the area, appear to be the preferred species of dugong; however this has yet to be confirmed relative to

Halophila spp.

Halophila ovalis

Halodule uninervis

Halophila spinolusa

the feeding consumption with that of the data on seagrass biomass in the feeding trench. In a 100m x 100m plot, the number of feeding trenches observed ranged from 230 to 250 and were approximately between 13 and 20cm wide and 112cm long.

Study of the water quality of the area and its vicinity (within the three km stretch) revealed negative for coliform bacteria. On 4 October 2007 there was a chance to examine the gut of a dead dugong (2.55m, approximately 400kg, male). The gut was heavily infested with worms (Nematode).

Discussion

A viable population of dugongs are found in area of New Argao, Malita, Davao del Sur. A luxuriant vegetation of seagrass dominated by *Halophila* species is mapped within the three-kilometre coastal stretch of the study area. The seagrass beds of the area provide the feeding ground for the resident population of dugongs in the area. The sustainability of the seagrass has to be further studied relative to herbivory data for the last quarter of this year yet to be gathered in the study. The negative results for coliform bacteria may indicate that there is no problem as to disposal of faecal matter along the coast of the study area.

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Population structure and reproductive biology of *Cerithidea obtusa* in the mangrove system of Camau province, Vietnam

Research Grant Programme

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Introduction

The mangrove snail *Cerithidea obtusa* is a common species in the mangrove ecosystem in the Asian-Pacific region (Ellison *et al*., 1999; Tan and Chou, 2000; Suwanjarat and Klepal, 2001). Certain species of the *Cerithidea* genus are sold generally as seafood in Vietnam and other Asian countries. Although the population size of *C. obtusa* has been decreased due to over-exploitation and mangrove destruction, few studies have been conducted on these particular gastropods, including on their oxygen consumption (Houlihan, 1979), feeding behaviour (Bouillen *et al*., 2002) and lipid and fatty acids of *C. obtusa* (Misra *et al*., 1986). During their studies of the reproduction of the *Cerithidea* genus, Suwanjarat and Klepal (2000) only described the ultrastructural characteristics of euspermatogenesis and euspermatozoa of *C. obtusa* but not reproductive cycle. It is necessary to understand both the population structure and reproductive biology of *C. obtusa* for the purposes of resource management, biodiversity conservation and sustainable aquaculture.

Objectives

The objectives of this research are to: (1) observe the variation of population structure of *C. obtusa*; (2) determine the seasonal variation of biochemical compositions; and (3) investigate the reproductive cycle of *C. obtusa*. The following data are being collected:

(1) Variation of environmental conditions at sampling sites
(2) Population structure
(3) Seasonal changes of proximate compositions of mangrove snail
(4) Reproductive biology

Study site

This research will be conducted at Ca Mau province in the Mekong Delta of Vietnam, located from 8°30′ to 9°10′N, 104°80′ to 105°5′E. It has an amount of 107km and 147km of coastline in the east and the west, respectively. With its dense network of canals, creeks and rivers, mangroves, this province is considered a very important area for forestry, fisheries and agriculture.

Expected output

(1) Some scientific articles published in national or international journals
(2) Presentation at the National Molluscan Workshop 2009 (in Vietnamese with an English abstract)
(3) One master thesis

Other information

The results of this study will be significant contribution toward the establishment of a suitable management plan for natural resources within the mangrove system. As biodiversity conservation and diversification of cultured species are an important task in the Mekong Delta, the study will help stabilise the status of ecosystem and aquaculture development. The information regarding the population structure and reproductive biology of *C. obtusa* is important for management of the species helping the maintenance of the population recruitment. Furthermore, the results are useful for artificial seed production of the species so as to contribute to biodiversity conservation and aquaculture development.

Study site (inside mangroves)

Study site

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Cave fauna of Java: diversity of and contribution to karst conservation

Research Grant Programme

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Introduction

Indonesia has an extensive karst region extending from Sumatra to Papua, though the biological information pertaining to many areas is still limited and unevenly available. Caves in Java have an extensive development; however very few biological surveys have been conducted, particularly on the diversity of cave fauna. In general, caves are known to be home for a huge number of species, such as arthropods and bats. However, in stark contrast with the 15 species described at Maros Karst, only five species have been described in Java. The most recent description was in 2006 when a cave obligate species from Java, *Stenasellus javanicus*, was found in the small puddles of small caves near a limestone quarry. The status of its population still remains unknown. Moreover, it is believed that several species, including ones new to science as obligate cave fauna, are still waiting to be described.

Karst areas in Java are densely populated and threatened by limestone quarry, habitat conversion, and many other human activities. Since none of these karst areas have been designated as a conservation area, it is very difficult to manage the karst ecosystem and to ensure conservation of cave faunas and their habitat. This project focuses on cave arthropods and bats that form an important link between the subterranean and epigean worlds. Survey on arthropods and bats in Java's karst areas is tremendously necessary, as the result will provide baseline data for more critical steps toward conservation.

Objectives of the project are to:
(1) study the diversity of cave fauna, focusing on cave arthropods and bats;
(2) build baseline data for further activities and support for conservation and management of karst;
(3) promote public awareness of the importance of cave fauna, especially of its diversity and role in karst conservation; and
(4) support the declaration of karst protection using the fauna baseline data collected from caves.

Where we work

Important karst areas in Java are:
(1) Gunung Sewu Karst – Yogyakarta, Central Java and East Java Province (Gunung Kidul, Pacitan and Wonogiri Regency); and
(2) Gombong Selatan – Central Java Province (Kebumen Regency)

However, the following areas in Java lack biological data:
(1) Sukabumi Selatan – West Java province (Sukabumi Regency)
(2) Cibinong-Ciampea-Jagabaya – West Java Province (Bogor Regency);
(3) Taksimalaya Karst – West Java Province (Tasikmalaya Regency);
(4) Grobogan Karst – Central Java (Grobogan Regency)
(5) Menoreh Karst – Central Java (Purworejo and Kulon Progo Regency);
(6) Tuban Karst – East Java (Tuban Regency); and
(7) Madura Island – East Java (Madura).

Methodology

The methods are divided into the following two categories:
(1) Unstandardised methods

Unstandardised methods are used mainly for cave arthropods and include direct collection, such as hand collecting and bait trap. For bats, hand nets or other apparatus are used and direct observation provides the number species present in such caves and karst.

(2) Standardised methods

Standardised methods are used for bats and cave arthropods. A mist net is used for bats collection, while pitfall trapping is used for cave arthropods.

Preliminary results

(1) Cave arthropods

More than one-hundred species of cave arthropods were identified from the approximately one-thousand specimens collected. They are composed of several classes, such as crustaceans, arachnids, diplopods, chilopods and insects.

In addition, some cave-adapted species were discovered during the trips to the Java caves. These include a second

species of cave stenasellids from Sukabumi (*Stenasellus* sp. (Isopoda)), cave shrimps (*Macrobrachium* sp.) from Grobogan, and several cave species of atyids and terrestrial isopods. Moreover, more than seven species of cave arthropods are believed to be new to science, such as two species of *Stygophrynus* sp. (Amblypygi) from caves in Grobogan Karst (Central Java) and Tuban Karst (East Java) and one species from epigean habitat in the limestone forest of Ujung Kulon NP (Banten). Each of those species has specific distribution and all are endemic to certain karst areas.

The composition of each cave arthropod varied with the caves and karst areas. The finding of *Stenasellus* sp. shows the linkage between Java, Sumatra and Borneo, as this genus is found in an area ranging from Cambodia, Thailand, Sumatra, Borneo to the western part of Java.

(2) Cave bats

About 14 species of bats from seven families were collected from four karst areas (Sawarna, Sukabumi, Grobogan and Tuban). The majority of these species are insectivorous (85%), with the remaining species being

The passage of Gua Manuk, Tuban (East Java) in Gua Nglirip Nature Reserve (Photo: C. Rahmadi)

Descending in vertical cave in Tuban (East Java) (Photo: ABE)

A female whip-spider *Charon grayi* (Amblypygi) carrying nymphs on the abdomen. Taken from Gunung Sewu cave (Photo: C. Rahmadi)

Collecting small arthropods on deadwood in Gua Gadjah, Grobogan (Central Java) (Photo: ABE)

Recording data in cave, Sawarna Karst (Banten) (Photo: C. Rahmadi)

Phosphate mining in Gua Pawon (Grobogan) (Photo: ABE)

Herpetofauna diversity patterns along disturbance gradients in the Gunung Ciremai National Park, West Java: implications for effective conservation

Research Grant Programme

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Background

Mount Ciremai is the highest (3,078m) mountain in West Java and is one of the most important assets for Kuningan and Majalengka regencies. The mountain has extensive natural resources including rich agricultural land and a natural, spring-fed water supply. However, the extinctions of forest-dependent amphibians and reptiles due to forest loss and degradation as well as the isolation of once-continuous populations are serious problems. Along with SK Menteri Kehutanan No.424/Menhut-II/2004, the area of approximately 15,500ha on Mount Ciremai should be set aside as a national park. However, very few data are available regarding the biota of this region. Herpetofauna is not an exception despite the fact that amphibians and reptiles form an important part of the ecosystem as significant predators on invertebrates as well as smaller vertebrates, and are themselves important food items for birds and mammals (Howell, 2002).

Knowledge of biodiversity and organisation of its communities is essential for the development of conservation policies and a sustainable environmental management system. Given the limited conservation resources, such knowledge provides the basis for identifying important areas to be conserved and threats that needs to be mitigated. This may only be achieved if sound knowledge exists of systematics, taxon distributions and habitat associations (Gillespie *et al*. 2005). The data of their diversity and abundance are needed and essential for planning effective conservation and resource management strategies (Das, 1997). Furthermore, documentation of the biodiversity of this area would enable better understanding of its community organisation and the impact of disturbance processes.

This study intends to promote future conservation efforts in this area by providing biodiversity and ecological data on the herpetofauna. My objectives are to (1) document taxa occurring in the area; (2) collect baseline information on the relative abundance and habitat associations of species; (3) identify the different diversity patterns of chosen taxa in the national park using standard diversity indices; (4) formulate conservation measures as the basis for future protection of the species and their remaining habitat; and (5) develop recommendations for the management of the Gunung Ciremai National Park based on herpetofauna diversity patterns data.

Overview of the project

This research is conducted in three steps over the course of three years. As the first step in 2007, I am currently conducting a survey on the herpetofauna diversity using a variety of standard methods for collecting samples with care taken to specific microhabitats. Diurnal opportunistic collections are conducted as I walk slowly through various habitats, such as forests, streams, agricultural areas or swamps to find active reptiles and investigate under logs, rocks or other ground debris that function as a shelter for animals. Nocturnal searches are conducted for frogs, geckos and snakes, mostly in or near aquatic environments, such as streams, swamps and waterfalls but for geckos and snakes also in other land habitats, such as forest land and around human settlement. The voucher specimens are stored in a glass bottle and preserved in 70% alcohol. The taxonomic and nomenclature for specimens were following: Brongersma (1942), Iskandar (1998), Iskandar and Cholinj (2000; 2001), Inger and Stuebing (1989), Kampen (1923), Manthey and Grossmann (1997), Musters (1983), Steubing and Inger (1999), and Rooij (1915; 1917).

The second step, during 2008, will be the investigation of the diversity patterns of chosen taxa. At least three methods will be used at selected sites, including pitfall traps, line census and intensive/plot sampling. Sampling at each site will be conducted once in the dry season and once in the wet season. The data will be analysed using diversity and equability indices.

In the third and final step, during 2009, two activities are planned after the completion of data compilation. First, I will make recommendations concerning the effective management of the Gunung Ciremai National Park based

on the herpetofauna diversity patterns data. Second, I will produce a field guidebook of herpetofauna of the Gunung Ciremai National Park including their ecological data, such as distribution, status and habitat.

Results of the first year

I have identified a total of 49 species, comprised of 16 species of frogs (Bufonidae, Megophryidae, Microhylidae, Ranidae and Rhacophoridae), 23 species of lizards (Agamidae, Gekkonidae, Lacertidae, Scincidae and Varanidae) and 10 species of snakes (Colubridae, Elapidae, Pythonidae and Viperidae). Two endemic frogs, *Huia masonii* and *Microhyla achatina*, have also been recorded. Unidentified specimens include possibly undescribed species of the genus *Elapoidis* and *Cyrtodactylus*.

Huia masonii

Gonocephalus chamaeleontinus

Rana hosii

Cyrtodactylus fumosus

Tachydromus sexlineatus

Calamaria virgulata

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Some ecological aspects of Sulawesi crested black macaque *Macaca nigra* at the Tangkoko – Batungus Nature Reserve, North Sulawesi, Indonesia

Research Grant Programme

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Background and objectives

The Sulawesi crested black macaque *Macaca nigra* is one of seven monkey species that are endemic to North Sulawesi (Bynum, 1999). This species is categorised as an endangered species by IUCN and included in Appendix II by CITES (Soehartono and Mardiastuti, 2002). The Indonesian government has protected the species under the national law. However, given the current trend toward a loss of forests, Lee *et al*. (2002) suggested that the Macaca nigra require its conservation status revised to 'critically endangered'.

Taking appropriate conservation action requires an understanding of different biological aspects of the species, including their ecology and behaviour. However, at present, there is only a limited amount of ecological information on the current condition of the monkeys. This study intended to fill in the gap in knowledge on ecology of the Sulawesi crested black macaque *Macaca nigra*. The purpose of this study was to determine the group size and composition, range measurements, daily activities, vegetation domination and intergroup domination.

Methods

This research was conducted from October 2006 to September 2007. The subjects consisted of two large habituated groups (Rambo I and Rambo II) and a smaller, less-habituated group (Rambo III). Group size was counted by conducting a monthly census, while group composition was determined by grouping individuals into sex and age classes. The coordinates of their daily movements were determined with a GPS receiver, and the length and width of their range subsequently measured with the Garmin MapSource program. Daily activities were determined with focal animal sampling. Vegetation analysis was done using Point-Centred Quarter Method in order to count important value index. Determination of group dominance was based on its access to food sources and the result of agonistic interaction.

Results and discussion

The size and composition of the three groups are shown on Figure 1. Group size and composition depended on birth and death rate, male migration and age growth of individuals. Combining with data from previous studies, the result revealed that Rambo I and Rambo II were stable on 58-70 individuals since 2004, while Rambo II was on 13-17 individuals.

Sociality

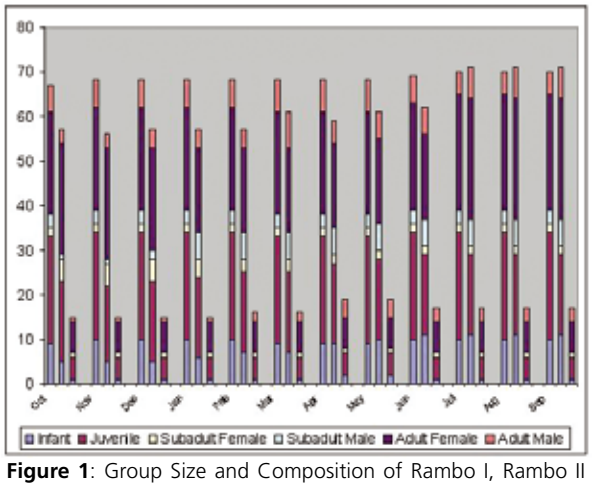

Figure 1: Group Size and Composition of Rambo I, Rambo II and Rambo III from October 2006 to September 2007

Rambo I had a day range of up to 3.0km (± 0.69) within a 254ha home range, while Rambo II had a day range up to 3.7km (± 0.91) within a 380ha home range (Figure 2). On the contrary, the small group, Rambo III had a day range up to 3.7km (± 1.17) within only a 50ha home range. The home range of Rambo II was wider than that of Rambo I, despite having similar group size. The principal factor contributing to this difference was the difference of their habitat. Rambo I occupied areas that were primarily rainforest, whereas Rambo II had half of habitat as primary forest, with secondary forest, shrub and grasses occupying the other half. Since 2002, the range of Rambo II has become wider toward the range of Rambo I and also toward Batuputih Village. Food secured by raiding plantations enabled Rambo I to expand its range and dominance.

Daily activities were divided into five classes including feeding, foraging, resting, moving and social (Figure 3). Social activity consisted of all grooming, agonistic interaction, sexual and playing. The daily activities of the groups varied according to each group's habitat condition and intergroup domination. Comparing with the results of previous study of Rambo, the original group before separated into Rambo I and Rambo II in 1993-1994 (O'Brien and Kinnaird, 1999), the time spent for foraging became longer while resting became shorter. This indicates that the habitat quality pertaining to its carrying capacity is decreasing.

Based on the important value index, seven species had indices of more than 10%. Monkeys used *Ficus variegata*, *Palaquium amboinense* and *Cananga odorata* as food sources, while *Dracontomelon dao* as a food resource and main sleeping site. The other trees are *Alstonia ranvolfia*, *Vitex quinata* and *Octomeles sumatrana*.

Based on its authorising of food sources and resulting from its intergroup agonistic interaction, Rambo II was dominant to Rambo I and Rambo III, while Rambo I was dominant to Rambo III. Due to its position within the dominance hierarchy, Rambo II could expand its range especially when there was a fruiting tree at a particular area. For the small group, Rambo III, moving activity was higher than other groups' to avoid intervention with the other groups.

Observation

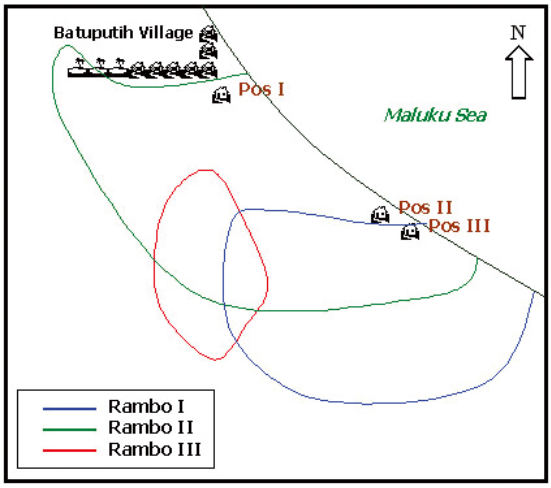

Figure 2: Home Ranges of Rambo I, Rambo II and Rambo III

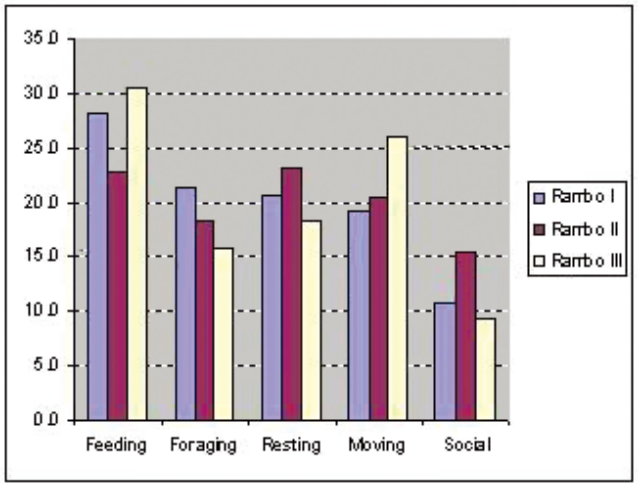

Figure 3: Daily Activities of Rambo I, Rambo II and Rambo III

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Study on moth diversity at Gunung Halimun-Salak National Park

Research Grant Programme

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Introduction

A study on moth diversity is conducted in the Gunung Halimun-Salak National Park, which holds the largest remaining lowland and montane tropical rainforest in the whole of Java. Though originally covering only 40,000ha, the park had been extended in 2003 to cover the Mt Salak area, Mt Endut and other surrounding areas; at present it is approximately 113,357ha in area. Although a number of studies have been conducted to investigate the biological diversity of the park both for its flora and for fauna, its moth fauna has remained unstudied.

The aims of the study

The main aims of this study are to acquire information of the moth diversity and to assess the composition of moth species in the tropical rainforest, especially at the Halimun-Salak National Park. A side goal of the study is to establish national references for moth collections in Indonesia.

Methods

In order to obtain a comprehensive understanding of moth fauna of the park, four sites of differing elevation within the Halimun and Salak mountains have been sampled from January to September 2007, namely, Cikaniki (900m), Pasir Banteng (1,700m), Citiis (600m) and Cidahu (900m). The first two sites are located at Mt Halimun while the last two sites are at Mt Salak (Figure 1). Moth collection was conducted by using a light sheet with a 160W mercury lamp. This trap was set up from 18.00h to 24.00h at night for 5-10 nights each month (Figure 2). Moths attracted to the light sheet were collected using an ethyl acetate killing bottle and were pinned down the following morning while they were still soft (Figure 3). The number of species of moths and number of individuals belonging thereto were recorded for statistical analysis. All identified species were deposited at the Laboratory of Entomology of the Museum Zoologicum Bogoriense (Figure 4).

Figure 1: Sites of study at Halimun-Salak National Park

Tentative results

From the four sites, more than 300 named species of macro-moths have been collected, while identification of collected moths is continuing. Families Noctuidae and Geometridae are the most frequently found among the 24 recognised

Figure 2: Collecting moths at night using a light trap

Figure 3: Pinning moths in the field

families that inhabit this park. Larger moths (Noctuidae, Geometridae, Sphingidae and Notodontidae) tend to inhabit a higher elevation compared with smaller moths, such as Pyralidae, which prefer to live at lower elevations and open area. This preference is not due solely to the distribution of their host plants but also the adaptation of larger moths to the low temperatures at high elevations: large moths are covered with heavy scales that can keep the inside of their body warm.

The other significant finding from this research is that a species of very rare family Dudgeoneidae is found (two males and two females) (Figure 5). This family consists of a single genus, *Dudgeonea*, which was described based on the species *leucosticta* from the Eastern Himalaya by Hampson in 1900 (Roepke, 1955). To date, this genus comprises eight described species: *D. leucosticta* Hampson 1900 (Oriental species), *D. actinias* Turner 1902, *D. lychnocycla* Turner 1945, *D. polyastra* Turner 1933, (Australian Species) *D. sierraleonensis* Strand (African species), *D. locuples* Mabille 1879, *D. malagassa* Vitte 1958 (Madagascar species), and *D. nummata* Roepke 1955 (New Guinean species). Although this genus is widely distributed in the world, it has not been recorded in Indonesia due to lack of study, and the biological information of this genus is very poor (Common, 1970; 1990; Holloway, 1986; Edwards, 1996). In order to confirm whether the finding of this species in this study is new to science, a more comprehensive study will be conducted by dissecting its genitalia.

Figure 4: Mounting specimens

Figure 5: *Dudgeonea* sp.

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Eco-based sustainable development of agarwood in Myanmar

Research Grant Programme

Aung Than
Forest Resource Environment Development and Conservation Association, Myanmar

The rationale

This two-year, NEF-funded project was launched in January 2007 with the long-term objectives of conservation and sustainable management of natural agarwood resources with a participatory approach. The rationale of the project is that there is a need for the genetic conservation and sustainable development of agarwood within the context of the national sustainable forest management (NSFM) policy and plan, as it is a rare and endangered species that produces valuable non-timber forest produce (NTFP).

Agarwood mother tree and sapling in Kayin Orchard

Project activities

I am currently carrying out an assessment of the diversity, distribution and survival status of natural *Aquilaria* trees throughout the country. The project also investigates traditional knowledge and the socioeconomic features of the major agarwood-dependent ethnic communities, such as the Lisu, Shan and Kayin, through ethno-biological research, including interviews and surveys in Kachin State and Tanintharyi Division. In order to develop a scheme for community-based agarwood conservation and sustainable development, the phenology and silviculture of the species are also being studied. Awareness raising and mobilization of the local ethnics for agarwood domestication are performed under the Community Forestry Instruction of the Forest Department. A report was submitted to the Minister of Forestry (with presentation in person) arguing the importance and urgency of such a scheme.

I will survey more areas of concentration in the Shan State, Sagaing and Tanintharyi divisions in the coming open season this year and again in early 2008, followed by test planting in the monsoon and resin inducement trials. This will be done with the cooperation and collaboration of the research scientists from the University of Minnesota, USA and the Rainforest Project Foundation, The Netherlands and Vietnam.

Aquilaria

Aquilaria tree exploited

Agarwood in brief

Agarwood is a valuable scented resin, produced naturally by at least seven out of 33 known tropical plant species of the genera *Aquilaria* and *Gyrinops*, members of the family Thymelaeaceae. It occurs in a zone spanning 16 countries, from Bhutan and northeastern India across to southern China through Southeast Asia and then as far as the Papua New Guinea. Only two species of *Aquilaria*, *A. agallocha* (syn – *A. malaccensis*) and *A. crassna*, have been reported in Myanmar so far. A shade-tolerant understorey species of evergreen and semi-evergreen forests, *Aquilaria* grows throughout Myanmar from the tropical lowland forests in Tanintharyi to the hilly evergreen forests of Putao, Kachin State with the exception of the central dry zone.

This natural non-timber forest species is increasingly under threat as the trees are overexploited (for example, the felling of every tree found, including saplings of 1cm dbh, in the search for resin) due to the expanding market and attractive price of its resin and due to the widespread clearing of natural tropical forests for other land uses. Its clumped and poor natural regeneration exacerbates the vulnerability of the species. Today, all of the presently discovered 33 species of agarwood are listed in the Convention on International Trade in Endangered Species (CITES) Appendix II. The networking of and negotiations between range and consumer countries may help curb the indiscriminate and irresponsible exploitation and trade of agarwood.

The resin inducement technique successfully produced after a decade-long research by the University of Minnesota has offered opportunities to save the wild genetic resources of agarwood by domestication. The research is ongoing and expanding to potential range countries like Myanmar to improve the plantation resin to near-natural quality. Likewise, ecological and silvicultural studies are also warranted to ensure genetic preservation and sustainable management of the remaining natural agarwood resources.

The potential of agarwood and the importance of ethnic involvement

Agarwood is an important NTFP for local socioeconomic development. It has large potential as a substitute for both poppy and shifting cultivation and, accordingly, to save the tropical forests and forest environment. Local ethnics – the Naga, Kachin and Shan in the north and the Kayin, Dawei and Mon in the south of the country – have been involved in agarwood trade for four decades. Today, the most active agarwood collectors are the Lisu, a sub-group of the Kachin tribe. While the indigenous knowledge of these people is valuable for research, their cooperation and participation is indispensable for the preservation and sustainability of agarwood resources. More cooperation is called for among ethnic stakeholders, ethnobiologists, forestry researchers, policy and decisionmakers and, no less, the international community.

A Lisu happy with agarwood trees in his homestead

Small-scale Research Grant Programme

Population distribution and conservation status of the pale-thighed langur *Presbytis natunae* on Natuna Island, Indonesia

Small-scale Research Grant Programme

Firman Aldy
TrackLine Indonesia, Indonesia

Introduction

Primates are key species in certain critical habitats and protected areas. They form conspicuous components of the forest fauna and some species (such as orangutans, siamangs, gibbons and macaques) act as important seed dispersers and help to maintain tropical rain-forest regeneration (Corlett, 1995). The major threats to wild primate populations fall into three broad categories: habitat destruction, hunting and live capture for export or local trade. The relative importance of these factors varies across species and regions, but one or more of them affect almost all existing primate populations (Mittermeier and Cheney, 1987).

The island of Bunguran or Natuna Island, the main island of the Natuna archipelago, is situated on the edge of Sunda Shelf. It is located 225km northwest of Borneo and 475km east of the Malay Peninsula or between 2˚ – 5˚ N to 104˚ – 110˚ E. The primary aim of the project is to conduct a population survey of the pale-thighed langur, or Natuna leaf monkey, *Presbytis natunae* in the Ranai mount area of Natuna Island. The research results will provide an important update on the current status of this threatened species, which is thought to occur only on Natuna Island. Little is known of the current status of this species and data is lacking for strengthening conservation measures.

The specific aims of this project are: (1) to determine the distribution of the Natuna leaf monkey in lowland, hills and logged forests; (2) to estimate their population size and remaining habitat; (3) to describe their habitat preferences; (4) to assess the potential threats to the population and their habitat; and (5) to develop a GIS database for the species.

Methods

Fieldwork was conducted from May to July 2007. The line transect method was used to estimate population density and distribution of the Natuna monkey. A total of four transects were set and we walked along each between 0630AM and 1100AM when primate groups were most active. Data on group size and composition were collected. We also conducted random sampling: when we found a group, we counted the number of animals classifying age-sex into five classes (adult male, adult female, sub-adult, juvenile and infants).

Result

The leaf monkey population in each habitat type were estimated as follows:

Ranai mountain	5.93 individuals/km^2
Rubber plantation	12.91 individuals/km^2
Lowland forest (logged forest)	10.71 individuals/km^2
Average	8.88 individuals/km^2

The sex ratio of the Natuna leaf monkey was as follows:

Hill forest	3 male : 4 female
Rubber plantation	1 male : 1 female
Logged forest	1 male : 1 female

Based on our research results, we suggest that the population in the Ranai forest be given priority for conservation of the species. Conservation planning for the Natuna leaf monkey should focus on the enforcement of existing protected areas to reduce commercial logging and hunting. Conservation education is also important to increase awareness of local people on the protection of endangered species on Natuna Island and reduce conflicts between people and the monkeys.

During the second year of this research, we plan to conduct interviews of local people to assess their recognition of the importance of wildlife protection and to learn more about conflicts between local people and the Natuna leaf monkey. Non-parametric statistical analysis will be conducted following the completion of data collection.

Study on the improvement of soil environment through agroforestry tree leaf mulch: tomatoes at different water regimes during the dry season in Bangladesh

Small-scale Research Grant Programme

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Department of Agroforestry and the Environment, Bangladesh Sheikh Mujibur Rahman Agricultural University

Tomato production in Bangladesh is dependent upon irrigation due to the limited amount of rainfall during their growing period. However, poor farmers are not always able to apply irrigation because of its high cost. Mulching is a good agronomic practice because it can conserve soil water, reduce weed infestation and ultimately increase crop yield. This study was designed to compare the effects of two different types of mulches, namely an agroforestry tree *Senna siamea* leaf and indigenous rice straw, on the yield and quality of tomato production, soil properties and weed infestation at three irrigation regimes in Bangladesh.

The experiment was laid out in a 3m x 3m spilt-plot design with three replications. Three different mulch conditions, namely *S. simaea* leaf, rice straw and open field (no mulch) were applied to the main plots while three levels of irrigation were assigned in the sub-plots. The levels of irrigation water (IW) were set based on cumulative pan evaporation (CPE) and rainfall. CPE of 40, 20 and 10mm were applied and IW/CPE of the irrigation regimes were 1.0, 0.5 and 0.25, respectively. In the plots with straw mulch and no mulch, tomato yield did not vary significantly up to IW/CPE 0.5, while in the plot with *Senna* leaf mulch the yield was 4.5% and 13.57% higher than straw mulch and no mulch, respectively. The ascorbic acid content in the fruit was relatively higher in the no mulch with lower irrigation regime, while β-carotene was higher in the mulch with higher irrigation regimes. The *Senna* leaf mulch conserved more soil water than straw mulch and no mulch. Soil organic carbon, nitrogen and cataion exchange capacity (CEC) contents were slightly higher in the *Senna* leaf mulch when compared to the other treatments. A significantly higher weed dry weight (136.27g/m^2) was recorded in the no mulch treatment compared to the straw (49.27g/m^2) and Senna leaf (41.13g/m^2) mulch. The present study suggests that using mulch with about 50% of the water supply through irrigation can improve tomato production during the dry season in Bangladesh.

A plot for experiment

Behaviour and ecology of Delacour's langur in Van Long Nature Reserve, Vietnam

Small-scale Research Grant Programme

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Introduction

Delacour's langur *Trachypithecus delacouri* is listed as a Critically Endangered species as CR A2cd+3cd; C2a(i) ver. 3.1 (2001) in the IUCN Red List 2006. The species is endemic to Vietnam, and one of the 25 most-endangered primate species in the world (Mittermeier *et al*., 2006). During the 10 years of the pre-1999 period, hunting caused the loss of over 316 individuals and the current total number of *T. delacouri* individuals is estimated as being between 281 and 317 (Nadler, 2004). The species is facing the threat of genetic degeneration due to potential inbreeding as its entire distribution area is fragmented into separated parts by surrounding development. Our surveys indicated that stone exploitation for cement factories is a serious threat to the langur habitat. However, since 1932, there has not been any long-term study on wild langur's behaviour and ecology. We study the behaviour and ecology of Delacour's langur for the species' conservation.

New all-male band

Ba Dao group

Objectives

Our project has two goals. First, to determine the behaviour and ecology of Delacour's langur in nature in order to prepare a rehabilitation plan for recovering the past distribution of langurs with the following four specific aims:

(1) to investigate the home range use of *T. delacouri*;
(2) to develop a list of food plants for Delacour's langur and their availability;
(3) to study langurs' social behaviour and how they occupy their day; and
(4) to study the behaviour relationships between langurs, especially their feeding behaviour and ranging behaviour, with ecological factors.

Second, to raise local community awareness about wildlife conservation, emphasising Delacour's langur and the protection of its habitat.

Methodology

From January 2006 to December 2007, we conducted fieldwork in the nature reserve. Our research team consisted of four researchers divided into two groups. The methods used to collect data on behaviour were scan sampling, one-zero sampling, and *ad libitum*. For the study of home range use of the langur, the study area was gridded on a topographic map into blocks of 100x100m. Portions of plants eaten by the langurs were collected for identification. Phenology was monitored every month within the study time at botanical plots. Behavioural and ecological data are analysed both by hand and by using statistical software packages.

Along with interviews with local people and local authorities, we disseminate information on langur ecology in their area of habitation, intending to raise awareness of the necessity of the langur's conservation.

Results

(1) Population status

Along with some new neonates, several male dispersals and an observed female transfer have been recorded

through the study. A new male-female group was observed in 2007, indicating that the population has been increasing. The loud noise produced by stone exploitation near the nature reserve forced most of langur groups to change their home range in 2006. In late 2007, more surveys to re-determine each group's distribution and status in Van Long will be conducted for the final result.

(2) Home range use

For two of the groups of langur we have observed from 2005-2007, the home range was from 36ha to 46ha. At present, our focal group's home range is being narrowed under territorial competition between harem groups.

(3) Social behaviour

There were four social unit types found in Delacour's langur: one-male unit, multi-male unit, all-male band and single male. We had *ad libitum* observations and described male display, chasing between the resident male and a neighbour-group male and an all-male band, pre-copulation time, actual copulation and pseudo-copulation process during a few months in 2007.

(4) Time budget

Scan data are weighted and calculated to provide an accurate time budget of Delacour's langur for their activities. This work will be completed at the end of 2007.

(5) Feeding ecology

There were at least 65 food plant species in the area. Among them 40 species were reported as the langur's food by Pham Nhat (2002); we determined 25 new species as the langur's food in the wild from our botanical plots. Some additional plant species are in the identification process and potential food species are being monitored.

From May 2006 to May 2007, we collected data of phenology for the focal group. We stopped the monitoring process in May 2007 because its home range was changed. However, botanical surveys are continued to find the distribution of food plants in the whole study site.

New place of stone exploitation

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Biodiversity of plant resources in homesteads: its meaning and change

Small-scale Research Grant Programme

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Homestead agroforestry, known as the home garden, is an important component of the rural economies in different regions of the world as well as in Bangladesh. Homesteads have special significance in the context of Bangladesh rural areas where approximately 62% of farmers are landless. Homestead agriculture may be a lifeboat for their survival and existence, as a secured supply of food and petty cash may be gained from its products (Akanda, 1994). In homesteads, villagers understand the characteristics of each plant, including wild plants, are grown and utilised to meet villagers' daily needs. More than 120 species are known to exist in one village of the floodplain. Keeping the above points in mind I conducted my research to study the plants diversity and villagers' knowledge on the plants in the homesteads.

Wild species grown the back yard of homestead

The study site was the Kazirshimla village of Mymensingh district in Bangladesh. Kazirshimla is comprised of about 300 farm families (households) from which sample households were selected from different farm categories (marginal, small and medium). The study found that, in average, there were about 84 species of plants in each homestead, including timber plants, fruit trees, seasonal vegetables, flowering plants, medicinal plants and some other wild species of plants. Interviews of household members revealed that almost all timbers and some aged fruit trees had been planted by their ancestors, while other fruit trees and seasonal vegetables, medicinal plants were planted by the existing household members, whereas the wild species were spontaneously grown.

The care and management of the plants are practiced by female members of the household, and the utilisation patterns of the plants are based on their daily needs. Almost all of the plants are commercially important and also frequently used by the household members to fulfil their daily needs. Except for some wild species, all of the other plants and trees have been grown by the household members and they try to maintain the species diversity. Saplings, seedlings or seeds are obtained mainly from

Different seasonal vegetables grown in homesteads

Different timbers and fruit trees in the backyard of homested

their local market and sometimes from the relatives and neighbours. It has been found from the household sampling that the number and diversity of plants are larger in the medium category of household than that of marginal category due to the limited land space of the latter.

The households are interested in growing more plants in their homestead, as they are concerned with the economic benefits of different types of plants that are grown in their homestead area. From interviews of the household members, it was also evident that women were those who were mainly interested to keep the biodiversity of plants as they, rather then the male household members, were the ones who usually remained at home and took care of and managed the plants.

Getting identification, plant history and counting of homestead plant species

Conservation Activity Programme

National conference of insect conservation in tropical landscape: opportunity and challenge

Conservation Activity Programme

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Centre for Conservation and Insect Studies/PEKA Indonesia Foundation, Indonesia

From the 27 to 30 of January 2007, the Centre for Conservation and Insect Studies in collaboration with the Department of Plant Protection, Entomological Society of Indonesia and Indonesia Plant Protection Student Association, co-organised the National Conference entitled 'Insect Conservation in Tropical Landscape: Opportunity and Challenges,' in Bogor, Indonesia. This was the first national conference on insect conservation that had ever been conducted in the country. The topic of insect conservation was chosen because, for a long time, insects had rarely been mentioned in discussions of conservation, mainly because insects had not received enough attention by conservationists across the globe. This is unfortunate, because insects play multiple roles in the food web. They are not only a group consisting of herbivores; many are carnivores, decomposers, and pollinators. In their capacity as pollinators, insects guarantee the production of our food; as decomposers, insects help recycling nutrient across different compartments; and as carnivores, they act as natural enemies of many insect pests. It is indubitable that insects play a major role in ensuring crop productivity. The other roles of insects, such as being silk and honey producers, are known worldwide; furthermore, their uniqueness in colours and shapes has also inspired people in many ways. It is undebatable that insects serve important roles in ecosystem services. However, their conservation has remained obscure.


Training


Presentation

The conference was run with the aims: (1) to develop and formulate a concept or model of insect conservation efforts in Indonesia; (2) to provide the younger generations of entomologists and conservationists with different topics of insect conservation and technology to prepare them for future challenges on insect conservation; and (3) to increase public awareness with respect to insect conservation. A series of activities, including a plenary session, symposia, trainings and exhibition, was designed in order to achieve our goals. Some speakers from various backgrounds beyond entomology, such as ornithology, herpetology, economics and social science, were invited to discuss broader issues of insect conservation and its importance for sustainable life.

Approximately 285 academics, students and persons from the private sector from 25 provinces participated in the conference, and about 80 researchers took part in oral presentations in the symposia covering eight aspects: (1) land use change and insect diversity in the tropics; (2) insect systematics and entomology development in Indonesia; (3) ecosystem health and biological control; (4) the use of information systems in insect study; (5) the role of insect pollinators in agriculture; (6) the threat of invasive species in the agroecosystem; (7) herbivorous insects in agroecosystem; and (8) physiology and toxicology of insects. Several trainings were also conducted, including biodiversity analyses, GIS for insect study, macro-photography, and insect handling and

identification. In order to achieve the goals of the conference, 74 young rising scientists from various provinces were invited to participate in the conference and trainings. Exhibition was one of the significant programs in the conference, with several institutions participating, including the Wildlife Conservation Society - Indonesia Program, National Geographic Indonesia, the Insect Museum of Indonesia Miniature Garden, and the Indonesian Biodiversity Foundation. An impressive fact was the total entry of 684 insect photos from 354 participants was competed in the Insect Photo Competition, in which about 50 of the best insect photos were honoured and displayed in the Insect Photo Exhibition under the theme 'Insect in Colours' at the Oktagon Gallery, Jakarta from 23 to 25 February 2007.

The conference was funded by various institutions including the Nagao Natural Environment Foundation, the Indonesian Biodiversity Foundation, the Wildlife Conservation Society, the Wildlife Trust Alliance, Croplife Indonesia, PEKA Indonesia, Department of Plant Protection-IPB and numerous individual donations. It was also supported by Nasional Geografi Indonesia in providing merchandise, the Oktagon Foundation for the Insect Photo Exhibition Gallery as a venue, Radio Ramako FM and Radio Pesona FM for publicities. The conference has given an opportunity for Indonesian scientists, especially from the younger generation from various regions in Indonesia, to gather for discussion of many issues related to insect conservation in the country. The conference enhanced the recognition among participants that there is an urgent need to build and strengthen a network that can facilitate potential collaboration in future research and to develop an effective strategy for insect conservation in Indonesia.

Photo exhibition

Award winners

Conference participants

Schools awareness programme in Sri Lanka

Conservation Activity Programme

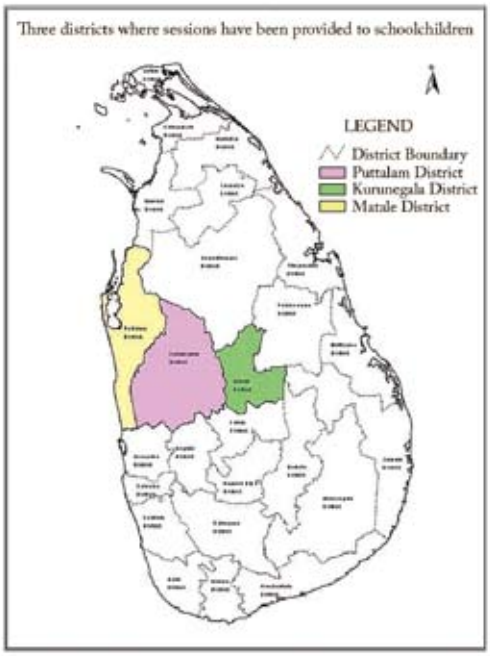
Jayantha Jayewardene
Biodiversity and Elephant Conservation Trust, Sri Lanka

Introduction

The dwindling wild elephant population in Sri Lanka is a cause for serious concern. Increasing human populations in this small island nation have resulted in clearing more and more jungles for human settlement and agriculture. With this there has been a reduction of the elephant's jungle habitat.

From a population of 17,000 wild elephants in Sri Lanka in the 19th century, numbers have declined, with recent figures showing that the present population stands at between 4,000 and 4,500. According to the Department of Wildlife Conservation, an average of 65 humans and 120 elephants are killed annually due to the human-elephant conflicts that have developed over the years. These conflicts also cause the destruction of cultivations and dwellings by elephants.

The people of Sri Lanka have a long history of coexistence with elephants, both tame and wild. This relationship is visible in the religious and sociocultural traditions of the people, who advocate a benevolent attitude towards wildlife. Building upon these traditions will make it possible to take some positive action toward conserving the elephants.



Schools awareness programme

The Biodiversity and Elephant Conservation Trust (BECT) is an organisation committed to the conservation of elephants. They had found that there were no programmes to educate people, especially schoolchildren, on the value of having elephants as a part of their environment. With this in mind, BECT started conducting awareness programmes specially focused on schoolchildren in the rural areas where there are human-elephant conflicts that adversely affect the lives of the people.

The objectives of the Schools Awareness Programme is to create awareness amongst the children living in these areas on: (1) the value of elephants; (2) their ecology, biology and physiology; (3) their role in the religion and culture of the country; (4) that only a few elephants cause damage to crops and houses, or cause human fatalities; and (5) the need to conserve elephants for the future as part of their and the world's heritage.

BECT has carried out a number of sessions in schools under this programme from about six years ago. The Nagao Natural Environment Foundation supported this programme by providing funds for sessions to be conducted in 30 schools. These funds were utilised in the year of 2007 to carry out this programme in 33 schools chosen from three districts.

Programme in the schools

Preparations for this programme started with obtaining approval from the Provincial Directors of Education and the District Directors of Education in each of the three districts, as well as the central Ministry of Education. Assistance for the programme was obtained from the Department of Wildlife Conservation with members of their regional staff also participating in these sessions.

Each session in a school is conducted according to the following agenda: (1) lighting of the traditional oil lamp; (2) prayers; (3) welcome by the principal or a teacher; (4) objectives of the programme; (5) lecture on biodiversity and elephants, both including a multimedia presentation; (6) discussion, starting with a question and answer session; (7) presentation of books for the school library; and (9) vote of thanks.

The programmes funded by the Nagao Natural Environment Foundation were held in schools from the districts of Anuradhapura, Matale and Puttalam. A total of 3,585 schoolchildren and 326 teachers attended these programmes from the 33 schools, for an average of 108 participants per school session.

Outcome

Most children who participated in these programmes now have a greater awareness of the elephant and its habits. They know of the need to conserve wild elephants and will view wild elephants more kindly. Some of them may get involved in elephant conservation in the future, maybe in a small way. They have also been advised to create an awareness amongst the adults in their community.

Conclusion

This programme has been carried out successfully and according to plan. The lecturers have done a very good job and interacted with the children well. The principals of schools have appreciated these programmes greatly and have sent letters of appreciation to us and to various relevant authorities.

Workshop on Sulawesi biodiversity and conservation curriculum for North Sulawesi high school teachers

Conservation Activity Programme

Johanis Pelealu
Biology Study Program, Faculty of Mathematics and Science, Sam Ratulangi University, Indonesia

Introduction

The Workshop on Sulawesi biodiversity and conservation curriculum for North Sulawesi high school teachers was held from 8 to 12 January 2007 at the Biology Study Program, Faculty of Mathematics and Natural Science of Sam Ratulangi University Manado, Bogani Nani Wartabone National Park and Animal Rescue in North Sulawesi, Indonesia. The objectives of this program were to (1) provide training for high school biology teachers in North Sulawesi on Sulawesi biodiversity and its conservation; and (2) construct a biology curriculum on Sulawesi biodiversity and its conservation for high schools in North Sulawesi.

The topics of the workshop activities included the biodiversity of Sulawesi, its threats and conservation, relevant Indonesian laws, the evaluation of the biology curriculum in high schools, and the development of a biology curriculum for biodiversity and conservation. The workshop included a field trip to the Bogani Nani Wartabone National Park and Animal Rescue. Participants included 20 teachers of biology at North Sulawesi high school. The workshop instructors were officials of the North Sulawesi Education Department, the Director of the Wildlife Conservation Society IP Sulawesi (Johny Tasirin, PhD), officials of the Indonesian Forestry Department, and Dean of the Faculty of Mathematics and Science.

Visit to a private animal rescue

Workshop outcomes

After the Workshop, we conducted a questionnaire survey and discussion with the participants in order to ascertain their perception of Sulawesi biodiversity and its conservation and how they would implement biodiversity in teaching process. Some important findings are as follows:

(1) The teachers generally know little about biodiversity and do not realise that the Sulawesi islands hold unique and rich biodiversity and that some species are endemic. They were unaware that there have been some serious threats upon the persistence of biodiversity because they have learnt only little about the subject and have attended only short courses on relevant topics.

(2) The teachers perceive that they have a moral responsibility to disseminate knowledge on Sulawesi biodiversity and its conservation to their students and communities. Prior to attending this workshop, in their biology classes, they had only picked examples of either a species not belonging to Indonesia or a species that can be found in Indonesia but not in Sulawesi. This resulted in difficulties for the teachers and students to comprehend local biodiversity.

(3) In the learning process in their school, the teachers plan to incorporate the following methods to provide their students with knowledge on Sulawesi biodiversity and its conservation:

- Local curricula: Some of the teachers are willing to compile school curricula on local biodiversity and its conservation for their school.

- Use of cases on Sulawesi biodiversity; in particular, cases around students' environments: many environmental cases in North Sulawesi, especially the devastation of the forest and coral reefs, declining of wildlife populations, and natural disasters, like floods, can be used by teachers to deliver their messages on the conservation of natural resources to their students.

- Integration of material on Sulawesi biodiversity and its conservation into existing curricula: as the existing biology curriculum includes a topic about biodiversity, the teachers can incorporate Sulawesi biodiversity into the topic.

- Introduction of extracurricular programmes outside classroom: for example, field trips, picnics and Boy Scout activities. Teachers will arrange a schedule for these activities at the end of semester or during semester breaks to visit various conservation sites and animal rescue sites. As there is no zoo in Sulawesi, visiting nature would be a good experience for the students.

Workshop activity

Workshop opening by dean

Development of an ecotourism plan for the Mt Pulag National Park

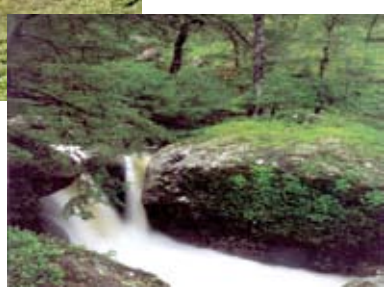
Conservation Activity Programme

Reynald Yawan and Emerita Tamiray
Protected Areas, Wildlife and Costal Zone Management Service, Department of Environment and Natural Resources - Cordillera Administrative Region, Philippines

Ecotourism is one of the fastest evolving industries not only here in the Philippines but also in other countries. As the industry expands into new areas, it presents new opportunities for host communities and natural environments. Ecotourism is about connecting conservation, communities and sustainable travel. The International Ecotourism Society defined ecotourism as 'responsible travel to natural areas that conserves the environment and improves the well-being of local people.' Accordingly, those who will implement and participate in responsible tourism activities should follow the following ecotourism principles: minimise impact; build environmental and cultural awareness and respect; provide positive experiences for both visitors and hosts; provide direct financial benefits for conservation; provide financial benefits and empowerment for local people; and raise sensitivity to host countries' political, environmental and social climates.

The objectives of this project were to develop an ecotourism development plan for the Mt Pulag National Park that is reflective of indigenous customs, knowledge and practices that sustain and conserve the cultural and biological diversity of the park and also meet the needs of visitors. Mt Pulag National Park is one of the eighteen sites designated as protected areas under the National Integrated Protected Areas System of the Philippines for its high biodiversity.

Trail towards the Mt Pulag summit



Crystal clear water at Eddet River

The park is located at the main island of Luzon, a three-hour ride from Baguio City. With an approximate area of 11,550ha, the park holds 528 recorded species of plants, of which 42% are endemic to the area. It is also home to 76 bird species, of which 30 are endemic to the Philippines and nine are endemic to Luzon. Several different groups of indigenous peoples, such as the Kankanaeys, Kalanguyas, Ibalois and Karaos inhabit this area. They are represented in the Protected Area Management Board that takes care of the general administration of the park, while day-to-day park management is being undertaken by a Protected Area Superintendent.

The park is considered one of the identified emerging ecotourism destinations in the Philippines due to its unique natural features and biological diversity. In accordance with the principle of ecotourism, the Department of Environment and National Resources of the Cordillera Administrative Region (DENR-CAR), with a grant from the Nagao Natural Environment Foundation, has prepared this ecotourism development/business plan in partnership with the DOT-CAR, the Provincial Government of Benguet and the Municipality of Kabayan, Benguet. This development/business plan focuses on the ecotourism products and services required for the development of identified ecotourism programmes in the Mt Pulag National Park, their benefits, operational requirements and the marketing, financial analysis and projections, action plan and the composition of the management team.

Information and data generated in this development/business plan were gathered through site assessments; public hearings and consultations; meetings with DOT-CAR, the provincial government, municipal government, Mt Pulag Indigenous Tour Guides Association, private tourism operators and other stakeholders; workshops; and from references, such as the General Management Plan of the Mt Pulag National Park, Protected Area Suitability Assessment and Resource Basic Inventory, available in the DENR-CAR. In addition, the programmes in the development/business plan were reviewed and agreed upon by the review committee.

Publication Programme

Publication of 'Marine fishes of Palawan'

Publication Programme

Benjamin J. Gonzales
Western Philippines University, Philippines

As one of the hotspot islands for biodiversity, Palawan features a wide range of flora and fauna listed as endangered and threatened species or populations by IUCN. Despite fishing and fisheries being the main industry of the province, little information exists pertaining to the extent of fish fauna species. Moreover, few efforts have been made to record and document fish species in their relatively pristine marine habitats. Accordingly, the aim of this project is to publish an illustrated book that would record marine fish species and serve as a guide to researchers, students and anyone interested in fishes.

Fish specimens were collected from a total of 15 stations across the province of Palawan. Main collection came from fishermen and vendors in fish landing areas and markets in municipalities and bays to the north, south, east, and west of mainland Palawan between August 1998 and June 2001. Additional fish collections from wet markets in Puerto Princesa City and photographing of specimens were done in November 2005. The author had the opportunity to reinforce information on fish habitats during SCUBA dive trips in St Paul Bay of Western Palawan in August 2005, Honda Bay of Eastern Palawan in April 2006, Coral Bay of Southern Palawan in March 2007, and Taytay Bay in Northern Palawan in June 2007. Some underwater photographs of fishes and habitats were taken during these dives. Collected specimens were measured, weighed, photo-documented and identified in fresh state in the field or in the laboratory.

Our total specimen collection in fish catalogue of the Western Philippines University is composed of 613 species, belonging to 269 genera and 99 families. Results revealed that we have added 360 species into the Palawan fishes as recorded by Schroeder (1980).

Total records of specimen collection have estimated that around 50% of fishes recorded by Schroeder (1980) appeared in our collection despite that Schroeder (1980) had collected only from the eastern side of mainland Palawan. This indicates that much still has to be done in terms of documenting the marine fish species of Palawan. Another probable reason may be that fish collection methods before were easier and more varied. In the 1980s, rules and regulations on gears and methods used to gather fishes were still lax and few, and Palawan then was considered an isolated island where law enforcement could be weak.

With reference to the total number of fish families in the world, the Philippines has decreased in ratio from 60% in 1986 (Smith and Heemstra, 1986) to 54% in 2004 (Fishbase 2004). Judging from the fish samples collected in this study, the Palawan fish families constitute 44.4% of the fish families of the Philippines and 24% of the world. In this book, photographs of the above fishes will be provided with their respective scientific names, Tagalog names, and local names, notes on their ecology and biology, and other relevant scientific information.

The author conducting ecological and biological observations

Siganus vulpinus, Taytay Bay, northern Palawan

Survey team preparing to dive, Apulit Island, northern Palawan

Saurida gracilis, Coral Bay, southern Palawan

Coral patch where damsel fishes thrives, Coral Bay, southern Palawan

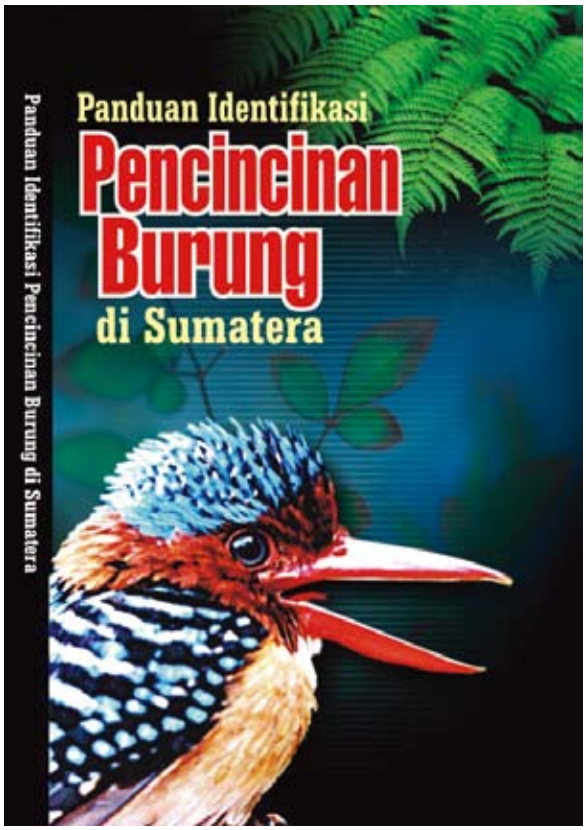
References
FishBase, 2004. A global information system on fishes. DVD, World Fish Center Philippine Office, Los Baños, Philippines, Published in May 2004.
Schroeder, R. E., 1980. Philippine shore fishes of the Western Sulu Sea. Bureau of Fisheries and Aquatic Resources and NMPC Books, Manila, Philippines. 266 pp.
Smith, M. M. and Heemstra, 1986. Smiths' sea fishes. JLB Smith Institute of Ichthyology, Grahamstown, South Africa. 1047 pp.

Publication of 'A field identification guide for bird banding studies in Sumatra'

Publication Programme

Wilson Novarino
Biology Department, Faculty of Mathematics and Natural Science, Andalas University, Indonesia

The manuscript, 'A Field Identification Guide for Bird Banding Studies in Sumatra', has been prepared based on the results of fieldwork conducted in West Sumatra between 1997 and 2004. This book presents field findings from the last phase of my study supported by the NEF. Some additional information was collected and several editing processes have been completed for the review of its contents. The book includes current literature available regarding birds in Indonesia. International standards, such as "Recommended English Bird Name" from the International Ornithologist Union (2007), have been implemented in the book. Additionally, we have added some subspecies names for species specific/endemic to Sumatra. The Pusat Informasi Lingkungan Indonesia/PILI (www.pili.or.id), an international NGO based in Indonesia, was the major contributor to the publishing of the book. PILI has experience in publishing and distributing books focused on environmental issues. Currently the manuscript is undergoing its final review and is in the layout process. We intend to complete the publication in late November and will launch in December 2007.




Black and Yellow Broadbill *Eurylaimus ochromalus*

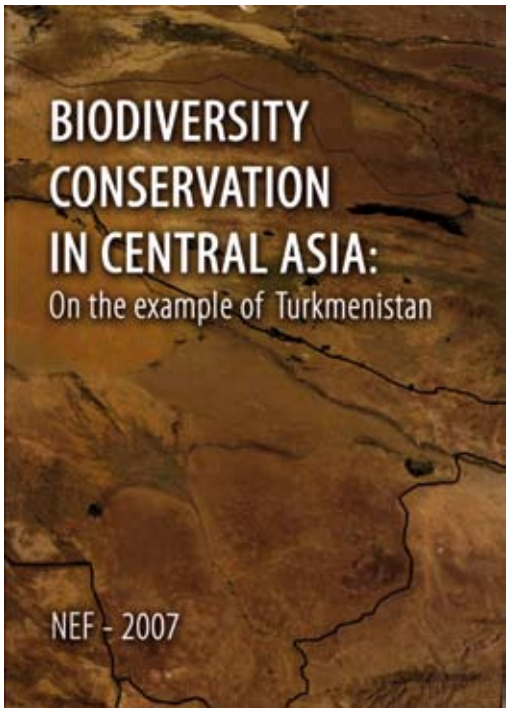

Scarlet-backed Flowerpecker *Dicaeum cruentatum*

Publication of 'Biodiversity conservation in Central Asia'

Publication Programme

Eldar Rustamov
Institute of Zoology of Academy of Science, Turkmenistan

The publishing of the book 'Biodiversity conservation in Central Asia', sponsored by the NEF, was completed in 2007. The original data were based on the results of the NEF-supported research project conducted from 2004 to 2005 for inventorying biodiversity in the southwestern part of Central Asia. Covering a wide range of topics, this book includes sections that consider general principles of nature and biodiversity conservation with respect to specific regional peculiarities. The book presents descriptions of modern biodiversity structure and status, explanations of the principles of flora and fauna conservation and of their sustainable use, and also outlines the national history and modern achievements concerning the protection of nature in Turkmenistan. It is stressed that the conservation of biodiversity requires the joint efforts of scientists, stakeholders, local communities and other collaborators. Significant portions of the book are dedicated to commercial fishery, the importance of mammals and birds as hunting species, and the relationship between amphibian and reptilian fauna and humans, particularly the value of poisonous snakes. The book also discusses the role of strictly-protected areas for biodiversity conservation and the importance of protecting unique and rare ecosystems. Descriptions of the strictly-protected areas include their status, history, natural conditions, inventory of flora and fauna, and specific works pertaining to the conservation of rare and endangered species. A number of photographs taken in the field is also included to help readers learn about conservation more effectively.



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 2007, the NEF assisted more than 380 students. The Scholarship Scheme is operated with the cooperation of the NEF's local counterparts.

List of NEF Scholars in 2007

Indonesia
Undergraduate students (150)

University of Indonesia
Eka Viantira
Erny Soraya
Kholifah
Meilisha P. Pertiwi
Pipit Merianingsih
Putri R. Ratri
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
Intan A Pratiwi
Rika Prihatiningsih
Anjar Prianto
Sarah Albar
Nidya Susanto
Eko Burhanuddin
Adhitia P

Assyafi'iyah Islamic University
Hajar Wahyudi
Isnamaini
Iswahyudi Zuliman
Yunitasari Amaliah
Andam Dewi Maelani
Dwi Widyanti Octavia
Hetty Jariah
Ridho Tahir
Sartika
Sapan
Syahrul lail
Winanjar Restu
Septika Wijayanti
Dedi Rahman
Arif Saifudin
Cut Safrina
Fadlurahman
Sukriyanti
Dahliana
Adi Saputra
Juliana
Nur Khodimah
Sumarni
Nasron Azizah
Dieka Pertiwi
Didi Prasetyo
Nur Asiyah
Nur Aini
Risky Darmawan
R.A.Ayu Yekti.N
N.Elis .kuraisin
Siti Fatimah aazzahra
Eka zakiah Setiawati

National University
Dina Fitria
Fauzan Abdul Mun:im Alkatiri
Rahayu Kurniangsih
Rahmalia Nurul Ahsani Amda
Etika Sayekti Hidayati
Dessy Sulistya Ashari
Fratiwi
Masyaroh
Neneng Mardianah
Shafa Noer
Dian Fajar Vitianingrum
Windrati
Melinda Octaviana Kuswandari
Rebina Urfhy Zen
Mursyidah
Wulanita Kuswotanti
Nuzuki Atara
Abdurrachman Syafiih
Devi Margareth
Dewi Andini Fitriani
Hesmi Rahmawati.H
Husnul Khotimah
Rima Paramita
Ririn Diah Ramadani
Siti Mardiyana Ulfah
Zahra Harifannisa

State University of Jakarta
Achmad Sobari
Anna Syachrial
Arief
Ariyani Fortuna
Conny Samir
Octavianto Sinthauly
Rince Pradana
Subhan Yuliyani
Yuyun Yusuf Harahap
Daulat Arwah
Fatyah Setiawati
Fuji
Lutviah
Muna Murnianjari
Mutia Hardhiyuna
Putri Kesuma Werdani
Supri
Listinayah Fajri
Maria T.P.
Evindika Upik
Nur Malasari
Tinur Chanafi
Muhammad Mahmudah
Afdini Rihlatul
Desy Permatasari
Norma Rahmawati
Sari Setyaningsih
Muhammd Fathoni
Retno Dyah Kumala
Siti Amanah
Wahyuningsih
Anis.M
Febrina Ariyanti. I
Dina Silviana
Ria Amelia

Pakuan University
Asep Yana
Dewi Agustina
Dina Agustina
Mimi Jamilah
Yunis Tias Andriani
Enri Agus Setiani
Dian Sudianto
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
Avia Agustian Minanti
Mila Setyani
Astri Anggraeni
Olivia Mersylia Tombe
Irfan Agustiawan
Taufik Hidayatullah
R.Farida

Malaysia
Postgraduate students (5)

Universiti Malaysia Sabah
Suzen Immit Mojiol
Alvin Azril Mahat
Jovinia Jowinis
Ivan Koh Chong Chu
Jacqueline Vincent

Myanmar
Postgraduate students (20)

Defense Services Medical Academy
Thet Su Mar
Khaing Khaing Kyi

University of Dagon
Kyaw Min Htay
Nwe Ni Win
Sao Mon Theint

University of Forestry
Win Ni Hein
Ni Ni Thin
Ye Wint Tun
Thida Swe

University of Maubin
Aye Aye Min

University of Monywa
Khin Than Oo

University of Pathein
San Tha Tun

University of West Yangon
San San Aye
Moe Kalayar Oo

University of Yangon
Kyaw Zay Moe
Wint Wint Tun
Malar Htwe
Sapai Min
Thaw Maw Moe

Yangon Institute of Education
Thanda Win

Undergraduate students (26)

University of Forestry
Kyaw Sein Win Tun
Aung Myint Myat
Khine Wut Hmone
Zaw Zaw
Thu Han Soe
Su Sandar Aung
Tet Nay Tun
Nwai Mon Mon Aung
Kay Zin Than
Thant Zin
Kay Khine Thwe
Way Soe Zin
Thura Kyaw
Latt Mi Tin Win
Talun Hmone Htan
Htet Lin
Paing Htet Oo
Ma Aye Myat Ko Ko

Phyo Zaw Hein
Ma Ei Sandar Myint
Arr Kar Phyo
Arnt Myo Zaw
Myat Ko Ko Oo
Ma Yadanar Zaw
Ma Myat Su Mon
Ma Su Su Lwin

Philippines Undergraduate students (36)

Palawan State University
Gabo, Astrid Korina
Garcellano, James A.
Jardinero, John Rex N.
Orge, Cedric Ian V.
Patigdas, Madel M.
Tenefrancia, Jonas G.
Alleda, Allan P.
Jalover, Cherry Lyn S.
Pablico, Riza Jane B.
Pagliawan, Ma. Retchie C.
Tan, Ken D.
Urquiola, Joan P.
Villamor, Irish L.
Cacho, Darelle Kaye M.
De Guzman, Arnica L.
Firmalo, Honey Rose O.
Garibay, Jessa Belle B.
Herrera, Ebenezer C.
Quinit, Winston G.
Quirino, Alison T.
Tabayag, Erickson T.
Vicente, Florence Joy B.
Apdon, Roselle T.
Argonoso, Gerold Allen S.
Alvior, Carlito D.
Altea, Jastin Robert D.
Bacani, Neliza B.
Besa, Dorcas O.
Jagmis, Jessa Mae F.
Josol, Ma. Rose Cristy B.
Palmon, Edgar R.
Rolando, Joana B.
Western Philippines University
Agsamosam, Mercy G.
Capadosa, Annielyn L.
Laxamana, Rajie Ann L.
Asis, Jonnie A.

Postgraduate students (5)

Palawan State University
Casia, Cristina T.
Megallos, Jeffrey
Cobilo, Maureen Darling Joy F.
Ollave, Bienvenido Jr. M.
Castro, Lyca Sandrea

Vietnam Postgraduate students (48)

Hanoi Agriculture University
Ta Thi Binh
Pham My Dung
Nguyen Thi Bich Thuy
Vietnam National University
Vuong Tan Cong
Nguyen Khoa Hieu
Nguyen Van Hung
Pham Van Vien
Nguyen Thuy Vinh
Le Thi Thanh Huong
Truong Ngoc Kiem
Nguyen Thi Thanh Nga
Le Nguyet Hai Ninh
Dang Thi Huong
Nguyen Thi Minh Phuong
Dang Trung Tu
Nguyen Thi Hien
Nguyen Thi Hoa
Nguyen Xuan Hoa
Ho Thu Minh
Pham Thi Hong Phuong
Nguyen Khac Son
Doan Viet Tien
Phan Quoc Toan
Nguyen Xuan Vinh
Le Thi Thanh Xuan
Luu Hoang Yen
Vinh University
Phan Thi Giang
Trinh Thi Hong
Cao Thang
Dao Thi Hang
Do Van Toan
Nguyen Thi Thu
Hue University of Sciences
Phan Tien Dung
Can Tho University
Le Diem Kieu
Hanoi Pedogogical University
Nguyen Phuong Linh
Dinh Minh Quang
Nguyen Thi Thuy Ninh
Institute of Ecology and Biological Resources
Vuong Tan Tu
Duong Thi Hoan
Nguyen Manh Hung
Phan Xuan Binh Minh
Dao Thi Sen
University of Forestry
Do Thanh Hung
Ngo Van Mac
Pham Van Nam
Pham Anh Tam
Nguyen Toan Thang
Hue University of Agriculture and Forestry
Ho Thi Nhu Trang

Lao PDR Undergraduate students (92)

National University of Laos
Phonesavanh Phonnaly
Teuanchai Xaisomeboun
Bounmy Lorlaithong
Somsouphanh Simmanivong
Khamsamone Phanthavilay
Panhyasook Keoleuxay
Philaylak Youtthasanty
Sengsouly Phaleukham
Laty Pangpaseuth
Phonesavanh Xayalath
Khaokeo Lorvanxay
Nongnouth Phanvongsa
Kongsy Khammavong
Khamsompong Sinthabandith
Alounsak Xayasouk
Mengxiong Xaichui
Phommachanh Phothichanh
Santy Phiyadeth
Yileng Thaochoutheng
Phetsomphone Thammavong
Somphanith Si One Chanh
Kathingthong Latsavongxay
Khamsing Xayluexiong
Vannasin Inoudom
Oulaivanh Chantjaloth
Maithor Laouyiajong
Yipheng Thayongyia
Souksakhone Chanpadith
Khamboui Soukhantha
Sisavath Phimmasone
Phaengta Bounthavangkham
Sayphin Khampanya
Mai Phonvixay
La Ong dao Sisomphou
Phetviengkham Onexaivieng
Kenemai Phengpaseuth
Bounhieng Sisavanh
Viengvilay Vanthanouvong
Chounnaphon Sibounheuang
Hongphakham Inthavong
Souksakhone Boubphavong
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
Kengchalith Soukvixay
Soulisack Vilayphone
Sengpasith Houng Aloune
Inthanongsone Inthavongsa
Xaisuvanh Phaxaisomebath
Bounphack Lorbreeryao
Phaivone Khounthavone
Khoun Thammavong
Yenpapha Vilavong
Khammanh Vongvansy
Somchanh Ouphanxay
Vanpaseuth Phoutthavong
Phayvieng Vongkhamheng
Vilayvanh Phaisavath
Vonesackda Phoudthavong
Soukphaphone Soudthalavong
Sivanh Vivanhxai
Bounhuong Yachongtou
Xaysavanh Khiaovongphachanh
Souksakhone Phanthoulak
Chanthala Vinthaxay
Sonnasak Phaipasith
Nilaphai Taxo
Lidthisone Kettavong
Xaiyalarth Vongsavath
Silisack Dalavong
Nouxay Bounmixay
Soudaniame Inthisane
Viengsavanh Xomvimane
Somta Siharath
Thany Phimmasone
Sadsada Inthavong
Ketsana Sirivong
Oulavanh Sinsamphanh
Soulichanh Lamxay
Bounmany Soulideth
Taykeo Somachanmavong
Chindavanh Souliyaphak


ANNUAL CEREMONY of
NAGAO NATURAL ENVIRONMENT FOUNDATION
SCHOLARSHIP PROGRAM in INDONESIA
As-Syafi`iyah Islamic University, Jakarta, October 27th 2007
COOPERATION BETWEEN JAPAN AND INDONESIA


NEF


TOYOTA



NEF Student International Workshop 2008 in Sabah



The NEF Student International Workshop 2008 was held from 22 to 27 January in Sabah, Malaysia in cooperation with the Institute of Tropical Biology and Conservation of the Universiti Malaysia Sabah (ITBC/UMS). The aims of the Workshop were to provide NEF scholarship recipients with the opportunity of first-hand experience in the field and to promote exchange between different cultures. Five students representing each of the four countries chosen to receive the NEF scholarship (Indonesia, Lao PDR, the Philippines and Vietnam) were invited to join the Workshop.

The NEF and ITBC agreed to promote the high level of involvement of students in its preparation and implementation of the Workshop. Under supervision of Prof Datin Dr Maryati Mohamed, Director of the ITBC, and Prof Madya Dr Hamid Ahmad, the UMS students were responsible for different parts of the Workshop's operation. The programme included a variety of activities both indoor and outdoor. On 22 January, upon their arrival in Kota Kinabalu, the capital city of Sabah, an orientation session was held so the participants could meet one another. Various kinds of games helped break the ice among them, encouraged unity and teamwork, and helped to provide a foundation upon which to build new ideas through shared experiences over the week to come.

During the following day (23 January), the opening session of the Workshop started with a welcome address from Prof Datuk Dr Mohd. Noh Dalimin, Vice Chancellor of UMS, followed by a welcoming speech by Prof Dr Yasuhiko Taki, President of the NEF. The main session of the Workshop was comprised of a presentation of plenary paper by Prof Datin Dr Maryati Mohamed on the Borneo's natural environment and student presentations given either individually or in a group.

Titles of student presentations and presenters:

Indonesia

'Sebangau National Park: a message from the impact of climate change on Orangutans' habitat'
Aziza Nasron and Stephanie

Malaysia

'A survey of bird fauna in mangrove area at Menumbuk Forest Reserve, Sabah'
Suzan Immit Mojiol

'Diversity of pests in identified stored food products in Sabah'
Alvin Azril Mahat

Vietnam

'The Challenge of conservation of Pu Luong Nature Reserve'
Nguyen Khac Son

Philippines

'Management of a natural world heritage site: the Puerto Princesa Subterranean River National Park'
Astrid Korina S. Gabo and James H. Garcellano

Lao PDR

'A part of biodiversity issues in Lao PDR'
Soulichanh Lamxay, Phayvieng Vonghamheng and Oulavanh Sinsamphan

Student presentations at UMS

Cultural exchange

The evening of the second day was a student cultural show. Having donned their ethnic costumes, the participants demonstrated songs and dances from their home country; the audience meanwhile learned some of the dances and songs of different cultures and were able to find cross-cultural similarities to their own culture.

As a donor organisation intending to promote nature conservation, the NEF considers that fieldwork is fundamental, particularly for students who wish to work on nature conservation as their career. NEF believes that students' participation in hands-on field activities is necessary for them to develop their interest in nature by providing access to research and conservation tools. Thus, the main activities of the Workshop were conducted in the field. Borneo is one of most suitable places for activities like this Workshop.

In the early morning of 24 January, the participants enjoyed bird watching at the Kota Kinabalu Wetlands Centre, where mangroves are preserved for the purposes of bird conservation and public environmental education. Guided by an education officer of the Centre, the tour was conducted before sunrise along the boardwalk in the wetland.

An approximately two hour's drive then took the participants to the Peat Swamp Conservation Centre of Klias Peninsula, which was established in 2007 with a fund from the UNDP/GEF. There the participants gained knowledge and understanding of the ecological importance of peat swamps as well as information on monitoring activities the Centre is conducting.

Bird watching at the Kota Kinabalu Wetlands Centre

Trip to Klias Peninsula

Learning field research skills at Kinabalu

The last field activity of the day was a boat ride in the Klias River. Cruising in the extensive mangrove forests of the Klias River has been one of the major ecotourism attractions of Borneo as it allows visitors to experience the tranquillity of nature with ease of access. This area also provides an important habitat for proboscis monkeys and other wildlife. As the participants were enjoying spotting wildlife, they also learned how tourism can be operated while conserving the wildlife and their habitat.

The highlight of the Workshop was a trip to the Kinabalu National Park. Mount Kinabalu (4,095m) is the highest mountain between the Himalayas and Mount Wilhelmina of Irian Jaya. It has a wide range of vegetation types, from rich tropical lowland and hill rainforest to tropical mountain forest, sub-alpine forest and scrub on the higher elevations, where exceptionally rich species of flora and fauna are observed. Upon the recognition of its ecological and cultural importance, in 1964, the Kinabalu National Park was established and later inscribed on the World Heritage list in 2000.

On 25 January, the Workshop participants first visited Poring Hot Springs. Park Rangers took them on a tour of the forest canopy walkway. Constructed high up in the forest canopy, some 30-40m above the forest floor, the canopy walkway enables scientists to conduct research and visitors to appreciate nature up close. In the afternoon, the group proceeded to the Park Headquarters where the Sabah Parks has its research unit. Researchers there demonstrated field techniques, such as trapping and mist netting, and each participant set up a trap to capture a small forest mammal. Early the following morning (26 January), the participants retrieved their traps and checked the mist nets. Although no animals had been captured in the traps, two fruit bats and one mugimaki flycatcher were caught in the mist net. After returning to the lab, the Sabah Parks researchers showed the participants how to identify and measure the animals caught. This was followed by a demonstration of the preparation of wet and dry specimens. As many of the participants had never had a chance to learn fieldwork skills in their school, despite such fieldwork being fundamental for studying nature, the NEF hopes that this Workshop inspired their further interest in field-based research. (Yae Sano)

The NEF would like to extend its thanks and gratitude toward Prof Datin Dr Maryati Mohamed, her staff and the students of the UMS for their enthusiastic efforts in making the Workshop successful; and to the organisations that kindly cooperated with the Workshop, particularly Sabah Parks, UNDP's Peat Swamp Conservation Project in Klias Peninsula, the Sabah Wetlands Conservation Soceity; and the number of individuals who helped with participants' activities during the Workshop.

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