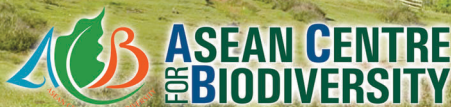




THE ASEAN HERITAGE PARKS

*A Journey to the
Natural Wonders
of Southeast Asia*



**ASEAN CENTRE
FOR
BIODIVERSITY**



THE ASEAN HERITAGE PARKS

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Natural Wonders
of Southeast Asia*

The ASEAN Heritage Parks: “A Journey to the Natural Wonders of Southeast Asia”

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Message from the ASEAN Secretary-General

Evergreen tropical forests, mountain forests, monsoon forests, limestone or karst formations, wetlands, marine and coastal waters - these are among the major habitats or ecosystems found in Southeast Asia that store the world's largest collection of plant and animal life. These are life-giving resources for over half a billion people of the region and millions more around the world.

We take pride that the region is home to 20 percent of all known species of plants and animals, and numerous centres of concentration of restricted-range bird, plant and insect species. The region is blessed with three mega-diverse countries (Indonesia, Malaysia and the Philippines); and several bio-geographical units (e.g. Malesia, Wallacea, Sundaland, Indo-Burma, and the Central Indo-Pacific); and covers one-third or 284,000 square kilometres of all coral reefs that are among the most diverse in the world.

With millions of people depending primarily on this natural resource base, many of these marine and terrestrial resources and ecosystems have come under increasing stress. Statistical records so far show that a total of 2,517 out of 8,613 or 29 percent of plants and animals species assessed in Southeast Asia are already threatened. The stress alone on these natural resources is so complex that not one nation can lay claim to solving this problem, which transcends national boundaries. As such, this calls for increased concerted and proactive regional and global cooperation to ensure sustainability of these life-giving resources.

To preserve and protect these life-giving resources, the ten Member States of ASEAN have declared 28 ASEAN Heritage Parks out of the 1,523 designated national protected areas.

It is my pleasure to take you on this journey to some of ASEAN's wonderful natural and cultural heritages through the *"The ASEAN Heritage Parks: A Journey to the Natural Wonders of Southeast Asia."* This book outlines pertinent information that hopefully brings you closer to these natural wonders, and aims to inform and showcase the unique and diverse biological resources of these natural wonders.



DR. SURIN PITSUWAN
Secretary-General
Association of Southeast
Asian Nations (ASEAN)

The publication is an important step toward encouraging the public to be actively involved in, and support efforts to protect these natural heritage sites and conserve the biodiversity they contain.

ASEAN shall continue to focus efforts on the ASEAN Heritage Parks Programme and also encourage further expanding the list of ASEAN Heritage Parks as well as World Heritage Cultural Sites in the region. This is in support of the ASEAN Vision 2020 that calls for “a clean and green ASEAN with fully established mechanisms to ensure the protection of the region’s environment, sustainability of its natural resources, and the high quality of life of its peoples”.

The ASEAN Member States are proud of the inherent pristine natural beauty, unique and abundant biodiversity and ecosystems, and fascinating and strong cultural heritage of the region as reflected in the customs and traditions of the indigenous peoples of the region that co-exist with nature. Brunei Darussalam, Cambodia, Indonesia, Lao PDR, Malaysia, Myanmar, Philippines, Singapore, Thailand, and Viet Nam show it all in this book, and commit to sustain them for many more generations to come.

Enjoy the journey and be inspired.

A handwritten signature in black ink, appearing to read "Sam Ritskumar". The signature is fluid and cursive, with a long horizontal stroke at the end.

Message from Head of Delegation of the European Union to the Philippines

The 27 Member States of the European Union (EU) and the 10 Member States of the Association of South East Asian Nations (ASEAN) together share a commitment to regional integration as a means of fostering regional stability, building prosperity, and addressing global challenges. The Nuremberg Declaration of 2007 on an EU-ASEAN Plan of Action further strengthens the 30-year EU-ASEAN partnership in pursuing closer cooperation and dialogue on several regional issues that includes climate change/ environment and sustainable development.

The EU supports ASEAN integration, inter alia, the implementation of the Vientiane Action Programme (VAP) and subsequent plans to achieve the Declaration of ASEAN Concord II and the establishment of the ASEAN Community by 2015, and I am confident that EU-ASEAN relations will continue to flourish in the years ahead.

In the field of environment and natural resources, the EU has been providing support to ASEAN and its individual member countries through technical and financial assistance and capacity building. More specifically, the EU has been assisting the ASEAN Member States to meet the United Nations Convention on Biological Diversity target of significantly reducing the rate of biodiversity loss in the region.

The EU has also made a concrete commitment to the conservation of the region's natural resources by supporting the establishment, organization and operations of the ASEAN Centre for Biodiversity (ACB). The EU takes pride in this achievement as ACB is now a permanent institution and a regional centre of excellence that helps in strengthening the capacity of ASEAN Member States to formulate and coordinate biodiversity-related policy, strategy and action; and to promote and advance common positions on matters related to biodiversity conservation, among other issues.

The present publication "The ASEAN Heritage Parks: A Journey to the Natural Wonders of Southeast Asia", is another testament to EU's strong commitment to protected area management and biodiversity conservation. I am sure that through this

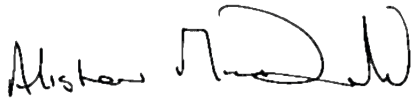


H.E. ALISTAIR MACDONALD
Head of Delegation
Delegation of the European
Union to the Philippines

book, more and more people not only in Southeast Asia but throughout the world will be inspired to care for and support these natural and cultural heritages.

The EU congratulates ASEAN and the ACB for putting together this book. We believe that this book will stir the minds of the readers to understand and become more aware of the importance of these ASEAN Heritage Parks, which house and protect countless important biological resources that are often unique to Southeast Asia.

We encourage you to take this journey and become involved in activities to save these pristine wonders, just as the European Union will continue to support ASEAN and the ACB in their endeavours, and in fulfilling the ASEAN Vision 2020 that calls for “a clean and green ASEAN region”.

A handwritten signature in black ink, appearing to read "Alexander N. D. W.", with a stylized, cursive script.

Foreword

Southeast Asia is a region noted for its natural scenic sites whether forests and mountains, valleys and plains, lakes and rivers, oceans and seas. All these are home to wildlife that are incomparable in beauty and uniqueness, and rich terrestrial and marine life not to mention people with beautiful and diverse culture and heritage. All these have to be protected and sustained to ensure a continuous flow of goods and ecosystems services for the generations now and in the future. These rich resources directly sustain more than 120 million people, and provide valuable sources of food, clean water, shelter, medicine and livelihood.

The “journey” toward recognizing the natural wonders of Southeast Asia and protecting the biodiversity therein began in 1978. The ASEAN Experts on the Environment then conceptualized a special category for national parks and nature reserves in Southeast Asia that have outstanding wilderness and other values. They acknowledged that the region provides habitats for some of the world’s most enigmatic species and harbors a globally significant wealth of biodiversity. They recommended that *“these be given the highest regional recognition so that their importance as conservation areas would be appreciated internationally.”*

In 1983, the ASEAN Group on Nature Conservation (AGNC) proposed a set of principles, objectives, criteria and guidelines for the selection, establishment and management of protected areas in the ASEAN region. The following year, in November 1984, the Second ASEAN Ministerial Meeting in Bangkok issued the important Declaration on Heritage Parks and Reserves that created the first group of Heritage Sites.

The establishment of ASEAN Heritage Parks stresses that the ASEAN Member States share a common natural heritage, and should collaborate in their efforts to protect the rich biodiversity that supports the lives of millions of ASEAN nationals. The biodiversity that characterizes the region as well as the common threats that have to be addressed further underlines the significance of the ASEAN Heritage Parks Programme.



RODRIGO U. FUENTES
Executive Director
ASEAN Centre
for Biodiversity (ACB)

More than 30 years later to this year 2010, a total of 28 parks and reserves from 10 ASEAN Member States now embody the ASEAN Heritage Parks Programme.

In 2004, the then ASEAN Regional Centre for Biodiversity Conservation Project published *ASEAN's Greatest Parks* to showcase the region's first group of ASEAN Heritage Parks and World Heritage Sites including other protected landscapes and seascapes and major habitats in the region.

This year (2010), the ASEAN Centre for Biodiversity offers an updated version of the 27 ASEAN Heritage Parks and includes the newest addition from the Philippines—Mt. Kitanglad Range Natural Park. It features as well brief profiles of the biodiversity and natural resources of each of the member states of the ASEAN, and some glimpses about the cultural history and heritage of some indigenous peoples within the region. Indigenous and local people are inherent to conservation sites as their culture and traditions are basically tied to nature, and their indigenous knowledge systems provide lessons in conservation management.

The ASEAN Centre for Biodiversity (ACB), aside from its supportive role as the Secretariat for the ASEAN Heritage Parks Program, is mandated to enhance and strengthen the administrative and management capacity of protected area managers and promote the AHPs through the development of information and education resource materials, one of which is this AHP book. ACB's capacity development program includes organizing or conducting workshops on ecotourism, transboundary protected area management, law enforcement, biodiversity information management, and addressing gaps in terrestrial and marine protected areas.

In 2007, ACB convened the 2nd ASEAN Heritage Parks Conference and the 4th Regional Conference on Protected Areas in Southeast Asia from 23-27 April 2007 in Sabah, Malaysia. In this conference, the protected area managers reassessed their program of activities in light of the global programs and directions adopted during the 5th World Parks Congress held in Durban, South Africa in September 2003, and in compliance with the Programme of Work for Protected Areas ((PoWPA) of the Convention on Biological Diversity (CBD). The Durban Action Plan and the PoWPA were vital to the formulation of the Regional Plan of Action for ASEAN Heritage Parks and Protected Areas. The Regional Action Plan would complement and support national conservation initiatives toward the conservation and management of protected areas.

ACB also organized the 3rd ASEAN Heritage Parks Conference in Brunei Darussalam on 23 - 25 June 2010 in collaboration with the country's Department of Environment, Parks and Recreation (JASTRE), Ministry of Development. Attended by AHP managers from the 10 ASEAN Member States, the conference aimed to (1) enhance the AHP regional action plan and develop strategies for AHPs; (2) identify, discuss, and prioritize activities to effectively manage the AHPs; (3) identify possible partners for the implementation of selected activities in pilot areas; and (4) identify further actions for implementation by AHP Managers.

The development and production of *"The ASEAN Heritage Parks: A Journey to the Natural Wonders of Southeast Asia"* was made possible with funding support and collaboration with the European Union and the ASEAN and its Members States.

Most of the information and data in this book were taken from the ASEAN Member States' National Reports to the Convention on Biological Diversity; from the

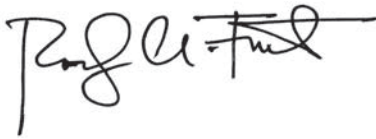
AHP Park Managers themselves; and the offices managing these Parks. Other sources of information were the websites of several international and regional environment agencies. Some information, especially those about activities that can be done in some AHPs, were sourced from the websites of a few government tourism offices as well as private travel agencies.

This book aims to encourage greater appreciation for the ASEAN's natural heritages, as well as generate greater support for their protection and conservation and encourage more collaborative activities for their sustainable development and management. The book tries to capture the essence of each Park's integrity and naturalness for one to understand why these have to be preserved and/or conserved for everybody's enjoyment, appreciation, and benefit.

Taking *A Journey to the Natural Wonders of Southeast Asia* is truly like a real-life educational journey across the 10 AMS. As you pore through the pages, making stops at each AHP, you will surely appreciate these nature's wonders through the information and photographs provided.

This book is indeed a good read, not only for researchers or scientists, but for everyone as well.

Take the journey! Discover the natural wonders. You will be enlightened and informed at the end of this journey.

A handwritten signature in black ink, appearing to read 'Peng Li-Fun', with a horizontal line extending from the end of the signature.

Acknowledgements

The ASEAN Heritage Parks: A Journey to the Natural Wonders of Southeast Asia would not have been developed and produced without the support of countless individuals, organizations and offices within the ASEAN region. We are greatly indebted to our colleagues and National Contact Points in all the ASEAN Member States as well as other partner organizations and various protected area officials and experts in the ASEAN region for reviewing the profiles of the ASEAN Member States and ASEAN Heritage Parks and for providing pertinent information and photographs.

We wish to acknowledge in particular the contributions of the following:

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- Cambodia: Ministry of Environment and General Department of Administration for Nature Conservation and Protection (GDANCP). We wish to thank Phyrum Yang, Director, Preah Monivong (Bokor) National Park for reviewing the profile and for providing photographs of the Park.
- Indonesia: Ministry of Environment, and Ministry of Forestry. We would also like to thank Harijoko Siswo Prasetyo, Head of Gunung Leuser National Park, for providing additional photographs and information on the Park.
- Lao People's Democratic Republic: Rice and Cash Crop Research Center, National Agriculture and Forestry Institute. Our thanks also to Mr. Savanh Chanthakoummane, Deputy Director of the Division of Forest Resource Conservation, Ministry of Natural Resources and Environment for his inputs.
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- Philippines: Department of Environment and Natural Resources (DENR) and the Protected Areas and Wildlife Bureau (PAWB-DENR), particularly Theresa Mundita Lim, Director, PAWB-DENR. We also thank Rodel M. Boyles, Protected Area Superintendent, and Danilo Z. Roca, Field Operations Assistant, both of the Protected Area Office of Mts. Iglit-Baco National Park, and the Tamaraw Conservation Project; Felix S. Mirasol, Community Environment and Natural Resources Officer and concurrent Protected Area Superintendent, Mt. Kitanglad Range Natural Park; and Leonilo R. Rivera, Chief of the Protected Area and Wildlife Division, DENR-Region X1 and Protected Area Superintendent of Mt. Apo Natural Park, for providing photographs and reviewing the profiles of their respective AHPs. Our thanks also to Ruel Colong, Protected Area Superintendent of Mt. Hamiguitan Range Wildlife Sanctuary for sharing some photographs of Mt. Apo Natural Park.
- Singapore: National Parks Board (NParks). We would like to thank, in particular, James Gan, Assistant Director, Sungei Buloh Wetland Reserve, and Cheryl Chia Siew Wah, Senior Biodiversity Officer (Terrestrial) of NParks for reviewing and providing inputs to the profile of Sungei Buloh; and Jeremy Ang, Conservation Officer, Sungei Buloh Wetland Reserve, for providing the photographs.
- Thailand: Office of Natural Resources and Environment Policy and Planning. Our gratitude, in particular, to Ratana Lukanawarakul, Director of Recreation and Interpretation, Department of National Parks, Wildlife, and Plant Conservation; Chinda Srisupphatpong of Ao Phangnga National Park; and Dr. Chumphon Sukkaseam, Program Coordination Unit Senior Officer, ASEAN-Wildlife Enforcement Network (ASEAN-WEN), for reviewing the profiles of their country's AHPs as well as providing photographs.
- Viet Nam: Department of International Cooperation and Science, Technology; and the Biodiversity Conservation Agency of the Viet Nam Environment Administration, Ministry of Natural Resources and Environment. We would also like to thank Mai Ngoc Bich Nga, Officer, Ecology Division, Biodiversity Conservation Agency; Nong The Dien, Director, Ba Be National Park; Hoang Thi Phuong, Communication officer of Chu Mom Ray National Park; and Ho Dac Thanh, Director of Chu Mom Ray National Park, for reviewing the profiles and providing photographs of the AHPs.

We are also indebted to the European Union and the Association of Southeast Asian Nations and its member countries for their financial support in the development and production of this book.

Our thanks and appreciation also to all the ACB officials for their support and guidance: Executive Director Rodrigo U. Fuentes; Programme Development and Implementation Director Clarissa C. Arida; Biodiversity Information Management Director Sheila Vergara; Communication and Public Affairs Head Rolando A. Inciong; Finance and Administration Head Wilfredo Obien, and other ACB staff who have contributed to the completion of the Book.

To everyone, thank you very much.

Dr. Monina T. Uriarte
Sahlee Bugna-Barrer
Bridget P. Botengan

Acronyms

ACB	ASEAN Centre for Biodiversity
AHP	ASEAN Heritage Park
AHPP	ASEAN Heritage Parks Programme
AGNC	ASEAN Group on Nature Conservation
AMS	ASEAN Member States
ARCBC	ASEAN Regional Centre for Biodiversity Conservation
ASEAN	Association of Southeast Asian Nations
ASOEN	ASEAN Senior Officials on the Environment
AWGCME	ASEAN Working Group on Coastal and Marine Environment
AWGNCB	ASEAN Working Group on Nature Conservation and Biodiversity
BCP	Bokor Conservation Project
BMS	Biodiversity Monitoring System
BTCC	Barangay Tamaraw Conservation Council
CBD	Convention on Biological Diversity
CI	Conservation International
CITES	Convention on International Trade of Endangered Species
CLUP	Comprehensive Land Use Plan
CMDP	Community Management Development Program
CMS	Convention on Migratory Species
CPA	Community Protected Area
CTRC	Conservation Training and Resource Center
DENR	Department of Environment and Natural Resources
DNP	Department of National Parks, Wildlife and Plant Conservation
ESP	Environmental Services Program
EU	European Union
FAO	Food and Agriculture Organization
FFI	Flora & Fauna International
FLEGT	Forest Law Enforcement, Governance and Trade
FLUP	Forest Land Use Plan
GBIF	Global Biodiversity Information Facility
GIAHS	Globally Important Agricultural Heritage Systems
GMS	Greater Mekong Sub-region
IBA	Important Bird Area
ICRAF	World Agroforestry Centre
IUCN	International Union for Conservation of Nature

ITPGRFA	International Treaty on Plant Genetic Resources for Food and Agriculture
KBA	Key Biodiversity Area
KGV	Kitanglad Guard Volunteers
MAB	Man and Biosphere Program
MAFF	Ministry of Agriculture, Forestry and Fisheries
MARD	Ministry of Agriculture and Resources Development
MDG	Millenium Development Goal
MEA	Multi-lateral Environmental Agreement
NBCA	National Biodiversity Conservation Area
NBSAP	National Biodiversity Strategy and Action Plan
NCP	National Contact Point
NIPAS	National Integrated Protected Areas System
NPA	National Protected Area
NSDS	National Sustainable Development Strategy
NGO	Non-Government Organization
PA	Protected Area
PAMB	Protected Area Management Board
PAO	Protected Area Office
PAWB	Protected Areas and Wildlife Bureau
PBCP	Philippine Biodiversity Conservation Priorities
PoW	Programme of Work
PoWPA	Programme of Work on Protected Areas
PRF	Permanent Reserved Forest
RRF	Rapid Response Facility
SBC	Sarawak Biodiversity Centre
SDENRO	Special Deputy Environment and Natural Resources Officer
SEA	Southeast Asia
SGP	Singapore Green Plan
TCP	Tiger Conservation Unit
TIHPA	Turtle Islands Heritage Protected Area
UN	United Nations
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
WCS	Wildlife Conservation Society
WCPA	World Commission on Protected Areas
WHC	World Heritage Convention
WHS	World Heritage Site
WWF	World Wide Fund for Nature

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The ASEAN Heritage Parks Programme

The category of ASEAN Heritage Parks and Reserves (AHPRs) was first conceptualized by the ASEAN Experts on the Environment during their first regional meeting in 1978. The group defined the ASEAN Heritage Parks and Reserves as *“a category of protected areas conceived for a select group of national parks and nature reserves that have outstanding wilderness and other values.”* They also recommended that *“these be given the highest regional recognition so that their importance as conservation areas would be appreciated internationally.”*

In 1981, ASEAN environmentalists called on the United Nations Environment Programme (UNEP) and the International Union for the Conservation of Nature (IUCN) to support the preparation of a regional conservation action plan, focusing on the establishment of the AHPRs. With financial support from UNEP, the IUCN prepared the Action Plan on Nature Conservation for the region and included the establishment of 10 initial protected areas as AHPRs.

The ASEAN Experts Group on the Environment then recommended that the plan be reviewed by experts. The group of experts, which became known as the ASEAN Group on Nature Conservation (AGNC), met to review the proposed plan. The AGNC proposed a set of principles, objectives, criteria and guidelines for the selection, establishment and management of protected areas in the ASEAN Region in 1983. An 11th Heritage Park was also proposed when Brunei Darussalam became a member of the ASEAN.

ASEAN Declaration on Heritage Parks and Reserves

On 29 November 1984, the Second ASEAN Ministerial Meeting in Bangkok, issued the important Declaration on Heritage Parks and Reserves that created the first group of Heritage Sites.

A total of 11 parks and reserves were named as ASEAN Heritage Parks and Reserves (AHPR) when six ASEAN Member States (AMS): Brunei Darussalam, Indonesia, Malaysia, the Philippines, Singapore and Thailand, signed the ASEAN Declaration of Heritage Parks and Reserves. The Declaration recognized *“the uniqueness, diversity and outstanding values of certain national parks and reserves of ASEAN Member States that deserve the highest recognition so that their importance as conservation areas could be appreciated regionally and internationally.”* These identified heritage parks and reserves shall be *“managed to maintain ecological processes and life-support systems; preserve genetic diversity; ensure sustainable utilization of species and ecosystems; and maintain wilderness that have scenic, cultural, educational, research, recreational and tourism values.”*

The ASEAN Declaration called for the development of management plans for each heritage site, tasking the ASEAN Heritage Experts Group on the Environment to help draft model guidelines. The UNEP Regional Office for Asia and Pacific provided technical and financial assistance for the manual entitled “*Planning for ASEAN Heritage Parks and Reserves,*” which was completed in 1986. The manual provides guidelines in planning and an outline for a management plan.

Following the ASEAN Declaration in 1984, the ASEAN Heads of State and Governments adopted the Hanoi Plan of Action on 15 December 1998. One action stated under Article VI (Protect the environment and promote sustainable development) is to promote regional coordination for the protection of the AHPs. The ASEAN Senior Officials on the Environment (ASOEN) then mandated the ASEAN Regional Centre for Biodiversity Conservation (ARCBC), through the ASEAN Working Group on Nature Conservation and Biodiversity (AWGNCB), to encourage collaboration on AHPs. ARCBC thus conducted a workshop on 20-22 September 2000 in Hanoi, Viet Nam, to review the criteria and guidelines for the selection, establishment and management of AHPs.

Definition and Criteria of ASEAN Heritage Parks

ASEAN Heritage Parks (AHPs) are defined as “*Protected areas of high conservation importance, preserving in total a complete spectrum of representative ecosystems of the ASEAN region*”.

Protected areas are established as AHPs to generate greater awareness, pride, appreciation, enjoyment and conservation of ASEAN’s rich natural heritage, through a regional network of representative protected areas, and to generate greater collaboration between AMS in preserving their shared natural heritage.

For a protected area or reserve to become an AHP, it must meet the following criteria:

- **Ecological completeness.** The site demonstrates a wholesome ecological process and the capability to regenerate with minimal human intervention.
- **Representativeness.** The site embodies the variety of ecosystems or species representing or typical of the particular region.
- **Naturalness.** The site, for the most part, is in a natural condition. It may be a second-growth forest or a rescued coral reef formation, with the natural processes still going on.
- **High conservation importance.** The site has regional significance for the conservation of important or valuable species, ecosystems or genetic resources. It creates or promotes awareness of the importance of nature, biodiversity and the ecological process. It evokes respect for nature when people see it and a feeling of loss whenever the natural condition is lost.
- **Legally gazetted conservation areas.** The site has been identified, defined and designated by law or any legally accepted instrument of an AMS. The site must have been primarily designated as a protected area with well-defined boundaries.
- **Approved management plan.** The site has a management plan duly approved by authorities of each AMS.

Additional criteria included the following:

- **Transboundary.** The site plays a role in nutrients, materials or support for species (especially migratory species) to the region as a whole. Both the ecological processes and natural resources that contribute to the maintenance of species or ecosystems often go beyond natural boundaries.
- **Uniqueness.** The site possesses special features that are not seen in any other site.
- **High ethno-biological significance.** The site demonstrates harmonious relationships between culture and ecology.
- **Importance for endangered or precious biodiversity.** The site could provide habitats for important or endangered flora and fauna.

The major categories of AHPs are as follows:

- **Natural park.** Major potential for education, recreation and ecotourism
- **Natural reserve.** High conservation value but low accessibility or potential for tourism and recreation.
- **Cultural site.** Cultural practices symbolize the concept of communities living in harmony with nature.
- **Prehistoric site.** Protect essential chapters of the evolution and prehistory of mankind in ASEAN.
- **Peace park.** Straddle international frontiers or disputed territories, where mutually agreed upon management for conservation can serve both to protect valuable biodiversity and diffuse political tensions, as well as promote cooperation between neighboring nations.

The management of the AHPs was initially addressed with the creation of a Task Force at the ASEAN Secretariat in Jakarta, an ASEAN Heritage Parks and Reserves Secretariat, and a Focal Point for each AMS. Now, the ASEAN Centre for Biodiversity serves as the Secretariat of the AHP Programme and the AHP Committee, with representatives of the 10 AMS serving as members.

Procedures for the Nomination and Listing of ASEAN Heritage Parks

An AMS may submit the nominated national protected area with complete information to the ASEAN Centre for Biodiversity.

The nomination shall contain detailed information on each of the elements of the main criteria, and additional criteria as appropriate, including the following information:

- Details of legal gazettelement
- Details of the size, together with a location map of the site
- Description and map of the natural vegetation of the site, including description of the main features of each vegetation type
- Description of physical details such as geology, hydrology, soils and climate
- Description and list of fauna and flora of special interest
- Description of special cultural sites, customs, or prehistoric remains of the site
- Review of the potential of the site for educational, research and recreational uses
- Details of human use levels in the site
- Details of current management facilities and staff

- Summary of Management Plan for the site
- Independent evidence of high conservation importance of the site [recognition in international reviews, e.g. recognized biodiversity hotspot, center of endemism such as an Endemic Bird Area, or recognized in protected area systems reviews, or by the International Union for the Conservation of Nature—World Commission for Protected Areas (IUCN—WCPA) or equivalent body reviews as a site of international significance]
- Argument as to why the site should be regarded as the best example of the particular ecosystem/s that it contains
- Bibliography
- Photographs, illustrations, maps and other information needed to support the descriptions

ACB shall compile all the information and documents and submit these for consideration to the ASEAN Working Group on Nature Conservation and Biodiversity (AWGNCB), for terrestrial parks, or to the ASEAN Working Group on Coastal and Marine Environment (AWGCME), for marine parks. The respective Working Groups shall make their recommendations for consideration by the ASEAN Senior Officers on the Environment (ASOEN) and the ASEAN Secretariat.

The ASOEN shall consider the recommendations made and seek the approval of the Environment Ministers for listing.

Management of ASEAN Heritage Parks

In the management of AHPs, the AWGNCB shall provide guidance and promote regional coordination in the implementation of conventions and activities related to biodiversity conservation. The AWGNCB and other Working Groups may request the assistance or utilize the expertise of relevant ASEAN centers such as the ACB, or other regional and international organizations, in the implementation of the activities that may include the following:

1. Develop and implement regional conservation and management action plans as well as regional mechanisms complementary to and supportive of national efforts to implement conservation measures in AHPs.
2. Promote a common identity and collective action in terms of education, public awareness and ecotourism.
3. Promote exchange of information, best practice and management experiences.
4. Promote training and capacity building.
5. Promote partnerships with relevant national, regional and international organizations to enhance the conservation and management of protected areas.
6. Develop and maintain an information database on AHPs.

The AHP Committee represents the AHP managers of the 10 AMS (See page 273 for the Directory of AHP Committee Members). The tasks of the AHP Committee include the following:

1. Develop a Regional Work Plan for the ASEAN Heritage Parks, to include among others, the conduct of the AHP Conference.
2. Review and update the AHP Programme and Selection Criteria.
3. Review and recommend new AHPs in accordance with the AHP Selection Criteria.

4. Participate and provide technical assistance in the conduct of other related activities of ACB.

The authority and management of the individual AHPs shall remain with the respective member states.

Relationship with World Heritage Sites

World Heritage Sites (WHS) are selected as globally outstanding sites, while AHPs are selected as regionally representative sites. WHS are special and unusual, while AHPs will be typical though generally the best example of their types. Some sites may merit recognition under both headings but others may not.

The AHPs however should by no means be seen as secondary to WHS and there must be no conflict or confusion about these two different categories of international recognition.

More ASEAN Heritage Parks Protect the Best of the Region

In December 2003, the AMS issued a new Declaration on ASEAN Heritage Parks. The Declaration recognized the additional membership of Cambodia, Lao PDR, Myanmar and Viet Nam to the ASEAN, including their respective AHPs. In signing the Declaration, the AMS agreed that *“common cooperation is necessary to conserve and manage the ASEAN Heritage Parks for the development and implementation of regional conservation and management action plans as well as regional mechanisms complementary to national efforts to implement conservation measures”*.

The Declaration followed the World Summit on Sustainable Development in 2002, which, among others, set a target of reducing the current rate of loss of biological diversity by 2010. This further emphasized the need to create an effective system of protected areas to maintain ecological processes and life-support systems, preserve genetic diversity, and ensure sustainable use of species and ecosystems.

From an initial list of 11, there are now 28 AHPs that best represent the wonderful diversity of ecosystems and species of the ASEAN region. The most recent is Mt. Kitanglad Range Natural Park in the Philippines, which was declared an AHP in November 2009.

As of 2010, the number of AHPs per country is as follows: Brunei Darussalam, one; Cambodia, two; Indonesia, three; Lao PDR, one; Malaysia, three; Myanmar, six; the Philippines, three; Singapore, one; Thailand, four; and Viet Nam, four.

The AHP Programme underlines the need for greater collaboration for biodiversity conservation in ASEAN, particularly since the region provides habitats for some of the world’s most enigmatic species and harbors a globally significant wealth of biodiversity.

The ASEAN Centre for Biodiversity and the AHP Programme

As the secretariat for the AHP Programme, ACB promotes the AHPs, by developing resource materials, and developing or enhancing the capacity of protected area managers.

In April 2007, ACB convened the 2nd ASEAN Heritage Parks Conference and the 4th Regional Conference on Protected Areas in Southeast Asia that was held in Sabah, Malaysia. The back-to-back event was organized together with the State Government of Sabah, Malaysia; the International Union for the Conservation of Nature—World

Commission on Protected Areas—Southeast Asia (IUCN—WCPA—SEA); and BirdLife International.

The Conference brought together 223 participants that included the heads and staff of protected areas (PAs) and AHP management authorities; officials and representatives of international and local non-government organizations, and other PA practitioners.

The participants reviewed the AHP Programme, in particular its components: capacity development; information sharing network; technical staff exchange program; promotion of tourism; participation in joint research program; bi-annual conference of managers; and management improvement program.

Specifically, the Conference reviewed the status of PA management in the Southeast Asian region, shared experiences, imparted best practices, identified problems and issues and formulated a common regional strategic direction to respond to the challenges in the sustainable use of biodiversity, access and equitable sharing of the benefits from biodiversity and the conservation of biodiversity.

The participants identified the regional actions for PAs in relation to meeting the objectives of the Durban Accord and the commitments in the Programme of Work on Protected Areas and the AHP Programme. They also discussed various strategies that would strengthen the management of the network on PAs in the region with special focus on AHPs.

They also drafted the Regional Action Plan for AHPs and PAs of Southeast Asia that would complement and support national conservation initiatives toward the conservation and management of PAs.

Key areas for action proposed for AHPs and PAs include the following:

- Establish and strengthen national and regional systems of PA management integrated into a global network as a contribution to globally agreed goals.
- Establish and strengthen regional networks, thereby promoting equity and benefit sharing and integrating PAs in broader landscapes and seascapes.
- Promote improved site-based PA planning and management and capacity building of PA staff through appropriate technology transfer.
- Assess, monitor and evaluate the effectiveness of PA management and development and adoption of minimum standards and best practices for national and regional PAs, and ensure that scientific knowledge contributes to the effectiveness of PA systems.
- Enhance and secure involvement of indigenous and local communities in PA activities and strengthen communication, education and public awareness, as well as ensure financial stability.

The Centre further supported the protection of ASEAN's natural heritages through the conduct of the 3rd ASEAN Heritage Parks Conference held in Brunei Darussalam on 23-25 June 2010. The conference was hosted by the Department of Environment, Parks and Recreation (JASTRE), Ministry of Development and was preceded by the 2nd AHP Committee Meeting on 22 June 2010. The 10 AMS were represented in both events.

The 3rd AHP Conference aimed to promote the effective management AHPs and identify areas for cooperation among AHP Managers and partners. Specifically, the Conference aimed to: (1) enhance the AHP regional action plan and develop strategies for AHPs; (2) identify, discuss, and prioritize activities such as capacity development

and public awareness activities to effectively manage the AHPs; (3) identify possible partners for the implementation of selected activities in the pilot areas; and (4) report the results of the 2nd AHP Committee Meeting and identify further actions for implementation by AHP Managers.

The conference was attended by 56 participants composed of park managers from 26 AHPs, AHP Committee Members, resource persons, other participants from Brunei Darussalam, the ASEAN Secretariat, and ACB.

A major output of the 3rd AHP conference is the development of a Network of AHP Managers (See page 275 for the Directory of AHP Managers). This network will allow the exchange of learning and experiences among managers as well as create greater awareness of the AHPs. The conference also generated a Regional Work Plan for AHPs that included the following areas: resource assessment and monitoring including species identification and habitat management; ecotourism; law enforcement; information sharing, communications and outreach; exchange programs and study tours. There were also discussions on possible financing windows and donors, as well as potential partners in the implementation of the different activities of the AHPs.

Part I of the Conference reviewed and discussed the: (a) Programme of Work on Protected Areas (PoWPA) of the CBD (context, objectives, programme elements, and goals and targets of PoWPA); (b) Protected Area Management (global perspective and trends in protected area management; accomplishments in the implementation of PoWPA, as well as PoWPA plans); and (c) Best practices and lessons from conservation implementation in ASEAN countries. Part II discussed the ASEAN Heritage Parks Programme, including the outcome of the 1st and 2nd AHP Conferences held in 2004 (Khao Yai, Thailand) and 2007 (Sabah, Malaysia), respectively. Part III focused on Action Planning among AHP Managers.

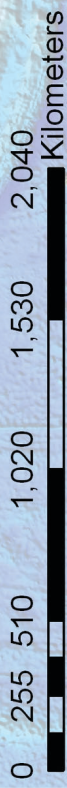
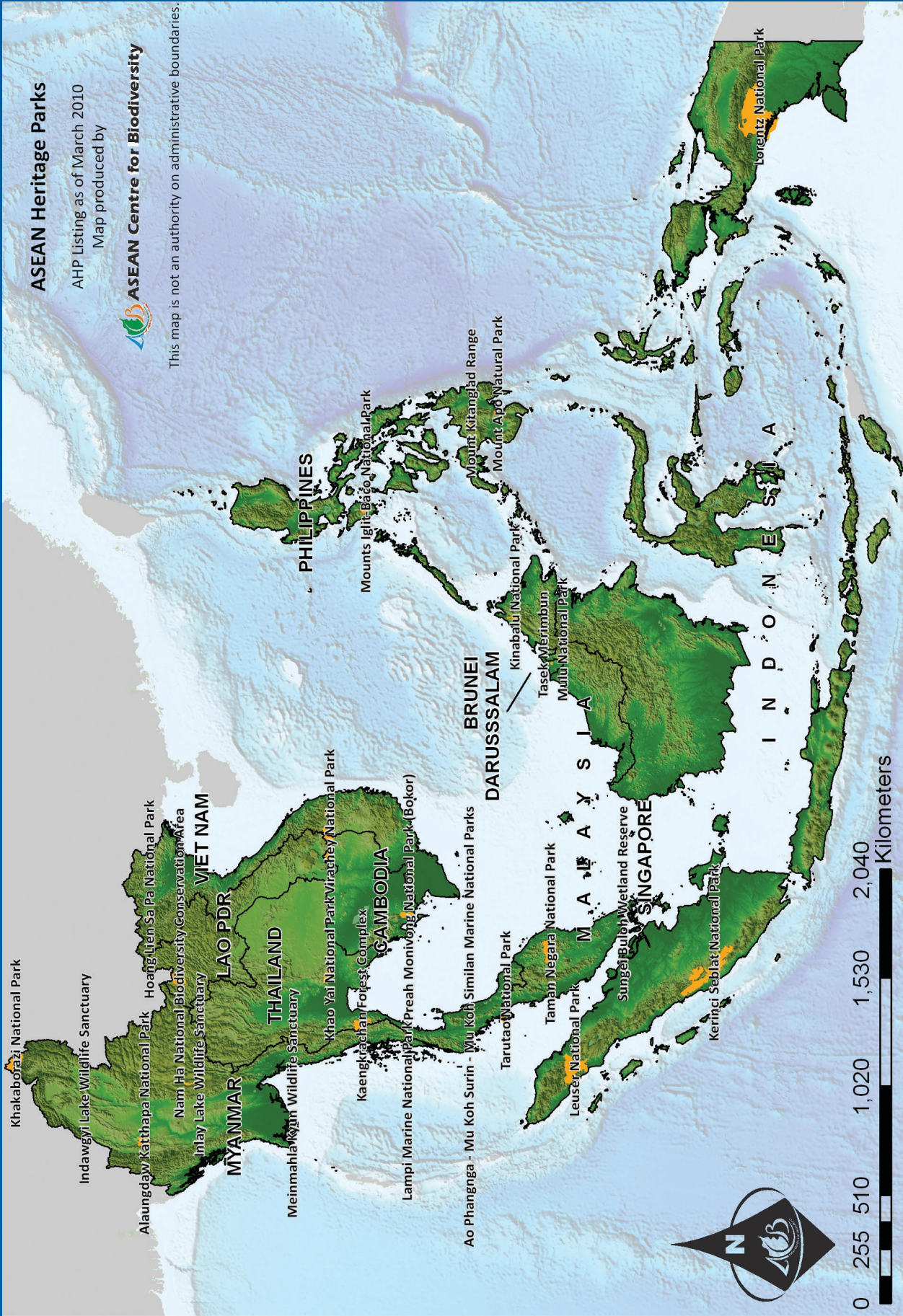
The 3rd AHP Conference proved to be a welcome opportunity for the AHP managers to discuss common issues and problems, and learn from the experiences of others. There was renewed vigor in the community of AHP managers, since this also served as a chance to renew old ties, and strengthen or build new partnerships. There was a sense that the AHPs are really part of a network of protected areas, and the managers expressed optimism for more collaboration with AHPs in their respective countries, and in the region.

ASEAN Heritage Parks

AHP Listing as of March 2010
Map produced by



This map is not an authority on administrative boundaries.



PROFILES:

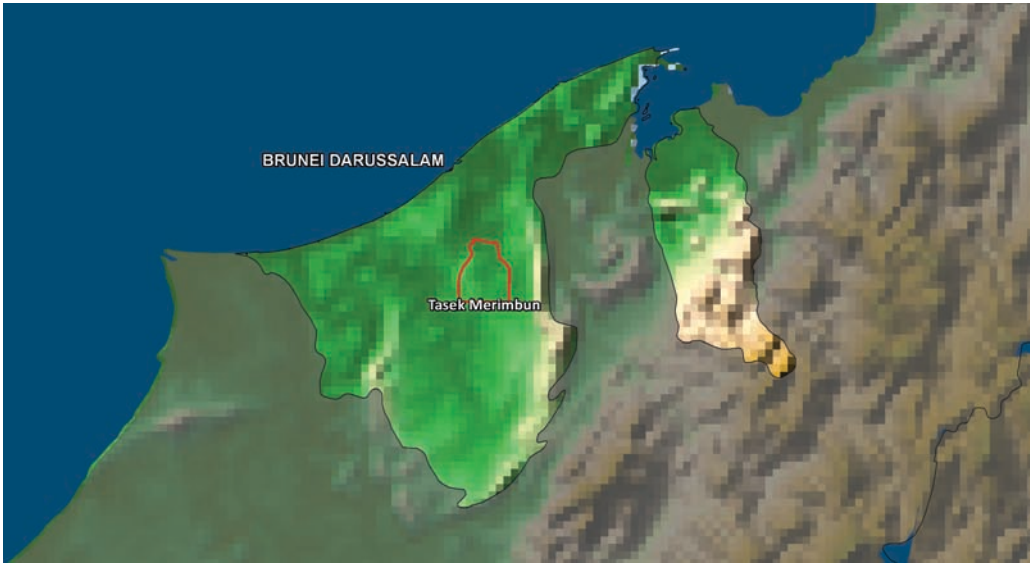
**ASEAN
MEMBER
STATES
AND
ASEAN
HERITAGE
PARKS**





BRUNEI DARUSSALAM





The Abode of Peace

Brunei Darussalam is located northwest of the island of Borneo, and shares a common border with Sarawak, one of the two eastern states of Malaysia. The western part of Brunei, comprising Brunei/Muara, Tutong and Belait districts, is predominantly hilly lowland, with the elevation reaching up to 100 meters, although areas on the Sarawak border rise to over 300 meters. The eastern part of the State, comprising Temburong district, is predominantly rugged mountain terrain that rises up to 1,850 meters on Bukit Pagon. A wide and swampy plain can be found close to the coast.

The total land area of Brunei is 567,500 hectares (5,675 square kilometers), with a coastline of about 161 kilometers along the South China Sea. Although occupying less than one percent of Borneo's land area, Brunei is the only sovereign country on the island, which it shares with the Indonesian provinces of West, East, South and Central Kalimantan and the Malaysian states of Sabah and Sarawak.

Like its surrounding neighbors, Brunei has a tropical climate, which is characterized by constant temperature and hu-

midity and high rainfall. Rainfall in the country normally ranges from about 2,800 millimeters annually in the lowland areas to over 3,800 millimeters in many parts of the interior. Temperatures are high throughout the year and annual extreme range of temperature is 23 degrees centigrade to 32 degrees centigrade.

Habitats and biological resources

Of the total land area of Brunei, 78 percent is forested, giving rise to forestry as one of the State's major activities. The

country's forests are categorized according to their primary function, namely: protection, production, recreational, conservation, and national parks. As such, the State of Brunei may be classified ecologically under the following forest types: mangrove, freshwater swamp, peat swamps, mixed dipterocarps, kerangas and montane.

Unspoiled and abundant mangroves protect myriad forms of plant and animal life unique to Borneo. This forest type covers about four percent of the country and is found at sea level and characteristically inundated at high tides by brackish water. The mangroves are classified according to species composition, namely: bakau minyak (*Rhizophora apiculata*) and bakau kurap (*Rhizophora mucronata*); nyireh bunga (*Xylocarpus granatum*); linggadai (*Bruguiera gymnorrhiza*), nipah (*Nypa fruticans*), nipah-dungun (*Heritiera globosa*), pedada (*Sonneratia caseolaris*), and nibong (*Oncosperma tigillarium*). The nyireh bunga forest occurs in association with bakau minyak and pure stands can be found in the Selirong and the Labu Reserves.

Covering almost three percent of all forests, the freshwater swamp occurs only in the Belait and Tutong Districts. Typical trees found in this forest include two kawang species (*Shorea macrophylla* and *S. semins*) and valuable timber species such as belian (*Eusideroxylon zwageri*) and merabau (*Intsia palembanica*).

The peat swamps are the second most dominant forest type (next to mixed dipterocarp forest), occupying about 20 percent of all forests in the country. These swamps are found adjacent to the main rivers, and include endemic and economically important dipterocarp species such as the light red meranti (*Shorea albida*) and the *Dryobalanops rappa*.

Lying immediately above the peat swamp forests and extending to elevations above 1,300 meters, the mixed dipterocarp

Number of species recorded	
Amphibians	62
Birds	495
Butterflies	480
Dragonflies	9
Mammals	235
Plants	3,188
Reptiles	57
Freshwater Fish	80
Total	4,606

Some endemic species of Brunei

- Proboscis monkey (*Nasalis larvatus*)
- Tufted ground squirrel (*Rheithrosciurus macrotis*)
- *Dryobalanops rappa*

forests provide the largest cover (at least 41 percent), and include species of meranti (*Shorea*) and urat mata (*Parashorea*), and non-dipterocarp trees such as *Koompassia malaccensis*, *Alseodaphne bancana*, and *Melanorrhoea macrocarpa*.

The kerangas forest comprises the following sub-types: Belait Pleistocene forest, Tolong (Belait Quaternary), Kapur Paya Forest, Ru Forest (Marine White Sand Terraces), and Mountain kerangas. Among the species found in these forests are *Dipterocarpus borneensis*, ru (*Casuarina nobilis*), *Dryobalanops rappa*, and *Agathis borneensis*.

The montane forests—found only in Ulu Temburong adjacent to the state border—are confined to higher elevations, from 760 meters up to 1,800 meters. These forests protect characteristic flora such as the *Entomophobia kinabaluensis* ground orchid species, the *Kinabaluclhoa nebulensis* bamboo species as well as many *Nepenthes* insectivorous pitcher plant species.

Mammals active during the daytime include tree shrews, squirrels, and monkeys and apes, while the shrew, moon-

rat, pangolin, civet, wildcat, flying lemur, and flying squirrel are active at night. There are five large terrestrial herbivorous mammal species: the bearded pig, two mouse deer species, barking deer, and sambar deer. The clouded leopard is the country's largest wildcat species. A great majority of bird species are exclusively forest dwellers. All eight Bornean species of the larger birds—eagles, pheasants, and hornbills—occur in the country. The most evident of all bird groups are the brownish babblers, which feed on insects in the lower levels of the forest canopy. The Bornean bristlehead (*Pityriasis gymnocephala*), a noisy black bird with a red and orange head, is found in the peat swamp and kerangas forests. The country also has two species of crocodiles—estuarine (*Crocodylus porosus*) and false gharial (*Tomistoma schlegelii*).

For centuries, the resources of its rivers, Brunei Bay, and the coastal waters have provided a substantial part of the protein requirements of its people. With its coastal waters very rich in aquatic life, aquaculture has become a promising industry.

Ecological and cultural tourism activities

The rich and diverse pristine rainforest and unspoiled coral reef ecosystems, mangrove-covered islands, white sand beaches and accessible nature reserves of the country offer visitors an array of ecotourism options. Visitors can walk under the rainforest canopy or stroll around the hauntingly beautiful lakeside walkways of Tasek Merimbun Heritage Park—the ASEAN Heritage Park of Brunei—or relax on the uncrowded turquoise shores of Muara beach. At Tasek Merimbun in Tutong District, visitors can join the different ethnic groups in celebrating the Adau Gayoh festival to celebrate the

Species in the 2004 IUCN Red List

Endangered

- Asian elephant (*Elephas maximus*)
- Banteng (*Bos javanicus*)
- Bornean treeshrew (*Tupaia longipes*)
- Bornean orangutan (*Pongo pygmaeus*)
- Otter civet (*Cynogale bennetti*)

Vulnerable

- Bay cat (*Catopuma badia*)
- Clouded leopard (*Neofelis nebulosa*)
- Dugong (*Dugong dugon*)
- Flat-headed cat (*Prionailurus planiceps*)
- Indian smooth-coated otter (*Lutrogale perspicillata*)
- Marbled cat (*Pardofelis marmorata*)
- Pig-tailed macaque (*Macaca nemestrina*)
- Proboscis monkey (*Nasalis larvatus*)

Threatened species (Critically endangered, endangered, and vulnerable)

Taxa	Number
Mammals	35
Birds	21
Reptiles	5
Amphibians	3
Fish	8
Plants	99
Total	171

spirit of unity and to uphold the ethnic groups' traditions and cultural identity, and express their gratitude for the good harvest.

The world-famous Ulu Temburong National Park and the Kuala Belalong Field Study Centre offer ecotourism and adventure activities. The longboat ride down a winding jungle river, surrounded on all sides by pristine rainforest, makes the journey as much an adventure as the destination itself. Furthermore, with Sabah, Sarawak and Kalimantan next door, visitors can spend weeks uncovering Borneo's magnificent natural beauty,



Hornbill

using Brunei's capital, Bandar Seri Begawan, as a gateway.

Protected area management and conservation programs

The Government of Brunei Darussalam has acted to conserve some 322,000 hectares as forest reserves. About 235,520 hectares (41 percent of the total land area) have already been gazetted as

Multilateral Environment Agreements (MEAs) ratified

Convention on the International Trade of Endangered Species - 1990
Convention on Biological Diversity – 2009

forest reserves, of which about 50,000 hectares have been allocated as national parks.

Other programs and activities include the following:

- Conservation Programme for Environmental Forests that involves the preservation of ecosystems, and the establishment of resource conservation and documentation centers;
- Forest Development Programme for Industrial Forests involving the silvicultural management of natural and man-made forests and dynamic forest management regimes; and the restoration/rehabilitation or greening of degraded lands in the country;
- Development Plan for recreational forests and national parks to promote ecotourism and scientific studies;
- Forestry Extension and Education Programme; and the
- National Forest Protection Plan Programme on the generation and transfer of forestry technology.

One of the important legislations enacted by the Government of Brunei is the Wildlife Protection Act of 1978 that provides for the conservation and protection of wildlife, and the establishment of wildlife sanctuaries in the country. The legal authority on wildlife is vested on the Department of Museums under the Ministry of Culture, Youth and Sports. On the other hand, the Wild Flora and Fauna Order 2007 serves as the wildlife national legislation under CITES, which provides for the protection of the wild flora and fauna in the country. Brunei Darussalam had become a party to CITES since 1990, with the Department of Agriculture serving as the National CITES Management Authority. ■

TASEK MERIMBUN HERITAGE PARK

The gateway to Brunei's past and culture

Every first of May, ethnic Dusuns gather in Tasek Merimbun to celebrate the annual Aduu Gayoh festival, which marks the end of the padi harvesting season, and to express their gratitude for the good harvest. The festival brings together not only the Dusuns but other ethnic groups and people from all walks of life from the Tutong District to celebrate the spirit of unity. This gathering is also an opportunity to uphold the ethnic group's traditions and cultural identity (Brunei Times, 2009).





Tasek Merimbun is indeed both a natural and cultural heritage of Brunei. Thus, it is now being referred to as the gateway to Brunei's past and culture.

Tasek Merimbun is a wildlife sanctuary, conservation spot for flora and fauna, recreational center, and a venue for research and education. The wildlife sanctuary is the first site to be declared a national park, and the biggest wildlife sanctuary among three others in Brunei Darussalam: Pulau Berembang (721 hectares), Pulau Siarau (393 hectares), and Pulau Pulong Pulong (two hectares).

The 7,800-hectare Heritage Park is located about 32 kilometers south of the Tutong-Kuala Belait coastal highway on the west bank of Sungai Tutong in Mukim Rambai, Tutong District. The Park encloses catchments of small rivers feeding into the Tasek Merimbun Lake, Brunei's largest lake that is shaped almost like the letter S.

Biological resources

A general census of wildlife conducted since 1983 has led to the astonishing discovery and first rare record of the white-collared fruit bat, which is found only in Tasek Merimbun. The discovery of other rare species and the richness of mammals and bird species in the Park have led to the declaration of Tasek Merimbun as an ASEAN Heritage Park (Nyawa, 2007).

Biological richness of Tasek Merimbun Heritage Park

- 50 species of freshwater fish
- 83 species of mammals
- 200 species of birds
- 23 species of amphibians
- 31 species of reptiles
- 181 species of Lepidoptera
- 58 species of dragons and damselflies
- 162 species of ants
- 14 species of stingless bees
- 800 species of plants

Fauna

More than 90 percent of the Park has yet to be studied. Current records indicate 50 species of freshwater fish, 83 species of mammals, 200 species of birds, 23 species of amphibians, 31 species of reptiles, 181 species of *Lepidoptera*, 58 species of dragon and damselflies, 162 species of ants, 14 species of stingless bees, and numerous other insect species (Brunei Darussalam Country Report to 3rd AHP Conference, 2010). One endemic species of damselfly, the *Euphaea ameeke*, was recently discovered in Tasek Merimbun. Both the biggest (*Tetracanthagyna plagiata*) and the smallest (*Nannophya pygmaea*) species of dragonflies from Borneo Island have also been recorded in the Park (Nyawa, 2007).

Tasek Merimbun is also one of Brunei's seven Important Bird Areas (IBAs) listed by BirdLife International. IBAs are critical sites for the conservation of the world's birds (BirdLife International and IUCN-WCPA Southeast Asia, 2007).

The Heritage Park is also home to a number of rare and endangered species, including all eight species of hornbills in Borneo, clouded leopard, slow loris, tarsier, sun bear, great argus pheasant, Bornean gibbon, white-collared bat, white-bellied sea eagle, Vordermann's flying squirrel, yellow-throated marten, Malay weasel, otter civet, banded palm civet, banded linsang, reticulated python, and estuarine crocodile. Butterflies of the genera *Trogonoptera* and *Troides*, which are listed in CITES, are also found in the Park (Nyawa, 2007).

Table 1 shows some of the wondrous species in Tasek Merimbun recorded during a survey conducted in 2003 by Dr. Masatoshi Yasuda of the Forestry and Forest Products Research Institute in Japan.

Table 1. List of mammal species in Tasek Merimbun Heritage Park (2003)

Scientific name	English name	Malay name
<i>Echinosorex gymnura</i>	Moonrat	Tikus bulan
<i>Tupaia glis</i>	Common treeshrew	Sangtabok (Cencurut pokok)
<i>Tupaia picta</i>	Painted treeshrew	Sangtabok (Cencurut pokok)
<i>Tupaia</i> sp.	Unknown treeshrew	Sangtabok (Cencurut pokok)
<i>Cynocephalus variegates</i>	Colugo	
<i>Nycticebus coucang</i>	Slow loris	Kukang (Kongkang)
<i>Tarsius bancanus</i>	Western tarsier	Tempelileh (Kera hantu)
<i>Presbytis rubicund</i>	Maroon langur	Maragang
<i>Presbytis hosei</i>	Hose's langur	Kikok kelabu
<i>Presbytis cristata</i>	Silvered langur	
<i>Macaca fascicularis</i>	Long-tailed macaque	Ambok
<i>Macaca nemestrina</i>	Pig-tailed macaque	Berok
<i>Hylobates muelleri</i>	Bornean gibbon	Wa wa
<i>Manis javanica</i>	Pangolin	Tenggiling
<i>Ratufa affinis</i>	Giant squirrel	Tengkerawak puteh-kuning
<i>Callosciurus prevostii</i>	Prevost's squirrel	Tupai
<i>Callosciurus notatus</i>	Plantain squirrel	Tupai
<i>Exilisciurus exilis</i>	Plain pigmy squirrel	Tupai
<i>Rheithrosciurus macrotis</i>	Tufted ground squirrel	Tupai
<i>Petaurillus hosei</i>	Hose's pigmy flying squirrel	Tupai terbang
<i>Iomys horsfieldi</i>	Horsefield's flying squirrel	Tupai terbang
<i>Petinomys genibarbis</i>	Whiskered flying squirrel	Tupai terbang
<i>Petinomys setosus</i>	Temminck's flying squirrel	Tupai terbang
<i>Petinomys vordermanni</i>	Vordermann's flying squirrel	Tupai terbang
<i>Rattus rattus</i>	House rat	Tikus rumah
<i>Rattus exulans</i>	Polynesian rat	Tikus
<i>Sundamys mulleri</i>	Muller's rat	Tikus
<i>Maxomys rajah</i>	Brown spiny rat	Tikus
<i>Maxomys whiteheadii</i>	Whitehead's rat	Tikus
<i>Leopoldamys sabanus</i>	Long-tailed giant rat	Tikus
<i>Niviventer cremoriventer</i>	Dark-tailed tree rat	Tikus
<i>Hystrix brachyuran</i>	Common porcupine	Landak Raya
<i>Trichys fasciculata</i>	Long-tailed porcupine	Landak
<i>Thecurus crassispinis</i>	Thick-spined porcupine	Landak
<i>Helarctos malayanus</i>	Sun bear	Beruang madu
<i>Mustela nudipes</i>	Malay weasel	Musang
<i>Lutra</i> sp.	Otter	Memberang
<i>Viverra zangalunga</i>	Malay civet	Musang

Continued next page

Scientific name	English name	Malay name
<i>Prionodon linsang</i>	Banded linsang	Linsang
<i>Paradoxurus hermaphrodites</i>	Common palm civet	Musang pulut
<i>Arctogalidia trivirgata</i>	Small-toothed palm civet	
<i>Arctictis binturong</i>	Binturong	Binturong
<i>Hemigalus derbyanus</i>	Banded palm civet	Musang belang
<i>Cynogale bennettii</i>	Otter-civet	Muang memerang
<i>Herpestes brachyurus</i>	Short-tailed mongoose	Bambun ekor pendek
<i>Felis marmorata</i>	Marbled cat	Kuching dahan
<i>Felis planiceps</i>	Flat-headed cat	Kuching hutan
<i>Felis bengalensis</i>	Leopard cat	Kuching batu
<i>Sus barbatus</i>	Bearded pig	Babi hutan
<i>Tragulus javanicus</i>	Lesser mouse deer	Kancil
<i>Tragulus napu</i>	Greater mouse deer	Napu
<i>Muntiacus muntjac</i>	Bornean red muntjac	Kijang
<i>Muntiacus atherodes</i>	Bornean yellow muntjac	Kijang
<i>Cervus unicolor</i>	Sambar deer	Rusa

Source: Yasuda, Masatoshi (<http://cse.ffpri.affrc.go.jp/myasuda/merimbun/>)



Proboscis monkey



Nepenthes bicalcarata

Flora

At least 800 species of plants have been recorded on just four one-hectare study plots in the 7,800-hectare Park. The number could increase to thousands after more studies are conducted on the whole area. The Park has four species of pitcher

plants (*Nepenthes ampullaria*, *N. mirabilis*, *N. bicalcarata* and *N. gracilis*), and one species each of agar wood or gaharu (*Aquilaria beccariana*) and of ramin (*Gonystylus maingayi*). Agar wood is a native tree species endangered by commercial poaching, and is used to manufacture in-



A gateway to Brunei's history

Archaeological studies that began in 1988 in the Park have unearthed rich archaeological remains such as Chinese and European ceramic, bronze and brass wares. Based on their findings, the researchers made several assumptions that included the following:

- Tasek Merimbun is among the earliest settlements in the interior of Tutong District. Chinese ceramics collected at several sites within the Park, such as at Pulau Labi-Labi and Pulau Jelundong, date to as early as the 15th century of the Ming dynasty.
- The earliest inhabitants used two types of burial practices: jar and coffin burials. The Jar burial site at Pulau Jelundong, a small island west of Tasek Merimbun, is one of the earliest burial sites and among the oldest burial practices, perhaps dating to the 15th to the late 19th centuries. The coffin burial site located at Nung Gunang, east of Tasek Merimbun is dated early 20th century. A large majority of Dusun animists continue to bury their dead in the cemetery.
- The unearthed ceramics and Brunei's Malay traditional bronze and brass objects suggest the existence of a barter trade between Tasek Merimbun and the coastal communities, in particular the Tutong and Brunei Malays. Tasek Merimbun directly links with the outside regions through its inland river systems such as Sungai Merimbun, Sungai Rambai and Sungai Tutong; the latter directly flows into the South China Sea.
- The lake and river ecosystems have provided the inhabitants of Tasek Merimbun their daily needs and requirements. These ecosystems have been used for fishing and other domestic activities. From the forests, the locals obtain food, medicines and materials for building houses and making handicrafts. This tradition continues to this day, but on a smaller scale.

cense and perfume (Brunei Times, 2008). Another native plant is called purun (*Lepironia articulate*), which abundantly grows wild in the lake. Its long stalk is so pliable that it sways so beautifully, creating natural patterns of movement, especially during low tide.

Purun is one of the raw materials used by the Dusuns for their handicrafts. Because of its uniqueness, purun was selected for the logo of the Park. One of the Park buildings is also named Balai Purun or Purun Hall.

Facilities and other attractions

Exhibition hall. This spacious building is perched atop a hill to provide visitors with a spectacular and panoramic view of the lake and its environs. Large folding doors open onto a wrap-around veranda from where one can simply enjoy the sweeping and impressive scenery. Aquarium tanks displaying the fishes and plants in the Park and associated waterways demonstrate the species richness of freshwater fishes.

The administrative office and workshop rooms are housed in the building to serve as coordinating body between the Park staff and the public.

Dusun house. Located close to the Exhibition Hall, this sturdy, traditional house is a two-family structure built entirely with materials from the forest, and without any nails. Over 42 species of forest products were collected and used as supports, walls, thatches and ties. The house evokes the traditional lifestyle of the Dusuns, specially their handicraft skills. Various traditional crops have been planted around the house. Kitchen gardens at the back of the house provide daily cooking ingredients. Handicrafts and forest fruit seedlings are also sold. Illustrated booklets that describe and explain the plants used, names for the

parts of the house, and furnishings are available. Visitors and researchers may stay at this house.

Villagers who helped build the house sometimes spend time during the weekends to provide information to visitors about the house and its contents.

Nature trail. The trail is accessible from several points along the peninsular land that includes the area of the Park headquarters. Several trail markers have been placed along the trail. Shelters evenly spaced along the trail afford protection from rain and encourage visitors to prolong their stay in natural surroundings. An illustrated booklet is available for those who want to take a self-guided tour.

Forest camp sites. There are three forest campsites: two along Sungai Meluncur and one at Sungai Merimbun. Each camp has separate shelters for sleeping, working and cooking. A full complement of camping equipment is available for use by visiting researchers.

Lakeside gazebos. Shelters have been constructed along the trail leading from the multi-purpose hall going to Kampong Merimbun. This short trail that goes



Lakeside gazebo

Strides in Protected Area Management

Park management has incorporated environmental and cultural features of Tasek Merimbun in its public awareness program. The Natural History Exhibition Center includes exhibits of the biodiversity resources in the Park, as well as products of local communities for sale. Discoveries from archeological sites in the area that go back as early as the 15th century during the Ming Dynasty are featured exhibits. There is also an Ethnography Section highlighting the Dusun ethnic group. The Dusun are also featured in a video presentation shown to all visitors.

Nature Interpretation Trails have been established to support the Park's environmental awareness program. There are two nature interpretation trails with information boards, directional signs and trail markers every 25 meters. Facilities include a lookout area for the lake and wetland biodiversity resources, as well as butterfly and damselfly stations. Trees along the trail are identified.

As a wildlife sanctuary, the Park provides a great opportunity for scientific research, particularly on biodiversity conservation. Camera traps have been installed to monitor wildlife. Priority species for research include the proboscis monkey, nepenthes and agar wood. Three books on Tasek Merimbun have been published, one of which focuses on specimen data and collection. International researchers especially from

Queen Mary University of London often conduct their studies in the Park. Pulau Jelundong, which is one of the archaeological sites in the Park, is being used as a release area for wildlife species listed in the national Wildlife Protection Act, IUCN Red List and CITES.

There is constant capacity building activities for staff. Training courses have focused on species identification, use of camera traps for wildlife monitoring and establishment of the natural history exhibition.

Park management also encourages local community participation especially in awareness and outreach programs. Local people are engaged as tour guides as well as to entertain visitors with their traditional dances, and enlighten visitors with their knowledge on biodiversity values. The Park offers a number of activities that visitors can engage in such as lake cruising, handicraft making, paddy planting, fruit trees planting and harvesting, and gathering of traditional medicines.



Students learn the art of making handicrafts.



Cruising the lake is a popular activity.



through the woodland, with an open and well-manicured understorey, is excellent for families with small children.

Walkway to Pulau Jeludong. Made of wood from the forest, the walkway was funded and constructed by the villagers themselves. Admission rates are charged for those who use the walkway. This hauntingly beautiful lakeside walkway of Tasek Merimbun is also a perfect place for a stroll.

Environment-friendly boat rides.

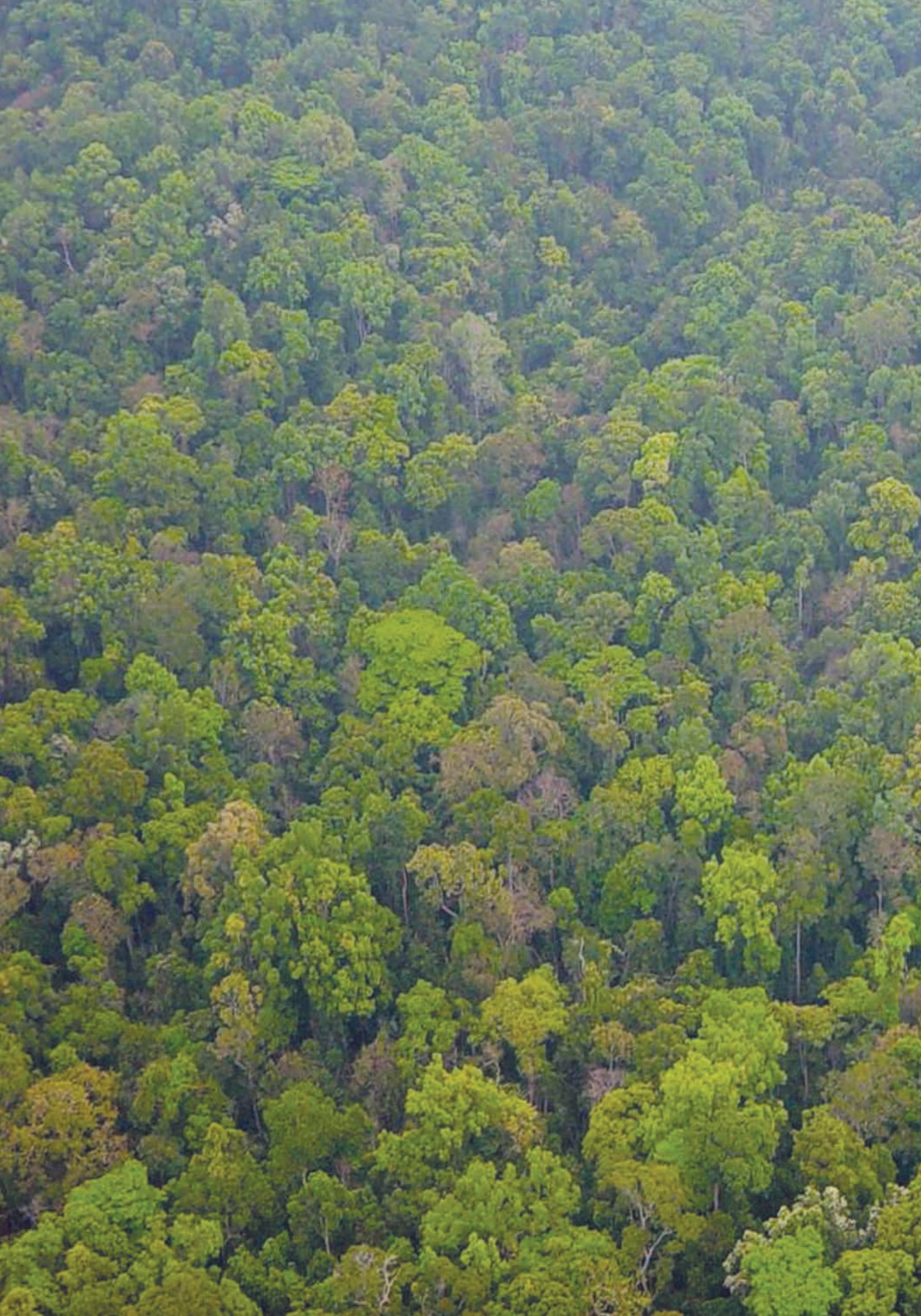
Row boats provide a healthy recreational activity for visitors who would like to paddle in the lake close to the headquarters. Electric-powered boats would be the only viable transport to take visitors for further scenic rides in the eastern lobe of the lake, and along the rivers. Besides not polluting the aquatic environment, the boats provide a quiet ride, enabling passengers to hear the sounds of nature. The boats are designed to be slow movers so as not to disturb the aquatic vegetation.

Laboratory building. The Laboratory is divided into wet and dry areas and has a separate office for researchers to process data. The back porch provides a large open space for outdoor activities.

Guest quarters for researchers. This building has four double bedrooms for a maximum of eight persons, two bathrooms, a large living room, a dining and cooking area, and laundry facilities. Each bedroom has ample storage space for personal belongings, and a wide covered veranda.

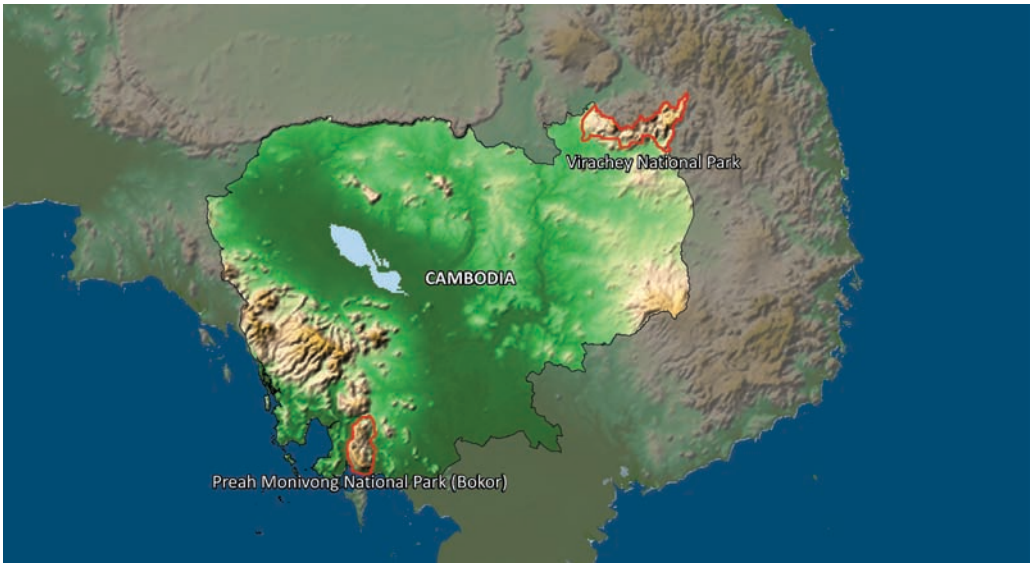
Multi-purpose hall. Known as Balai Purun, this building is intended for varied uses. One can view the natural beauty of the Park from the spacious veranda around the building.

Surau. A Surau (prayer room) is provided close to the car park area. ■





CAMBODIA



Home of the Angkor Wat

Cambodia is a small country located in Southeast Asia and shares borders with Viet Nam (east), Thailand (west) and Lao PDR (north). It spans 181,035 square kilometers (FFI 2005) or 18,103,500 hectares. The central part of the country is generally a low-lying alluvial plain. Southeast of the plain lies the delta of the Mekong River while eastward of the plain are ranges of undulating hills that separate Cambodia from Viet Nam. To the southwest, the Chuor Phnum Krâvanh mountain range fringes the plain and forms a physical barrier along the country's coast. Cambodia's highest peak, Phnom Aural (1,771 meters), is situated in Phnom Aural Wildlife Sanctuary and rises in the eastern part of this range. To the north, the Chuor Phnum Dangrek mountain range separates Cambodia from Thailand.

Cambodia's most important river is the Mekong, the longest river in Southeast Asia and the 10th largest in the world. The Mekong flows from north to south through Cambodia and is navigable for much of its course. Cambodia's principal freshwater lake, the Tonle Sap (Great Lake), is the largest in Southeast Asia and

one of the richest sources of freshwater fish in the world. The annual inland fish catch in Cambodia is estimated between 130,000 to 682,000 tons.

Habitats

Cambodia has 23 protected areas designated by Royal Decree on 01 Novem-

Table 1. Major ecosystems under the current national protected areas system

Management category	Number	Main ecosystem coverage	Area (hectares)	IUCN category
<i>Protected area system under the Royal Decree of November 1993</i>				
National parks	7	Lowland evergreen forest, coastal forest, mangrove, <i>Dacrydium/Podocarpus</i> , swamp forest, coral reef and sea grass	742,250	II, IV
Wildlife sanctuary	10	Evergreen forest, mangrove, coral reef	1,891,271	II, IV
Protected Landscape	3	Lowland evergreen forest	97,000	V
Multiple-use area	3	Flooded forest, mangrove, coastal wetland	403,950	VI
<i>Forest protected areas</i>				
Protection forest	6	Lowland evergreen forest and wetlands	1,490,500	II, IV
<i>Aquatic conservation areas</i>				
Fish sanctuary	8	Inland wetland	23,544	II, V

ber 1993, covering 3,134,471 hectares or about 18 percent of the country, under the authority of the Ministry of Environment. The Ministry of Agriculture, Forestry and Fisheries, through its Forestry Administration, had designated 10 additional protected forests covering 1,490,500 hectares (Cambodia Forestry Statistics 2004) and through its Fisheries Administration, eight fish sanctuaries.

Under its protected area system, Cambodia has seven national parks, covering 742,250 hectares, 10 wildlife sanctuaries (1,891,271 hectares), three protected landscapes (97,000 hectares), three multiple-use areas (403,950 hectares), 10 protected forests (1,490,500 hectares) and eight fish sanctuaries (23,544 hectares).

Community Protected Areas

The government has also established Community Protected Areas (CPAs)—now totalling 84 (2009 data)—to offer better protection for protected areas through the active participation of local communities. These communities are deeply involved in the planning and decision-making process of protected area management, so as to ensure their access rights and sustainable de-

velopment of natural resources to improve their livelihoods. Two CPAs are part of the Preah Monivong (Bokor) National Park, namely: the Prek Thnout community protected area in the Teuk Chhu district, and the Ou Touch community protected area, Kampot City.

Wildlife

The country has 2,308 plant species belonging to 852 genera in 164 families such as seven genera and 14 species of Gymnosperm; 219 genera and 488 species of Monocotyledons; and 626 genera and 1,806 species of Dicotyledons. While a complete and systematic study has yet to be done in the country, a full list is expected to exceed 3,000 species, with at least 700 species expected to be described as new in the country (Aswell 1977, as cited in the 4th National Report of Cambodia). In 2000, the World Conservation Monitoring Centre estimated a total of 8,260 species, of which 10 percent are endemic.

Surveys conducted in 1991 and 2001 have respectively recorded 57 and 125, of taxa of aquatic macro invertebrate, including *Insecta*, *Oligochaeta*, *Mollusca*, and *Crustacea*, and have described 28 species

of amphibians and reptiles. Around 874 fish species have also been recorded, of which 490 are freshwater species from 64 families; 410 are saltwater from 83 families; 22 are threatened; one is endemic; and 13 are introduced species (FishBase 2009, as cited in the 4th National Report of Cambodia).

The country's community wildlife conservation program monitored monthly the tigers, elephants and other large mammals in the most important regions from 2000 to mid-2005. Some important findings are the following:

- Kouprey (*Bos sauveli*) is most likely extinct since there has been no confirmed sighting since 1980.
- Wild water buffalos (*Bubalus bubalis*) are likely feral rather than truly wild stock, but their conservation importance is still quite high.
- Khiting Vor (*Pseudonovibos spiralis*) appears to have never

existed, but every set of horns in every collection has yet to be tested for DNA.

- Numerous wildlife surveys throughout Cambodia since 2000 have not reported any trace of the Javan Rhinoceros (*Rhinoceros sondaicus*) although it was reportedly present, at least until the 1930s.
- Eld's deer (*Cervus eldii*) population has been confirmed from multiple locations. The deer's conservation potential for long-term survival and expansion of its population is high.
- A population of nine tigers and 20-30 elephants estimated in patrol areas in Mondulkiri, and 10-20 tigers and 15-25 elephants may be present in each of the two regions. Around 116 Asian elephants have also been reported in the Seima Biodiversity Conservation Area. Tiger prey such as wild pig,



Gaur

Table 2. Number of known species in Cambodia*

Taxon	Total Number of Species	Under IUCN Red List
Mammal	123	39
Bird	545	36
Reptile	88	13
Vascular plant	2,308	38
Fish	874	-
Hard coral	24	-
Soft coral	14	-
Sea grass	10	-
Amphibian	63	12

*Source: 4th National Report of Cambodia to the Convention on Biological Diversity

muntjac, sambar, gaur and banteng are all commonly recorded and collectively comprise the regional prey base.

Protected area management and conservation programs

The Ministry of Environment shares the primary responsibility for conserving biodiversity and ensuring the sustainable use of biological resources with other sectoral departments such as the Ministry of Agriculture, Forestry and Fisheries; Ministry of Land Management, Urban Planning and Construction; Ministry of Rural

Multilateral Environment Agreements (MEAS) Ratified

- World Heritage Convention — 1991
- Convention on Biological Diversity — 1995
- Convention on International Trade of Endangered Species — 1997
- Convention on Wetlands of International Importance — 1999
- Cartagena Protocol on Bio-Safety — 2003

Development and Ministry of Water Resources and Meteorology. Provincial and urban government, private property owners, businesses, local and indigenous communities, international conservation organizations, university and research institutions and other groups also play an essential role in conserving biodiversity and sustainably using biological resources.

The government policy framework governing Cambodia's implementation of the CBD provisions is incorporated in the following documents:

- The Government Rectangular Strategy (2009-2013)
- The National Strategic Development Plan (2006-2010)
- The National Environmental Action Plan (1998-2002)
- The National Biodiversity Strategy and Action Plan (2002)
- The Cambodia Millennium Development Goals (2001)

The area of land for conservation has increased from 18 percent to more than 26.1 percent of the total land area. The number does not include some fish sanctuaries and some important bird areas. The Government has already designated three Ramsar sites, three core areas of Biosphere Reserves and two World Heritage sites. At least nine more protected areas are also being studied and proposed for designation as World Heritage Sites.

Cambodia has also launched several projects to provide alternative livelihood opportunities to local communities and proposed at least three corridors that include the coastal-central Cardamom, northern plain in Preah Vihear, northeastern plain in Mondulhiri and several projects around Tonle Sap, all with the aim of reducing threats to biodiversity. ■



PREAH MONIVONG (BOKOR) NATIONAL PARK

Biodiversity amongst the mist and ruins

More popularly referred to as Bokor National Park, the Preah Monivong National Park was established by Royal Decree on 01 November 1993 and covers an area of 140,000 hectares (1,400 square kilometers) that span three southern provinces: Kampot, Kompong Spue and Preah Sihanouk. The area forms part of the Elephant Mountains, which are contiguous with the Cardamom Mountain range to the northeast. The southern boundary of the Park is located less than one kilometer from the coastline of the Gulf of Thailand. The northern boundary forms a seven-kilometer link to Kirirom National Park, separated only by the National Highway. Mt. Bokor, at 1,079 meters (3,540 feet), is the Park's highest point.

The Park was first accessed in 1916 and developed later as a famous altitude resort during the regime of the French Protectorate and Prince Norodom Sihanouk in the 1960s. Altitude ranges from 10 meters to 1,079 meters above sea level. The Park is the catchment area for Touk Chhou, a major river that flows from the north central forests to the southeast and down to Kampot town.

The abandoned French Hill Station of Bokor was established in 1922 at an altitude of 1,071 meters, and included the grand Bokor Palace Hotel as the centerpiece of the small community. The area was well known for its refreshing climate, views, and waterfalls. The Hill Station was very popular in the 1920s, but was abandoned after an assault by Vietnamese independence forces in the late 1940s and during the Khmer Rouge regime in the 1970s. It served as a strategic base for Vietnamese and Khmer Rouge forces during most of the last few decades, but is uninhabited now.

Climate

The climate in the area is tropical monsoon with two distinct seasons: dry and hot from November to May and cool

with heavy rainstorms from May to October. Winds are frequent and the annual rainfall is 1,813 millimeters. Temperatures on the plateau are six to 10 degrees cooler than on the coast, ranging from a low 10°C in July to a mean 21°C the rest of the year.

Habitats

The Park is hilly in the north and east with a plateau and escarpment in the west and southwest, which gives it a certain level of natural protection from encroachment. Bokor is predominantly covered with moist tropical evergreen forests but has a wide range of habitat types—from mangrove in the south where river estuaries join the Park to the sea, to dwarf montane on the top of a mountainous plateau. The plateau is 1,079 meters above sea level and abruptly ends in a steep cliff that falls to sea level just a few hundred meters from the sea. The plateau provides a spectacular view of the Cambodian coast.

Forest types include virgin lowland forest, dry dipterocarp and mixed deciduous in the north to predominately moist evergreen. A small montane forest zone is recognized on the highest points.

Strides in Protected Area Management

Management authorities at Preah Monivong (Bokor) National Park involve various stakeholders in conservation activities. The Department of National Parks of the General Department of Administration for Nature Conservation and Protection under the Ministry of Environment collaborates with non-governmental organizations and other relevant program agencies, local authorities (provincial, district and commune levels), local communities and other local organizations in the conduct of different activities within the Park. Local communities, in particular, provide a solid fence in protecting the natural resources. A portion of the Park has been placed under community control so that communities can benefit from conservation activities.



Wildlife

Inventory of the Park is still far from complete but the presence of large mammals like elephant, tiger, leopard, sun-bear, sambar deer, gaur and binturong has been confirmed in addition to an important population of pileated gibbon (*Hylobates pileatus*). Over 300 bird species are expected to be present. The globally threatened green peafowl and the chestnut-headed partridge have been sighted as have the blue-eared drongo, rufous-winged buzzard and three species of hornbill. The inventory also noted 11 species of amphibians and a variety of reptiles.

In 2005, some 34 different animal species were identified. Of the species identified, four are listed as endangered—Asian elephant, banteng, elongated tortoise, and tiger; eight as vulnerable; three as near threatened; and 16 as least concern. Wildlife species identified

Biological richness of Preah Monivong National Park

- Over 300 species of birds
- 11 species of amphibians

but only to the genus or family level include the bear, civet, buzzard, egret, cobra, hornbill, macaque, parrot, and squirrel.

A few years ago, species that were identified based on camera traps include the leopard cat, common palm civet, red muntjac, eastern porcupine, kalij pheasant and wild boar. Species that could only be identified to the genus level include a bear, a macaque, and a squirrel.

The Park's flora is rich and includes valuable examples of the flowering plant, *Burretiodendron hsienmu*. It also has several endemic flora. Its ferns and bogs



Porcupine



Sundew

are an unusual feature, and insectivorous sundew plants are also found.

Conservation issues

Although Bokor is sometimes considered as one of the country's best protected parks, it still faces constant threats from encroachment, tree cutting (using chainsaw) and poaching, as well as inadequate patrol equipment and funds.

Bokor has come under increasing pressure from landless migrants who have moved to the area and have become involved in many of the logging, rattan collection, encroachment and poaching incidents in and around the Park. Forest fires remain a problem in the drier forests on the north and on the south sides of the Park.

Park management and conservation activities

The Park has been receiving funding support from some organizations for

management activities such as protection, monitoring of wildlife and community outreach programs.

WildAid, a non-government organization dedicated to combating the illegal wildlife trade, has been working in partnership with Bokor Park staff and their government superiors since 2001. WildAid's Surviving Together team has worked with the Cambodian government to enforce Bokor's protected area status and to establish the Park as a national training center for staff from other protected areas across the country.

WildAid's rural development work in four high priority villages has resulted in successful mushroom farming programs. Mushroom farming is among WildAid's programs that aim to reduce the villages' dependence on the forest as well as to restore important water sources. The organization has also supported the construction of a local school.

In 2001, the Bokor Conservation Project (BCP) was initiated in cooperation with the Protected Areas Office, and the Department of Nature Conservation and Protection of the Ministry of Environment with the aim of reducing illegal poaching activities within the National Park. The BCP combines park protection, wildlife monitoring and community outreach to create a comprehensive and durable protection system that can be replicated elsewhere in Cambodia and Southeast Asia.

The Park also receives support from the PeunPa Foundation (now FREELAND Foundation), a member of the international organization, Wildlife Alliance. The Foundation works with the Cambodian Government, Bokor National Park staff and communities surrounding the Park in stopping poaching activities and giving locals a better chance of escaping poverty (ENN, 2008). ■

VIRACHEY NATIONAL PARK

A treasure trove of biodiversity and culture

Virachey National Park was created under the Royal Decree Concerning the Creation and Designation of Protected Areas, issued on 01 November 1993, and managed by the Ministry of Environment. The Park occupies 332,500 hectares (WDPA 2010, as cited in ACB ASEAN BISS) in the extreme northeast corner of Cambodia, adjacent to the borders of Lao PDR and Viet Nam. A high percentage of ethnic minority peoples live around the Park, which falls within the Taveng and Voeun Sai districts of Ratanakiri Province and the Siem Pang district of Stung Treng Province. The streams from the mountains of Virachey contribute significantly to the flow of the Mekong River.





The mission of the Virachey National Park is to conserve and sustainably manage the natural and cultural resources of the Park in partnership with local communities and other stakeholders for the benefit of the people of the local communities and Cambodia as a nation (Hong, 2008).

Habitats

The Park has diverse habitats and biological communities of international importance, and of transboundary potential. Dense semi-evergreen lowland and montane forest, upland savannah, bamboo thickets and occasional patches of mixed deciduous forest dominate the Park's vegetation. Grassland and scrubland formations are found in isolated areas as well as marshes.

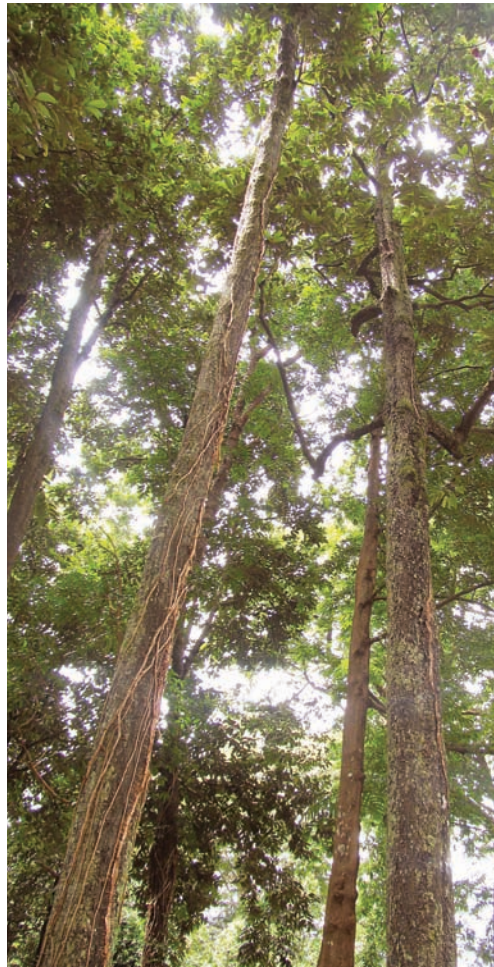
The most widespread habitat is its tropical evergreen rainforest, most of which is in pristine condition. Hills and low mountains dominate the topography of the area, with most areas lying higher than 400 meters above sea level, and elevations reaching over 1,500 meters above sea level. The Park's massif contains a range of mountains that reach over 1,400 meters in altitude to the east, and over 1,500 meters towards the Lao PDR border. These high elevation sites are far from any footpaths or villages. This remoteness may have protected the area from any encroachment, but it has also prevented biological assessments since it requires five to seven days of hiking through evergreen rainforest to reach these areas (CI, 2007).

Wildlife

The Park has rich and abundant plant and animal species that are representative of the border regions between Cambodia, Lao PDR and Viet Nam as a result of its large size, relative lack of disturbance and wide range of habitats.

Plant life

Lowland and hill evergreen forests cover a large area and are dominated by dipterocarp and tall tree species such as *Sindora*, *Lagerstroemia*, *Pterocarpus*, *Dalbergia*, *Diospyros* and *Sterculia*. Notable species include *Burretiodendron hsienmu* and malva nuts. Mixed forests with large clumps of tall bamboos and drier dipterocarp forests are also present. Dense evergreen forests grow along the rivers and streams, and some marshy areas are found in the southern parts. Secondary scrub and grass lands occur in areas that have been cleared for agriculture.



Diospyros sp.

Animal life

Surveys indicate that there may be as many as 156 vertebrate species, of which 43 are of international significance. These include globally threatened primates, elephants, tigers, gaur and banteng. Wildlife reports also indicate two kinds of leopard, wildcat, wild dogs, sambar and barking deer, sun bears, civets and wild pig.

As many as 100 bird species of international significance are known to occur in the Park. Virachey is one of only two areas in Cambodia known to support Germain's peacock pheasant, a restricted-range species. The Park also supports a number of globally threatened and near-threatened species, including Siamese fireback, red-collared woodpecker and great hornbill. Other birds include the typical hornbills, pigeons, eagles, broad-bills, magpies, woodpeckers, sunbirds and flower peckers. Elegant Siamese pheasants, shy pittas and jungle fowl feed on the forest floor.

In 2007, Conservation International (CI) led a team of local and international scientists on a biological survey of Virachey National Park. The preliminary report indicates that the area has extremely high diversity and abundance of species.

Mammals. The CI survey included direct observations of several large mammal species, such as sambar deer (*Cervus unicorn*), wild dog also known as dhole (*Cuon alpinus*), various species of wild cattle, and tracks and signs of other mammals (e.g., bears, clouded leopards). Bear signs indicated the presence of the Asiatic black bear and the

At least 15 wild dogs or dhole (*Cuon alpinus*) were observed in Virachey by the CI survey team. Some 2,500 dhole are estimated to remain in the wild (CI, 2007).

Globally threatened primates

- Slow loris
- Pygmy loris
- Pig-tailed macaque
- Long-tailed macaque
- Douc langur (*Pygathrix* sp.)
- Yellow-cheeked crested gibbon

Biodiversity richness of Virachey National Park

- 15 species of mammals
- 100 species of birds
- 26 species of amphibians
- 35 species of reptiles
- 37 species of fish
- 19 species of katydid
- 30 species of ants

Source: CI, 2007



Water dragon



Reticulated python

Malayan sun bear. Preliminary analyses of transect results indicate that Virachey National Park may have one of the highest densities of bears in Cambodia. The presence of globally threatened wildlife highlights the crucial importance of the Park. Along the rivers and hill streams, the survey team saw some tracks of otters that appear to be those of the Asian small-clawed otter (*Aonyx cinerea*), which is hunted for its fur. At least two species from the genus *Crocidura* are likely to represent new country records and may even be undescribed species (CI, 2007).

Amphibians and reptiles. Many of the species in the Park have never been recorded elsewhere in Cambodia, making the Park significantly important in terms of herpetological conservation for the country. Vulnerable species include the Asiatic softshell turtle (*Amyda cartilaginea*), Asian giant pond turtle (*Heosemys grandis*), and impressed tortoise (*Manouria impressa*). This rare tortoise lives in the montane forest and feeds predominantly on fungi.

Fishes. The 2007 CI survey recorded at least 37 fish species, of which at least 10 appear to be new records for Cambodia. Two of the fish specimens, *Acanthocobitis* sp. and *Devario* sp., are potentially undescribed species.

Probable new country records

- Horned tree lizard (*Acanthosaura* sp.)
- Keelback (snake) (*Amphiesma* sp.)
- Wolf snake (*Lycodon* sp.)
- Horned frog (*Ophryophryne* sp.)
- Bushfrog (*Philautus* sp.)
- Frog (*Taylorana* sp.)

Probable species new to science

- Slender-toed gecko (*Cryptodactylus* sp.)
- Water skink (*Tropidophorus* sp.)
- Bushfrog (*Leptolalax* sp.)

Ants. At least 30 ant species were present, in addition to many unidentified *Ponerinae*, *Myrmicinae*, and *Dolichoderinae* species. Most of the species will be new records for Cambodia, as only 22 species from six genera are currently listed for the country (CI 2007).

Conservation values of Virachey National Park

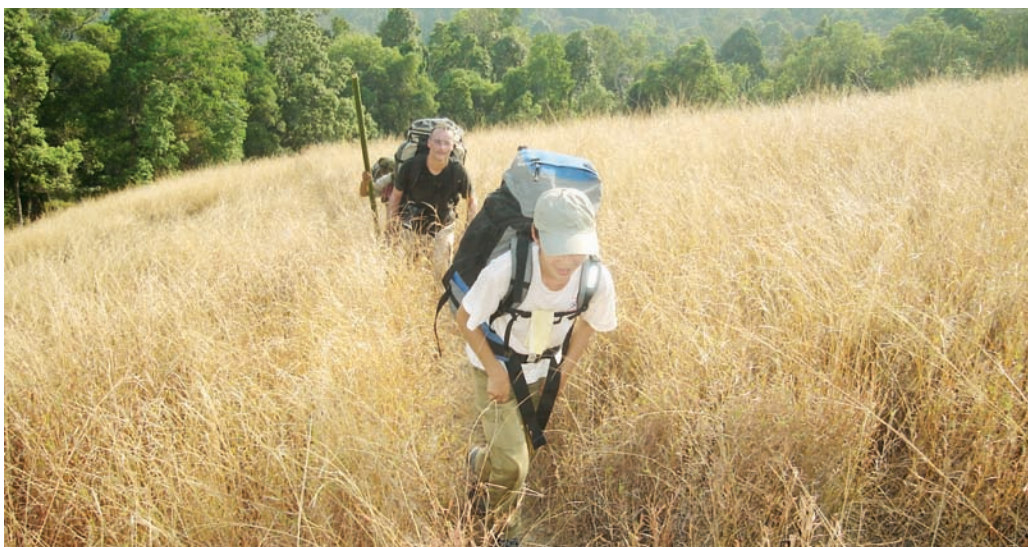
Watershed/catchment area values.

The water from the protected area flows into the Sesan and Sekong Rivers, and together with the Srepok River system (south of Virachey), accounts for about 20 percent of the Mekong River's flow. It provides water for the local residents for domestic uses and rice cultivation, as well as supports local fishery resources.

Biological values. The Park harbors about 75 percent of Cambodia's "humid medium elevation" habitats. Key animal species include elephant, tiger, gaur, banteng, sun bear, black bear and gibbons.

Aesthetic and tourist values. The remoteness and "wilderness feel" of the Park may be its biggest aesthetic and tourist values. Adventure tourism is one of the fastest growing sectors of the tourism industry and Virachey has a high potential of developing this type of ecotourism without negatively affecting the natural and cultural environment.

Cultural resource values. Most communities adjacent to Virachey National Park belong to ethnic groups. The major groups are Kreung, Kavet, Brao, Lao and Lun while the minority are Tampuen, Kachok, ethnic Chinese, ethnic Khmer and ethnic Vietnamese. Virachey has great importance to the local communities, especially the Brao and Kavet, whose former territory occupied areas of the present Virachey National Park. This is in part related to the values they associ-



Trekking in the park

ate with traditional food and medicines obtained from the forests, and the importance attached to the harvesting and consumption of bamboo. Other plants and animals are also used for cultural ceremonies and rites. Some areas are also culturally significant, and include sacred burial or ritual sites, or sites associated with natural products that are present in unusual quantity or quality.

Conservation issues

The area is threatened by a variety of pressures that include illegal logging and poaching. Clearing of forests for shifting cultivation is a minor problem as population density is still very low. For-

est fires along the southern borders and fires used to clear land for farming have spread into neighboring forests, degrading evergreen and mixed forest habitat. With its location along the border, the Park is faced with increasing threats of cross border poaching and smuggling of forest products.

Things to do

Aside from viewing the astounding landscapes and wildlife values of the Park, visitors can go bird watching, mountain climbing, and trekking. Tourists can also go boating on the river.

The best time to visit is from November to April. ■

Strides in Protected Area Management

Conserving and sustainably managing the Park's natural and cultural resources is high on the agenda of Park authorities. Ethnic minority peoples living around the Park and other local communities and stakeholders are involved in various management and conservation activities to ensure that the natural resources of Virachey National Park are nurtured and effectively conserved, and the cultural values are preserved.





INDONESIA





The Megabiodiversity Region of Southeast Asia

Indonesia is a vast archipelago of 17,000 islands, of which around 990 are permanently inhabited. The archipelago extends 5,150 kilometers east to west, between the Indian and Pacific Oceans in Southeast Asia. The largest islands are Sumatra, Java, Kalimantan (Indonesian Borneo), Sulawesi, and the Indonesian part of New Guinea (known as Papua or Irian Jaya). Many of the smaller islands belong to larger groups, like the Moluccas (Spice Islands). Islands are mountainous with dense rainforests, and some have active volcanoes.

The Indonesian Archipelago, which is located between the continents of Asia and Australia, and two oceans (Pacific and Indian), has a very rich and unique biodiversity with its complex interactions as a result of the upheaval of Asian and Australian plates. Based on the distribution of the world's biodiversity, Indonesia is often called the *mega biodiversity* region, i.e. one with the highest biodiversity in the world. Therefore, efforts to conserve biodiversity

in Indonesia are very important since many areas are centers of origin, centers of diversity and centers of endemism.

Indonesia is known for its unusually high levels of species richness and endemism. This may be because the country straddles two zoogeographic regions and three floristic Malesian regions, is located in the wet tropics, and has many islands and an extremely complex geological history.

Globally, Indonesia ranks:

- First in species richness for mammals (515 species, of which 36 percent is endemic)
- First for swallowtail butterflies (121 species, of which 44 percent is endemic)
- First for palm species (400 species)
- Fourth for reptiles (781 species)
- Fourth for primates (35 species)
- Fifth for birds (1,595 species, of which 28 percent is endemic)
- Sixth for amphibians (270 species)
- Seventh for flowering plants
- One of the world's centers of species diversity of hard corals and many groups of reef-associated flora and fauna.

Having 186,035,967 hectares of terrestrial area; 5.8 million square kilometers of water area, and an 81,000-kilometer coastal line, all teeming with diverse and endemic wildlife, Indonesia is ranked second after Brazil in terms of high biodiversity level. Indonesia is also one of the countries with rich genetic resources and high endemism level.

Habitats and biological resources

Geologically, the country's diverse terrestrial ecosystems encompasses snow and

tundra in the mountain peaks of Papua, tropical rainforest in Sumatera and Kalimantan, and savanna and shrubs in Nusa Tenggara. These categories are based on the vegetation type that is influenced by rainfall and temperature.

The size of forests designated as Provincial Forest and Water Area and TGHK (Forest Land Use by Consensus) until 2005 totalled 120.35 million hectares: (a) Conservation Forest (20.50 million hectares); (b) Preserved Forest (33.52 million hectares); (c) Limited Production Forest (23.06 million hectares); (d) Fixed Production Forest (35.19 million hectares); and (e) Conversable Production Forest (8.08 million hectares).

Forest ecosystems in Indonesia are also classified into two main groups: (a) tropical rainforest (dry land forest: lowland rain forest, mountain rain forest and conifer forest, and wetland forest); and (b) monsoonal tropical forest (savanna and grassland).

Karst is also one of the terrestrial ecosystems found in Java, Kalimantan and Sulawesi Islands. The karst landscape comprises limestone, dolomite, marble, salt



Karst landscape

stone and gypsum.

Other terrestrial ecosystems of the Indonesian Archipelago are the small islands, which in most cases have high endemic flora and fauna species, probably because of their isolation.

Indonesia has three important water ecosystem types that have been identified based on salinity level. These are mangrove ecosystem; coral reef ecosystem such as the beautiful coral reefs in Bunaken and Raja Ampat, and the sea grass ecosystem like that in Sunda Strait. The lakes, rivers, and swamps form part of the freshwater ecosystem. Based on the climate and composition of vegetation, the swamp vegetation in Indonesia is further classified into three—freshwater swamp; peat swamp, and monsoonal swamp.

There are seven major biogeographic regions in Indonesia, centered on the major islands and their surrounding seas. Conservation International considers Indonesia to be one of the 17 megadiverse countries, having two of the world's 25 hotspots, 18 World Wildlife Fund's Global 200 ecoregions and 24 of BirdLife International's Endemic Bird Areas. The country also is home to 10 percent or an estimated 25,000 species of the world's flowering plant species and ranks as one of the world's centers for agro-biodiversity of plant cultivars and domesticated livestock.

The 4th National Report of Indonesia to the CBD (2009) mentions that the country is among the top five in the world, in terms of species diversity. Of these species, 55 percent are endemic plants (Newman 1999, as cited in SoER Indonesia 2007). The results of a taxonomic assessment in 2007 by Research Centre for Biology, the Indonesian Institute of Sciences showed that 31,746 species of vascular plants have been recorded and described.

For fauna diversity, about 12 percent of mammals (515 species) of the world

Distribution and number of species of vascular plants (Angiosperms, Gymnosperms and Pteridophytes)

Islands	Number of species
Sumatera	8,538
Kalimantan	5,524
Java	4,364
Sulawesi	5,076
Moluccas	4,128
Papua	3,311
Lesser Sunda Islands	805
Total species	31,746

Source: LIPI 2008, National Taxonomy Assessment Report for Indonesia, Research Centre for Biology, LIPI

Recorded Species

- 10% or 25,000 flowering plant species of the world's plant species
- 12% of all mammal species
- 16% of all reptile and amphibian species
- 25% of all fish species
- 1,595 bird species
- One-eighth of the world's coral reefs
- More than 400 dipterocarp species

occur in Indonesia. About 16 percent of world reptiles (781 species) and 35 species of primate ranked Indonesia as fourth in the world. The 2007 data of the taxonomic assessment of Indonesia showed that bird diversity of Indonesia is 1,595 species. From this assessment, the highest bird diversity occurred in Papua with more than 650 species. Sumatera ranked second with about 600 species. For amphibians, the number of species has reached 363 species, of which 243 species are endemic (4th National Report of Indonesia, 2009).

Protected area management and conservation activities

Programs and activities aimed at protecting and preserving biodiversity are carried out through the establishment of biosphere reserves, wildlife sanctuaries,



Clown fish

national parks, ecotourism parks, forest parks and hunting parks. Coverage of these conservation areas has increased to 27.968 million hectares in 2007, compared to 7.628 million hectares in 1981. Indonesia now has 50 national parks covering 16.4 million hectares (including seven marine national parks) and 527 nature reserves and game reserves covering more or less 28.3 million hectares. Forests in Indonesia cover 88,495,000 hectares.

In terms of *ex-situ* conservation, there was an increase in the number of flora and fauna being bred in captivity—from 171 species in 2006 to 416 species in 2008. Of the captive breeding activities in 2008,

Multilateral Environment Agreements (MEA) ratified

- Convention on International Trade of Endangered Species – 1979
- World Heritage Convention – 1989
- Convention on Wetlands of International Importance (Ramsar) – 1992
- Convention on Biological Diversity – 1994
- Cartagena Protocol on Bio-Safety – 2005

a total of 383 were for protected flora and fauna.

Conservation programs being implemented with non-government organizations aim at protecting key species such as the Sumatran elephant (*Elephas maximus sumatranus*), tiger (*Panthera tigris sumatrae*), rhinoceros (*Dicerorhinus sumatrensis*) and orangutan (*Pongo abelii*). The protected areas also provide habitats for the white-handed gibbon or owa (*Hylobates lar*) and the kedih (*Presbytis thomasi*).

The Ministry of Forestry has also made efforts in conserving and managing mangroves through policies and programs. These include the preparation of the National Strategy on Management of Mangrove Ecosystems, the National Strategy and Action Plan Management of Wetlands – (2004), the Forest and Land Rehabilitation Movement (GERHAN), ratification of the Ramsar Convention on Wetlands, and the development of guidelines, criteria, and standard procedures in Mangrove Forest Rehabilitation.

With regard to ASEAN Heritage Parks, Indonesia has three, as of 2010: Kerinci-Seblat National Park, Gunung Leuser National Park, and Lorentz National Park.

Gunung Leuser, Kerinci Seblat and Bukit Barisan Selatan National Parks form part of the 2.5-million hectare Tropical Rainforest Heritage of Sumatra, which is one of Indonesia's World Heritage Sites (WHS).

The WHS is home to an estimated 10,000 plant species, including 17 endemic genera; more than 200 mammal species; and some 580 bird species, of which 465 are resident and 21 are endemic. Of the mammal species, 22 are Asian, not found elsewhere in the archipelago and 15 are confined to the Indonesian region, including the endemic Sumatran orangutan. The site also provides biogeographic evidence of the evolution of the island. ■



KERINCI-SEBLAT NATIONAL PARK

Home to Asia's oldest tropical rainforest

Covering close to 1.4 million hectares, Kerinci-Seblat National Park is one of the largest conservation areas in Southeast Asia, and harbors the oldest tropical rainforest in Asia. The National Park protects the world's largest flowers and hundreds of plants and animals not found anywhere else in the world. It also nestles several mountain lakes, notably Danau Gunung Tujuh (*danau* means lake) or "Lake of Seven Mountains," the highest caldera lake in Southeast Asia, with an altitude of almost 2,000 meters (ASEAN/JICA/UNEP, *undated*).

Kerinci-Seblat lies in nine districts of four provinces of Sumatra: West Sumatra, South Sumatra, Jambi, and Bengkulu. Kerinci was decreed a National Park in November 1992 by the Minister of Forestry, and then officially gazetted through a Decree issued by the Minister of Forestry and Estate Crops in October 1999 (KSNP Management Framework, 2002-2006).

Together with Gunung Leuser and Bukit Barisan National Parks, Kerinci-Seblat is part of the 2.5 million-hectare Tropical Rainforest Heritage of Sumatra, which was declared a World Heritage Site in 2004 (www.unesco.org).

Kerinci-Seblat is largely mountainous as it forms part of the Bukit Barisan Mountain Range, with elevations ranging from 200 to 3,805 meters above sea level. Towering over most mountains in the country, at 3,800 meters in altitude, Mount Kerinci is the highest mountain in Sumatra, and the second highest in Indonesia. Most of the area is covered by tropical mountain rainforest, and

more than 70 percent of the terrain is steep slope. The Park also makes up a large proportion of the catchment areas of 23 major rivers in four provinces, making it a significant site for soil and water conservation.

The ASEAN Heritage Park is one of the most important habitats for tigers in the world as it is a level one Tiger Conservation Unit (Wikramanayake, *et al.* 1998, as cited).

Some endemic species

- Sumatran ground cuckoo (*Carpococcyx viridis*)
- Red-billed partridge (*Arborophylla rubirostris*)
- Blue-masked leafbird (*Chloropsis venusta*)
- Sumatra cochoa (*Cochoa beccarii*)
- Blue thrush (*Myiophoneus malanurus*)
- Stresemann's scops owl (*Otus stresemanni*)
- Schneider's pitta (*Pitta scheidari*)
- Sumatran peacock pheasant (*Polyplectron chalcurun*)
- Spot necked bulbul (*Pycnonotus tympanistragus*)



Sumatran tiger

Biodiversity richness of Kerinci-Seblat National Park

- 4,000 species of flora
- 36 species of mammals
- 129 species of birds
- 8 species of primates
- 6 species of amphibians
- 10 species of reptiles

Source: Country Report of Indonesia to the 3rd ASEAN Heritage Parks Conference, 2010

Habitats

Kerinci-Seblat National Park has seven forest types: lowland, hill, sub-montane, lower montane, mid-montane, upper montane, and the sub-alpine.

1. The lowland forest ranges from 150 to 200 meters above sea level in the eastern slope of Bukit Barisan, and up to 300 meters above sea level in the west coast. *Dipterocarpus*, *Shorea atrinervosa* and *S. multiflora* are the dominant forest species. In the west side of the Park, this forest type is often restricted to valley bottoms and isolated from areas of similar habitat by hill and sub-montane forests. Small areas of lowland forest are confined to the North Bengkulu, Pesisir Selatan, and Musi Rawas Districts.
2. The hill forests, which range from 300 to 800 meters above sea level in the western side, and from 150 meters (lower hill) to 800 meters (upper hill) in the eastern side of the Barisan Mountains, are similar in structure but differ in emergent and canopy species. On the volcanic bedrock of the eastern Bukit Barisan, the *Dipterocarpaceae*, *Fagaceae* and *Burseraceae* are dominant, with *Hopea cf. beccariana* as the most abundant species. *Sterculia* is the most abundant emergent species on the steep hill forest on the west coast.
3. Between 800 and 1,400 meters above sea level, lies the sub-montane forest where trees with heights ranging between 20 and 45 meters, as well as emergent trees growing as tall as 50 meters, are common.
4. The lower montane forest, which occurs between 1,400 and 1,900 meters above sea level, is abundant with epiphytes and mosses that include *Fagaceae*, *Lauraceae*, *Myrtaceae*, *Theaceae*, and a number of *Sapotaceae* species. The undergrowth is particularly rich in *Myrsinaceae*.
5. In the mid-montane forest that ranges between 1,900 and 2,400 meters above sea level, *Microphylus* plants increase considerably and the forest



Dipterocarpus

becomes less dense. *Podocarpus* species may reach 25 meters in height. Trees that grow up to 15 to 20 meters tall include *Quercus oidocarpa*, *Vernonia arborea*, *Symingtonia populnea*, *Drypetes subsymetrica*, *Gordonia buxifolia*, *Weinmannia blumet* and *Polysma integrifolia*. The lower canopy includes such species as *Olea javanica*, *Archidendron clypearia*, *Platea excelsa*, *Lithocarpus pseudomoluccus* and *Myrsine hasseltii*. Bryophytes are abundant near the upper limit of this forest type.

6. The upper montane forest is between 2,400 and 2,900 meters above sea level. Between the 10- to 15-meter canopy height, *Symplocos cochinchinensis* var. *sessilifolia* and *Ilex pletobrachiata* are dominant while *Ardisia laevigata*, *Meliosma lanceolata*, and *Cyathea trachypoda* dominate the lower layer (5-10 meters). The largest area of this forest type is found on the slopes of Mount Kerinci.
7. At 2,900 meters and above, the Ericaceae (*Rhododendron retusum*, *Vaccinium miquelii* and *Gaultheria nummularoides*), and Symplocaceae (*Symplocos cochinchinensis*) species dominate the sub-alpine thicket, where trees are three to six meters tall.

Other special and unique ecosystems are Rawa Bento, Ladeh Panjang, and Gunung Tujuh Lake. Rawa Bento is a freshwater swamp located about 1,300 meters above sea level and dominated by Bento grass (*Leersiahexandra*), and tree species such as bintungan (*Bischofia javanica*), gelam merah (*Xylocarpus granatum*), and kelat putih (*Alangium* sp.). Ladeh Panjang

is a peat swamp on the Mount Kerinci highland ($\pm 1,600$ meters above sea level), the highest peat swamp in Southeast Asia. Gunung Tujuh Lake ($\pm 1,600$ meters above sea level) is a deep volcanic mountain surrounded by seven hills (www.warsi.or.id/Forest/forest_tnks.htm)

Flora

Notable flowering plants protected by the forests include the *Amorphophallus titanum* known locally as Bunga Bangkai (when flowering) and the *Amorphophallus gigas* or Batang Krebuit (non-flowering phase). These are the world's tallest flowers, the latter species towering up to five meters above the forest floor. The world's largest flower, *Rafflesia* (*Rafflesia arnoldi*), and known as *Cendawan Harimau* in Indonesia, is also found in the Park.

Fauna

Many large mammals inhabit the area, such as the sambar deer (*Cervus unicolor*), muntjac (*Muntiacus muntjak*), Sumatran tiger (*Panthera tigris sumatrae*), sun bear (*Helarctos malayanus*), clouded leopard (*Neofelis nebulosa*), porcupine (*Hystrix* sp), wild pig (*Sus scrofa*), and Malayan tapir (*Tapirus indicus*). Rare and endangered species include the Sumatran elephant (*Elephas maximus sumatrensis*), Sumatran rhinoceros (*Dicerorhinus sumatrensis*), wild mountain goat (*Capricornis sumtraensis*), golden cat (*Catopuma temminckii*), and marbled cat (*Pardofelis marmorata*). The most important primates are the siamang (*Symphalangus syndactylus*), dark-handed gibbon (*Hylobates agilis*), and two macaque species: long-tailed (*Macaca fascicularis*), and pig-tailed (*Macaca nemestrina*). Threatened species include the helmeted hornbill (*Buceros vigil*), Salvadori's pheasant





Rafflesia



Sambar deer

Amorphophallus titanum

ant (*Lophura inornata*) and the Sumatran pit viper (*Trimeresurus trimesurus sumatranus*).

Park management

The Technical Management Unit called Balai Besar, which is under the

Directorate General of Forest Protection and Nature Conservation of the Ministry of Forestry, manages the Park. The Park Manager heads the Unit, and is assisted by the head of the Technical Conservation Sector, Head of the Administration Sector and three heads of the Regional Management Sector (Country Report of Indonesia to the 3rd AHP Conference, 2010).

Management activities of KSNP are guided by three principles: protection, conservation, and sustainable utilization. Protection activities cover patrols, law enforcement, intelligence work, confiscations, and legal processes. Conservation initiatives include such

Conservation issues

- Extensive agricultural encroachment
- Illegal logging
- Poaching of wildlife resources including non-timber forest products
- Small-scale illegal gold mining
- Road construction

Source: Country Report of Indonesia to the 3rd ASEAN Heritage Parks Conference, 2010



Hikers at the base camp of the Park.

Strides in Protected Area Management

Activities to monitor and control forest disturbance have been strengthened by routine patrols, intelligence operations and integrated patrols with other enforcement agencies. Partner organizations include Flora & Fauna International, IUCN, Conservation International, Birdlife, UNESCO, Australian Zoo, US Fish and Wildlife Service, Zoological Society of London, Dreamworld Foundation, Conservation Training and Resource Center (CTRC), Rapid Response Facility (RRF), Forest Law Enforcement, Governance and Trade (FLEGT), GEF, Ford Foundation, BP Conservation Programme, Save the Tiger Fund and ICRAF.

activities as transect walks, biodiversity monitoring, fix point photography, camera trapping, research, and habitat management.

Empowering the local community is also a priority activity aimed at enhancing local socio-economic conditions to discourage the illegal use of Park resources. Such activities include ecotourism development, communication and education projects, and Park socialization in partnership with the local government and non-government organizations. The Management Unit also conducts field and school visits, and workshops to increase awareness of the importance of park protection and biodiversity conservation.

What to see and do

Kerinci-Seblat offers excellent access to hill and montane rainforest avifauna and the added attraction of seeing endemic Sumatran species. Bird watching is also a very popular activity. The Park is internationally recognized as the place to see many of Sumatra's 610 recorded bird species, and a majority of the island's endemic birds found generally at altitudes exceeding 1000 meters, notably on the slopes of the Kerinci and Gunung Tujuh mountains. For beginners, a good start for bird watching is around the rice fields (sawah)

of Sungai Penuh where munias (Genus *Lonchura*), lesser coucal (*Centropus bengalensis*), egrets, bitterns and purple moorhen (Genus *Gallinula*) have been spotted.

Many visitors from all over the world climb Gunung Kerinci, where the view from the top is awesome. As one goes up to the summit, nothing disturbs the sight across one of the last remnants of Sumatra's once vast natural rainforest landscapes. Most visitors start from Kersik Tuo, which is an hour's climb through tea and cinnamon plantations to the Park's entrance gate; or get an ojek (motorcycle taxi) to reach the gate. Normally, it is an easy 8-hour hike up to the base camp. From the camp, one has to get up at least two hours before dawn to make the final steep climb to the summit. If the summit is covered in clouds or if the volcano is active, no one is allowed up the mountain.

A guided trek between villages along the ancient trading paths is offered for visitors who can mingle as well with the villagers who have a good knowledge of the area, its animals, plants as well as legends. There are also longer treks through the rainforest for those with a sense of adventure. For deep jungle treks, the Park staff in Sungai Penuh require and recommend reliable guides. ■

GUNUNG LEUSER NATIONAL PARK

Core of Sumatra's Tropical Rainforest Heritage

Sumatra island in Indonesia is home to some of the country's last great forest wilderness. Its core can be found within the UNESCO World Heritage Site known as the "Tropical Rainforest Heritage of Sumatra". This rainforest spans the Barisan Range of mountains and includes three major national parks: Bukit Barisan Selatan, Kerinci-Seblat and Gunung Leuser.





Established in 1980, Gunung Leuser National Park covers an area of 1,092,692 hectares within the two provinces of North Sumatra and Nanggroe Aceh Darussalam. Gunung Leuser lies mostly in the region of Aceh Tenggara (South-east Aceh), encompassing smaller areas in the region of east Aceh, south Aceh, and Langkat (a part of North Sumatra), and more than 100 kilometers of the Bukit Barisan Mountains. As a result, the Park consists of steep, almost inaccessible mountainous terrain, with altitudes that range from 0 meters in Kluet (South Aceh), to 3,381 meters on top of the Gunung Leuser (Southeast Aceh), after which the Park is named. The Park encompasses a number of what were then much smaller nature reserves: Nature Reserve Gunung Leuser, Nature Reserve Kappi, Nature Reserve Kluet, Sikundur Langkat Wildlife Reserve, Ketambe Research Station, Singkil Barat and Dolok Sembilin. The Alas River runs through the Park, thus dividing the Park into an eastern and western half.

The National Park is particularly significant for conservation since it is the last place where orangutans, tigers, elephants, rhinoceros and leopards live together.

Habitats

The National Park and biosphere reserve covers a vast area of tropical rainforest in northern Sumatra with a range of ecosystems: lowland evergreen dipterocarp forest, lower and upper montane rain forest, peat swamp forest, forest over limestone, sub-alpine meadows and heathlands, freshwater lakes and rivers, and sulphur mineral pools. The megafauna in the biosphere reserve include the Sumatran rhinoceros (*Dicerorhinus sumatrensis*), the Sumatran tiger (*Panthera tigris*) and the Asian elephant (*Elephas maximus*) [MAB Programme, IN: UNESCO Website].

Biological richness of Gunung Leuser National Park

- 4,000 species of flora
- 129 species of mammals
- 10,000 species of plants
- 380 species of birds
- 103 species of reptiles
- 35 species of amphibians

Source: Country Report of Indonesia to the 3rd ASEAN Heritage Parks Conference, 2010

Wildlife

A total of 10,000 plant species have been recorded in the West Indo-Malayan Region, of which 4,000 can be found within the Gunung Leuser ecosystem. Among these are giant trees, palms, flowers, orchids, mangrove trees, and fruit trees such as mango, rambutan, banana, durian, wild figs, and citrus. There are also bamboo species that can grow up to 18 meters tall.

Spectacular species include the *Rafflesia*, the largest flower in the world, and the *Amorphophallus*, the tallest in the world.

Mammals

There are around 129 species of mammals, and include the Sumatran tiger (*Panthera tigris sumatrae*), rhinoceros, elephant, clouded leopard (*Neofelis nebulosa*), marbled cat (*Pardofelis marmorata*), Temminck's golden cat (*Catopuma temminckii*), red giant flying squirrel (*Petaurista petaurista*), Sumatran serow (*Capricornis sumatraensis*), sambar deer (*Cervus* sp.) and sun bear (*Helarctos malayanus*). The Park is believed to protect around 300 elephants, 60 tigers and 40 rhinoceros, but the chances of seeing one of these are slim. An estimated 5,000 orangutans can be found while other primates like the white-breasted Thomas leaf monkey (*Presbytis thomasi*), siamang (*Symphalangus syndactylus*), gibbon and several species of macaques are common all over the area.



Durian



Orangutans

Birds

Among the trees and flowers live more than 380 species of birds, including 36 of 50 “Sundaland” endemics such as the Sumatran ground cuckoo (*Carpococcyx viridis*) and Sumatran cochoa (*Cochoa beccarii*). Birds are particularly common along the Alas River, and include the Asian pied hornbill (*Antbracocerus albirostris*) and rhinoceros hornbill (*Buceros rhinoceros*), argus pheasant (*Argusianus argus*), the blue-crowned hanging parrot (*Loriculus galgulus*), the white-bellied sea eagle (*Haliaeetus leucogaster*), kingfishers, and bee-eaters.

Reptiles and amphibians

Reptile and amphibian species are highly represented, with estimates of up to 138 species of reptiles and amphibians. Among the most known are several spe-



Serow

cies of pythons, king cobra, black cobra, krait, tree snakes, as well as many species of frogs, turtles, and lizards. These include the swamp crocodile, estuarine crocodile, flying frog, flying snake, common flying lizard, hawksbill turtle, leatherback turtle, and water monitor.

Conservation issues

Sumatra has a large and increasing human population living in hundreds of villages often surrounding or even lying within remaining forests and national parks. This is a challenge to the Park managers who have to balance the need to protect natural habitats and wildlife while respecting the rights and livelihoods of the local people.

Encroachment and land claims have become major problems in the Park. Encroachment in particular, is wors-

ening other illegal activities such as poaching of tiger and rhinoceros, and illegal logging, which is extremely rampant on the Island, especially within and outside protected areas. In the buffer zone, large areas of mixed forests have been converted into tree and crop plantations.

One of the greatest threats to the wildlife and wildlands is forest clearance, generally for small-scale farming, especially of coffee. The removal of forests is also increasing the occurrence of floods. All these have seriously affected the survival of various species. In fact, the International Union for the Conservation of Nature (IUCN) has rated Indonesia as a country whose endangered

species are on the verge of extinction (WCS website).

The biosphere reserve also still faces the effects of the extensive forest fires that affected many parts of Sumatra in 1997-98, and seriously damaged or disturbed the habitats of wildlife.

Park management

The Technical Management Unit of the Directorate General of Forest Protection and Nature Conservation, Ministry of Forestry manages the Park. The management unit is composed of a Park Manager, administrative and technical staff, and rangers. Gunung Leuser has four Regional Conservation Sections located in Bukit Lawang, Besitang (in



Golden cat

Strides in Protected Area Management

Officials and staff of Gunung Leuser National Park have been provided with a series of capacity-building training and workshops to enhance their management skills and knowledge. These include training on law enforcement, management of ecotourism activities, environmental education, search and rescue, and weapons handling. Partners in the implementation of conservation programs include the World Heritage Center, UNESCO, WCS-Indonesia, Environmental Services Program (ESP-USAID), Yayasan Leuser Indonesia, Flora and Fauna International and WWF-Indonesia.



Conservation activities include observation of orangutans.

Langkat District); Alas, and Tapaktuan in Nanggroe Aceh Darussalam Province. In general, the infrastructure to support management operations, such as offices, guard posts, research stations and information centers, are in place.

Funding for the implementation of activities regularly comes from the central government. Since 2006, the World Heritage Center (WHC), and the Spanish Government (through the United Nations, Educational, Scientific and Cultural Organization or UNESCO) have been providing funds for the training and mentorship of Park staff, for meetings with partners and for equipment.

Ecological and cultural interests

Many different ethnic groups such as Pakpak, Koro, Melayli and Alas live in and around Gunung Leuser, sustainably using natural resources such as wood, damar, rattan and fish for income. Local people also benefit from the various eco-

tourism activities such as wildlife viewing, jungle trekking, river rafting, caving and horseback tours.

Many mountain climbers and trekkers also flock to the Park because of the challenges and trekking opportunities offered by the mountain ranges: Gunung Leuser (3,404 meters), Gunung Kemiri (3,414 meters), Gunung Simpali (3,270 meters) and Gunung Perkinson (2,828 meters). Trekking into Gunung Leuser can be arranged at two locations—Bukit Lawang and Kutacane/Ketembe.

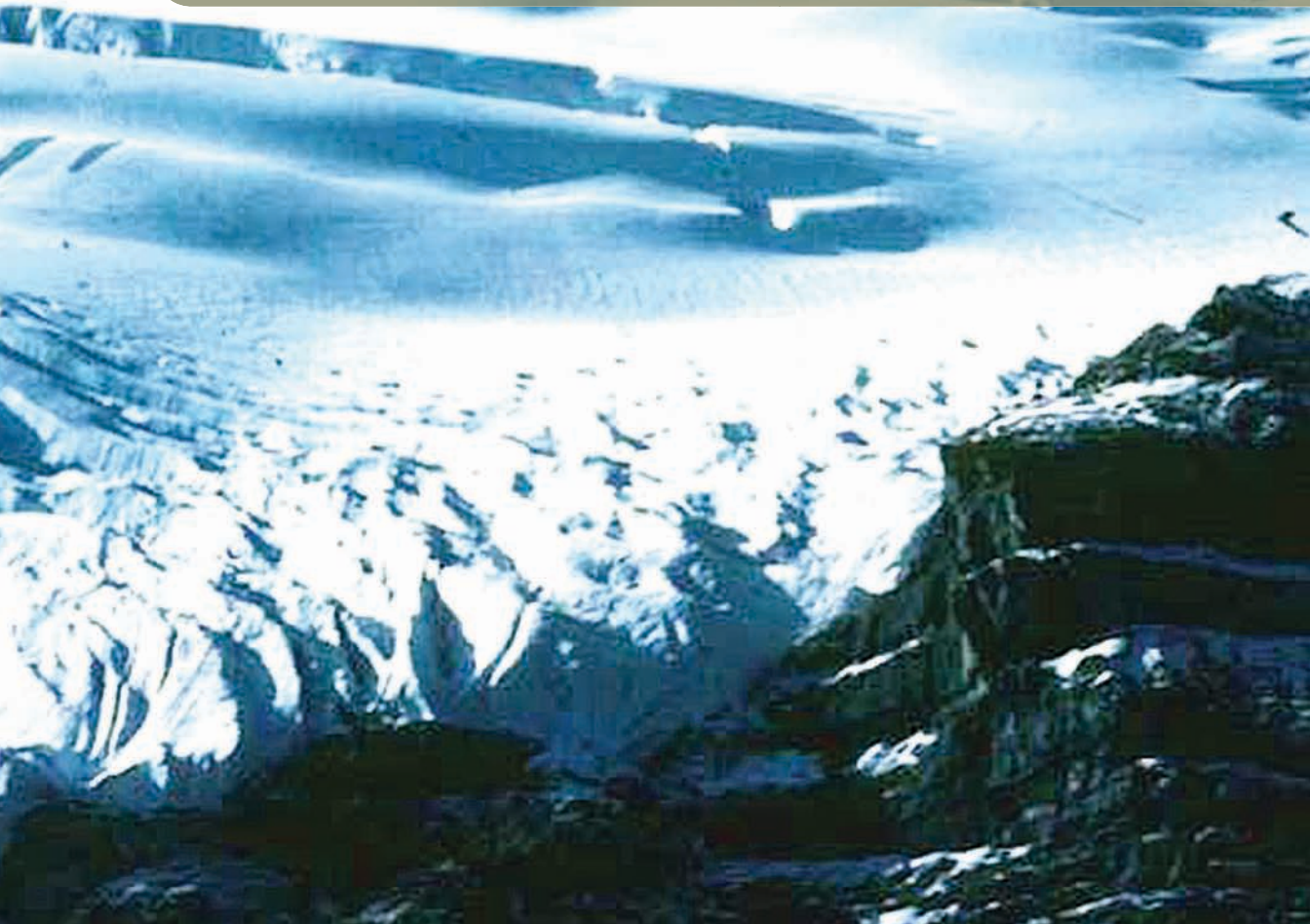
Tourists can also go rafting, kayaking, and canoeing, while cave enthusiasts will have a great time exploring caves and other geological structures. The extensive wildlife also encourages visits from photographers and bird watchers. Visitors can also go to Tengkahan to watch elephants and for guided jungle treks. The Park also provides campsites for mountain climbers, hikers, families and student groups. ■



LORENTZ NATIONAL PARK

*Southeast Asia's largest single protected area
with snow-capped mountains and glaciers*

Snow-capped mountains and glaciers linked with mangroves and tropical seas are the unique features of Lorentz National Park, the largest single protected area in Southeast Asia (MacKinnon 2002). The Park covers some 2,505,600 hectares including extensions on its eastern side, and a marine component (Ngudi et. al., 2008); its size is about 0.6 percent of Irian Jaya's total size. It also boasts the highest peak east of the Himalayas—the Puncak Jaya, sometimes called Mount Carstensz or the Carstensz Pyramid—Indonesia's highest mountain at 4,884 meters above sea level.



Archaeological, paleontological and palynological resources are known to occur in Lorentz National Park, in particular as deposits in caves and in peat bogs. These resources provide evidence of the evolution of the biota of Papua, and so contribute to the World Heritage values of the Park (evidence of the evolution of the biota and climate change).

Source: Ngudi et al. 2008

Lorentz is also the only protected area in the world that encompasses a continuous, intact transect—from snow cap mountains to tropical marine environment, including extensive lowland wetlands. Located at the meeting point of two colliding continental plates, the area has a complex geology with on-going mountain formation as well as major sculpting by glaciation and shoreline accretion, which has formed a large part of the lowland areas. These processes have increased the level of endemism and high level of biodiversity in the region. The area also contains fossil sites that record the evolution of life on New Guinea (whc.unesco.org/).

Lorentz has the most complete spectrum of New Guinean ecosystems, from mangroves on the coast, to montane and alpine forests. Yet Lorentz is still the most inaccessible and hence least known among the national parks of Indonesia (ASOEN/JICA/UNEP, undated). This may be the reason why the reserve is almost entirely pristine.

Lorentz Nature Reserve was named in honor of Dr. Hendrik Antoon Lorentz, the Dutch explorer, who, in 1909, became the first known explorer to make contact with the Dani tribe while leading an expedition to Mt. Trikora. The Dutch Colonial Government established Lorentz as a Nature Monument in 1919. Then in 1978, the Indonesian Government officially gazetted the Nature Monument as a Strict

Nature Reserve (Cagar Alam), covering an area of over 2.1 million hectares. In March 1997, the Ministry of Forestry declared it as a National Park, and included the eastern extension (Mt. Trikora, Mt. Rumphius, and Lake Habbema areas), and coastal and marine areas. Lorentz was inscribed as a World Heritage Site in 1999, although 150,000 hectares in the southeast corner were excluded to allow the exploration of oil.

The National Park lies within Irian Jaya, the Indonesian half of the world's second largest island of New Guinea. Specifically, it is within the administrative districts of Jayawijaya, Paniai, Merauke (Southern Division), Fak-fak, Mimika and Enarotali, and stretches over 150 kilometers from the Central Cordillera mountains in the north to the Arafura Sea in the south (www.unesco.org). Five major rivers flowing almost directly to the Aru Sea drain the south slopes of the reserve, passing through very extensive belts of freshwater and mangrove swamps (ASOEN/JICA/UNEP, undated).

Cultural heritage

The indigenous community composes several ethnic groups: Nduga, Amungme (Damal), Nakai (Asmat Keenok), Sempan, West Dani and Kamoro. The region has been inhabited for over 24,000 years and has evolved some of the most distinctive and long isolated cultures in the world. The agricultural Dani tribe of the Baliem valley is the best documented. To the south, the Kamoro, Asmat and Sempan tribes inhabit the lowland rivers and swamps, and follow a semi-nomadic lifestyle and simple but effective forms of agriculture. These traditional economies have evolved in harmony with the environment and are controlled by a complex system of cultural taboos and rituals that are helping to prevent the over-exploita-



Karst mountains

tion of forest resources (Kartawinata and Widjaja, 1988 as cited; Petocz, 1989 as cited; Manembu, 1991 as cited. *IN: www.unep-wcmc.org/*).

Physical features

The Park has two very distinct zones: the swampy lowlands and the high mountain area of the Central Cordillera. The Central Cordillera itself is subdivided into the eastern part and the western part on the basis of geology and vegetation types, with the north/south line at Kwiyawagi village as the dividing line.

The Carstenz/Puncak Jaya section of the Jayawijaya Mountain Range still retains small ice caps, and is one of only three equatorial highlands (Sierra Nevada region in the Andes, and Mt. Kenya, Kilimanjaro, Ruwenzori in East Africa) with very high altitudes. The main snowfields comprise five separate areas of ice on the outer mar-

gins of Mount Puncak Jaya. These include two small fields that feed the Meren and Carstenz glaciers and a small hanging glacier on the Carstenz Pyramid.

Puncak Jaya has several peaks—Jayakesuma/Carstenz Pyramid (4,884 meters); Ngga Pulu (4,862 meters); Meren (4,808 meters)—that developed from tertiary rocks. Wide ice caps, measuring 13 square kilometers, have covered the high area in 1936, but have since melted and further reduced to 3.3 square kilometers by 1991. The remaining ice is now divided into three patches: the North Wall Firn, the Meren and Carstenz glaciers.

The lowland area is a wide swampy plain, covered with virgin forest and intersected by countless winding rivers and streams, mostly tidal. The largest of these rivers empty into the shallow Arafura Sea, which separates the island of New Guinea from Australia. The Baliem

Biological richness of Lorentz National Park

- 164 species of mammals
- 411 species of birds
- 100 freshwater fishes
- Tens of thousands of species of insects
- Thousands of species of vascular plants
- 150 species of amphibians and reptiles

Source: Country Report of Indonesia to the 3rd ASEAN Heritage Parks Conference, 2010

Gorge, which runs through the Park, is one of the straightest, longest and steepest white water rivers in the world (MacKinnon 2002).

The plant life

The diverse vegetation and ecosystem types of Lorentz National Park are typical of New Guinea. The lowland forests have very strong affinity with those of Southeast Asia in structure and physiognomy, but differ in species composition.

The lowland zone comprises the following zones: beach (0-4 meters), tidal swamp (0-1 meter), meander belt subzone (0-25 meters), peat swamp subzone (3-50 meters), alluvial fans (50-150

meters), alluvial valley subzone, and the dissected terraces subzone. Beach zone vegetation includes floating and submerged plants, swampy grasses, reeds, sago, palm, pandan, and swamp woodland in progressively shallower water. Mangroves are found in the tidal swamp zone. In the meander belt subzone, bare land formed by sedimentation and changes in river courses, is colonized by pioneering plants resulting in a mixed climax forest, which is similar to the dryland lowland evergreen forest. The peat swamp subzone comprises three land systems: Pandago, Gambut and Iwika. The Pandago Land System consists of permanently inundated swamps of coastal plains, while the Iwika Land System consists of swamp-covered lower alluvial fans. At 50-150 meters, the alluvial fans consist of alluvial fan plains and closely resemble tropical dryland evergreen lowland forest. The alluvial valley subzone consists of braided rivers, floodplains and terraces. The vegetation along the dissected terraces subzone occurs mainly on podzolized soils.

The area has three forms of heath forest: medium open, open, and medium to tall mossy heath forests. Medium open heath forests have ant house plants (*Myrmecodia* sp.), ferns (*Lecanopteris mirabilis*) and carnivorous pitcher plants (*Nepenthes* sp.). The open heath forest is dominated by *Casuarina*, *Dacrydium*, *Podocarpus*, *Tristania*, *Eugenia*, and *Syzygium* species. The medium to



Syzygium aromaticum



Nipa

tall “mossy” heath forest occurs near the base of the mountains, where the rainfall is higher and more mists occur due to frequent cloud cover. The ground, tree trunks and branches are covered by dense growth of bryophytes (Ngudi *et al.* 2008).

The forests in the montane zone are distinctly drier and have fewer terrestrial ferns and mosses. These forests form the most floristically rich zones of New Guinea and contain more than 80 genera and 1,200 species of trees. The mid-montane subzone forest comprises the Kemum land system and is characterized by long slopes, spurs and ridges leading to the alpine summits. The vegetation types of the mid-montane subzone are mid-montane forest, *Castanopsis* forest, *Notofagus* forest, coniferous forest, mid-montane swamp forest, mid-montane sedge-grass swamp, mid-montane *Phragmites* grass swamps,

mid-montane *Miscanthus* grassland and succession on abandoned gardens (Ngudi *et al.* 2008).

Forests in the sub-alpine zone have a closed canopy that could grow up to 10 meters tall, with emergents up to 15 meters tall. *Rapanea*, *Dacrycarpus compactus* and *Papuacedrus papuas* are the dominant species (Ngudi *et al.* 2008).

The alpine zone is largely dominated by grassland, herbs, mosses and shrubs. The alpine tussock grassland, *Tetramolopium klossii*–*Rhacomitrium* heath, dwarf shrub heath, dry alpine tundra and wet alpine tundra can be seen in this area (Ngudi *et al.* 2008).

Animal life

Recorded species include 164 species of mammals and 411 species of birds. The Park protects two Endemic Bird Areas (EBA), with 45 restricted-range bird



Bird of Paradise

species, and nine endemic bird species confined to the Sudirman range and the South Papuan lowlands EBA.

Little is known about the diversity of amphibians in the Park, but some experts estimate about 150 species of amphibians and reptiles (Ngudi *et al.* 2008).

In the highlands, six species are endemic to the snow mountains, and include the mountain quail (*Anurophasis monorhonyx*), snow mountain robin (*Petroica archboldii*) and the long-tailed paradiagalla (*Paradiagalla caruneulata*). Globally threatened animal species include the southern cassowary (*Casuaris casuaris*), southern crowned pigeon (*Goura scheepmakeri*) and Pesquet's parrot (*Psittrichas fulgidus*) found in the lowlands (UNEP-WCMC, 2008).

Mammals include two of the world's



Rainbow lorikeet

three monotremes: the short-beaked Echidna (*Tachyglossus aculeatus*), a species shared with Australia, and the long-beaked Echidna (*Zaglossus bruijini*), a New Guinea endemic. Mammals also include a range of marsupials including at least four species of cuscus, several species of tree kangaroo (*Dendrolagus* sp.) and one *Dasyuridae* species, which is often referred to as the tiger cat (*Dasyurus albopunctatus*). Also, more than 100 species of freshwater fish species are expected to occur in the Park (UNEP-WCMC, 2008).

Conservation and management issues

Some issues concerning the Park include the management unit itself, which lacks capable personnel. There is also no management plan that outlines



Tree kangaroo

the environmental program of the Park. Appropriate infrastructure and other necessary support facilities have yet to be built. Distinct boundary markers and zones have still to be established.

Development of roads, urban centers, agricultural areas and plantations in the Park is increasing encroachment on natural resources, habitat fragmentation, erosion, and easy access to illegal logging and wildlife poaching and trade activities.

Protected area management

The Natural Conservation Agency of Papua manages the Park. In 2006, the Lorentz National Park Implementing Unit was established to oversee the Park management activities. The national government provides funds for management activities, with additional financial sup-

port from several international agencies like WWF Indonesia.

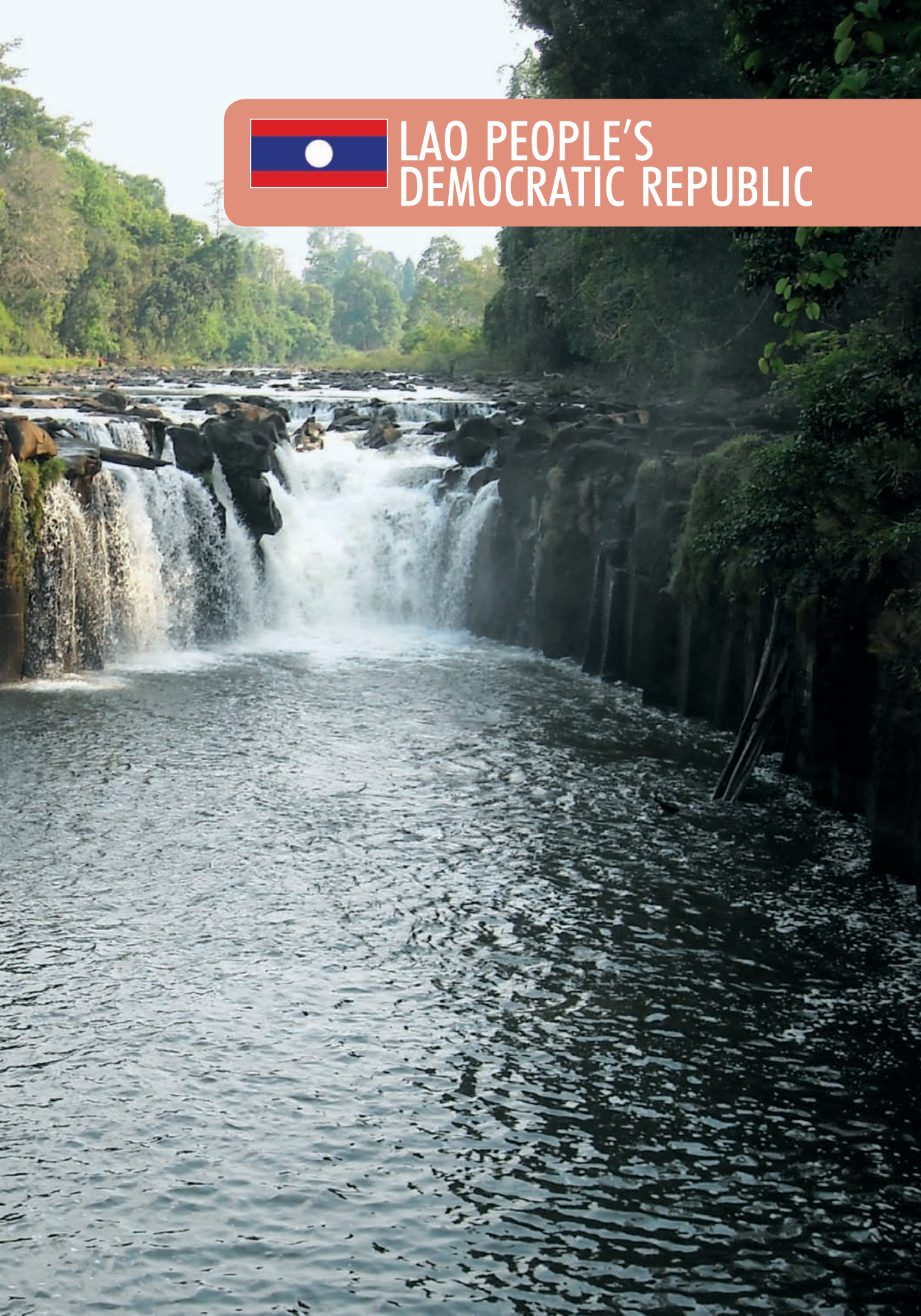
The provincial government has developed a spatial plan that directs all development away from the Park and creates a large buffer zone along its western boundary. The plan hopes to minimize impacts on the Park, from all the private sector investments and government-sponsored projects that the Indonesian government is promoting such as the development of a new town, infrastructure, transmigration, agriculture and industries.

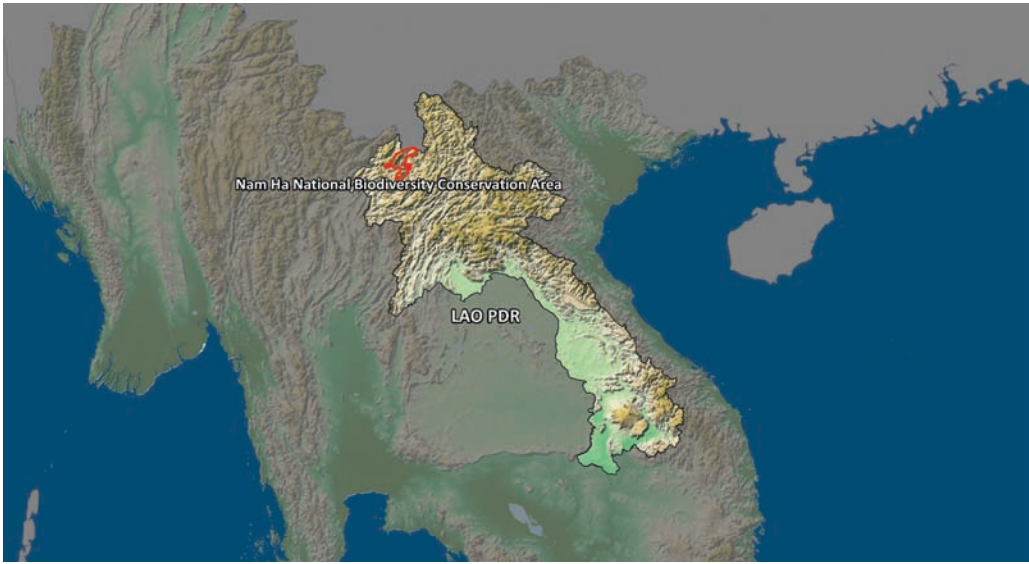
The Lorentz National Park Authority continues to work with the local governments of nine districts and the WWF Papua Sahul Region in guarding the Heritage Park's very rich biodiversity and cultural community. ■





LAO PEOPLE'S DEMOCRATIC REPUBLIC





Simply Beautiful

A land-locked country, Lao People's Democratic Republic (PDR) is known for its rich history, culture and ethnic populations and an environment with diverse landscapes. Strategically located at the heart of the Indo-Chinese Peninsula and surrounded by China, Viet Nam, Cambodia, Thailand and Myanmar, the country is a potential strategic resource base and land-link in the Greater Mekong Sub-region (GMS).

Lao PDR has a total land area of 23,680,000 hectares. About 70 percent of the country's terrain is mountainous, and the elevation reaches a maximum of 2,820 meters in Xieng Khouang Province. The landscapes of northern Lao PDR and the regions adjacent to Viet Nam, in particular, are dominated by rough mountains. Its borders stretch 416 kilometers north of the People's Republic of China, 492 kilometers south of Cambodia, 1,957 kilometers east of Viet Nam, and 1,370 kilometers west of Thailand.

The Mekong River is the main geographical feature in the west and, in

some areas, forms a natural border with Thailand. The Mekong flows through nearly 1,900 kilometers of Lao PDR territory and shapes much of the lifestyle of the people of Lao PDR. In the south, the Mekong reaches a breadth of 20 kilometers, creating thousands of islands.

Lao PDR enjoys a tropical climate with two distinct seasons. The rainy season is from May to the end of September, and the dry season is from October through April. The yearly average temperature is about 28 degrees Celsius, rising to a maximum of 38 degrees Celsius during April and May.

In Vientiane, a minimum temperature of 19 degrees Celsius can be expected in January. The temperature in mountainous areas, however, drops to as low as 14-15 degrees Celsius during the winter months, and during cold nights, can sometimes reach the freezing point. Precipitation is highest in Southern Lao PDR, where the Annamite Mountains receive over 3,000 millimeters annually. In Vientiane, rainfall is about 1,500-2,000 millimeters, and in the Northern provinces, only 1,000-1,500 millimeters.

Habitats and biological resources

The ecosystems of the country are classified according to the forest types based on altitude, rainfall, kind and dominance of tree species present, and the types of plant communities present. Forest habitats are classified into three broad groups: lowland, montane and azonal habitats.

Some biodiversity resources of Lao PDR

- 150-200 species of reptiles and amphibians, of which 16 species are endangered
- 247 species of mammals and 3 new species
- 700 species of birds, of which 23 species are endangered
- 90 species of bats, of which 51 are key species
- 500 species of indigenous fishes
- 8,000-11,000 species of flowering plants

Lowland forest habitats are those generally below the 800- to 1,000-meter elevation where tropical floristic elements predominate in terms of forest structure and diversity. These habitats are further classified into six broad groups: wet evergreen forests, semi-evergreen forests, secondary semi-evergreen forests, mixed deciduous forests, deciduous dipterocarp



A herd of elephants in the wild

forests and woodlands, and lowland pine woodlands.

The montane forest habitats, which are located above 800-900 meters elevation, are generally called montane evergreen forest, hill evergreen forest or Northern Indochina montane forest. These habitats comprise the transitional montane forests, open montane forests, open montane conifer forests, evergreen forests of *Fagaceae* and *Lauraceae*, mixed hardwood-conifer forests, dense montane conifer forests, *Ericaceous* cloud forest and degraded montane forests.

Also known as zonal communities, azonal habitats respond to broad patterns of climatic regimes in their evolution and distribution. Specific local environmental conditions override the broader

climatic regimes to produce specific types of communities like the wetlands, which are seasonally or perennially flooded. The country has nearly 60,000 hectares of seasonally flooded shrub lands; 27,000 hectares of permanently flooded swamp forests; and just 120 hectares of seasonally flooded forests. Important wetlands are the Mekong River, Xe Champhone, Nong Louang, Bung Nong Ngom, Xe Pian (Xe Khampho), the Khone Falls (Seephandon), the Xe Kong Plains, Soukhouma and the Nam Theun Wetlands (Nakai Plateau).

Lao PDR designated its first two Wetlands of International Importance when the country joined the Ramsar Convention as its 160th Contracting Party. The Convention entered into force for Lao PDR on 28 September 2010. The wetlands



are: the Xe Champhone Wetlands (12,400 hectares) located in the Savannakhet Province, and the Beung Kiat Ngong Wetlands (6,000 hectares) in the Champasak Province (Ramsar Convention Website: www.ramsar.org/).

The Xe Champhone Wetland is an outstanding example of a river with many meanders and oxbows, and also supports rice paddies and reservoirs, as well as swamp forests and freshwater marshes. Some of the lakes and ponds form the habitat for the critically endangered Siamese crocodile (*Crocodylus siamensis*), and are home to several turtle species. The deep pools have been traditionally conserved not only because of the crocodiles but also for other spiritual purposes. The Wetland provides important food, resources and livelihood

for about 20,000 people who live in and around the site.

The Beung Kiat Ngong wetland is located in a large floodplain and is made up of two parts. The first supports a large freshwater marsh situated in a low depression and a peatland, which is the only one found in the country. The second part supports seasonal wetlands with a small number of scattered permanent ponds and paddy fields. Fishes rely on the permanent wetlands for survival during the critical low water dry season. Fish species identified include the walking catfish (*Clarias* sp.), snakehead (*Channa striata*) and swamp eel (*Monopterus albus*). The Wetland supports some 11,534 villagers who rely primarily for their income on wild-capture fisheries, subsistence agriculture, and non-timber forest products.





This river supports rice paddies and reservoirs

Ecoregions

The high international conservation significance of forests and other habitats in Lao PDR has been noted through ecoregional analysis (e.g., MacKinnon, 1986, Berkmüller, *et al.* 1995b, Duckworth, *et al.* 1999). Ecoregions are contiguous habitats or ecosystems recognized by the World Wildlife Fund as areas of highest significance in the world for biodiversity conservation. The ecoregions of Lao PDR are:

- Annamite Range Moist Forests
- Indochina Dry Forests
- Northern Indochina Sub-tropical Moist Forests
- Mekong River and its catchment

Important Bird Areas

A total of 44 important bird areas have been identified within all protected areas of the country for which ornithological data are available, with one or two identified in each protected area. For the Nakai-Nam Theun Protected Area, three important bird areas have been identified. Because these are spatially delineated and important for other taxonomic groups, the important bird areas can be used as a guide for zoning protected areas.

Protected area management and conservation activities

The National Protected Areas (NPAs) system in Lao PDR was established in 1993, with the declaration of 18 national biodiversity conservation areas. These areas are managed by the Ministry of Agriculture, Forestry and Fisheries (MAFF). As of 2008, the total number of national biodiversity conservation areas is 23 (see Table 1).

In 1999, the area covered by Nam Ha NBCA in Luang Namtha province, was expanded to 222,400 hectares and is now

contiguous with the Shanhyong Nature Reserve, Xishuangbanna Autonomous Prefecture, Yunnan, China. The Nam Ha NBCA was declared as an ASEAN Natural Heritage Park in 2004.

The National Biodiversity Strategy and Action Plan (NBSAP) of Lao PDR towards 2020 aims toward environmental protection/conservation; sustainable utilization and management of natural

resources such as water and forests; maintenance of the rich biodiversity; protection and improvement of human settlements and cultural/historical heritage sites; protection of earth's atmosphere by limiting air pollution and harmful emissions; equitable sharing of benefits amongst Lao PDR people; and improvement, development, and effective enforcement of laws and regulations. ■

Table 1. National Biodiversity Conservation Areas (NBCA) in Lao PDR

NBCA	Year declared	Area (hectare)	Province covered
1. Phou Daen Din	1993	222,000	Phongsaly
2. Nam Ha	1993	222,400	Luang Namtha
3. Nam Et	1993	170,000	Houaphanh
4. Phou Loei	1993	150,000	Houaphanh/Luang Phrabang
5. Nam Xam	1993	70,000	Houaphanh
6. Nam Phui	1993	191,200	Xayaboury
7. Phou Phanang	1993	70,000	Vientiane Municipality Vientiane Province
8. Phou Khao Khouay	1993	200,000	Borikhamxay/ Xaysomboun
9. Nam Khading	1993	169,000	Borikhamxay
10. Phou Hin Poun	1993	150,000	Khammouane
11. Nakai Nam Theun	1993	353,200	Khammouane/ Borikhamxay
12. Hin Nam Nor	1993	82,000	Khammouane
13. Phou Xang He	1993	109,900	Savannakhet
14. Dong Phouvieng	1996	197,000	Savannakhet
15. Xe Sap	1995	136,897	Saravane/ Xekong
16. Xe Bang Nouan	1993	150,000	Saravane/ Savannakhet
17. Phou Xiangthong	1993	120,000	Champasak/ Saravane
18. Dong Hua Sao	1993	110,000	Champasak
19. Dong Ampham	1993	200,000	Attapeu/ Xekong
20. Xe Pian	1993	240,000	Attapeu/ Champasak
21. Nakai Nam Theun – Phou Hin Poun Corridor	2000	73,860	Borikhamxay/ Khammouane
22. Nakai Nam Theun – Hin Nam Nor Corridor	2000	3,310	Khammouane
23. Nam Kan	2008	136,000	Bokeo
Total		3,526,766	

Source: MAF & STEA, 2003; DFRC/DoF/MAF and WREA, 2009

NAM HA NATIONAL PROTECTED AREA

*Rich repository of biodiversity,
ethnic diversity and knowledge*

The Nam Ha National Protected Area was established in 1993 with the introduction of the Lao PDR protected area system. Located in Luang Namtha province in northern Lao PDR, the National Park spans five districts and covers 222,400 hectares. Luang Namtha is home to more than 20 different ethnic groups, making it a remarkable repository of ethnic diversity and indigenous knowledge.





Nam Ha is the fourth largest National Protected Area in the country and stretches as far as the Chinese border (Thamlasine, *undated*). It is also the fourth largest protected area in the northern Indochina subtropical forest zone and an extremely important watershed. The watershed is the first major tributary of the Mekong River after it enters Lao PDR and supports agricultural production and electricity generation along the Luang Namtha plain.

In 1999, the protected area of Nam Ha was expanded with two extension zones: Nam Ha West and Nam Kong. Nam Ha West has an important evergreen forest and a mosaic of grasslands. Wildlife surveys reported high populations of mammals and birds in some areas, like the Nam Kong area adjoining the Xieng Yong Reserve in China, which contains the only remaining population of Asian elephant in the country (Tizard, *et al.* 1997).

In the biological prioritization of the country's 20 protected areas where national species were analyzed, Nam Ha ranked third for birds and fifth for large mammals. Overall, Nam Ha ranked third in the national management priority index based on biodiversity and watershed values, ecotourism potential, and the level of pressure on the site.

Climate

The rainy season is from May to September. The average annual rainfall is 1,256 centimeters, and the maximum rainfall is about 1,990 centimeters. During the colder months of the dry season, from December to February, temperatures can reach as low as 5 degrees Celsius. The average annual temperature is 23.75 degrees Celsius.

Habitats/ecosystems

Most of the area is covered by mixed deciduous forest, in particular in Nam



A herd of water buffalo

Ha East with few mountain peaks. In Nam Ha West, mountain ranges run from “Phou 2094” to the China/Lao PDR border on the northeast. Along the top of these ranges are mainly dry evergreen forest and some grassland.

Tropical and sub-tropical forest types include evergreen gallery forests, semi-evergreen forests, subtropical *Castanopsis* forest, submontane forests on the higher peaks (up to 3,094 meters) and limestone forest on the karst portions. Other habitats include caves, freshwater streams, secondary scrub, and village lands.

Four vegetation zones have been identified in the National Biodiversity Conservation Areas (NBCAs) (Tizard, *et al.* as cited, 1997). The Luang Namtha plain, with an elevation range of 540 to 1,000 meters, is made up of human-modified habitats of bamboo, secondary evergreen forest and shrubs. The Northern Highlands zone (1,000 – 2,094 meters) has patches of primary evergreen forest mixed with secondary forest and large patches of *Imperata* grasses. In the Southern Highlands, evergreen forests and shrubs are common in elevations ranging from 1,000 to 1,572 meters. Along the China border, the elevation of the Nam Kong area ranges from 600 to 1,556 meters and the area is characterized by secondary evergreen forest and shrubs.

Flora

Nam Ha is home to about 2,000 plant species including a wide range that is used by local people for medicine and other purposes. Most valuable are the *Aquilaria* trees whose red-infected heart is prized for making incense.

More than 200 species of non-timber forest products are considered important for local use and trade. Aside from the *Aquilaria* trees, these include cardamom,

Biological resources of Nam Ha National Protected Area

- 2,000 species of plants
- 37 species of large mammals
- 288 species of birds



Aquilaria tree

Jewel orchid, *Cinnamomum c.*, bamboo, and rattan (Thamlasine, *undated*).

Fauna

Nam Ha harbors 37 species of large mammals (Tizard *et al.* 1997; Thamlasine, *undated*). About 19 key species of conservation concern have been observed and reliably reported by villagers. Among these are three large cat species (clouded leopard, leopard and tiger); at least six ungulate species including gaur and an unidentified species of muntjac; and a small population of Asian elephants (Tizard *et al.* 1997).

A survey in 2003 confirmed that the black-cheeked crested gibbon, one of the rarest and endangered gibbon species, occurs in low numbers in at least three remote forest locations in Nale, Vieng Phoukha and Long districts (Luang Namtha Provincial Tourism Department, 2008).

The hills are home to troops of northern pigtail and rhesus macaques. The wilder valleys still protect families of white-cheeked crested gibbon.

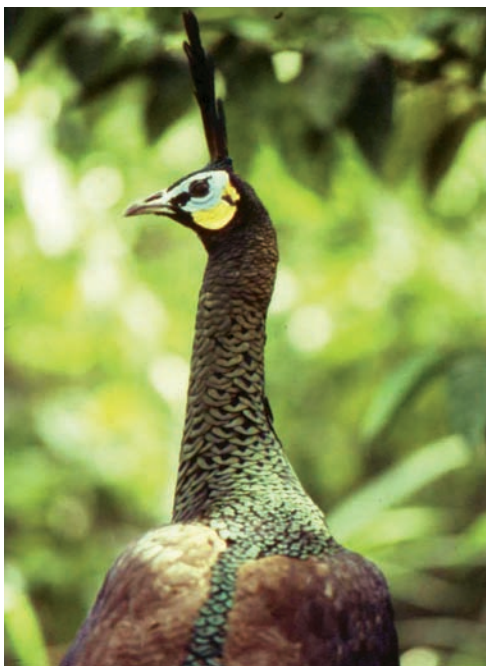
Great flocks of butterflies gather around pools or the places where an animal has urinated.

There are 288 species of birds (Tizard *et al.* 1997; Thamlasine, *undated*) in Nam Ha, including at least 18 key species of conservation concern. These encompass nationally important populations of silver pheasant (*Lophura nycthemera*); a healthy population of Blyth's kingfisher (*Alcedo hercules*); and several Southeast Asian highland species that have been found in a few other places in northern Lao PDR such as whiskered yuhina (*Yuhina flavicollis*), ashy-throated warbler (*Phylloscopus maculipennis*), green-tailed sunbird (*Aethopyga nipalensis*) and the rare crimson-breasted woodpecker (*Dendrocopos cathpharius*) (Tizard *et al.* 1997). Other species include the spectacular great hornbill (*Buceros bicornis*), green peacock (*Pavo muticus* sp.), fairy pitta (*Pitta nympha*), red jungle fowl (*Gallus gallus*) and grey peacock-pheasant (*Polyplectron bicalcaratum*).

The forest hums to the rhythmic calls of the great barbet (*Megalaima virens*) and blue-faced barbet (*Megalaima* sp.) or the loud calls of the Indian cuckoo (*Cuculus micropterus*). Lesser racket-tailed drongo (*Dicrurus remifer*) also have melodious calls, but the best songster in the forest is the white-rumped shama (*Copsychus malabaricus*). Flocks of doves and pigeons



Gibbon



Green peacock



Leaf butterfly

scour the canopy for fruiting fig trees while serpent eagles (*Spilornis* sp.) give eerie cries while circling over the forest.

Swordtail and swallowtail butterflies, and other *Papilio* and *Graphium* species, the Indian purple emperor (*Mimathyma ambica*) and the amazing leaf butterfly (*Kallima* sp.) are common. Large black and yellow birdswing butterflies (*Troides* sp.) sail over the canopy or hover around the *Aristolochia* vines where they lay eggs.

Conservation issues

Major threats to the Park's resources are shifting cultivation, population growth, livestock production, infrastructure development, harvest of non-timber forest products and wildlife for food and profit, and wood cutting for fuel and construction (Thamlasine, *undated*).

Illegal logging and hunting are also rampant. While hunting for elephant and tiger has the biggest impacts on those species, hunting for gaur and deer for food is more widespread. Even monkeys and gibbons are not safe from the hunters' muskets and traps.

Conservation benefits of ecotourism in Nam Ha Protected Area

- Villages acknowledge the economic values of wildlife and the forest, through ecotourism.
- There is growing interest in conservation management of wildlife and the forest.
- Poverty in surrounding villages is being reduced.
- Strong enforcement of rules is deterring illegal activities.
- Monitoring of wildlife is regularly conducted.
- Ecotourism is providing additional income for management.

Conservation and ecotourism programs

Ecotourism is widely promoted in protected areas in Lao PDR. It was first developed at the Nam Ha National Protected Area through a collaborative project of the National Tourism Authority of Lao PDR and UNESCO. The UNESCO—Nam Ha Ecotourism Project benefits not only Nam Ha but the residents of the Luang Namtha province as well. Promoting sustainable travel in the area is one of the Project's major objectives.

Ecotourism projects aim at conserving and protecting the natural and cultural

Nam Ha: A gateway to other areas

From Luang Namtha to the southwest, there is a major road to Vieng Phoukha district and the Thailand border, which passes through the corridor between Nam Ha East and West. From Luang Namtha to the north, a major road to Muang Sing district passes through the corridor between the Nam Ha West and the Nam Kong area. From Muang Sing to Muang Long, there is a major road network that parallels the northwestern border of the NBCA to the Myanmar border. From Luang Namtha to the northeast, a major road to Oudomxay province and the town of Boten on the China border parallels the NBCA boundary.

Smaller roads lead also to the NBCA borders. These include roads to Ban Nam Ngen and Ban Nam Mai on the east side of Nam Ha West and Suen Ya village on the east border of the Nam Kong area. The local government plans to build roads that would connect Nale district with Vieng Phoukha on the south border of Nam Ha East and from Vieng Phoukha to Long district on the southwest border of Nam Ha West.

heritage of Luang Namtha and the biodiversity of Nam Ha.

With its spectacular views, caves, and waterfalls, and several minority groups, Nam Ha National Protected Area has been identified by the National Tourism Authority of Lao PDR as having high potential for both cultural and ecological and/or nature tourism. Several minority groups living around the Park have their own distinct culture and colorful costumes. Most are still highly dependent on forest and non-timber forest products,

and live relatively traditional lifestyles. They have a strong tradition in herbal medicine.

Since 1999, the Park's ecotourism development has encompassed capacity building for managers and tourism guides, as well as villagers, who were trained on providing hospitable services and accommodations and handicraft development. Study tours and workshops were also conducted.

Trekking, hiking, kayaking, rafting, mountain biking, and boat tours through

Ethnic communities and ecotourism

The Park supports a diverse community of ethnic groups who are highly dependent on the forest and its resources, and living comfortably with their traditional lifestyles. These ethnic groups include the Lao Leu, Thai Dam, Lao Thueng, Ikor, Lao Hoi, Kui, Hmong and Etong.

In Nam Ha East, the Lao Thueng settled along the main road while the Lao Hoi lived along the rivers. One Hmong village (Ban Nam Vang) settled in the area among them. Some Lao Lum (sub-ethnic Leu) settlements are also found along the Namtha River. In the highlands of Nam Ha West, the communities are mostly Ikor (ethnic group: Lao Sung).

In Finho and Nam Bo, the communities are composed of Lao Hmong, Etong sub-ethnic groups in Etong village, and Lao Lum (Leu) in Tinthat village. The Nam Kong area is dominated by the Ikor, except for Lao Lum (Thai dam) in Nam Kong village, Kui in Kui Soung village and Hmong in Suen Ya village. Other class III or IV villages are Lao Lum settlements.

The area has been identified by the National Tourism Authority of Lao PDR as having high potential both for culture and nature tourism. A pilot project for an ecotrekking trail is planned for Nam Ha West, which is also supported by the Luang Namtha Province Ecotourism Project. Boating on the Namtha River and hiking in the hills are also being promoted by the Project.

Source: Assessing Progress Towards the 2010 Biodiversity Target: Fourth National Report of Lao PDR, May 2009.





Whitewater rafting

the villages of Luang Namtha, Muang Sing, Vieng Phoukha and Long are some of the activities managed by locals that help in improving their lives and in preserving the natural and cultural wonders of Nam Ha. Visitors can also have a taste of the local culture by availing of homestays in local villages.

With thousands of tourists flocking to the Park to see the natural and cultural landscape of the area, funds are also generated through park fees, packaged treks or tours, and souvenirs. The local

communities benefit from the tourist influx by providing accommodations (homestays); selling handicrafts, food and supplies; and being employed as guides, rangers and park management staff.

Single or multi-day trekking tours that include visits to villages and homestays are led by trained local guides. Many other activities such as boat tours, special tours for wildlife sighting, trekking or learning about rural lifestyles have been developed for visitors. Local communities are actively involved in tourism development and receive a significant part of the benefits.

The income that Nam Ha villagers get from the various ecotourism activities is one way for the villagers to cut back on their less sustainable enterprises and help prevent the loss of the country's fragile wildlife.

The ecotourism projects are indeed greatly contributing to the conservation of Nam Ha (Thamlasine, *undated*). Thus, this ASEAN Heritage Park has become a model for ecotourism development in Lao PDR. ■

Strides in Protected Area Management

Nam Ha National Protected Area is well known for its Eco-guide Services. The international award-winning Nam Ha Ecotourism Project was established in 2000 as the first community-based ecotourism project in Lao PDR. The Nam Ha and Muang Sing Eco-guides and the more recently established Vieng Phoukha Eco-guide Service organize community-based eco-tours that include forest trekking, river trips and village homestays. These are designed to produce economic benefits for local people, protect cultural heritage and raise funds for environmental conservation. All eco-guide tours employ certified guides from local communities to provide livelihoods for local people. Eco-guides and participating communities have received training in foreign languages, guiding techniques, hospitality management, food preparation and biodiversity monitoring. They work closely with protected area managers to ensure that sustainable ecotourism activities do not negatively affect the environment or the local communities' traditional culture.





MALAYSIA





Truly Asia: Where nature embraces heritage

Malaysia is one of the world's mega-diverse countries and ranks 12th in the world according to the National Biodiversity Index. The Index is based on the estimates of country richness and endemism in four terrestrial vertebrate classes and vascular plants. In addition, the 2008 Environmental Performance Index led by Yale and Columbia Universities ranked Malaysia 26th out of 149 countries for efforts in managing biodiversity and environment.

The country signed the Convention on Biological Diversity (CBD) on 12 June 1992 and ratified it on 24 June 1994. But even before the CBD, the country had programmed efforts toward the conservation of natural resources and biodiversity. After ratifying the CBD, Malaysia continued to pursue its objectives by vigorously strengthening these efforts.

Malaysia comprises 13 states and three federal territories. Eleven states and two federal territories (Kuala Lumpur

and Putrajaya) are located in Peninsular Malaysia while the two states of Sabah and Sarawak are located on the island of Borneo. The federal territory of Labuan is an island situated off Borneo. Malaysia has 877 islands within its political boundaries.

Throughout the year, the climate is warm and humid, with daily temperatures ranging from 21 degrees Celsius to 32 degrees Celsius, except in mountain and hill areas where the climate is cool.

Table 1. Forested area in Malaysia

Category	1990	2000	2005	2007
Area ('000 hectares)				
Permanent Reserved Forest (PRF)				
Peninsular Malaysia	4,750	4,800	4,800	4,696
Sabah	3,350	3,600	3,600	3,605
Sarawak	4,500	6,000	6,000	6,000
(a) Total PRF	12,600	14,400	14,400	14,301
(b) Stateland Forest	6,820	4,640	4,141	3,416
(c) National Parks and Wildlife and Bird Sanctuary	1,120	1,120	1,120	1,946
Total Forested Area (a+b+c)	20, 540	20,160	19,661	19,663
(d) Rubber plantation	1,836	1,431	1,229	1,207
(e) Other land uses (oil palm, agricultural crops, urban and other uses	10,480	11,265	11,966	11,986
(f) Inland water bodies	119	119	119	119
Total area for country (a+b+c+d+e+f)	32,975	32,975	32,975	32,975

Source: Forestry Department Peninsular Malaysia

Ecosystems and biological resources

Based on 2007 statistics, approximately 60 percent of the total land area of Malaysia is still forested (see Table 1). This includes permanent reserved forests (PRF),

stateland forests, national parks, and wildlife and bird sanctuaries. Agricultural crops, rubber plantations, oil palm plantations, urban areas and other land uses cover the remaining 40 percent.



Thousands of bats emerging from Deer Cave

Malaysia's terrestrial biodiversity is concentrated in tropical rainforests that extend from coastal plains to mountain areas, including inland waters such as lakes and rivers. Marine biodiversity is found among islands, marine and coastal ecosystems such as coral reefs

and seagrasses. The inter-related thematic areas and associated types of ecosystems are grouped into three categories: forest/mountain/inland waters; marine and coastal/islands; and agricultural biodiversity (see Table 2).

Table 2. Thematic areas and ecosystems of Malaysia

Thematic Area	Ecosystems
Forest biodiversity	<ul style="list-style-type: none"> • Lowland evergreen forest • Lowland dipterocarp forest • Heath forest • Limestone forest • Mixed dipterocarp forest • Hill dipterocarp forest • Hill mixed dipterocarp forest
Mountain biodiversity	<ul style="list-style-type: none"> • Montane forest • Sub-alpine forest
Inland waters biodiversity	<ul style="list-style-type: none"> • Peat swamp forest • Freshwater swamp forest • Riparian forest • Rivers, ponds, lakes, etc • Mangrove forest
Marine and coastal biodiversity Islands biodiversity	<ul style="list-style-type: none"> • Coastal hill dipterocarp forest • Mangrove forests • Mudflats • Coral reef • Seagrass
Agricultural biodiversity	<ul style="list-style-type: none"> • Plantations • Rice fields • Fruit orchards and vegetable farms • Livestock rearing and aquaculture farms

Summary of Terrestrial Fauna Species

Class	Number of Species		
	Peninsular	Sabah	Sarawak
Vertebrate			
Mammals	229	221	
Birds	74		
Amphibians	242		
Reptiles	567		
Freshwater fish	290	100	200
Marine fish	1,500		
Invertebrate			
Butterfly	1,031	936	
Leaf insect	1,073		
Freshwater crabs	102		
Hard coral	500-600		
Soft coral	200		
Mollusc	3,000		

Source: Ministry of Natural Resources and Environ-

Estimated Number of Flora Species

Class	Number of Species		
	Peninsular	Sabah	Sarawak
Algae	377		
Bryophytes	475	582	330
Ferns and associates	637	963	
Gymnosperm	27	34	
Monocots	2,010	2,170	
Dicots	5,529	4,497	

Protected area and conservation management activities

Safeguarding ecosystems ensures the conservation of the country's diverse biological resources. Of the 19.6 million hectares of forested areas in Malaysia,

World Heritage Sites	ASEAN Heritage Parks	Ramsar Sites
Kinabalu National Park	Kinabalu National Park	Tasek Bera, Pahang
Mulu National Park	Mulu National Park	Tanjung Piai, Johor
	Taman Negara National Park	Pulau Kukup, Johor
		Sungai Pulai, Johor
		Kuching Wetlands, Sarawak
		Lower Kinabatangan-Segama Wetlands, Sabah

14.3 million hectares (43.4 percent of total land area) were gazetted in 2007 as permanent reserved forest, and 1.9 million hectares (5.9 percent of total land area), as national parks, wildlife and bird sanctuaries.

Other forms of protection for natural habitats include state parks, wildlife reserves, wildlife rehabilitation centers, bird reserves, terrapin centers, and conservation areas. Some of these areas have been designated as United Nations Edu-

cational, Scientific and Cultural Organization World Heritage Sites (Natural List), ASEAN Heritage Parks, and Ramsar Sites.

Land and forests are under state jurisdiction while some protected areas are managed by federal agencies.

In Peninsular Malaysia, the Department of Marine Parks Malaysia manages the marine protected areas. These include 42 islands in Peninsular Malaysia and federal territories gazetted as marine parks.



Swamp forest

These areas cover 235,723 hectares and represent a wide range of habitats that include coral reefs, seagrasses and mangrove forests. In Sabah, marine protected areas, which cover 57,533 hectares, are managed by Sabah Parks. In Sarawak, these areas cover 206,344 hectares and are managed by the Sarawak Forestry Department.

The protection of wildlife in Peninsular Malaysia is regulated by the Protection of Wildlife Act 1972; in Sabah, the Sabah Wildlife Conservation Enactment 1997, and in Sarawak, the Sarawak Wildlife Protection Ordinance 1998. Based on the International Union for the Conservation of Nature Red List, Malaysia has 1,141 threatened plant and animal species. With this number of globally threatened species, the country is strengthening its

efforts to prevent their loss.

The Department of Wildlife and National Parks is in the process of strengthening the Protection of Wildlife Act 1972. The proposed new legislation aims to increase the penalties between 10 to 30 times, and to include derivatives of wildlife, and provisions to regulate or ban the entry of invasive alien species. It will also complement the International Trade in Endangered Species Act of 2008 that was passed to deal with the import, export and re-export of species listed in the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) throughout Malaysia.

In the implementation of the Convention on Biological Diversity (CBD) and relevant action plans, many government agencies, state governments and other



Sarawak chamber

stakeholders are involved. The programs of work for thematic areas and cross-cutting issues under CBD are coordinated by ministries, and supported by several other implementing agencies. For instance, the Ministry of Agriculture takes the lead for invasive alien species, with its Department of Agriculture as the

coordinating arm for other agencies that deal directly or indirectly with invasive alien species such as the Department of Fisheries, Malaysia; the Malaysian Agricultural Research and Development Institute; the Forest Research Institute Malaysia; and the Department of Wildlife and National Parks. ■

Sabah's Traditional Knowledge Documentation Programme

Local indigenous communities in the State of Sabah preserve their traditional knowledge through proper recording or documenting techniques.

The Sarawak Biodiversity Centre (SBC) has conducted consultative meetings and collections in 33 locations among 12 ethnic communities in Sarawak. The Traditional Knowledge Documentation Programme, which the SBC started in 2001, has achieved the following:

- Traditional Knowledge on Useful Plant Database – 2,122 plants documented.
- Herbarium – 3,716 plant specimen duplicates.
- *Ex-situ* Plant Collection – 1,155 plants.
- Natural Product Library – 16,678 plants parts extracts.
- Actinomycetes Collection – 6,815 strains.
- Fungi Collection – 1,946 strains.

Documentation efforts are carried out through the journal method and include consultative meetings with community leaders for prior informed consent and capacity-building workshops on documentation techniques, and on the propagation and management of useful indigenous plants for local communities. The Programme also encourages local indigenous communities to cultivate useful indigenous plants for their own uses.

SBC also implements the Material Transfer Agreement with the indigenous communities when SBC collects plant materials with communities. SBC has provided a site for the *ex-situ* conservation of useful indigenous plants and also contributes towards enhanced awareness and appreciation of indigenous plants among all levels of society.

The Programme also strongly supports the Research and Development Programme of SBC by providing sufficient raw material for research on plants that may have potential in areas of product development, commercialization or drug discovery. In 2006, SBC established the Laila Taib Ethnobotanical Garden for useful indigenous plants from various communities in Sarawak.

The Programme also aims to discover chemicals and enzymes from biological resources that would be useful over a broad range of applications for industrial-related products such as essential oils, bio-pesticides and commercial dyes.



GUNUNG MULU NATIONAL PARK

Crown jewel of Sarawak's protected areas

Gigantic limestone caves, tropical karsts, and very high biodiversity are the more internationally recognized features of Gunung Mulu, the second highest mountain peak in Sarawak. It is the largest national park in the State and is considered the “jewel in the crown” of Sarawak’s expanding network of protected areas. Its tropical karsts are the most studied in the world and its large limestone caves are the roosting areas of millions of swiftlets and bats. Gunung Mulu National Park is one of Malaysia’s World Heritage Sites. The Park was first constituted on 3 October 1974, and opened to the public in 1985.



Gunung Mulu in Sarawak, Borneo and Mt. Kinabalu in Sabah, both of which are ASEAN Heritage Parks of Malaysia, are not more than 300 kilometers apart but have different features. These two Heritage Parks encompass almost all the land ecosystem types in Borneo. Mt. Kinabalu is one massive granite mountain rising sharply to some 4,100 meters while Gunung Mulu has varied geological formations dominated by a large sandstone mountain—the 2,376-meter high Gunung Mulu—and two smaller limestone mountains: Gunung Api (1,750 meters) and Gunung Benarat (1,585 meters).

The 52,865-hectare (528.65 square kilometers) National Park lies astride the watershed between Sungai Tutuh, which marks the Park's southern boundary and Sungai Medalam in the north (ASEAN/JICA/UNEP, *undated*). It is contiguous to the Medalam Protected Forest. Its steep ridges and escarpments, and karsts are among the most interesting in Southeast Asia.

Extraordinary limestone caves and mountains

Gunung Mulu National Park has one of the most extensive and spectacular limestone cave systems on earth. There are 19 major caves and over 89 kilometers of huge cave passages (Brook, D.V. *et al.* 1982).

The most spectacular is Gua Payau (Gua, means cave; Payau, deer) or Deer Cave, which is considered as the world's largest natural cave passage, measuring 120 to 150 meters in diameter. Gua Nasib Bagus or Good Luck Cave has the world's largest natural chamber within a cave. The Sarawak Chamber in the southeastern part of Gunung Api, measures 600 meters long, 400 meters wide and 270 meters high (from the lowest part of the floor to the highest ceiling), and accordingly can accommodate eight Boeing 747 aircrafts lined up nose to tail. On record, the 108-kilometer long Clearwater Cave System is the longest in Asia, and believed to be the 11th longest cave system in the world. Clearwater



Deer Cave



Shorea sp.

Cave contains the largest examples of photo-karst in the world and also the largest windblown stalactite, known to be over one meter long. Stromatolites are also common in all the cave entrances. The most beautiful is Gua Ajaib (Wonder Cave), which is adorned with all shapes and sizes of calcite formations such as fans and delicate halictites (ASEAN/JICA/UNEP, *undated*).

Gunung Api, a 1,750-meter high limestone mountain, lies directly beside Gunung Mulu. These mountains are known to be over five million years old. About two-thirds of the way up Gunung Api sits a mass of enormous razor-sharp limestone pinnacles, the result of millions of years of heavy rainfall.

Vegetation zones

Gunung Mulu has diverse vegetation formations because of its wide range of soil types and altitudes. Some 17 vegetation zones have been recognized, over 3,500 plant species listed, and 2,000 flowering plants identified. The World Wildlife Fund for Nature (WWF) and the



Pitcher plant

International Union for the Conservation of Nature (IUCN) have considered Gunung Mulu a Centre of Plant Diversity (1994-1995).

On the Gunung Mulu sandstone mountain, the multi-storied mixed lowland dipterocarp forest occurs up to an altitude of 800 meters. This forest represents one of the most diverse in Malaysia. Within three plots covering a total area of just 1.2 hectares, about 284 tree species have been recorded. Common species include *Shorea*, *Durio*, *Garcinia*, *Calophyllum* and *Eugenia*. The lower montane forest that occurs in altitudes ranging from 800 to 1,200 meters is dominated by *Quercus subsericea* (Clark *et al.* 2007).

The small trees and shrub layer on the upper montane forest (1,200 to 2,177 meters above sea level) is represented by four species of *Rhododendron* and *Vaccinium* and pitcher plants (*Nepenthes lowii*, *N. tentaculata* and *N. muluensis*) that are all endemic to Gunung Mulu.

On the Melinau limestone formation, one can find examples of limestone scree

forest, limestone cliff vegetation, lowland limestone montane forest, upper montane limestone forest and limestone cave vegetation. Many endemic calcareous species are represented in this area and the limestone flora is one of the most diverse and best preserved in Southeast Asia.

The alluvial plains feature lowland alluvial, tropical heath, peat swamp, and riparian forests—the most complex vegetation formation in the Park. Some emergent species attain a height of 40 meters, with maximum girths of 2.5 meters.

Flora

Gunung Mulu National Park has some 3,500 species of vascular plants and is one of the richest sites in the world for palms, with 111 species and 20 genera recorded. The most significant are the wild sago palm (*Eugeissona utilis*), occurring on the steep slopes; *Iguanura melinauensis* and *Licuala lanata* that are endemic to the alluvial plain; *Calamus neilsonii* and *Salacca rupicola*, endemic to the limestone mountain and *Areca abdulrahmanii* on the Setap shales (Clark *et al.* 2007).

A total of 1,700 species of liverworts and mosses have been recorded. Mosses endemic to the Park include *Stereodontopsis flagellifera*, *Coryphopteria andersonii*, *Hypnodendron beccarii* and *H. vitiense*. The

very rare bogmoss (*Sphagnum perichae-tiale*) grows in rain gullies in the high forest. A great number of *Pteridophytes* or spore-producing plants are also found in the area. Some 442 species have already been identified, many of which are ferns, and 4,000 species of fungi have been recorded. A floral inventory can be found in Anderson *et al.* (1982) although numerous species have since been described by Clark *et al.* (2007).

The Park is also home to 170 species of wild orchids, including the famous slipper orchids, and 10 species of insectivorous pitcher plants (*Nepenthes* sp.).

Fauna

A diverse range of faunal species have been recorded, including 75 mammalian species, 262 bird species (including eight species of hornbills found in Sarawak), 52 reptile species, 76 amphibian species, 47 fish species and an estimated 20,000 invertebrate species (Country Report of Malaysia to the 3rd AHP Conference, 2010).

The latest record shows 28 species of bats, one of the highest numbers recorded in Southeast Asia. Bat research is ongoing, with more species likely to be recorded in the future. The Deer Cave alone houses 12 species of bats, the largest number of different bat species in any cave. It contains one of the world's largest colonies of free-tailed bats (*Nyctinomops* sp.), and an estimated three million of the wrinkle-lipped bat (*Charephon plicata*). The lesser tailless round leaf (*Coelops robinsoni*) and the orange leaf tube-nosed bats (*Rhinonicteris aurantia*) are examples of bats in the Park that have not been seen anywhere else in Borneo.

Two endemic species of Borneo squirrels: the tufted ground squirrel (*Rheithrosciurus macrotis*), and the plain pigmy

Biological richness of Gunung Mulu National Park

- 3,500 species of plants
- 75 species of mammals
- 262 species of birds
- 74 species of frogs
- 52 species of reptiles
- 76 species of amphibians
- 47 species of fish
- 281 species of butterflies
- 458 species of ants
- 20,000 invertebrate species

Source: Country Report of Malaysia to the 3rd ASEAN Heritage Parks Conference, 2010



Fireback pheasant



Lantern bug



Snake

squirrel (*Exilisciurus exilis*) have been recorded in the Park. The smallest mammal in the world, Savi' pygmy shrew (*Suncus etruscus*), weighing only two grams, is also found here.

Of the 736 species of birds recorded in Malaysia, 262 are known to occur in Gunung Mulu. Out of 29 endemic Borneo species, 26 have been recorded in the Park. Eight of Borneo's hornbill species have been identified and include the wrinkled hornbill (*Rhyticeros corrugates*). Other species are Bulwer's pheasant (*Lophura bulweri*), crested fire back pheasant (*L. ignita*), Storm's stork (*Ciconia stormi*), and the bamboo muni, which is endemic to Borneo, and found only in Mulu and Kinabalu.

Cave fauna including many troglobitic species is also abundant, with over 200 species recorded. Many of the cave fauna are endemic, with 41 on the endangered species list. The largest colony of cave swiftlets (*Aerodramus* sp.), estimated to be in the millions, is said to occur in one cave formation. Many invertebrates are also endemic to the site. *Lepidoptera* is well represented, with 80 percent of Borneo species recorded. Other endemic species include the *Celastrina* sp.

A total of 40 snake species have been recorded and include the regal python (*Python reticularus*), and reed snake (*Calamaria borneensis* and *C. melanota*). Poisonous snakes include the banded-coral snake (*Maticora intestinalis*), the red-headed krait (*Bungarus flaviceps*) and the white-spotted cat snake (*Boigo drapiezzii*).

Two-thirds of all known amphibian species in Borneo like Wallace's flying frog are found in the Park. A significant species is *Philautus* that breeds only in the fluid of the pitcher plant. There were 27 species of lizard identified.

Conservation issues

Poaching has long been a threat to the wildlife. Edible bird's nests and rare orchids have become a thriving cash crop for local people. Although illegal, the gathering of these products has been very difficult to control. Other threats to wildlife resources include pollution of parts of the Melinau River, severe erosion of the riverbanks due to forest clearance for housing development and rice cultivation, and waste pollution from a growing population, as there is no waste management system.

Park management

The State Forestry Department has overall control of the National Park. The Director of Forests administers it through the National Parks and Wildlife Division, which delegates the management of the Park to the Sectional Forest Officer at Miri. The Park headquarters is located on the left bank of the Melinau River; this is where all visitors should get an entrance permit, and request for a Park guide.

High and low density, traditional use and wilderness zones have been identified in the Park. High-density zones are concentrated around the Park Headquarters, and the eight caves, four of which are show caves. Visitors are restricted to

designated paths. Rules governing visitor behavior are strictly imposed to minimize disturbance to the caves and their fauna. Traditional zones are for subsistence hunting and gathering of forest produce. Wilderness zones cover 95 percent of the caves. These zones are not open to the public, and research is only allowed if permitted by the Director of Forests.

A 'Special Parks Committee' has been created to advise the government about the management of the Park. The Committee also helps develop and deliver a series of community awareness programs to encourage community support for protection and conservation activities and deter activities that harm the environment.

Other activities and attractions

The four show caves developed for visitors are Deer Cave, Lang's Cave, Wind Cave and Clearwater Cave. These caves have cemented and timber walkways, and electric lighting. In addition, an extensive number of hiking trails totaling 37.9 kilometers have also been developed for adventure caving activities. Six to 10 persons in a group and one guide are allowed in these areas, visiting at 20-minute intervals. The total carrying capacity for these low-density zones is restricted to 60 people a day.

Strides in Protected Area Management

Park management has introduced a licensed Park Guiding System for park guides. This system provides extra knowledge in guiding activities as well as incentives and security for local park guides. Only tourist guides who have undergone the prescribed training course and have been issued with the park guiding license are allowed to bring tourists into the Park.

Local community members are also active in tourism activities as operators of boats, canteens, and lodging houses; park guides; park management staff; and as members of the Special Park Committee. These activities have provided local communities with income as well as increased support for the Park's conservation.



Canopy skywalk

Aside from caving or cave tours and learning about the cave life of bats and swiftlets, visitors can experience jungle trekking and night walks; and view the plant life while on the canopy skywalk.

Getting there

Miri, in Northeast Sarawak, serves as the main gateway to Gunung Mulu Na-

tional Park. Malaysian Airlines operates scheduled services from Miri and Limbang to Mulu; the flight takes approximately 45 minutes. The Park can also be reached by boat via Marudi town. There is no regular boat service in the last section of the trip so longboats must be chartered. Tour operators can also arrange boat passage to Mulu. ■



KINABALU NATIONAL PARK

Sacred mountain of Sabah

Kinabalu National Park is one of the biggest attractions of Sabah State. Covering an area of 75,370 hectares, the Park is situated in the East Malaysian state of Sabah and stretches through the entire west coast of Sabah. Its highest peak is Mount Kinabalu, standing at 4,101 meters (13,455 feet), which continues to rise five millimeters per year as the world's youngest granite pluton.



In 1961 and 1964, the Royal Society of London sponsored two expeditions to explore the mountain and its flora. The results of these expeditions eventually led to the establishment of Mt. Kinabalu as a National Park in 1961.

The next two highest peaks are Mount Trus Madi (2,641.40 meters / 8,666 feet) and Mount Tambuyukon (2,579.22 meters / 8,462 feet), which are located 50 kilometers south and 20 kilometers north of Mt. Kinabalu, respectively.

The lowest elevation in Kinabalu Park is at Poring Hot Springs (550 meters), which lies close to the Park's southern boundary. It is hot (average of 25 degrees Celsius) and humid at Poring, and crisp and cool (average of 4 degrees Celsius) at Mount Kinabalu's summit. The climatic changes provide a diverse range of habitats for thousands of plant species.

Kinabalu Park has six unique major topographical features: peaks and plateaus, gullies, rivers, streams and waterfalls, hot springs, caves (Paka Caves

and the tumbled bats cave at Poring) and granite slabs at the slopes of the summit.

Habitats

Stretching from the lowlands to the peak of the highest mountain in Borneo, Kinabalu boasts incomparable diversity of flora and a wide range of vertically-zoned habitat types. These range from hill dipterocarp forest, submontane forests dominated by *Lauraceae* and *Fagaceae* up to about 2,000 meters, stunted upper montane heath rhododendron forests as far as the treeline, and strange alpine flora on the bare granite massif itself.

Wildlife

Kinabalu is famous for its rich flora and fauna. In addition to a wide range of the lowland species of the island, Kinabalu has the most complete list of montane species of all taxa. Many species are found only in Kinabalu.

The flora mingles at all altitudes with most of the Malaysian upsurgents disap-



Slipper orchid

pearing above 1,200 meters, and many new genera unfamiliar to the lowlands begin to enter. Examples include the buttercups (*Ranunculus*) of Australian affinity, the climbing madder (*Rubiaceae*) of European affinity, the Rosaceous trees and shrubs of Sino-Himalayan affinity and *Gunnera* of the Southern Hemisphere together with the pitcher plants (*Nepenthes*) of Borneo. Some scientific experts believe that the mountain contains “the richest and most remarkable assemblage of plants in the world.”

Flora

An enumeration of the flora by Beaman (1996) reveals that nearly 4,000 species of vascular plants have been collected and that over 180 plant families and 950 genera occur in the flora. However, in 1998, Beaman & Beaman disclosed that Kinabalu flora could contain as many as 5,000 – 6,000 species, and over 200 families and 1,000 genera.

Studies on the flora show that there are around 1,000 orchid species in 121 genera including the famous slipper orchid (*Paphiopedilum rothschildianum*)

Estimated number of plant species

- 1,000 species of orchids in 121 genera
- 608 species of ferns
- 9 species of *Nepenthes* (3 species are endemic to Kinabalu: *N. burbidgeae*, *N. rajah* and *N. villosa*)
- 24 species of *Rhododendron* (5 species are endemic to Kinabalu: *R. ericoides*, *R. buxifolium*, *R. fallacinum*, *R. stenophyllum* and *R. abietifolium*)
- 78 species of *Ficus* (13 species are endemic and 5 are endemic varieties of other species)
- 30 species of gingers
- 6 species of bamboos
- 52 species of palms
- 2 species of *Rafflesia* (*R. pricei* and *R. keithii*)



Bamboo



Pitcher plant



Rhododendron species

(Lamb, 1996); 608 fern species (Holttum, 1996); nine *Nepenthes* species, of which three species (*N. burbidgeae*, *N. rajah* and *N. villosa*), are endemic to Kinabalu (Corner, 1978 as revised by Beaman, 1996); 24 *Rhododendron* species, of which five species (*R. ericoides*, *R. buxifolium*, *R. fallacinum*, *R. stenophyllum* and *R. abietifolium*) are endemic to Kinabalu (Argent, 1996); 78 *Ficus* species, of which 13 species are endemic and five are endemic varieties of other species (Corner, 1962 as revised by Beaman, 1996); 30 ginger species (Smith, 1996); six bamboo species (Wong & Dransfield, 1996); 52 palm species (Dransfield, 1996); and two *Rafflesia* species (*R. pricei* and *R. keithii*) (Mat Salleh, 1996; Basintal, 2007).

Fauna

Several scientists have also studied Kinabalu's faunal diversity. Payne (1996) revealed that at least 90 species of lowland mammals, including 21 species of bats, and 22 species of montane mam-

Biological richness of Kinabalu National Park

- 5,000 – 6,000 species of plants
- 90 species of lowland mammals
- 22 species of montane mammals
- 326 species of birds
- 9 families of fish
- 200 species of butterflies

mals have been recorded. More than 300 species of birds have been found (Jenkins & de Silva, revised by Wells & Phillips, 1996) and categorized into four groups: (1) subalpine zone species; (2) endemic montane species; (3) non-endemic montane species; and (4) lowland species. Four species of birds were found on the subalpine zone, while 46 species occurred in the montane zone, of which 14 species are endemic to Borneo (Smythies, 1996). A study by Biun (1999) within Kinabalu disclosed a total of 326 bird species in 180 genera and 47 families (Basintal, 2007).

Nine families of fishes have been recorded in the Park (Chin, 1996). The



Blackeye bird



Mountain blackbird



Butterfly

most common fishes found on the clear mountain stream are the *Gastromyzon-tidae*. The species list of frogs and toads have now gone up to about 61 species (Inger et al., 1996; Basintal, 2007).

Scientists have also recorded 200 species of butterflies that were found mostly below 2,000 meters on Kinabalu, and about 112 'macro' moth species that were most common at 2,000 meters and above (Holloway, 1996). The beetle fauna is numerous and diverse with eight families, and two sub-families. The family *Scarabaeidae* had the highest number of species (over 100) found within the Park (Basintal, 2007).

Conservation issues

With many villages and alienated lands surrounding the Park, development pressures have been increasing due to population encroachment and conversion of land adjacent to the Park

for agriculture. There have also been several claims on areas within the Park as 'native customary rights' based on the Land Ordinance (Sabah Cap. 68). Areas claimed total some 2,000 hectares and are adjacent to villages at Podi, Takulong, Piak, Lahanas and Melangkap. Fruit tree cultivation and burial grounds are the basis for the villagers' claims (Basintal, 2007).

Alien invasive species have also become a threat, particularly the compositae (*Taraxacum officinale*), which is found about 3,352 meters on Mt. Kinabalu, mainly between Panar Laban and Gunting Lagadan hut. Since this species may compete with or cause the decline of rare species, Park management initiated an eradication program that involves pulling out the plant manually. Drought and the illegal harvest of forest products are other threats to the Park's wildlife resources.



Visitors eager to reach the Park's summit.

Park management

The Park management unit is composed of the Park Manager based at the Kinabalu Park Headquarters; the Assistant Park Manager based at Poring Hot Spring Station, and a Park Ranger at Mesilau Station. Supporting the main stations at Poring and Mesilau are the three sub-stations located in Serinsim, Monggis and Sayap that are each headed by Park Rangers (Basintal, 2007).

The Park has accommodations for visitors staying overnight or for a few days. Chalets, hotels and dormitories are available for visitors. Campsites are strategically located at intervals all the way up close to the summit. The headquarters also has restaurants, souvenir and book shops, an education center and a botanic garden.

Activities and other interests

The granitic massif of Mt. Kinabalu offers a range of opportunities for hikers, scramblers and rock climbers. Two tourist trails at Timpohon and Mesilau, lead to the summit. Visitors who opt for the easier and shorter route may take a hike

to the summit from the Timpohon Gate, which is a 4- to 6-hour trek to reach the Laban Rata rest house, located at 3,307.93 meters / 10,850 feet above sea level. They can stay overnight at the resthouse, then hike to the summit the next day. The Mesilau trail is slightly longer but is more scenic than the Timpohon trail. A hike along this trail will usually take about 6 to 9 hours to reach Laban Rata rest house.

For those who love rock climbing, the Western Plateau boasts the largest number of peaks and rock climbing opportunities with several approach options.

For those who want a cultural experience, Mt. Kinabalu is known for its intimate connection with the folklore and local traditions of Sabah. On its slopes are the homes of Hill Dusuns or Kadazans, who belong to the largest ethnic group in the State. They live in small kampongs or villages scattered throughout the area. They are noted for their basketry and other handicrafts and still use traditional methods of farming. Their steep fields, planted with dry rice and other crops and thickly clothed

in secondary jungle while lying fallow, reach right to the Park's boundaries. For the Kadazans, Mt. Kinabalu is the resting place of the spirits of their ancestors and as such, remains sacred.

The Park is visited yearly by thousands of tourists who come to enjoy its climate, scenery, and floral and faunal splendors. Having an altitude that varies from 152 meters to 3,952 meters above sea level, the Park enables the preservation of tropical lowland forest and wildlife, as well as the alpine-like associations of the summit zone. The Park is open any time of the year but visitors especially mountain climbers should avoid the rainy months of November to February.

Poring Hot Springs offer several activities and attractions. Visitors can bathe in the natural hot springs; see the butterfly house, ethnic garden, and mini-zoo; or experience the canopy walkway

or the forest walk to a large waterfall. The Hot Springs area has a camping site and a chalet for those who want to stay overnight.

Getting there

The Park is about two hours' drive from Kota Kinabalu. Buses to the interior town of Ranau usually leave the main outstation bus depot starting at 7 in the morning and every hour thereafter, and pass the entrance to the Park headquarters, which is 80 kilometers away. To go back to Kota Kinabalu, one can wait at the Park entrance for buses that ply the route from 9 in the morning onwards.

Taxis are available from the bus depot. Vehicles for hire are also available from the car rental companies. Poring is 40 kilometers away from the main Park headquarters, and is accessible by road through Kundasang and Ranau. ■

Strides in Protected Area Management

Clear demarcation of park boundaries, implementation of fees, as well as strengthened safety program for tourists and climbers are among the major efforts supporting the successful management of Kinabalu National Park. In 1998, the Park was completely surveyed and its boundaries were clearly demarcated. This makes it easier for management to detect any encroachment and prosecute offenders.

While the Park receives a grant from the State Government of Sabah, its funds for operations and conservation management are supplemented by income generated from fees collected for a variety of activities. Aside from the entrance fee, other fees collected are for the canopy walkway, camera and video service at the canopy walkway, butterfly farm, Mountain Garden, mountain climbing, rental of bath tubs; compound fees; sale of park accommodations; and fines for violation of Park rules.

With the increasing number of Park visitors, management has taken steps to ensure their safety especially the mountain climbers. A Search and Rescue Unit has also been established and trained to ensure safety on the mountain. Park authorities limit the number of mountain climbers to the summit as well as the issuance of climbing permits. Currently, only 192 climbers a day are allowed to go up the summit. Climbers must pass through three check points along the trail, where a park staff checks a climber's identity card against the climbers' list. Only those whose cards tally with the climbers' list are allowed to proceed with the climb.

TAMAN NEGARA NATIONAL PARK

Malaysia's first and oldest protected area

One of the world's oldest rainforests, Taman Negara is considered to be older than either the Amazon or the Congo, as it has remained undisturbed for over 130 million years. Located close to the equator, Taman Negara boasts the most extensive protected area of pristine, lowland, evergreen rainforest in the country. The area receives 2,200 millimeters of rain in the lowlands and up to 3,800 millimeters in the mountains throughout the year. The rainforest covers 4,343 square kilometers (434,351 hectares) across the states of Pahang, Kelantan, and Terengganu.





Originally named King George V National Park, the Park was renamed Taman Negara after the nation gained independence in 1957. Taman Negara is the first and the oldest official protected area in the country. The site was declared a National Park by the sultans of the three states in 1939 for the sole purpose of protecting and preserving the indigenous flora and fauna. Taman Negara was established under three state enactments: Taman Negara Enactment (Kelantan) 1938, Taman Negara Enactment (Trengganu) 1939, and Taman Negara Enactment (Pahang) 1939 (Zainuddin *et al.* 2007).

The highest point in the Park is Gunung Tahan at 2,187 meters above sea level. The other peaks are Gunung Gagau (1,376 meters), Mandi Angin (1,459 meters), and Kuala Atok (75 meters). Gunung Tahan marks the Pahang-Kelantan border (Zainuddin *et al.* 2007).

No commercial exploitation is permitted, except for subsistence hunting by the aboriginals (the Orang Asli people).

Habitats

Taman Negara is generally hilly and mountainous. The center of the Park is mountainous and lies on sedimentary rock, and the surrounding area is comprised of granite and scattered outcrops of limestone.

The lowland area covers only about 10 percent of the Park's total area. Lowland dipterocarp forests dominate the

area, with many rattan and other palm species, and some huge emergent legume species such as *Koompassia* and *Instia*.

Salt licks occur naturally on the ground surface of certain locations in the forest where mineral salts are found. These places are frequented by many animals especially herbivores. Two artificial salt licks have been created to promote wildlife viewing. There is a string of limestone hills between Trengganu River and Kenyam River, and the largest is Gua Besar, which is visible from Teresik Hill. Close to Kuala Tahan is the limestone cave named Gua Telinga.

Biological resources

Taman Negara is home to an estimated 185,000 species of fauna and 8,000 species of flowering plants. Among the fauna are endemic species such as crested argus (*Rheinardia ocellata*) and mountain pheasant (*Polyplectron inopinatum*), and endangered species such as the world's smallest rhinoceros (*Dicerorhinus*



Crested argus

Habitat types

- Lowland dipterocarp forest
- Hill dipterocarp forest
- Riparian forest
- Lower montane forest
- Upper montane forest
- Heath forest

Source: Zainuddin *et al.* 2007

Biological richness of Taman Negara National Park

- 8,000 species of flowering plants
- 185,000 species of fauna
 - 250 species of resident birds
 - 58 species of reptiles
 - 56 species of amphibians
 - 109 species of fish



Mangosteen

sumatrensis), which is near extinction. This small rhinoceros can be found only in Malaysia (Peninsular Malaysia, Borneo and Sumatra), Indonesia, and possibly Myanmar.

Flora

With 22 endemic species on a land area of 434,300 hectares (4,343 square kilometers), Taman Negara has a ratio of 5:1 hyper-endemics per 1,000 square kilometers, making it the most important center of endemism in the Malay Peninsula (Zainuddin *et al.* 2007).

The lowland dipterocarp forest comprises about 57.6 percent of the plants in the Park. A hectare plot that contains more than 100 tree species illustrates the great richness of this tropical rainforest. The vegetation communities range from the humid tropical rainforests of the lowlands, to the montane oak and ericaceous forests of the higher elevations. The rainforests have tall evergreen trees that attain heights between 30-50 meters and are rich in woody tree species, with a large percentage of the known species occurring in the lowland region. Meranti (*Shorea* sp.) and keruing (*Dipterocarpus*



Rambutan

sp.) are common and frequently occur in association with the tall, buttressed tualang (*Koompassia excelsa*), known as the tallest tree in Southeast Asia. Most of the wild varieties of cultivated fruit trees occur in Taman Negara. These include wild durian (*Durio* sp.), petai (*Parkia* sp.), terap (*Artocarpus* sp.), langsung (*Lancium* sp.), rambai (*Baccaurea* sp.), rambutan (*Nephelium* sp.), macang (*Mangifera* sp.), mangosteen (*Garcinia* sp.), putat (*Baccaurea griffithii*), ara (*Ficus* sp.), and jambu (*Eugenia* sp.).

The understory trees and shrub community belong to the families *Euphorbiaceae*, *Rubiaceae*, *Annonaceae*, with the following species: *Memecylon*, *Helicia*, *Eugenia*, *Garcinia*, and *Gironniera* as the typical genera. Pucuk paku (*Athyrium esculentum*), the edible fern, is abundant on the edges and forest opening. The bird's nest fern (*Asplenium nidus*) and the staghorn fern (*Platycterium coronarium*) are common tree crown epiphytes.

The forest trees of the higher elevations are generally short. The forest canopy consists mostly of oaks (*Fagaceae* sp.) and some conifers (*Dacrydium* sp., *Podocarpus* sp., and *Agathis* sp.), and

the shrub layer has many rattan and dwarf palms (*Arenga* sp. and *Licuala* sp.). Epiphytic orchids, mosses, and ferns decrease in abundance with increasing altitude until the cloud forest is reached at 1,880 meters elevation. At the summit of the highest hills, ericaceous species (*Rhododendron* and *Vaccinium*) predominate.

The riparian vegetation is characterized by medium-size trees that include neram (*Dipterocarpus oblingifolius*), mepening (*Lithocarpus wallinichianus*), and berangan (*Castanopsis* sp.).

The flora of the Park has never been significantly disturbed. While forests worldwide have experienced the extinction of many of their early floral species, the Malayan forest has remained relatively unchanged in its composition because of its location in the Asian tropics. This has allowed the constant development of the flora and the evolution of new species.

Fauna

Several mammal species occur in the lowland regions and include seladang (*Bos gaurus*), elephant (*Elephas maximus*), Malayan tapir (*Tapirus indicus*), tiger (*Panthera tigris*), leopard (*Panthera pardus*), mouse deer (*Tragulus javanicus*), sun bear (*Helarctos malayanus*), and Sumatran rhinoceros (*Didermoceros sumatrensis*). Others include sambar deer (*Cervus unicolor equines*) and serow (*Capricornis sumatraensis*). Primate species include siamang (*Hylobates siamang*), white-handed gibbon (*H. lar*) and langur (*Presbytis* sp.) (Zainuddin *et al.* 2007).

Some 250 species of non-migratory birds have been recorded (Aiken and Leigh, 1983). The list includes the great argus pheasant (*Argusianus argus*), crested fireback pheasant (*Lophura ignita*), Malaysian peacock-pheasant (*Polyplectron malacense*) and three endemic species: moun-



Rajah Brooke's birdwing

tain peacock pheasant (*P. inopinatum*), hill prina (*Prina atrogularis*) and crested argus (*Rheinardia ocellaia nigrescens*).

There are 58 reptile species and 56 amphibian species and include the viper (*Trimeresurus hageni*) and the soft-shelled turtle (*Chitra indica*). Of the 109 fish species identified, 15 species are endemic to Taman Negara such as *Barynotus ocellatus*, *Lobocheilus cornutus* and *Puntius halei*. Other rare species are *Probarbus gullieni* and *Rasbora dusonensis*.

Conservation issues

The extensive boundary of the Park is susceptible to encroachment especially in the remote parts of the protected area, despite regular patrols. Some residents along the boundary enter the Park to illegally harvest non-timber forest products like *Aquilaria* and poach wildlife. Efforts have been stepped up to increase patrolling activities. Areas adjacent to the Park are also being rapidly developed into additional tourist facilities such as resorts, restaurants, and shops. Park management has no jurisdiction over these areas, which are privately owned, either by individuals, land development authorities or state agencies. As a result, these developments have, to some extent, degraded the quality of the river due to



Tapir

siltation and increase in water temperature, among other impacts.

Park management

The Department of Wildlife and National Park (Perhilitan), under the Ministry of Science, Technology and Environment, manages the Park. Management staff includes a Park Superintendent, Assistant Superintendent and Park rangers. The rangers are empowered under the Taman Negara Enactment to protect Taman Negara and its resources, and also to



Bushy crested hornbill

enforce the Protection of Wildlife Act of 1972, mainly for the protection of wildlife species (Zainuddin *et al.* 2007).

Ranger stations are located in strategic areas along the Park boundary, especially where infrastructure development activities is moving closer to the Park's vicinity. The old established stations are at Kuala Atok, Kuala Trenggan, Kuala Kenyam, Kuala Kelapor and Kuala Aur. New ranger stations have been built on the western boundary at Kuala Yu and Merapoh in Pahang, Kuala Koh and

Strides in Protected Area Management

The management of Taman Negara National Park partners with and directly involves the local community in ecotourism and other activities to generate awareness about the environment and its many issues. The local community is now actively involved in planning and managing ecotourism activities. Consultations with villagers around the Park are held as often to discuss new policies and issues related to ecotourism and park management.

Locals have become operators of boat services; tours; chalets; and food and beverage services, and also work as nature and mountain guides and suppliers of local handicrafts. The government has also transferred the management of the Golden Masheer Sanctuary in the Park to the local community through a Memorandum of Agreement. The local community manages the fish population of the Golden Masheer in a specific location and conducts recreation activities for visitors. The Park authority then monitors the implementation of the program to ensure that it achieves its conservation objectives.



Boat ride on one of the rivers

Kuala Pertang in Kelantan and Tanjung Mentong in Terengganu.

Funding comes mostly from the national government and the Taman Negara Trust Fund that was established to further support the conservation of biodiversity and the management of the Park. The resort operator contributes 1.5 percent of their annual gross profit to the Trust Fund.

Management activities in the protected area largely focus on conservation, habitat management, wildlife management, recreation, ecotourism, conservation education, public awareness, local community participation, and law enforcement.

Other interests

The most popular activities at Taman Negara are river cruises and a series of well laid-out jungle trekking trails. The world's longest canopy walk is also a must-see, offering a fantastic close up view of activity in the rainforest canopy. Observation hides are another great way to observe wildlife. Simple huts built high above the ground allow guests to stay overnight to catch opportunities to observe animals in their natural habitat. Cave exploration is also available, either by boat or on foot.

Other activities include canoeing, bird watching, fishing, camping, and swimming. Visitors can also experience cultural life at the Orang Asli settlement.

Getting there

The most popular entry to Taman Negara is via the town of Jerantut, Pahang. From Jerantut, you can drive, or take a taxi or bus to the Kuala Tembeling Jetty, which is 16 kilometers away. From there, you can take the three-hour boat ride to Kuala Tahan, where the Park's only resort is located.

Trains from Singapore and south of Malaysia stop at the Kuala Tembeling station, which is just a short walk from the jetty. Boats depart daily from the jetty at 9 o'clock in the morning and at 2 o'clock in the afternoon. Alternatively, you can drive to Kuala Tahan and wait at the river bank opposite the resort where a water taxi will ferry you across the river.

There are other entry points in Kelantan (Kuala Koh), Terengganu (Tanjung Mentong) and Pahang (Merapoh). Merapoh is primarily used by those who wish to climb Gunung Tahan. Facilities, however, are limited at these entry points. ■

The Batek/Orang Asli *Forest People of Taman Negara*

While many Orang Asli (“original people” or “first people”) have settled in permanent communities near the Park, some Batek people continue to live a semi-traditional life in Taman Negara. The Batek are one of the Negrito tribes and have similarities with people from the Andaman Islands, the Philippines, Indonesia and New Guinea. They are true nomads and are classified by some anthropologists as pygmies because of their short stature.

There are several theories on the harmonious relationship between the Orang Asli people and their habitat. One group of anthropologists suggests that the hunters and gatherers could not have occupied tropical rainforest independently without access to sedentary agricultural populations with whom they would have traded goods. This theory presupposes that rainforests are not an easy environment for human survival.

The Orang Asli people have survived in the rainforest, using the limestone caves for shelter. In 1985, charcoal drawings were discovered in Gua Batu Luas in Taman Negara and are attributed to the ancestors of the Batek people. While these drawings only date from 1920, anthropologists have speculated that the tradition of cave painting amongst these people is much older. The motifs found in the cave include a mountain scenery that is most likely Gunung Tahan.



Today, about 500 Orang Asli live in the Park at any one time, and live a very simple hunter-gatherer lifestyle. Visitors may visit and stay in these communities and learn about their daily activities such as forays into the forest in search for food. However, visitors have to be accompanied by an accredited guide.

Their typical camp usually comprises 10 to 30 family members living in temporary shelter made from natural vegetation. They stay in areas close to rivers and their structures are not sturdy as these are only needed for a few months before they move on.

Orang Asli communities move according to seasonal food requirements or when an area is nearly exhausted of food resources. They live sustainably in an area, and they move on before the resources are depleted. They value and respect the forest, which is considered the home of their ancestors and their “supermarket”.

Usually visitors to any Orang Asli community pay their guide for all travel arrangements and the community receives some of the money. While offering a gift is appreciated, visitors need to be careful about the type of gift offered. For example, sweets, cigarettes and junk food would be inappropriate gifts while rice and other staples would be most appreciated.

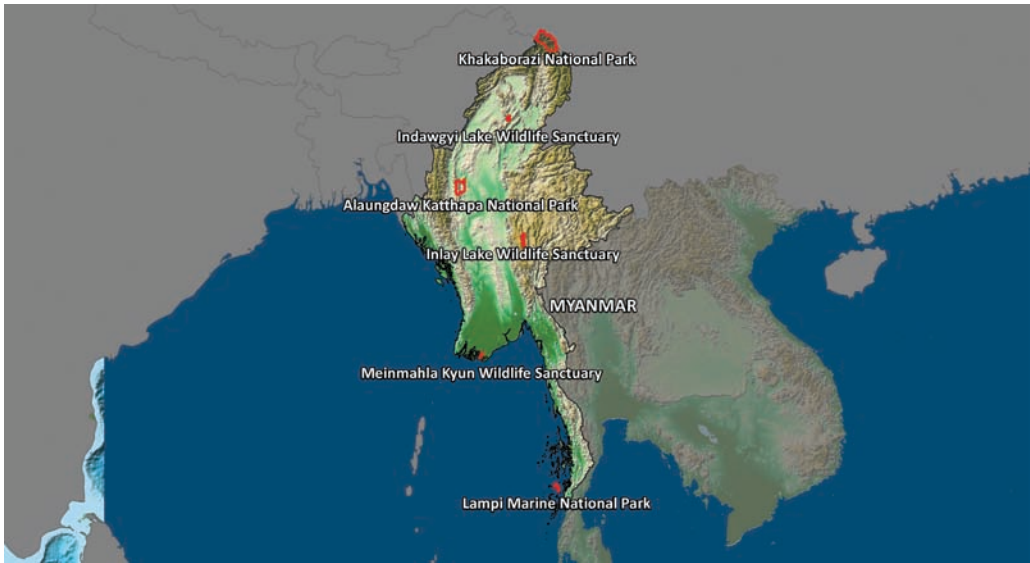
Source: <http://www.tamannegara.org/>





MYANMAR





The Golden Land

The Indo-Myanmar (Indo-Burma) Hotspot comprises most or all of Cambodia, the Lao People's Democratic Republic (PDR), Myanmar, Thailand and Viet Nam, parts of northeastern India and southeastern Bangladesh, a small fraction of peninsular Malaysia, and parts of tropical southern China (van Dijk *et al.* 2004, as cited). The wide variation in land form, climate, and latitude within the hotspot has led to the development of diverse natural habitats, which support a high diversity of plant and animal species, including many endemic ones. Myanmar supports some of the most intact natural habitats and species communities remaining in the Indo-Myanmar (Indo-Burma) Hotspot, including many globally threatened species that are found in a few or no other places in the world.

Myanmar, which is also known as the land of pagodas, has very rich and unique cultural and natural wonders. It is also blessed with an awe-inspiring range of natural sights—from majestic snow caps, idyllic lakes, vast virgin forests, fragrant pine trees and orchids (www.myanmar-tourism.org).

Myanmar has a tropical monsoon climate. The rainy season is from May to September, and the dry season is from October to April. This general pattern disguises the extreme climate variation within the country, with mean annual rainfall ranging from under 500 millimeters in the center of the country

up to a high of 6,000 millimeters in the Tanintharyi Division and the northern Rakhine State.

Habitats and biological resources

A complex array of plains with major rivers and plateaus running parallel to each other are also unique ecosystems supporting numerous lives. Myanmar is endowed with strikingly different forests

Some significant endemic species

- Thamin (*Cervus eldi thamin*)
- Leaf deer or Putao muntjac (*Muntiacus putaoensis*)
- Burmese starred tortoise (*Geochelone platynota*)
- Pride of Burma or thawka-gyi (*Amberstia nobilis*)
- Hooded treepie (*Crypsirina cucullata*)
- White-throated babbler (*Turdoides gularis*)
- Burmese yuhina (*Yuhina humilis*)
- White-browed nuthatch (*Sitta victoriae*)

because of its long range of latitudes from south to north and different elevations from sea level to snow-capped mountains that are over 6,432 meters high.

Its mountains, forests, dry and sub-humid land, inland waters, agriculture, and marine and coastal waters are important habitats for the myriad floral and faunal species that are vital resources for the sustainable development of the country. One fourth of the total number of species is known to be endemic to Myanmar.

There are no records of the population and abundance of wild animals except for thamin (*Cervus eldi thamin*), a completely protected mammal that is conserved in two wildlife sanctuaries in Myanmar. Thamin is an animal unique to Myanmar culture. The population of thamin is estimated to be around 2,736, and was found once in the whole central dry zone area. Due to habitat loss, human pressure



Forest ecosystem

and hunting, it disappeared in many parts of the dry zone and is now confined to the protected areas and fringes. Many other angulated species such as gaurs, sambar, serow, banteng, wild boars, hog deer, barking deer and wild buffalos are distributed in many habitats but their numbers have yet to be monitored.

Myanmar is home to the second largest population of the Asian elephant (*Elephas maximus*); India has the largest. The elephant species is completely protected in eight protected areas, with a total area of 1,520,800 hectares (15,208 square kilometers) designated as their habitat. There are now also a total 4,050 of this species under the *ex-situ* conservation program of the Forest Department, Myanmar Timber Enterprise and some private entrepreneurs. Some 5,000 to 10,000 wild elephants are estimated to be found in the forests across Myanmar.

In 2002, the Wildlife Conservation Society (WCS) assisted the Forest Department in the preparation of the National Tiger Action Plan. Seventeen localities with varying forest habitats were identified as potential sites for the tiger (*Panthera tigris tigris*). Photographs taken from the camera traps of the project revealed the evidence of tiger in Hukaung Wildlife Sanctuary and throughout Tanintharyi Forest Complexes. The Tiger Protection Unit and the Elephant Protection Unit enforce the law in the 645,900-hectare Hukaung Wildlife Sanctuary, the world's largest tiger reserve.

Hukaung is also a known habitat for most rattan species. A WCS rattan specialist team identified 15 rattan species, of which eight species were new to taxa. Moreover, the study on water fowls in Hukaung Valley by Dr. William Duckworth of the WCS reported the sighting of very rare and critically



Green peafowl

endangered water birds such as white-bellied heron (*Ardea insignis*), white-winged wood duck (*Cairina scutulata*), lesser fish-eagle (*Ichthyophaga humilis*), and green peafowl (*Pavo muticus*). Other large wildlife sanctuaries—Htammanthi, Alaungdaw Kathapa National Park, Shwe U Daung and Rakkhine Wildlife Sanctuary—are home to flagship species, mammals and many other wildlife species.

Evergreen and moist deciduous forests in the south, west and northwest of Myanmar are habitats for white-browed gibbon (*Hylobates hoolock*), white-handed gibbon (*Hylobates lar*), and siamang (*Hylobates syndactylus*).

The Malayan Sun bear and the Himalayan bear are also expected to be found in many forests in Kachin State, Sagaing Division, Rakkhine State and Tanintharyi Division. Malay tapir is critically endangered and a pair

confiscated by the Forest Department in Tanintharyi Division clearly indicated that this species is thriving. Tanintharyi is the only place in peninsular Southeast Asia where a large area of the lowland sundaic forests, and the only known habitat for Gurney's Pitta (*Pitta gurneyi*), is left.

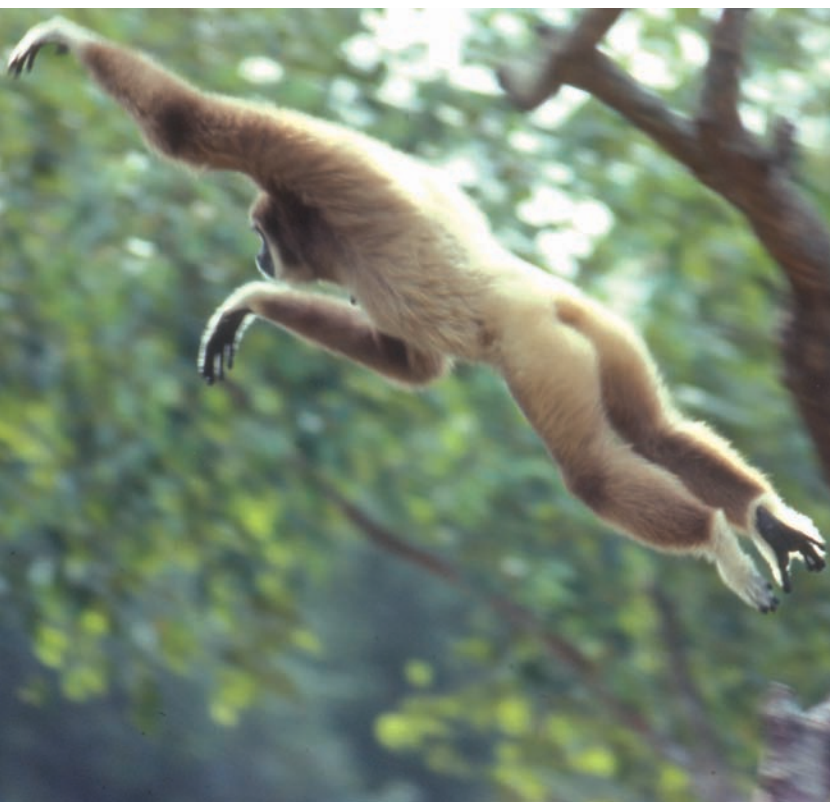
The rich marine and coastal resources of the country form the basis of a productive fisheries industry that is one of the primary sources of income in the country. In 2003, Myanmar accounted for three percent of the world's total fish catch and nearly two percent of global aquaculture production.

The importance of Myanmar's coastal resources extends beyond the commercial value of its marine products. The resources provide sustenance to local communities and are important for tourism and recreation.

Protected area management and conservation activities

Myanmar has conserved and managed its forests since time immemorial. As early as 1856, the country started scientific forest management by establishing forest reservations, developing management units, regulating yields of forest products, and prescribing silvicultural systems. Relevant laws like the Protection of Wildlife and Wild Plants and the Conservation of Natural Areas Law, are in place to protect and conserve these biological resources as well as natural areas of geo-physical or cultural significance. For one, protection of the teak species was enhanced with its declaration as a royal tree by Monarchy Decree in 1775.

In Myanmar's Agenda 21, two program areas are specific to biodiversity conservation (Fourth National Report, 2009). For the program area on strengthening protected area planning and management, the major activities are to develop an action plan to to promote and strengthen protected areas; and promote and strengthen protected area management; and international cooperation. With regard to the conservation of biodiversity, the major activities are to strengthen the national database on biodiversity, the laws and legislations for biodiversity conservation management, the sustainable use of wildlife resources, and institutional capacity for biodiversity conservation



White-handed gibbon

and management; protect threatened and endangered species of plants and animals; promote awareness and involvement of local communities; and study the economic issues concerning biodiversity.

As of 2010, about 32,221,900 hectares, which represent 50 percent of the country's total land area, are covered with forest. Records also show that Myanmar is home to 11,800 species of vascular plants, nearly 300 species of mammals, 360 species of reptiles, and 1,065 species of birds. One fourth of these species is estimated to be endemic to Myanmar.

To date, a total area of 16,274,800 hectares, which covers 24.15 percent of the total land area, has been constituted as reserved forests and protected public forests. A total of 35 protected areas covers 5.56 percent of the country, while eight forested areas have been proposed for gazettelement as protected areas.

Protected areas are established also to protect and conserve critically endangered species. For example, Meinmahla Kyun Wildlife Sanctuary in Ayeyarwady Delta

was established to protect *Crocodylus porosus*, which was once on the brink of extinction. The population of *C. porosus* is now increasing. The other species, *Crocodylus siamensis*, which is fewer in number, was sighted in the coastal area of Tanintharyi in 2008.

Zoological and botanical gardens have also been established by the Forest Department. Yangon Zoological Gardens, which was founded in 1905, has become the first place to do *ex-situ* conservation. As of this writing, a total of 58 mammals, 72 birds, and 16 reptile species are being kept for breeding and conservation purposes. The Kandawgyi Garden, which was established in 1917, has already preserved a total of 589 tree species, 75 bamboos, 75 crotons, 270 orchids and 410 medicinal plants. Other gardens established for *ex-situ* conservation include the National Landmarks Garden (for the study of significant national monuments across the country in one place); the Yadanabon Zoological Gardens in upper Myanmar; and a modern Zoological Garden in 2008 at the new capital city, Nay Pyi Taw.



Crocodiles

Laws Relating to Protected Areas in Myanmar

Law/Act	Year	Objectives
Wild Elephant Protection Act	1879	• Safeguard the population of wild elephants vital in timber operations
Forest Act	1902	• Manage wildlife; Forest Department is the lead agency
Wildlife Protection Act	1936	• Designate protected areas and protected species
Forest Law	1992	• Designate forest reserves for environmental and biodiversity conservation
Protection of Wildlife and Wild Plants and Conservation of Natural Areas Law	1994	• Implement the policies on protecting wild flora and fauna and natural areas; • Fulfill international convention obligations; and • Conduct research
Forest Rules	1994	• Provide articles to protect biodiversity
Forest Policy	1995	• Provide basic fundamentals to preserve biodiversity
Protection of Wildlife and Wild Plants and Conservation of Natural Areas Rules	2002	• Conserve natural ecosystems and protect wildlife species

Source: Forest Department

Myanmar's Commitment to Some Biodiversity-Related Agreements/Conventions

Sr. No.	Environment-Related Agreements/Conventions/Protocol	Status
1	Plant Protection Agreement for Southeast Asia and the Pacific Region	1959 (R)
2	United Nations Framework Convention on Climate Change	
3	Convention on Biological Diversity	1994 (R)
4	Convention on Conservation of World's Cultural Heritage	1994 (R)
5	International Tropical Timber Agreement, Geneva, 1994	1996 (R)
6	United Nations Convention on the Law of the Sea	1996 (R)
7	Convention on the International Trade in Endangered Species of Wild Fauna and Flora	1997 (A)
8	United Nations Convention to Combat Desertification	1997 (A)
9	ASEAN Agreement on the Conservation of Nature and Natural Resources, 1985	1997 (S)
10	ASEAN Agreement on Transboundary Haze and Pollution	2003 (R)
11	ASEAN Declaration on Heritage Parks and Reserves	2003 (S)
12	Convention on Wetlands of International Importance especially as Waterfowl, 1971, as amended 1982 and 1987	2004 (A)
13	International Treaty on Plant Genetic Resources for Food and Agriculture, 2001	2004 (R)
14	Agreement on the Establishment of the ASEAN Centre for Biodiversity	2005 (S)
15	Cartegena Protocol on Biosafety	2008 (R)

R- Ratified; S – Signed; A- Accessed/Accepted/Adhered

As of 2010, Myanmar has six ASEAN Heritage Parks:

- Alaungdaw Kathapa National Park
- Inle Lake Wildlife Sanctuary

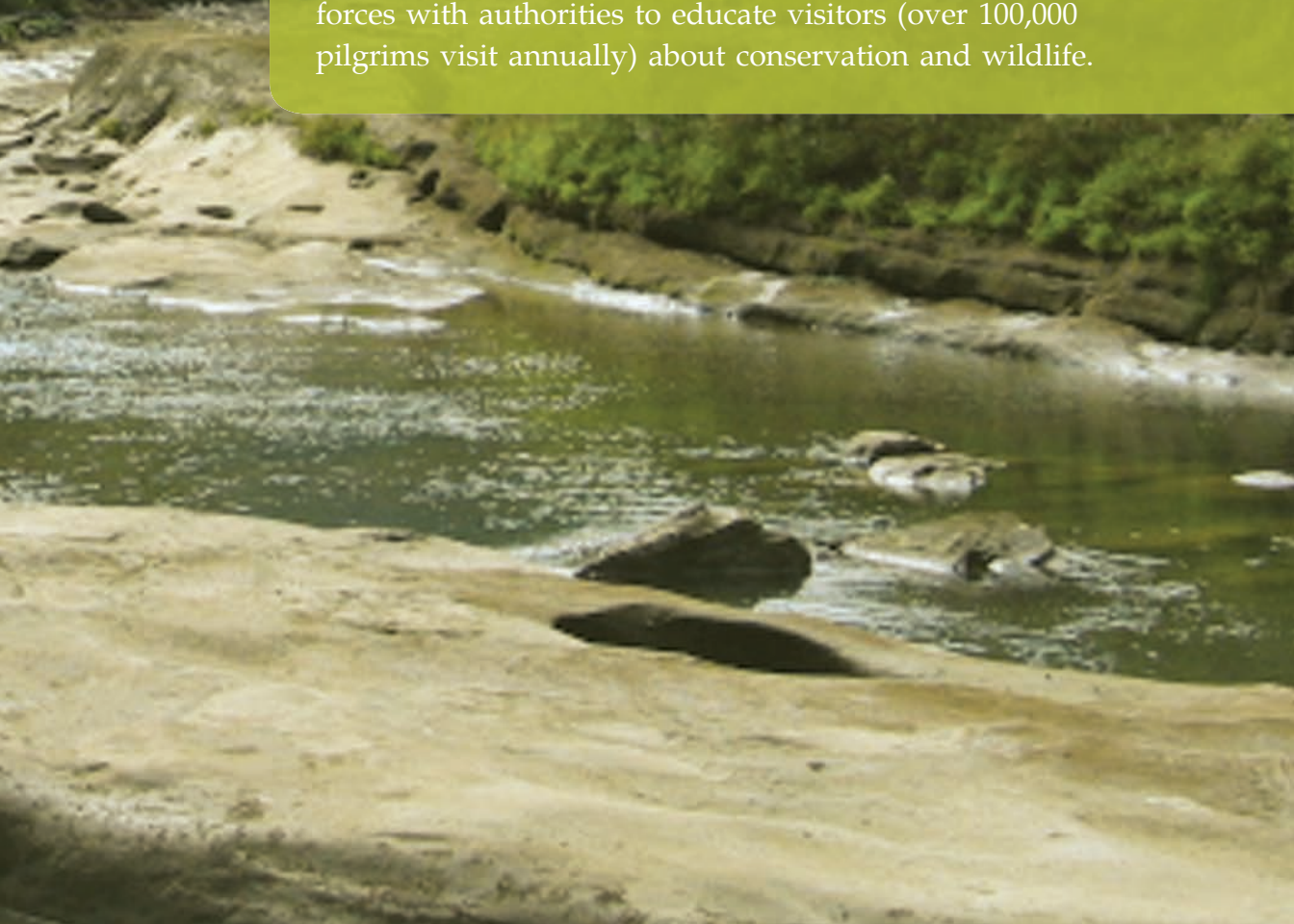
- Indawgyi Lake Wildlife Sanctuary
- Hkakaborazi National Park
- Lampi Marine National Park
- Meinmahla Kyun Wildlife Sanctuary. ■



ALAUNGDAW KATHAPA NATIONAL PARK

Shrine to Maha Kathapa

Named after Buddha's saintly disciple, the Alaungdaw Kathapa National Park was established as a Wildlife Sanctuary in 1981 and opened as a National Park in 1984. The Park covers an area of 159,761 hectares in the Mingin and Kani townships of Sagaing Division. A shrine can be found within the Park boundaries and depicts a reclining figure called Kathapa whose remains are believed to lie in the shrine. A small group of monks care for the shrine. The monks have joined forces with authorities to educate visitors (over 100,000 pilgrims visit annually) about conservation and wildlife.



Habitats

The Park is hilly with accented valleys. The terrain rises from 204 meters to 1,280 meters above sea level. It is well watered with many streams that become impassable during the rainy season. It protects the drainage basin of two perennial rivers, the Pa-hto-lon and Taung-dwin, which are western tributaries of the Chindwin River.

The Park covers a range of vegetation types that are based on elevation. These include moist upper mixed deciduous forests up to 1,400 meters, dry upper mixed deciduous forests, lower mixed deciduous teak forests, indaing dry dipterocarp forest and some pine forests on higher ridges.

Wildlife

Alaungdaw Kathapa harbors a wealth of large mammals such as elephant, leopard,

Biological richness of Alaungdaw Kathapa National Park

- 60 species of migratory birds
- 370 species of birds
- 80 species of reptiles and amphibians
- 240 species of butterflies
- 39 species of mammals
- 297 species of trees
- 106 species of orchids

ard, clouded leopard, black bear, gaur, banteng, sambar, barking deer, serow, goral, wild boar, wild dog and primates. In 1981, the Indo-Chinese tiger (*Panthera tigris corbetii*) was most abundant in the Park, but in June 1992, the tiger was listed in the Completely Protected category of Myanmar's Protected Species List.

At least 370 species of birds have been recorded. These include the great hornbill, oriental pied hornbill, redheaded trogon, hoopoe, the endemic hooded treepie,



Teak

vinous-breasted starling, hill myna, velvet-fronted nuthatch, chestnut-bellied nuthatch, streak-eared bulbul, endemic white-throated babbler, white-bellied yuhina, Kalij pheasant, white-bellied woodpecker, blue-eared barbet, red-billed blue magpie, bar-winged flycatcher-shrike, and blue whistling thrush. Birds most commonly seen along the streams and rivers at higher altitudes are the red wattle, lapwing, wagtails and sandpipers. Forest birds include several species of woodpeckers, laughing thrushes, babblers, mynas, parakeets, barbets, crucial, jungle fowls, pigeons and doves. Each year, from October to March, the Park hosts some 60,000 migratory water birds from northern Asia that use the East Asia Australia flyway and spend their non-breeding period in wetland habitats in Myanmar.

Around 80 species of amphibians and reptiles and 240 butterfly species have

been recorded, and many more await listing.

Common tree species include teak (*Tectona grandis*), ironwood (*Xylia dolabriformis*), Burma padauak (*Pterocarpus macrocarpus*), Burmese rosewood / Southeast Asian rosewood (*Dalbergia oliveri*), taeng (*Shorea obtusa*) and *S. siamensis*.

Conservation issues

The National Park faces problems mostly from the occurrence of forest fires, poaching and encroachment. Poachers prey on the abundant natural resources to profit from the illegal wildlife trade market for ivory, bones, skins and parts used in traditional Asian medicines.

There has also been some selective logging of teak prior to the area's establishment as a National Park.



Black bear



Barking deer

Conservation programs

Park management has several activities to conserve biodiversity. Among these are the study and research of ecosystems and plants and animals, and the management of forest resources including biodiversity, in accordance with the sustainable production policy of natural resources. There are also several ongoing environmental education and ecotourism programs.

Specifically, Park management specializes in the study of tigers, with assistance from some international organizations. The David Shepherd Foundation of the United Kingdom and the Forest Resources and Environmental Development Association (FREDA) help in carrying out the preservation of Myanmar's tiger species within the National Park.

WildAid also works in cooperation with FREDA to help strengthen the pro-



Serow



A pair of Myna



Leopard

Strides in Protected Area Management

Park management uses the local pagoda festival to feature programs on environmental education and awareness through an education center that also promotes wildlife conservation and sustainability of the Park. Local people are also engaged to train and care for elephants, which are used for transporting visitors to pagodas and other shrines. The Park has chalets for visitors who opt to stay overnight.

tection of the Park. WildAid's recent site assessments reveal that though there are threats from encroachment, logging and poaching, these problems are being successfully contained by Park staff.

Monitoring records of wildlife by Park Rangers also show a rich abundance of wildlife species. Camera traps, visual sightings and animal tracks have revealed the existence of populations of leopard, sun bear, banteng, gaur, wild dog and barking deer. Villagers reported seeing a tiger, which, if confirmed, would be the first sighting in the Park in over 20 years. It was assumed that these had been hunted out to supply the illegal wildlife trade.

The Forest Department and Smithsonian Institution have also conducted an elephant survey and research program using radio collars to estimate the home range of wild elephants.

Ecotourism and other activities

The Park offers excellent opportunities for study and recreation. These include visiting and worshipping at the place where Alungdaw Shinmahar Kathapa has been enshrined; visiting and conducting research in the least disturbed forest types; and conducting research on tiger conservation and management. This is also a good site for observing wildlife and birds. Students can use the area to study the growing conditions of the inda- ing and pine forests.



Elephant ride

Other interesting things to do are observing butterflies (studies have recorded about 240 species), plants and orchids, riding elephants, and trekking in several types of natural forest.

Guesthouses, log cabins and campsites are available in the Park.

The best time to visit is from November to May.

Getting there

By land, visitors can travel from Yangon to Alungdaw Kathapa (981 miles or 1,570 kilometers) or from Mandalay to Alungdaw Kathapa via Sagaing and Monywa (148 miles). From Yangon, Mandalay is 400 miles away and can be reached by air or land transportation. ■

INDAWGYI LAKE WILDLIFE SANCTUARY

The largest inland lake in Southeast Asia

The Indawgyi Lake Wildlife Sanctuary was established in 1999 with a total area of 77,525 hectares (775.25 square kilometers) for the protection of local waterfowl and their habitats, as well as the neighboring catchment areas. The Lake is located 175 meters above sea level and lies in a north-south elongated basin with flat plains. Indawgyi covers 12,000 hectares, making it the largest inland lake in Southeast Asia and the third largest lake in the world. The eastern side of the Lake is mountainous terrain that rises up to 1,175 meters. The hills to the west and north are more extensive and reaches up to 1,500 meters. Local inhabitants believe that the Lake is being protected by powerful spirits, known as the “Dragon”.





Habitats

The Wildlife Sanctuary is dominated by moist upper mixed deciduous and semi-evergreen forests on the mountainous terrain. The habitats of the Lake itself include open water, herbaceous marsh, floating mats, limited emerged beds and extensive areas of submerged macrophytes.

Wildlife

In terms of fauna, 37 mammals are known to inhabit the forests surrounding the Lake. Some of these mammals include wild elephant, leopard, bear, serow, gaur, banteng, red goral, gibbon, macaque, sambar deer, barking deer, wild dog, golden jackal, wild boar, hog badger, and civet.

Waterbird species and around 350 forest bird species have also been observed. Considered a bird watcher's paradise, the Sanctuary is home to hundreds of ruddy shelduck, bar-headed goose, greyleg goose, northern shoveler, tufted duck, common crane and brown-headed gull.

Many rare species can also be found, including the red-crested pochard, grey-headed lapwing, sarus crane, lesser adjutant, black-necked stork, woolly-necked

The wildlife sanctuary was established to:

- Conserve the inland water body
- Protect resident and migratory water fowl
- Conserve the watershed of Indawgyi Lake
- Facilitate and promote ecotourism
- Develop and enhance science and research in wetland ecology and conservation

Source: Htwin Paw Oo, 2007

Biological richness of Indawgyi Lake Wildlife Sanctuary

- 37 species of mammals
- 80 species of amphibians and reptiles
- 60 species of butterflies
- 64 species of fish
- 350 species of forest birds
- 99 species of waterbirds
- 10 species of turtle and tortoise
- 69 species of orchids
- 47 species of medicinal plants
- 80 species of trees
- 10 species of grass
- 9 species of rattan

stork, white-rumped vulture, slender-billed vulture, blue-bearded bee-eater and Brahminy kite.

A survey led by BirdLife International in 2004 had a possible but unconfirmed sighting of a pink-headed duck (which



Wild dog



Wild boar



was last seen in 1910) and recorded eight other globally threatened bird species. The eight species are: green peafowl (*Pavo muticus*), white-winged duck (*Cairina scutulata*), masked finfoot (*Heliopais personata*), greater spotted eagle (*Aquila clanga*), white-rumped vulture (*Gyps bengalensis*), slender-billed vulture (*Gyps tenuirostris*), spot-billed pelican (*Pelecanus philippensis*), and lesser adjutant (*Leptoptilos javanicus*).

The expedition also recorded five globally near-threatened species, namely: ferruginous pochard (*Aythya nyroca*), great hornbill (*Buceros bicornis*), lesser fish eagle (*Ichthyophaga humilis*), grey-headed fish eagle (*Ichthyophaga ichhyaetus*), and black-necked stork (*Ephippiorynchus asiaticus*).

The two new species recorded for Myanmar are the Himalayan griffon vulture (*Gyps himalayensis*) and the chestnut-crowned bush warbler (*Cettia major*).

A total of 80 species of amphibians and reptiles, and 60 species of butterfly

have also been recorded.

Fishes recorded in the Lake basin totalled 64 species, of which three are endemic to Myanmar like the catfish species, *Akysis prashadi*.

Conservation issues

The presence of human settlements and their local activities around Indawgyi Lake may prove detrimental to the Lake's ecosystem. Agricultural areas can be found along most of the southern half of the wetland and unregulated fishing occurs throughout the Lake. Other disturbances to the Sanctuary are the activities of rattan collectors and hunters, and the pollution of smaller tributaries as a result of gold mining.

Other threats to the Sanctuary include land-use conflicts; dependence of rural population on forest resources; ineffective management and planning; shortage of qualified staff and funds; and weak law enforcement (Htuin Paw Oo, 2007).



Migratory and resident birds stop for food

Strides in Protected Area Management

The management unit of the Wildlife Sanctuary uses the local pagoda festival to establish education centers that focus on environmental education and awareness. The program also promotes wildlife conservation and the sustainability of the wildlife sanctuary. The Department of Forestry spearheads the ecological restoration of the Lake by regulating and introducing proper fishing methods to the local community.

Conservation programs

Park management and conservation activities largely focus on: combating illegal wildlife trade, protection of species, revision of policies and wildlife regulation, community outreach, capacity-building program, environmental awareness program, and monitoring and research (Htuin Paw Oo, 2007).

In 2004, a joint team of researchers and other staff from the Biodiversity and Nature Conservation Association (BANCA), the Leicestershire and Rutland Wildlife Trust, BirdLife International in Indochina, undertook a survey of wetlands in the northern Kachin State as part of the Darwin Initiative-funded project entitled “*Building Constituencies for Site-based Conservation in Myanmar*”. This activity was organized by Wildbird Adventure Travels and Tours.

The project aimed to identify Important Bird Areas and hopefully rediscover the pink-headed duck (*Rhodonessa caryphyllacea*), which was last sighted in Myanmar in 1910. The project team, joined by staff from the Wildlife and Conservation Division of the Forest Department, surveyed Indawgyi Lake, which supports vast numbers of waterfowl.

The survey is part of a bigger project within Myanmar to identify important bird areas, capacitate relevant government agencies and local conservation

organizations to protect and manage wilderness areas, and create information materials to strengthen public awareness as well as mobilize support for conservation activities. The project also hopes to encourage ecotourism activities in the region to generate funds for conservation and provide alternative livelihoods to local communities.

Interesting things to see and do

The wildlife sanctuary provides researchers with the opportunity to study one of the largest wetland ecosystems in Southeast Asia and its attractive habitats. Researchers can also observe the ecology and behavior of residential and migratory waterfowl, rare species of fish, aquatic organisms, rare butterflies and insects, as well as orchids and bamboos around the Lake or along the Indawgyi stream (Htuin Paw Oo, 2007).

The wildlife sanctuary also presents wonderful opportunities to relax and reconnect with nature.

Travelers can view wildlife and take a leisurely walk through the lush forest. Bird watching is very popular because of the extensive number of bird species around the Lake.

Visitors may also participate in or view traditional fishing practices, or see the historically famous Shwe Myint Zu Pagoda on the western side of the Lake. ■



INLE LAKE WILDLIFE SANCTUARY

People, nature and culture in a unique wetland

Inle Lake is the second largest lake in Myanmar, next to Indawgyi Lake in Kachin State. The Lake was established as a Wildlife Sanctuary in 1985 and covers 64,200 hectares (642 square kilometers) in the Nyaung Shwe, Pinlaung and Peh Kon Townships of Southern Shan State. Situated 881 meters above sea level, the huge Lake is an important watershed and water resource for electricity and domestic use for people living within the four cities and innumerable small villages that straddle the Lake. The local communities living close to the Lake are the Intha, who are mostly Buddhists. They use small traditional boats for transportation, and for catching fish, the most popular occupation among the locals.





Egret

Habitats

The Sanctuary's vegetation comprises wetland sedge, reeds and evergreen flora. *Oryza hydrophasia chirugus granulate*, *Dalbergia spinosa*, *Hypericum prunizolium*, *Coladium sp.*, *Desmodium oblongum*, *Enhydra zluctuans*, *Panicum sarmentosum* grow on the natural floating islets. In shallower waters or on the shores, the species found include *Salix tetrasperma*, *Ficus sp.*, *Crataeva nurvala*, *Mitragyna parvizolia*, and *Salmalia malabarica* syn. *Bombax malabaricum*.

Wildlife

This unique wetland system is home to about 270 bird species. The Lake also provides habitats for 20 species of snails, and 43 species of fish, with 16 endemic fish species (U Htuin Paw Oo, 2007) that include ngapweh (*Chaudhuria caudata*) and ngaku-shinpa (*Silurus bumanensis*).

About 79 migratory bird species have been recorded, including the sarus crane (*Grus antigone*), purple swamp hen (*Porphyrio porphyrio*), black winged stilt (*Himantopus himantopus*), and Asian open bill stork (*Anastomus oscitans*). Other



Drongo

Biological richness of Inle Lake Wildlife Sanctuary

- 270 species of birds (191 resident; 79 migratory)
- 75 species of butterflies
- 3 new species of amphibians
- 20 species of snails
- 43 species of fish (16 species are endemic to Inle Lake, of which 12 species belong to the Cyprinidae family)
- 3 species of turtles
- 527 species of medicinal plants
- 134 species of orchids
- 292 species of Angiosperms (Monocot)
- 1,320 species of Angiosperms (Dicot)

species include Baer's pochard, Indian skimmer, greater spotted eagle, oriental darter, ferruginous pochard, and the black bellied tern.

Resident species include the lesser whistling duck (*Dendrocygna javanica*), pheasant tailed jacana, cattle egret (*Bubulcus ibis*), intermediate egret (*Meso-phoyox intermedia*), little egret (*Egretta garzetta*), Indian pond heron (*Ardeoia grayii*), purple heron (*Ardea purpurea*), little comorant (*Phalacrocorax niger*), water cock (*Gallix crax cinerea*), brown-headed



Purple swamp hen

gull (*Larus burnnivecephalus*) and the ruddy sheldrake (*Tedoma ferruginea*). A total of 527 medicinal plant species and 134 orchid species have been recorded in the Sanctuary.

Conservation issues

Major issues in the Sanctuary include shifting cultivation and unsystematic farming practices in the catchment area, which accelerate silting and sedimentation. Discharges from domestic sewage and fertilizer and pesticide application also pollute waterways. Other activities of local communities, such as aquaculture of invasive fish species, and improper fishing techniques may lead to biodiversity loss.

The increasing number of development activities, such as hotel and other constructions, also destroy habitats. Noise pollution from motorboats affects animal behavior and the ambience of the area (Htuin Paw Oo, 2007).

The build-up of silt by alluvial deposits from tributaries; the accumulation of decaying and decomposed vegetation on the Lake bed, and soil erosion

resulting from unregulated logging and clearing of the jungle for farms in the upstream areas, are all underlying factors that slowly destroy the Lake.

Conservation programs

The Lake was declared a wildlife sanctuary to protect the natural vegetation, geological features and unique species in the area. The Sanctuary's biodiversity significance, scenery and the local culture are important features that are also used to promote Inle Lake as a prime ecotourism destination. This includes the traditional floating gardens of the Lake dwellers that deserve to be preserved as well. The government has also launched a Greening and Reforestation Program to prevent further degradation of the Inle ecosystem, and rehabilitate some portions of the Lake. Some activities being conducted and aimed toward conserving the Sanctuary and its wildlife are: land use and mapping of Inle Watershed, bird watching and identification, butterfly identification, wetland inventory, herpetofauna survey, and bat survey (Htuin Paw Oo, 2007).



Pagodas

Strides in Protected Area Management

Management works well with the *Intha*—the local indigenous people—whose traditional cultural activities include leg rowing, floating markets and vegetable gardens on the floating islands. Aside from working with the Intha to preserve their traditional culture and activities, Park management also uses the pagoda festivals to establish education centers that promote environmental education and awareness, wildlife conservation, and the sustainability of Inle Lake.

Other interests

The Wildlife Sanctuary offers many activities that visitors can engage in such as fishing, boating, hiking, and visiting archaeological sites, famous pagodas and natural hot springs. Bird watching trips are also very popular. Visitors can also shop for colorful Shan cloth satchels, exquisite textiles, bamboo hats, handwoven garments, wooden dolls, and embroidered paintings, as well as intricately crafted silverware and silver ornaments. Weaving is done in the traditional way with a loom made of teakwood.

The Intha have also evolved a unique subculture resulting from their close relationship with the Lake system. They have moved onto the surface of the Lake and their typical home is constructed on stilts to keep them above water. Travel is done by boat and locals shop at 'floating bazaars', the only floating market in Myan-

mar. The locals are also famed for their unique rowing style, where they use one leg wrapped around a pole to push their amphibious vehicles of choice through the waters of the Lake. They also use distinctive conical rattan nets to catch fish, pushed down to the bottom of the Lake.



Floating market





Padaung woman

Agriculture is based on traditional hydroponic principles, wherein the locals plant tomatoes, cucumber, cabbage, peas, beans and eggplant on floating islands that they themselves have constructed. The floating gardens, called “Kyun-Myaw”, are anchored to the bed of the Lake, with bamboo poles filled with mud taken from the bottom of the lake. One exciting scene is the early morning activities of the hill tribes, when they bring their crops to the market as early as dawn.

The Padaung hill tribe, one of the ethnic minorities in Myanmar, lives within the vicinity of Inle Lake. The Padaung women are known as “long-necked Padaungs” because of the brass rings around their necks. At the age of five or six years, spiral rings are placed around the girls’ neck. More neck rings are added every four years until the age of 40. By then, the rings may weigh about five kilograms.

All around Inle Lake are a number of Buddhist shrines, monasteries and pagodas. The more famous ones are:

- **Nga Phe Kyaung Monastery.** This is a beautifully-carved wooden monastery that is over 170 years old. It is better known as the “Jumping Cats Monastery” since resident monks trained cats to leap through a small hoop. This has become quite an attraction for local and foreign visitors.
- **Phaung Daw Oo Pagoda.** The Pagoda houses five Buddhist images. A festival is held yearly at Inle Lake, where the five Buddha images are placed on a lavish royal barge and sailed around the Lake. The barge stops at every village for the villagers to pay homage to the images. Inle’s famed leg-rowers in full regalia and pageantry stand on board the stately pagoda barge. ■



Boating around the lake

HKAKABORAZI NATIONAL PARK

Myanmar's largest park and highest mountain

First established as a forest reserve in 1996, Hkakaborazi National Park was declared a national park in 1998. It is the largest national park in Myanmar, occupying an area of 381,246 hectares (1,472 square miles) in Putao district in Kachin State, in the northernmost part of Myanmar. It features Mt. Hkakaborazi, which at over 19,000 feet (5,791.2 meters), is the highest mountain in Myanmar, and the highest snow-capped mountain in Southeast Asia. Formed with mountain ranges, waterfalls, rapid streams and ravines, it is the largest natural park in Myanmar. Hkakaborazi is the natural habitat of numerous species of wildlife, including some rare birds and animals, and is also home of the rare "black orchid".





Habitats

The dominant forests and vegetation types include evergreen forests, hill pine forests, and moist upper mixed deciduous forests. The area also contains the headwaters of the country's most important river system, the Ayeyarwady, which drains vast expanses of agricultural lands and helps sustain extensive rice production.

Wildlife

A total of 42 mammals have been recorded. Rare mammal species in the Park include red panda (*Ailurus fulgens*), takin, musk deer, blue sheep, black barking deer and leaf deer or Phet-gyi (*Muntiacus putaoensis*).

Surveys indicate some 370 bird species, including white-cheeked partridge, snow pigeon, Blyth's tragopan, Temminck's tragopan, Sclater's monal, wreathed hornbill, great hornbill, rufous-necked hornbill, Blyth's kingfisher, white-bellied heron, spot-billed pelican, lesser adjutant, black-breasted thrush, collared myna, beautiful nuthatch, chestnut-headed laughingthrush, slender-billed scimitar babbler, black-backed shrike babbler and greater rufous-headed parrotbill. A total of 80 amphibian and reptile species have been recorded.

The colorful and rare species of butterflies are a major attraction in this region. The beautiful yellow and black Papilionidae butterflies, the bright orange-colored Pieridae and yellowish

Biological richness of Hkakaborazi National Park

- 42 species of mammals
- 370 species of birds
- 80 species of reptiles and amphibians
- 360 species of butterflies
- 297 species of trees
- 106 species of orchids





Red panda



Takin



Peacock

brown butterflies with black and white spots on their bodies, the *Nymphalid* butterflies, are all common in the Putao region, but rarely seen in other areas. A total of 360 butterfly species, including very rare species such as golden bird wing, Kaiser, and Apollo, have also been identified in the Park.

With regard to flora, 297 trees species have been identified. Scientists have discovered 106 orchids, including the black orchid (*Paphiopedilum wardii*), an endemic ground orchid species. The black orchid is systematically grown in a garden at the Hkakaborazi National Park Exhibition Centre. Other rare orchid species found in Kachin State, such as *Cymbidium*, *Pleione maculata* and *Dendrobium nobile*, can be examined in the garden of the exhibition center.

Conservation issues

The greatest threats to wildlife are hunting for trade, habitat destruction through shifting cultivation, a proposed mining concession, and over-extraction of forest products. Many village residents hunt wildlife and trade these



Tragopan

for basic household items or cash. But species are also heavily hunted for trade across the border. Over-harvesting of non-timber forest products also occurs in the Park.

Population growth and agricultural expansion have spurred extensive shifting cultivation that has degraded forest areas. A proposed mining concession poses a major threat to the viability of the area's ecosystem, particularly since the proposed lease will last 20 years.

Conservation programs

The Hkakaborazi National Park was established to conserve natural forests and wildlife in the northern part of Myanmar, following international standards and policies in environmental conservation. Some of its specific objectives are to promote ecotourism in the region, and conserve the watersheds where the Ayeyarwady River originates.

Conservation, development and research programs have been developed to protect the Park's habitats and species. These programs focus on actions against poaching and illegal trade of

Strides in Protected Area Management

The Hkakaborazi National Park Exhibition Center features a botanical garden to highlight the Park's extraordinary flora and fauna, such as the black orchid and rare butterflies. The Center also shows the significant natural environs of the Kachin State and the Park's other biodiversity values. Park management also works closely with the Kachin Hill Tribes—Rawang, Lisu and Tibet-Myanmar—who showcase their traditional culture and customs to visitors.

rare species; field studies for new plant and animal species; research and field studies to better promote and implement ecotourism; and the conservation of the traditional culture and customs of local indigenous people.

The extraordinarily rich flora and fauna in the Park have barely been studied and still await proper research and identification.

The Park remains an excellent center for field study for students of botany, geology, zoology and geography.

Other interests

The Park offers several opportunities for education and recreation. The extraordinary flora and fauna, such as the black orchid and rare butterflies, are major attractions. Orchid enthusiasts and biologists can see rare orchids planted in the botanical garden. Several international experts have also visited Hkakaborazi to study the rare butterfly species.

Many outdoor enthusiasts visit the Park to climb the challenging Mount Hkakaborazi and other nearby mountain ranges. Some also explore

the Ayeyarwady River and its headwaters. A visit to the Park will also provide insights into the traditional culture and customs of the Kachin Hill Tribes (Rawang, Lisu and Tibet-Myanmar).

The Hkakaborazi National Park Exhibition Centre is another Park attraction that highlights the programs and activities of the Park, including the objectives, conservation tasks, achievements, and measures for improving and maintaining ecotourism. Through numerous photographs and maps of the area, the Centre also shows the significant natural environs of Kachin State, and other biodiversity values of the region. ■



Camping at the Park



LAMPI MARINE NATIONAL PARK

Myanmar's first national park

Lampi Marine National Park was established in 1996 with an area of 20,484 hectares in the Boatpyin Township of Taninthayi Division. The Park encompasses a section of the Mergui Archipelago including the large island of Lampi, several smaller islands and the seas around them. It was declared an ASEAN Heritage Park in December 2003. Lampi Island is about 48 kilometers long and has a maximum width of six kilometers. The Island's topography is generally hilly and rises steeply from sea level to 270 meters, and 500 meters in some areas. Much of the coast is rocky, although there are a number of sandy beaches, bays and inlets. The Park boasts large caves and plenty of freshwater sources on the Island, and major coral formations around the smaller islands.



Several medium-sized islands and smaller islets are found within the Park boundary, and include Wa-de-kyun, Pulo Nala (Eyes Island), Kanzagyi, War Kyun (Dolphin Island) and the Gregory group. Wa-ale Kyun and Pulo Nala Myun are located close to Lampi Island, but are separated by two narrow channels. The total area of the islands is 79.09 square miles (20,484 hectares) (Htuin Paw Oo, 2007).

Habitats

The Park comprises seas, coral reefs, beaches, mangroves and lowland tropical evergreen forests. These lowland forests are dominated by dipterocarps, especially *Dipterocarpus alatus*.

Epiphytic species are abundant and include lianas (*Calamus* sp). Lampi Island

is about the size of Singapore, so such an area of uninhabited lowland rainforest is very rare and precious.

Sandy beaches support the beach forest that boasts pure stands of *Casuarina equisetifolia*, as well as species of *Dillenia* and *Calophyllum*. Estuaries on the west coast of the Island support apparently untouched mangrove formations. There are also some swampy areas, and freshwater streams that support many kinds of fish.

Biological richness of Lampi Marine National Park

- 20 species of mammals
- 129 species of birds
- 50 mangrove species
- 6 species of seagrass
- 60 species of corals



Mangrove



Nicobar pigeon



Long-tail macaques

Wildlife

Wildlife is plentiful, and many kinds of birds can be seen such as various types of kingfishers, hornbills, Pacific reef egrets, white-bellied sea eagles and herons. Other notable birds include the nicobar pigeon (*Caloenas nicobarica*) and the edible-nest swiftlets (*Collocalia fuciphaga*) that inhabit the caves of Pub Tika.

Mammals include an indigenous subspecies of the lesser mouse deer (*Tragulus javanicus lampensis*), small-clawed otter (*Aonyx cinera*), crab-eating macaque (*Macaca fascicularis*) and langur (*Presbytis* sp). Indian muntjac (*Muntiacus muntjak*) and wild boar are abundant, possibly because of the absence of predators. A small herd of wild elephants has been seen and there are stories of tiger sightings on Lampi.



Kingfisher



Flying fox

A large colony of flying foxes (*Pteropus hypomelanus*) inhabits the small island of Pulau Myang Basa. Raptors include *Pandion haliaetus*, *Haliastur indus* and *Haliaeetus leucogaster*. Reptiles include monitor lizards (*Varanus* sp), pythons and mangrove snakes.

The green, hawksbill, Olive Ridley and leatherback turtles nest on the Island's many beaches. There are also whales and dolphins such as the spinner, spotted, and striped dolphins, along with long-finned pilot whales, false killer whales, Bryde's whales and Minke whales. Dugong (*Dugong dugon*) has also been recorded in the area. Other marine species include spiny lobster, jacks, tuna and barracuda and other large fish. Large heads of hard and soft corals with algae, sponge crinoids and hydroids cover rocks and calcereous substrates. Nudi-branches, several species of eel, cowrie shells and perhaps a hundred species of reef fish can be seen underwater.

The mangroves of Lampi harbor a myriad species of crabs, mudskippers, weaver ants, and archer fish. At night, the mangrove flickers to the light of fireflies. Wild orchids and ferns are abundant among the mangrove trees. Different types of beautiful butterflies are seen everywhere. Estuarine crocodiles have also been sighted.

Conservation issues

Formerly a refuge for pirates, the islands now are relatively safe. Though there is generally very little disturbance on the islands, illegal logging and forest encroachment pose threats to the evergreen forest. Also, with the influx of visitors, damage to the environment may be caused by anchors, littering and pollution. The coral reefs are still in good condition but would be vulnerable to destructive fishing methods.

Strides in Protected Area Management

The Nature and Wildlife Conservation Division works with OIKOS from Italy in various protection efforts. Through this partnership, frontier camps are being constructed, and patrol boats and other necessary field equipment are provided for conservation activities.

At the northern end of Lampi, the superbly protected anchorage of Salet Galet offers jungle walks, great fishing, snorkeling and kayaking and the chance for an encounter with the Moken Sea Gypsies. These nomads live in family groups complete with dogs and cats aboard their tiny wooden boats. An added attraction for visitors is the opportunity to observe the traditional culture of the Salon tribe in the village of Pu Nala.



Corals

Sea turtles are threatened by long-line fishing and nets, collection of their eggs for trade and water pollution. Threats to dugongs include hunting, eradication of sea grass beds, collisions with boats, and encounters with nets. Dolphins are threatened by over fishing, which reduces their available food, by accidental death in fishing nets, and hunting for illegal trade.

Dynamite fishing, sedimentation, anchor damage, trampling, over-fishing and over-harvesting have become challenging issues toward the conservation of the marine fauna and flora (Htuin Paw Oo, 2007).

Conservation programs

The conservation of globally important and endangered species such as sea turtles and dugongs, and the ever-green forest and mangrove ecosystem is important to Myanmar's protected areas system. Lampi and surrounding islands represent a beautiful and biologically important illustration of Myanmar's natural heritage. The diversity of forests, in particular the intact mangrove forests, and wildlife resources within the Park indicates significant conservation value on a regional and global scale. The mangrove and coral reef ecosystems and other habitats provide sustenance for the majority of commercially exploited marine species in Myanmar.

The government's management program includes protecting the area's wildlife and habitats, developing ecotourism facilities and assisting the indigenous group—*Salon* (Sea Gypsy)—in adapting to a more sedentary lifestyle.

Other interests

There are endless white sandy beaches along the coast, some stretching for two kilometers or more. Surfing and diving in coral reefs are also popular activities. ■



MEINMAHLA KYUN WILDLIFE SANCTUARY

Sanctuary of freshwater turtles and dolphins

Meinmahla Kyun was declared a Wildlife Sanctuary in 1993 and covers an area of 13,700 hectares (137 square kilometers) in the Bogalay Township of Ayeyarwaddy. The Sanctuary was established to protect the remaining mangrove forests and as a refuge for species such as estuarine crocodiles and resident and migratory water and shore birds. The forests also serve as a breeding ground particularly for fish and prawn. The site also serves as a research area for the conservation of mangroves and wildlife, and as an environmental education center. The many attractions of the area are ideal for ecotourism.





Habitats and wildlife

A total of 40 mangrove species and 53 species of medicinal plants dominate the Wildlife Sanctuary. Several bird species numbering about 88 are known to occur in the area. The Sanctuary also protects two freshwater turtle species—the mangrove terrapin and the Burmese roofed turtle. Freshwater dolphins have been reported in the area as well.

Other signs of species richness include: 15 mammal species; 59 fish species; 12 prawn species; 10 crab species; 26 snake species, and one crocodile species (Htuin Paw Oo, 2007).

Biological richness of Meinmahla Kyun Wildlife Sanctuary

- 40 species of mangroves
- 53 species of medicinal plants
- 15 species of mammals
- 88 species of birds
- 59 species of fish
- 12 species of prawns
- 10 species of crabs
- 26 species of snakes
- one species of crocodile

Conservation issues

Most mangrove forests face threats from habitat destruction and human population pressures, and these forests are often cut for firewood and cleared for rice paddies. Large mangrove areas along Myanmar's coastline are being degraded, thus making Meinmahla Kyun one of the country's last remaining strongholds for mangroves and their associated species.

Conservation programs

Some of the projects being conducted in the Sanctuary include the conservation of the mangrove forests with natural regeneration practices; captive breeding and reintroduction of estuarine crocodiles to increase population; construction of wooden tracks in forests; and research on wildlife behavior.

The Wildlife Conservation Society has conducted research in Meinmahla Kyun, primarily to assess the status of freshwater turtles and make a survey of the saltwater crocodile. There have been few sightings of turtles as well as promising



Turtle



Ardea sp.



Crocodile



Heron

reports on crocodiles. The number of crocodiles in Meinmahla has increased since the reserve was established in 1994.

The Ministry of Forestry runs a crocodile headstarting program, where newly hatched crocodiles are collected from wild nests and raised in captivity by the Sanctuary staff. Once these crocodiles reach about 50 centimeters in length, they become less vulnerable to predators and are then released in the wild.

Other interests

Visitors can go bird watching and observe myriad species of wildlife that abound in the area. From November to January, they can also watch marine turtles lay eggs at Kadonlay beach, which is 16 kilometers from the Sanctuary. Researchers can also study and research on the mangroves and their conservation, as well as observe wildlife behavior. ■

Strides in Protected Area Management

The management has established a program for the conservation of valuable mangrove species and endangered wildlife. Guard posts have been established for patrolling and protection of the Sanctuary's resources, and for environmental education on the need to protect natural resources, and restore the mangrove forest species. The Sanctuary is well protected as a good experimental site for marine turtles and crocodiles in the wild.





PHILIPPINES





Pearl of the Orient Seas

The Philippines is located between the Philippine Sea and the South China Sea, east of Viet Nam and north of Indonesia and Malaysia. It comprises 7,107 islands covering an estimated area of three million hectares. The main island groups are Luzon, Visayas and Mindanao, with Manila as the capital city.

The country's vast natural resources provide food, water, shelter and livelihood for its rapidly growing population, estimated at more than 88 million. It is one of the 18 megabiodiversity countries that together contain 2/3 of the earth's biodiversity and around 70-80 percent of the world's plant and animal species. With its geographical isolation, diverse habitats and high rates of endemism, the Philippines ranks fifth in the number of plant species and maintains 5 percent of the world's flora.

The Philippines is located within the coral triangle, at the center of the highest marine diversity. Carpenter and Springer (2005) noted that there is a

higher concentration of species per unit area in the Philippines than anywhere in Indonesia and Wallacea, and that the Philippines is the center of the center of

Multilateral Environmental Agreements (MEAs) ratified

- Convention on International Trade in Endangered Species of Flora and Fauna – 1981
- World Heritage Convention – 1985
- Convention on Biological Diversity – 1993
- Convention on Migratory Species – 1993
- Ramsar Convention on Wetlands – 1994
- Cartagena Protocol – 2006
- International Treaty on Plant Genetic Resources for Food and Agriculture – 2006

marine shore fish diversity in the world (Fourth National Report 2009).

In terms of agricultural diversity, the Philippines is part of the center of diversity for rice, coconut, mungbean, taro and yam as well as the center of origin and diversity of bananas in Southeast Asia. There is also significant genetic diversity in spices in the country.

Ecosystems and biological resources

Based on the Food and Agriculture Organization (FAO) definition of a forest, the Department of Environment and Natural Resources (DENR) estimates that 7.2 million hectares comprise the forest ecosystem, which is approximately 24 percent of the total land area. The forest ecosystem plays a crucial role in soil and water conservation and major ecological services. It directly supports approximately 30 percent of the population including some 12 to 15 million indigenous peoples who depend on forests for their survival and whose cultures revolve around their interactions with their natural environment.

The largest remaining forest patches in the Philippines are found in northern and southern Luzon (especially the Sierra Madre mountain range), Palawan, Mindanao, and Eastern Visayas. Of the total land area and the remaining forest cover, 12 percent are dipterocarp/lowland rainforest and 3.5 percent, mossy/montane/cloud forest. Only 0.4 percent are coastal and mangrove forests. The pine forests are found in Mindoro, Benguet and Mountain Provinces, and Zambales while sub-marginal forest areas are found in various locations in the country.

There are also patches of beach forests, but current data are still being generated. Surveys by researchers have

also noted the emergence of a new forest type—the peat swamp forest or peat dome found in Agusan Marsh, based on a floristic survey done in Barangay Kaimpugan, San Francisco, Agusan del Sur and in Bunawan, Agusan del Sur. This is a distinct and unique forest type and is considered as among the least botanized of Philippine terrestrial habitat types.

The diversity in agricultural ecosystems directly sustains the lives of many Filipinos through regular provision of food, medicine and shelter, and indirectly, by sustaining the sources of their livelihoods.

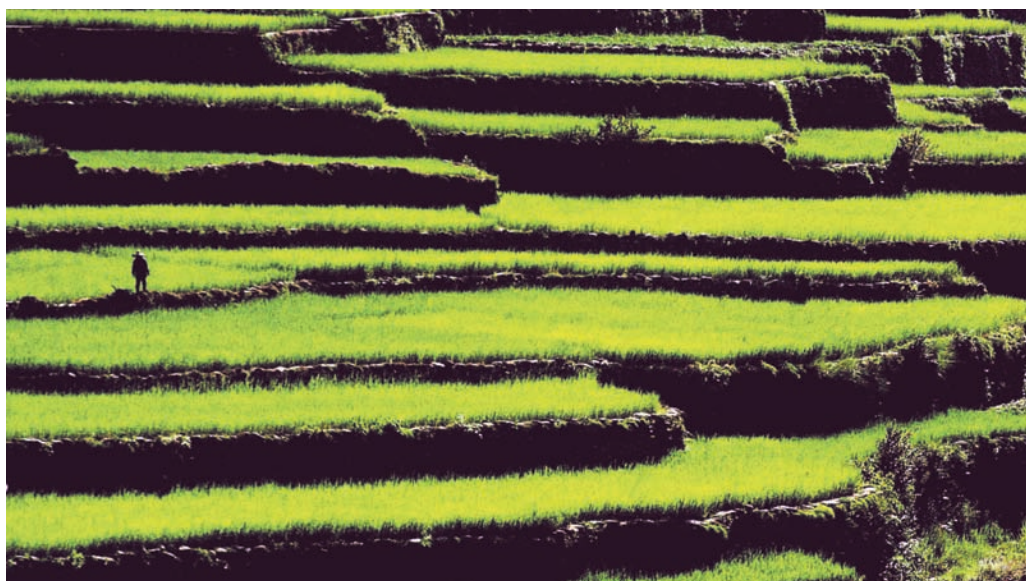


Also, the country's Ifugao Rice Terraces was included as one of the pilot sites in the FAO project on Globally Important Agricultural Heritage Systems (GIAHS). The project aims to establish the basis for global recognition, conservation and sustainable management of such systems and their associated landscapes, biodiversity, knowledge systems and cultures. The GIAHS project will also conserve and manage biodiversity in the form of traditional agricultural systems practiced in the site, thus complementing the objectives of the Convention on Biological Diversity.

In terms of inland water biodiversity, inland waters are home to more than 316 fish species, some of which are endemic and confined to single lakes like the *Sardinella tawilis* found only in Taal Lake. Other species that depend on these habitats are waterbirds, semi-aquatic species like the highly endangered Philippine crocodile (*Crocodylus mindorensis*), plants, and a majority of amphibians.

The country's coastal, marine and island biodiversity are known to be highly endemic and specialized, with the Philippines being within the coral triangle, at the center of the highest marine diversity. The country has earned the reputation of being the center of the center of marine shore fish diversity in the world. Its vast, rich and diverse coastal and marine resources comprise coral reefs, seagrass beds, mangrove and beach forests, fisheries, invertebrates, seaweeds, and marine mammals. Species diversity recorded by various authors indicate that there are 468 scleractinian corals, 1,755 reef-associated fishes, 648 species of mollusks, 19 species of seagrass and 820 species of algae.

The country also is second to Australia with the highest seagrass diversity in the world. It contributes about 19 species or about 55 percent of the number of species in East Asia. Seven species, comprising 40 percent of the total recorded in the Philippines and in Southeast Asia and 18 percent of the global record, are found in Ulugan Bay in Palawan.



Ifugao rice terraces, a World Heritage Site.



Corals

Five species of marine turtles are also found in the Philippines: green, hawksbill, olive ridley, loggerhead and leatherback, although loggerhead and leatherback just forage in Philippine waters. A well-known marine turtle nesting area is the Philippines Turtle Islands (also known as the Turtle Islands Wildlife Sanctuary or TIWS) and the Sabah Turtle Islands, which together, have been declared as the Turtle Islands Heritage Protected Area (TIHPA). TIHPA is the first transfrontier protected area for marine turtles in the world and is composed of six islands administered by the Philippines and three islands administered by Sabah, Malaysia. It is a major nesting area for green sea turtles in Southeast Asia. Hawksbill turtles also nest in the area.

Species endemism is indeed very high in the country and covers at least 25 genera of plants and 49 percent of terrestrial wildlife. It also ranks fourth in bird endemism. In terms of fishes, about 3,214 (incomplete list) have been recorded with about 121 endemic and 76 threatened species.

Among the significant species are the smallest raptor, the Philippine falconet (*Microhierax erythrogenys*), and

the flightless Calayan rail (*Gallirallus calayanensis*), which was discovered in May 2004 on the island of Calayan, one of the Babuyan Islands in the northernmost part of the Philippines archipelago. Another unique species is the Taal sea snake, the world's only sea snake that knows how to adapt to life in a freshwater lake.

Conservation issues

The country unfortunately, is included in the list of the world's hotspots, making it one of the top global conservation priority areas. A large number of species are either endangered or threatened.

The 2004 IUCN Red List of Threatened Species reports 491 species from the Philippines. Endangered bird species include the Visayan wrinkled hornbill, the Philippine cockatoo and the Cebu flowerpecker.

Invasive alien species in the Philippines

Higher plants

- Paper mulberry (*Broussonetia papyrifera*)
- Coronitas (*Lantana camara*)
- Mahogany (*Swietenia macrophylla*)
- Ipil-ipil (*Leucaena leucocephala*)
- Mile-a-minute (*Mikania micrantha*)
- Mangium (*Acacia mangium*)
- Auri (*Acacia auriculiformis*)
- Siam weed (*Chromolaena odorata*)
- Ivy gourd (*Coccinia grandis*)
- Water hyacinth (*Eichornia crassipes**)

Insect Pests

- Measuring worm (*Ozola minor*)
- Jumping lice (*Heteropsylla cubana*)
- Shoot borer (*Hypsila robusta*)

Pathogens

- Pink disease/canker (*Corticium salmonicolor*)
- Gall rust (*Uromycladium tepperianum*)
- Root rot (*Phellinus noxius*)

Sources: Asia-Pacific Invasive Species Network
*PAWB

The national list of threatened faunal species includes 34 species of mammals, 80 species of birds, 18 species of reptiles and 14 species of amphibians (DENR Administrative Order [DAO] No. 2004-15, as cited in the Fourth National Report [4NR] of the Philippines). Among the critically endangered faunal species are the tamaraw (*Bubalus mindorensis*), which is endemic to Mindoro, and the Philippine eagle (*Pithecophaga jefferyi*). This list, however, includes some non-forest dependent species of birds, a marine mammal (*Dugong dugon*) and four species of marine turtles (DAO No. 2004-15, as cited in the 4NR).

For the floral species, 99 species were identified as critically endangered. Most of these species belong to the *Dipterocarpaceae*, *Orchidaceae* and *Palmae* families. Among the critically endangered dipterocarps are *Hopea acuminata*, *Shorea astylosa* and *Vatica pachyphylla*. Genus *Paphiopedilum* has the most number of critically endangered species in the *Orchidaceae* Family, and the Genus *Heterospatha* and *Pinanga* for *Palmae*. Included in the endangered category are many species belonging to the *Orchidaceae*, *Cyatheaceae*, *Asclepiadaceae* and *Melastomataceae* families.



Dugong

Protected area management and conservation activities

Legal measures have already been instituted to protect and conserve the country's ecosystems and biological resources. Foremost of these is the National Integrated Protected Areas System (NIPAS) Law. The NIPAS Law or RA 7586 provides for the establishment and management of a comprehensive protected areas system that encompasses remarkably outstanding areas and biologically important public lands that are habitats of various species.

The Protected Areas and Wildlife Bureau (PAWB) of the DENR is mandated to implement the NIPAS with the overall objective of ensuring the conservation and management of the country's environment and natural resources.

As of 2008, there are 234 protected areas under the NIPAS covering a total area of about 5,234 million hectares and a buffer zone of 222,634 hectares. Terrestrial protected areas occupy a total of 4,092,635.87 hectares and a buffer zone of 202,922.08 hectares while marine protected areas cover about 1,141,918.68 hectares and a buffer zone of about 19,712.86 hectares (DENR-PAWB, 2008).

Six protected areas covering a total area of 121,668 are under the jurisdiction of other government agencies, such as the National Power Corporation, the Philippine National Oil Corporation, and the National Irrigation Administration. So far, only 10 protected areas have completed the process of establishment by enactment of site-



Orchid

specific laws.

The DENR-PAWB has developed and is now also implementing the National Biodiversity Strategy and Action Plan (NBSAP). Among several strategies, the NBSAP focuses on expanding and improving knowledge on biological diversity in particular its uses and values; integrating existing and planned biodiversity conservation efforts with *in-situ* activities; formulating an integrated policy and legislative framework for the conservation and equitable sharing of benefits from biological resources. The NBSAP also aims to institutionalize community-based biodiversity conservation education and research, and harness traditional and alternative media to increase public awareness and support for biodiversity conservation.

With new information, approaches and analyses from several conservation initiatives, the NBSAP was extensively reviewed by multi-stakeholder groups including natural and social scientists from government, research and academic institutions, civil society organizations,

donor communities and the private sector. This resulted in a broad-based consensus on 206 conservation priority areas and species conservation priorities collectively known as the Philippine Biodiversity Conservation Priorities (PBCP).

With the PBCP serving as a framework for the country's biodiversity programs and activities, the DENR-PAWB, Conservation International, and Haribon Foundation have identified 128 Key Biodiversity Areas (KBAs), and at the landscape level, 19 terrestrial and 9 marine biodiversity corridors, with 66 marine KBAs being proposed.

A Biodiversity Information Sharing Network of about 20 institutions was initially formed to facilitate information exchange and provide data to the Philippine Clearing House Mechanism. In addition, a Biodiversity Monitoring System (BMS) was established for data benchmarking and as a decision-making guide of the Protected Areas Management Boards (PAMB) in their respective areas. ■



MT. APO NATURAL PARK

Where the Philippine Eagle soars to new heights

The majestic Mt. Apo towers over the whole Philippine archipelago, being the country's highest mountain that rises to 3,143.6 meters above sea level. Its base is known to be larger than the island of Singapore. In 1982, Mt. Apo was included in the list of National Parks and Equivalent Reserves of the United Nations while the 1984 ASEAN Declaration on Heritage Parks and Reserves named it as an ASEAN Heritage Park.



Mt. Apo is a dormant volcano, which last erupted in 1640. This is why its upper southeastern slopes, when viewed from the Provincial Capitol of Davao del Sur, sometimes appear to be covered with snow, but on closer look is really sulphur, which is yellow. On its upper slopes are hundreds of sulphur vents. It was proclaimed a National Park on 9 May 1936 and initially covered an area of 76,900 hectares. By virtue of RA 7586, which provides the legal framework for the establishment and management of protected areas in the Philippines, Mt. Apo became an initial component of the National Integrated Protected Areas System. Mt. Apo was finally proclaimed a Natural Park in 2003 by Congress through RA 9237, covering an area of 54,974 hectares with a buffer zone

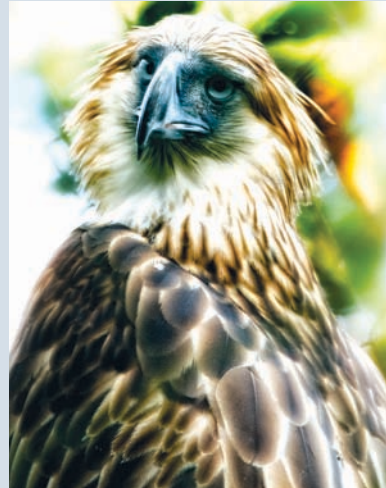
of 9,078 hectares (Molinyawe, 2007). The Park stretches over the territorial jurisdiction of two administrative regions of the country, namely: Region 12: City of Kidapawan and Municipalities of Makilala and Magpet, Province of Cotabato; and Region 11: Municipalities of Bansalan and Sta. Cruz and City of Digos, Province of Davao del Sur; and the City of Davao.

The Park is also regarded as the last stronghold of the remaining population of the rare and endangered Philippine eagle (*Pithecophaga jefferyi*), which, aside from being the symbol of environmental preservation in the country, has been declared as the national bird. This majestic raptor, mates for life and can live for half a century.

As a watershed, the whole Park provides the domestic and industrial water

The majestic Philippine Eagle: the country's national bird

One endemic but critically endangered bird species is the Philippine Eagle (*Pithecophaga jefferyi*) whose remaining population is believed to be only around 500. The Philippine eagle is of outstanding universal value for science and conservation, whose nesting and feeding areas are located in dipterocarp forests including closed canopy forests of Mt. Apo. It is the second largest eagle in the world. The Philippine eagle is the nation's symbol and is locally known as "haribon" or king of birds. With a wingspan of two meters, this bird of prey boasts the largest surface area in its wings among all eagle species. This bird is not found elsewhere in the world and has become the symbol of Philippine conservation efforts. Widespread destruction of its habitat and collection is driving this species to extinction.



Source: World Heritage Center



Lake Agco

needs of the surrounding communities. About 19 major rivers and 21 creeks drain into the Park's eight major watersheds (Protected Area Suitability Assessment Report, 1992).

The mountain protects several waterfalls and mountain lakes. The most popular are Lake Agco, also known as "The Blue Lake", and Lake Venado, a famous camp site for mountaineers and a stopover towards the peak. Lakes Mag and Jordan are found in the summit grassland. The most scenic waterfalls are Tudaya in Sibulan, Sta. Cruz, and Mabbu and Tagibaka both at Bongolonan, Magpet, Cotabato.

There are also a number of hot springs that are potential sites for ecotourism. Some of these are in Batasan, Makilala, Cotabato; Palaca at Sibulan, Sta. Cruz; Mainit, Sta. Cruz, Davao del Sur; Lake Agco at Ilomavis, Kidapawan City, Cotabato, and Marauer in Kapatagan, Davao del Sur.

Habitats

Mt. Apo hosts five distinct forest formations, from lowland forest to low montane forest, high montane forest and finally to summit or scrub forest. In addition to variations in its topography, interactions of other factors, such as climate, soil, geology, slope and drainage have allowed for the development of a wide diversity in plant community types and associations in the region.

Mt. Apo's vegetation has varying characteristics. The lowland or lowland evergreen forest occurs at elevations ranging up to 1,200 meters above sea level and is characterized by a multi-strata rainforest with closed canopy. The dominant dipterocarp species are lauau (*Pentacme contorta*), apitong (*Dipterocarpus grandiflorus*) and guijo (*Shorea guiso*) while *Syzygium* species include malaruhat (*Cleistocalyx aperculatus*), ulayan (*Lithocarpus*), and kalingag (*Cinnamomum*). Epiphytes (orchids) that include the endan-



Pitcher plant



Wild berries



Rare flower species

gered waling-waling (*Euanthe sandieriana*) are also abundant.

Its montane or low montane forest occurs from 1,200 to 1,800 meters above sea level, and is dominated by lauag-lauigan (*Syzygium*), banyas (*Dacrycarpus*) and species of igem (*Podocarpus*) and ulayan tindog (*Lithocarpus*) as well as the endemic almaciga (*Agathis philippinensis*) (PASA, 1992).

The mossy or high montane forest is found in an elevation ranging from 1,800 to about 2,600 meters above sea level. It is characterized by an abundant and high diversity of mosses, liverworts, epiphytes and stunted trees. Grasses such as cogon (*Imperata cylindrica*) and *Saccharum spontaneum* and ferns are also found, especially along banks of creeks, streams, and rivers and on steep slopes.

The summit or scrubland occurs on elevations greater than 2,700 meters above sea level. Fumaroles that include sedges (*Cyperaceae*), a fern species (*Gleichenia decarpa*) as well as species of *Ericaceae* and *Rhododendron* are found on this elevation. Mt. Apo has the largest, if not the only habitat, of this type in the Philippines.

Wildlife

There are 800 species of flora recorded in the Park (Country Report of the Philippines to the 3rd AHP Conference, 2010), including endemic species of the genera *Pipturus*, *Sauravia* and *Poikilospermum* and two endangered ones: *Lithocarpus submonticolus* and *Peperomia elmeri*. In the upper montane forest, the endemic species are *Cypholopus microphyllus* and *Nepenthes copelandi*. Other plants include the highly valued and endangered ones like almaciga (*Agathis philippinensis*) and dipterocarps such as the rare mang-gachapoi (*Vatica manggachapoi*) and *Shorea palita*.

Strides in Protected Area Management

Achievements in the management of Mt. Apo Natural Park are highlighted by co-management, partnership and collaboration, as well as the harmonization and mainstreaming of the Management Plan. Local Government Units (LGUs) share direct responsibility in the operation and management of the protected area, particularly in visitor management (mainly mountaineers and hikers). Regulations are stipulated in ordinances and guidelines adapted or sanctioned by the Protected Area Management Board (PAMB) and then implemented by LGUs. Park managers also work with various stakeholders, including government and non-government agencies, indigenous peoples groups, and private entities. Collaborations with stakeholders largely focus on law enforcement, area development and restoration and solid waste management within the Park.

The Management Plan has been updated to reflect current realities and management challenges, and harmonized or integrated with other management plans that affect the Park. The Ancestral Domain Sustainable Development Protection Plan (ADSDPP) includes the designation of portions of the Park as ancestral domain. The Management Plan has also been integrated into the Comprehensive Land Use Plan (CLUP) and Community Management Development Program (CMDP) of the LGUs. The PAMB uses the Forest Land Use Plan (FLUP) approach in updating, harmonizing and integrating/mainstreaming the management plan with technical assistance from the Eco-Governance Project of USAID.

Previous studies have identified about 272 bird species, of which 40 percent are endemic to the Park. From among all the species recorded, two are in the critical list: the Philippine eagle (*Pitheophaga jeferyi*) and abukay (*Cacatua haematopygia*); and 10 are endangered, among which are: Mindanao scops owl (*Otus mirus*),

lesser eagle owl (*Mimizuku gurneyi*), Mindanao lorikeet (*Tricoglossus johnstoniae*), and writhed hornbill (*Aceros leucocephalus*). Of the identified bird species found within the Park, some 45 species have restricted range in distribution.

Mt. Apo myna (*Basilornis miranda*), Apo lorikeet (*Trichoglossus johnstoniae*), Bagobo babbler (*Leonardina woodi*) and black cinnamon fantail (*Rhipudura nigrocinnamomea*) are some of the Park's endemic birds.

The Philippine brown deer (*Cervus mariannus apoensis*) is the most threatened among the 53 mammal species recorded. Other endemic mammals include the tudaya giant rat (*Bollimus bagobos*), tarsier (*Tarsius syriacta*), *Acerodon jubatus*, and the tree shrew (*Urogale everetti*).

The Park protects 17 species of amphibians and 36 species of reptiles.

Biological richness of Mt. Apo Natural Park

800 species of flora

- 629 vascular and non-vascular species
- 572 ferns and angiosperms
- 57 bryophytes or mosses
- 37 species with economic value

378 species of fauna

- 53 species of mammals
- 272 species of birds
- 17 species of amphibians
- 36 species of reptiles



Viper snake



Insect bat



Frog



Tarsier

Those restricted to the Mindanao faunal region include the bak-bak (*Rana magna*), Lokwak-manobo (*Ansonia mcgregorii*), “tok-tok” manobo (*Kalaula picta*), and cobra (*Naja samarensis*). The ibid or sailfin water dragon (*Hydrosaurus pustulatus*), halo (*Varanus salvator*) and the *Cuora ambionensis* turtle are among those on the critical list.

The wide ranging habitats and the rich biodiversity in the Park are the primary reasons why Mt. Apo has been rated as Extremely High Urgent for biodiversity conservation. Mt. Apo is one of the Key Biodiversity Areas of the Philippines.

People within the Park

Seven indigenous groups—Manobos, Klatas, Bagobo, Ubos, Atas, K’Iagans and the Tagacaolo—call Mt. Apo their home. They live on the lower slopes of the mountain, which they consider sacred ground and their ancestral domain. To them, the name Apo means “lord” or “ancient ancestor.”

Protected area management

The Mt. Apo Natural Park Management Board provides the site level management of the Park in accordance with RA 9237 that established the Park.

The Management Board is a multi-sectoral policy-making body that is composed of representatives from local government units, local communities, indigenous peoples, and non-government organizations with stakes in Mt. Apo. The Regional Executive Director of the Department of Environment and Natural Resources, Region XI stationed in Davao City chairs the Board. Assisting the Management Board in its daily operations is the Office of the Park Superintendent (PASu). The PASu is the chief operating officer, whose office is located at Barangay Kapatagan, Digos City and a Liaison Office at the Protected Areas and Wildlife Division-DENR Region XI, Lanang, Davao City.

The major management zones identified for Mt. Apo are multiple-use and strict protection zones and a buffer zone surrounding the Park. The multiple-use zones, which are divided into three sub-

Management activities in Mt. Apo focus on:

- Forest protection and law enforcement
- Coordination and linkages with local government units and other government agencies
- Conservation research for the Philippine Eagle Sustainable Livelihood Management
- Awareness, education and public relations
- Ecotourism

Source: Molinyawe, 2007

zones: recreation, cultural and special use, are managed to provide a social fence to prevent encroachment into the protected area by outsiders. The strict protection zone is divided into two sub-zones: habitat and restoration. In April 2009, the Management Board initiated the review and updating of the Park's management plan in order to harmonize it with the Ancestral Domain Sustainable



Development and Protection Plan of the indigenous people.

The major issues and challenges being faced by Park management include sustainable financing; awareness to support protected area management; conflicting land uses (e.g., agricultural development over biodiversity conservation); and human population growth and economic opportunities outside the protected area (Molinyawe, 2007).

Ecotourism destinations and activities

Mt. Apo is probably one of the country's most popular recreation areas and the mountain itself is now routinely scaled by hundreds of climbers each year.

Hiking

Several access routes lead inside the Park, but three are the most accessible, with a significant common factor: leeches.

- Northeast trail through Baracatan, which is steep and may take three days hiking/trekking.
- Northwest trail from Kidapawan in Cotabato, which is a two-day hike.
- Southwest through Makilala, which is also a two-day trek.

Lakes and waterfalls

- Lake Agco. Considered as sacred, the Lake is heated from below by volcanic vents to near boiling point and is located at Ilomavis, Kidapawan City. Passenger jeeps regularly ply the Kidapawan City to Barangay Ilomavis route.
- Lake Venado. Located at Sibulan, Davao City, Lake Venado could be reached through the different routes or trails mentioned above. It is the highest lake in the country, with an estimated surface elevation

of 7,200 feet (2,194 meters above sea level). The name of the Lake comes from the Spanish word "venado", which means "deer", owing to its deer-like shape.

However, the local people call the Lake "linaw", a Cebuano term for "clear", because of its crystal-clear water, where one can see a reflection of the peak of Mount Apo. The local people believe that the Lake is enchanted by spirits.

- Tudaya Falls, Sibulan, Sta Cruz.
- Mabbu and Tagibaka Falls, Bongolonan, Magpet, Cotabato
- Bacoco Falls, Kapatagan, Digos City. Jeeps from Digos City reach Kapatagan, from where one can hike to the Falls.

Hotsprings

- Batasan Hotspring at Makilala, Cotabato Province.
- Palaca Hotspring at Sibulan, Sta. Cruz, Davao del Sur.
- Kapatagan, Digos City, Davao del Sur.
- Mainit Hotspring in Sta. Cruz, Davao del Sur.
- Lake Agco at Ilomavis, Kidapawan City, Cotabato province, which could be reached by land transport from Kidapawan City to Ilomavis.
- Mainit and Marauer hot springs in Kapatagan, Davao del Sur can be reached by land transport from Digos City.

In his travel guidebook, *26 Days Around the Philippines*, Carlos M. Libosado, Jr. recommends the following places of interest within and around Davao City that one can visit before or after a trek to Mt. Apo:

Philippine Eagle Center/Camp, Malagos. The Center is home to about 36 Philippine eagles, 18 of which are



Tudaya falls

captive-bred. It also houses 10 other species of birds, four species of mammals and two species of reptiles. Simulating a tropical rainforest environment, the Center offers a glimpse into the country's forest ecosystem. Although the exhibits aim primarily to help educate the Filipino people on conservation, the facility is also considered a major tourist attraction in Davao City. The Center is about an hour drive from the city and can be reached either by private or public transport.

Orchid Farms and Gardens. Davao is famous for its orchid farms. A kilometer away from the Philippine Eagle Camp is the Malagos Garden Resort, an inland resort blooming with a myriad Philippine orchid species.

Farther down the road is the Yuhico Orchid Farms, the biggest orchid farm in Davao. Nearest the city is Fuentespina Orchid Garden, which has several varieties of highbred orchids, including the

world-famous *Vanda sanderiana* or Waling-waling, popularly referred to as the "Queen of Philippine Orchids". Other orchid farms are the Derling Orchid Garden in Buhangin and the Mindanao Flower Market in Bo. Pampanga, Lananang.

Buddhist and Tao temples. The Lon Wa Buddhist temple located along J.P. Cabaguio Avenue is where one can enjoy peace and quiet amidst a landscape of candle trees and bamboos. Not far from there is a Tao temple.

Ethnic experience. About six kilometers away from Davao city, one can visit a gallery of paintings and sculpture, and a souvenir shop selling colorful native crafts located at Lanang District. The museum is open (9:00-5:00) Mondays to Saturdays. Another attraction is Dabaw Etnika, where some Mandaya tribal women show their skills in weaving intricate patterns of abaca fibers. ■

MTS. IGLIT-BACO NATIONAL PARK

The refuge of the Tamaraw

Mts. Iglit-Baco National Park (MIBNP) is the only place in the world where one can find the biggest remaining population of the tamaraw (*Bubalus mindorensis*), a type of water buffalo that is endemic to Mindoro Island. This was the major reason for its declaration as an ASEAN Heritage Park. Also, the declining tamaraw population necessitated the area's establishment as a game refuge and bird sanctuary covering 8,956 hectares. On 9 November 1970, its area coverage was increased to 75,445 hectares and declared a National Park by virtue of Republic Act 6148.





The Heritage Park lies at the heart of Mindoro, about 130 kilometers south of Manila. Accordingly, Mindoro, an island of Luzon, Philippines may have been part of the land bridge connecting Palawan, another island province, with Luzon by which some of the Philippine's ancestors migrated from mainland Asia and Borneo. Today, the island is divided into the provinces of Oriental Mindoro and Occidental Mindoro and is home to the Mangyan who have long been known to be its caretakers.

Approximately 75 percent of the Park lies in the province of Occidental Mindoro, which comprises the municipalities of Sablayan, Calintaan, Rizal and San Jose. The remaining 25 percent is within Oriental Mindoro (Gloria, Bansud, Bongabong, and Mansalay).

The Park is characterized by a rugged terrain of slopes, river gorges and plateaus, encompassing at least eight major river systems and 10 low mountains close to each other. Mt. Baco, the high-

Biological richness of Mts. Iglit-Baco National Park

- 63 species of plants belonging to 49 genera under 9 families
- 104 species of birds belonging to 39 families
- 11 species of snakes
- 14 species of lizards
- 9 species of amphibians
- 10 species of fruit and insect bats
- 2 species of large mammals belonging to the Order *Artiodactyla*

est mountain with an altitude of 2,488 meters above sea level, dominates the central portion of the Park.

Southwest of Baco is Mt. Iglit or "Fungso Mangibok", the second highest, with an altitude of 2,364 meters, and where the most number of tamaraws roam.

Habitats and wildlife

The Park's major habitat types are grassland and evergreen forest. The most important fauna is the tamaraw, which is considered one of the most seriously



Tamaraw



The Mangyan

Living harmoniously with the tamaraw and nature, the Mangyan is the major indigenous group in Mindoro and is classified into at least eight ethno-linguistic groups: Iraya, Batangan, Hanuno’o, Alangan, Ratagnon, Tagaydan (or Tadyawan), Buhid and Pula. Some groups are believed to have been coastal dwellers, but have since moved into the remote forest interior to avoid religious conversion by migrants.

The Mangyan are traditionally nomadic within their territory and settle temporarily where food is found. Extended families set up loose clusters of bamboo huts with thatched roofs and raised floors. There are no formal leaders or social classes, and elders settle community disputes.

The Tau-buid or Batangan and the Buhid directly depend on Mts. Iglit and Baco for their source of food and livelihood. They grow corn and sweet potato close to their huts; others supplement these with cassava, rice, bananas, papayas, avocados, squash, beans, taro, and other vegetables. They gather edible forest products, trap wild pigs and chickens and raise domestic stock.

Both tribes are distinguishable for their earthen-tobacco pipe-smoking habits, and share a passion with their fellow Mangyan for the betel nut. The Buhid are said to be highly literate, and write in ancient scripts similar to the Tagbanua, an ethno-linguistic group of Palawan.

The Mangyan consistently stress their desire to maintain their cultural identity and ancestral domain, asserting their right to use resources for sustenance and cultural survival.



Tarictic hornbill



Bleeding-heart pigeon



Jade vine

endangered large mammals in the world, and has become a principal concern of the Species Survival Commission, International Union for the Conservation of Nature and Natural Resources. About 314 heads were recorded in the most recent Tamaraw Population Count conducted at the Mt. Iglit Range (Tamaraw Conservation Program, 2010).

Mts. Iglit-Baco best showcases the Mindoro biodiversity. Aside from the critically endangered tamaraw, the Park is also home to other unique species of flora and fauna such as Mindoro imperial pigeon (*Ducula mindorensis*); Mindoro tarictic hornbill (*Penelopides mindorensis*); Mindoro bleeding-heart pigeon (*Gallicolumba platenae*); Mindoro scops owl (*Otus*

mindorensis); Mindoro rusa deer (*Cervus marianus barandanus*) and the Mindoro pine (*Pinus merkusii*).

The Philippine deer and the wild pig also inhabit the grasslands, which are dominated by *Themeda triandra* and *Imperata cylindrica* species. The large Mindoro forest mouse (*Apomys gracilirostris Ruedas*) and a number of other endemic bird species such as the black-hooded coucal (*Centropus steerii*) and scarlet-collared flowerpecker (*Dicaeum retrocinctum*) are found in the mossy forest of the highlands and peak summits.

One of the rare and endangered plant species in the list is the endangered Jade vine.

Strides in Protected Area Management

Park management encourages the participation of local communities and other stakeholders in conservation activities. Stakeholders participate in the decision-making of the Protected Area Management Board (PAMB)—a policy making body that manages the Park with the Protected Area Superintendent (PASu). Members of the local indigenous groups are employed as protected area staff. Park authorities also coordinate with the tribal community to curb problems on poaching. There are also efforts to provide livelihood opportunities for the local communities around and adjacent to the Park, as well as organize them into a conservation council, such as the Barangay Tamaraw Conservation Council.

Authorities have also taken advantage of the 2002 Presidential Proclamation 273 that set October as a “Special Month for the Protection and Conservation of the Tamaraw in Mindoro.” This proclamation aims to highlight the importance of the tamaraw as a unique biological resource and the Filipinos natural heritage. It also hopes

to encourage active public participation and support in the protection and conservation of the species. Activities that celebrate Tamaraw Month include the conduct of a Biodiversity Conservation Camp or BioCamp, which is a one-week engage-to-nature seminar that primarily aims to gain support in disseminating information and educating the public on the need to conserve the Tamaraw and its associated biodiversity. A Poster-Making-Contest and Biodiversity Quiz is also conducted to educate students on the importance of Tamaraw and its associated biodiversity. Programs such as Dalaw-Turo (visit and teach) are conducted in schools while municipal seminars are held to educate the public and encourage LGU participation in biodiversity protection and conservation. A Tamaraw Conservation and Protection Forum is also held to gather leaders and decision-makers from the twin provinces of Mindoro to discuss issues on Tamaraw conservation and protection and identify opportunities for collaboration.



Park management

The Protected Area Office (PAO) is headed by a Protected Area Superintendent, who is the administrator of the Park. The PAO provides information and services such as trail guides and camping guidelines. It is located at Airport Rd., San

Roque I, San Jose, Occidental Mindoro, and maintains a guard post at Sitio Magtanggob, Calintaan, Occidental Mindoro.

Management activities generally focus on forest protection and law enforcement; conservation research for the tamaraw and its habitats; awareness, educa-

tion and public relations; and ecotourism (Molinyawe, 2007).

Park authorities also face a number of issues that are threats to the resources of the national park. These challenges include inadequate funds; awareness and support for management of the protected area; conflicting land uses (i.e. development issues such as mining and timber production against biodiversity conservation) as well as human population growth and the availability of economic opportunities outside the Park (Molinyawe, 2007).

Local ecotourism destinations and activities

The major activities that one can engage in and the local destinations to visit within the Park and its surrounding areas are:

Tamaraw watching. Watching tamaraw grazing in the wild is a relaxing activity. While atop Mt. Magawang or

on any adjacent peaks, the visitor will be spellbound by the surrounding landscape of Mt. Iglit Range as well as the seascape on the west side. Visitors can also observe the tamaraw in captivity at the Gene Pool Farm Facility of the Tamaraw Conservation Program in Sitio Canturoy, Brgy Manoot, Rizal.

Bird watching. Birdwatchers will enjoy observing the birds endemic to the Park as well as other interesting ones like the blue shortwing, Island thrush tardus, Blueheaded racket-tailed parrot, barred graybird, Philippine bulbul, and the Mindoro canegrass warbler.

Mountain climbing. The climb to Mt. Iglit (2,364 meters above sea level) starts with a one-hour trek from Barangay Poypoy, Calintaan, in Occidental Mindoro to Station 1 at Sitio Magtangcob. Another three-hour hike brings one to Station 11 at the foot of Mt. Iglit. From there, one can start a four- to five-hour ascent to the summit. Climbers can



Tamaraw watching



Tamaraw herd

descend to Loibfo Hill and Magawang, where tamaraws may be spotted any time of the day.

Attractions outside the Park

Sablayan is the central town of mainland Occidental Mindoro. Before or after a visit to the Park, one can take a 2½-hour-jeepney or mini-bus ride to see the many attractions around Sablayan.

Pandan Grande is a three-hectare islet, with a lagoon and white sand beaches. A French national developed the area into an international beach resort, which is listed in the International Tourist Guidebook as one of the “Philippines’ Top 10”. The resort has native cottages and serves international cuisine. Scuba diving facilities and instructors are available.

Pandan Piqueño is an islet with virgin forests. Like Pandan Grande, this is an atoll with scuba diving possibilities.



Bats

Apo Reef Natural Park is a protected area covering 15,792 hectares that includes both land and water, and encompasses three islands with white beaches: Apo Island, Apo Menor (Binangaan Island) and Cayos del Bajo. The islands are accessible by motorized banca. An astonishing site for snorkeling and scuba diving, the crystal blue waters and coral reefs teem with a wide variety of marine life. Apo Reef is home to some 385 species of colorful marine fishes, including sharks, stingrays, mantas, tropical fish and morays, and over 500 species of soft and branching types of hard corals.

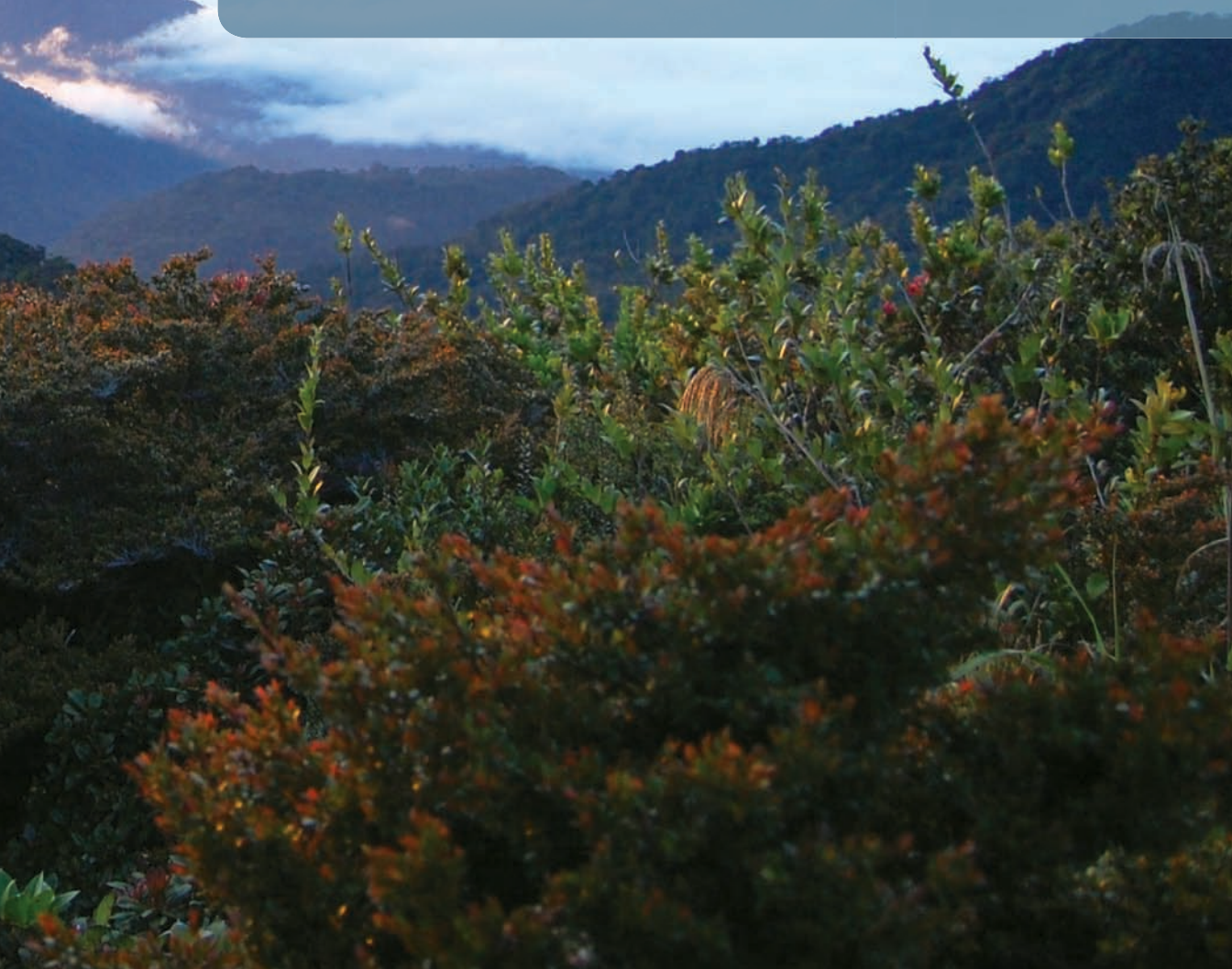
Parola Park is situated on the hilly coastal portion of Sablayan, where the early Sablayanons established a watchtower (*parola*) in 1861 to guard against Muslim pirates who used to raid the area. Round-the-clock watchers would signal the people to hide whenever they sight Muslim vistas. In 1896, the *parola* was equipped with bells that rang musical chimes. In later years, a church was built but is now in ruins. The *parola* still stands as a historic landmark. ■



MT. KITANGLAD RANGE NATURAL PARK

Wellspring of living tradition

Mt. Kitanglad Range Natural Park (MKRNP) is one of the few remaining rainforests in the Philippines, hosting one of the most important diverse species of rare and endemic wildlife, most especially the Philippine Eagle, which is now known as the country's national bird. Indeed, the Park's diverse and rich flora and fauna make it one of the last sanctuaries of the country's natural heritage.



In October 2009, Mt. Kitanglad Range became the 28th ASEAN Heritage Park. Next to Mt. Apo Natural Park—the highest mountain in the country, Mt. Kitanglad Range Natural Park is accordingly the country's second highest mountain. Mt. Kitanglad was declared a protected area in 2000 by virtue of Republic Act No. 8978.

Mt. Kitanglad Range Natural Park covers 47,270 hectares (protected area – 31,236 hectares; buffer zone – 16,034 hectares) in the north central portion of the province of Bukidnon, and straddles parts of the municipalities of Baungon, Talakag, Lantapan, Impasugong, Sumilao, Libona and Manolo Fortich and the city of Malaybalay.

The Natural Park is the major watershed that provides water for irrigation, power generation and domestic use for Bukidnon as well as the province of Misamis Oriental, and the catchment area of the Cagayan, Tagoloan and Pulangi river system. It is likewise the ancestral domain of the Talaandig, Higaonon and Bukidnon ethnolinguistic groups that share common historical and cultural ties with Mt. Kitanglad, which they consider the wellspring of their traditions.

More than a dozen mountain peaks, densely forested slopes, a number of caves, several waterfalls and a hot spring can be found in the Park. Five of its peaks have very high elevations: Mt. Dulang-Dulang, the highest at 2,938 meters; Mt. Kitanglad, 2,899 meters; Mt. Maagnaw, 2,742 meters; Mt. Lumuluyaw, 2,612 meters; and Mt. Tuminungan, 2,400 meters.

Mt. Kitanglad Range has unique ecological diversity characterized by a combination and interplay of human communities, connected landscapes, immense natural diversity of its flora and fauna, and its importance to the national economy and heritage (MKRNP website).

How Mt. Kitanglad got its name

Stories have been told that when the great flood submerged the native lands, only the tip of the mountain, which was the size of a tanglad plant (lemon grass), remained visible; thus the name Kitanglad.

Habitats and biological resources

The Natural Park has six major habitat types, ranging from lowland evergreen forest, which is the most species-rich forest formation; lower montane forest, upper montane (mossy) forest, grasslands, freshwater wetlands and caves. Every part of Mt. Kitanglad's habitat is considered precious not only for harboring countless species but more for its life-support functions for its inhabitants.

The Park accordingly has the highest tree density ever reported in a tropical forest. This combination of a small, manageable size and a rich, singular biodiversity conforms to the type of protected ecosystem that, according to Sayer (1995), ought to receive the most determined attention in tropical biodiversity protection (Garrity, *et al.* 2002).

The lower montane forest is characterized by a two-layered canopy. Trees in this habitat type are shorter than those found in the lowland residual dipterocarp forest. In the upper montane (mossy) forest, trees are gnarled and stunted with a more or less uniform height, and trunks and branches are adorned with numerous species of mosses, lichens and ground epiphytic ferns.

Biological richness of Mt. Kitanglad Range Natural Park

- 168 species of birds
- 131 species of butterflies
- 63 species of mammals, of which 17 are endemic species
- 26 species of amphibians
- 21 species of reptiles



Philippine brown deer

The brushland/grassland and cultivations are confined to the central lower portions of the Park (CPPAP, 2001). These forests and grasslands protect a large population of flora and fauna endemic to the Philippines, but many are already endangered like the Philippine eagle. There are 168 known bird species and about 131 species of butterflies. Numerous bat species have been recorded and these include the Mindanao pygmy fruit bat, which is abundant and endemic to the Park, and the first fruit bat species known in Asia. On the other hand, 63 mammalian species are known to exist in Mt. Kitanglad, compared to 49 in the entire island of Negros. There were 17 endemic species recorded in contrast to only eight such species in Mt. Apo. The equally diverse amphibians and reptiles represent 26 species and 21 species, respectively, with 50 percent endemism.

Some species may have been common during previous studies done but today are rarely observed. The list includes *Phaphitreron amethystina*, *Macrophygia phasianella tenuirostris*, *Prioniturus discurus*, *Trichoglossus jhonstoniae*, *Harpactes ardens*, *Coracina mcgregori*, *Aceros leucocephalus*, and *Basilornis miranda*. On the other hand, some species rarely seen before seem to be more abundant now. These include



Medenilla

Lophozosterops goodfellowi, *Hypocryptadius cinnamomeus*, *Leonardina woodi* and *Erythra coloria*. Another species, *Serinus estherae* was recorded for the first time. Others include the Whitehead's swiftlet, Mindanao lorikeet, Mindanao racquet-tail, Mindanao scops owl, slaty-backed jungle-flycatcher, red-eared parrot finch, Apo myna, Philippine brown deer and the Mindanao pygmy fruit bat (*Alionycteris paucidentata*).

Mt. Kitanglad supports the richest known vertebrate fauna (mammals and birds) in the country (Heaney and Peterson 1992, Amoroso *et al.* 1996; L. Heaney, unpublished manuscript, as cited in Garrity, *et al.* 2002). Heaney and Peterson (1992), as cited in Garrity, *et al.* (2002), observed 13 of the 14 species of birds endemic to Mindanao, like the critically endangered Philippine eagle.

Very few mammalian and herpetological species were observed but this is not necessarily a reflection of the real conditions in the area. Common species of the Families *Suidae* and *Cervidae* have become rare in the area because of the increased demand for meat by the local inhabitants.

The Park also has an exceptional conservation value in terms of the high endemism of the vascular flora. This includes the *Tmesipteris lanceolata* Dang,



Woodcock



Rafflesia

an endangered rootless vascular plant (Amoroso et al. 1996; Pipoly and Madulid, 1995, *personal communication*, as cited in Garrity, et al. 2002).

The indigenous peoples

The indigenous communities consider Mt. Kitanglad as the center of their wellbeing. They regard the mountain range as their ancestral domain—their history, myth and tradition revolve around it. Despite the influx of migrants and the impact of inculturation, they still manifest strong cultural traits in their activities and way of life. Their current livelihood practices determine the sustainability of the biodiversity conservation goals instituted in the Park.

They grow mostly root crops, but some residents have also ventured into gathering rattan poles, weaving rattan and bamboo strips, abaca production, and hunting. Though some 40 percent of the occupants engage in fishing in nearby creeks or rivers, their catch contributes very little to their daily subsistence.

The three main indigenous communities—the Tala-andig, Higa-onon and Bukidnon tribes—living within different

“...On 3 November 1999, the indigenous peoples (IP) of Kitanglad made history when they proclaimed ownership of all medicinal plants and resources in the mountain range. The IPs warned that violators of the proclamation would be penalized in accordance with customary laws. The proclamation was preceded by a Kitanglad-wide documentation of the uses of medicinal plants which the IPs declared should be recognized as their intellectual property...” (Philippine Daily Inquirer, 5 November 1999, as cited by Canoy, E. et al. 2001. “Mapping that matters”. In: PA Monitor special issue. February 2001.)

areas of the Park, asserted their rights of ownership over the plant and wildlife resources of Mt. Kitanglad through a proclamation made during a program that included a customary ritual where a boar and several heads of chicken were slaughtered. Accordingly, they hope to put the entire world on notice that they have first and prior rights over these resources as they are the ones who nurtured and conserved these resources over several generations. Thus, academic researchers or scientists who wish to have access to these resources would have to deal with the Council of Elders



Tala-andig tribe

of the three indigenous groups and comply with their requirements (Peria, E. *undated*).

These indigenous communities, in particular the Tala-andig group, have started building cultural monuments within their ancestral domains in the Park to stop bio-piracy in the areas; preserve the cultural tradition of the people; and, organize and institutionalize indigenous leadership. They have become more vigilant against intrusions into their areas especially after they saw researchers gathering herbal plants for medicine research (Vanzi, 2000).

The Tala-andig community plans to build some 200 monuments or altars that they call *bangkasu*, where offerings to their gods are made. The first monument was built in a hidden spring at the foot of Mt. Apolang; the altar of the gods who keep honey, *bangkasu hu lalawag*, marks the traditional worship area of the Tala-andig community (Vanzi, 2000). The second monument, the altar of the gods who protect wild animals, was built at the eastern side of Kiabansag mountain while a third built at Kaatuan, Lantapan hopes to regain and strengthen the traditional worship

Kitanglad Cultural Zones

- Prohibited areas: *igbando*, *ibabanduwa*, *ibobowala*, *igbalaw* or *inlaw*.
- Sacred or worship areas: generally called *lalaw*; specific names depend on its purpose, such as: *tulungdanon* (ritual areas), *pangapuga* (altar), *pangampuay* (where offerings are given to spirits who bring illnesses to humans), *panalikuta* (where hunting dogs are given blessings) and *panungdana* (worship areas).
- Livelihood areas: *pangosuha* (for hunting wild pigs by using dogs), *tangkal* (wild pig sanctuary), *talauwa* (granary of agriculture produce), *panlaisa* (for hunting wild animals by traps), *unayan* (farmplot), *kalukalan* (for honey bee collection), *pangilawa* (water bodies where there are aquatic animals).
- Resources use areas: *pamigtawa* (for rattan extraction) and *pangahara* (for timber extraction).
- Dangerous areas: Also known as havens of bad spirits, these areas are named *manugpong*, *panlaaga* and *bila*.
- Special areas for tribal guards: *iliyan* (headquarters) and *pambatala* (checkpoint).
- Natural areas: *kaulo hu dal-og* (water source) *tugdonan* or *salebseb* (spring), *kahulugan* (falls), *liyang* (cave) and *kalasan* (forest).

Source: Canoy, E. et al. 2001. "Mapping that matters". IN: PA Monitor special issue. February 2001.

area, which is now known as the Cinchona Reforestation Project (Vanzi, 2000).

Park management

The Office of the Protected Area Superintendent under the Department of Environment and Natural Resources directly supervises the day-to-day operations and management of Mt. Kitanglad. The Office works closely with

the Protected Area Management Board (the governing body) and in partnership with the Kitanglad Integrated NGOs or KIN. Recognized as the host non-government organization (NGO) of the Park in April 1996, KIN is a consortium of five local NGOs organized in May 1995 with proven capability in various fields that include cultural, environmental and church-based programs, upland and

Strides in Protected Area Management

Mt. Kitanglad Range may be considered as having the longest forest resource monitoring system in place since it was designated as a Biodiversity Monitoring System pilot site. Local communities play a significant role in gathering / monitoring data at the field level. Park management has tapped volunteers to form the Kitanglad Guard Volunteers (KGV), the community-based protection arm of the



Council of Elders and the Protected Area Management Board (PAMB) of the MKRNP. These forest protection volunteers are deputized by the Department of Environment and Natural Resources as Special Deputy Environment and Natural Resources Of-

ficers (SDENROs). The KGV has been instrumental in curbing forest degradation by providing confidential reports on illegal activities within the Park. Cellphones have been provided by Smart Communications, a private telecommunications company, to the KGV to facilitate their activities in protecting the Park. The Council of Elders, on the other hand, serves as adviser to the PAMB on issues concerning the indigenous peoples in the Park. The Council plays a vital role in planning and decision-making regarding resource access following traditional practices, boundary conflicts and the implementation of the tribal justice system. Peace and harmony among indigenous peoples and Park authorities has been promoted through the Council of Elders.

Park management also distinguishes itself with achievements in resource mobilization and generation. Local government units that have political jurisdiction over the Park have provided funding for operations. A number of local officials also provide funding assistance, particularly for the volunteer guards that protect the Park.



A perfect site for research and recreation.

tribal community welfare activities, as well as in cooperative and entrepreneurial social development aspects.

The focus of KIN in the Natural Park is on reviving and strengthening the cultural integrity of local communities toward their socio-economic upliftment and capability enhancement to protect Mt. Kitanglad. The Kitanglad indigenous peoples, through their Council of Elders, take an active role in the management and protection of the Park. They use a two-pronged approach—maximizing established legal mechanisms and firming up indigenous structures and practices. With the need to intensify forest protection, the indigenous communities revived the tribe’s defense system (*pagalad*) with the ‘*datus*’ and the ‘*baes*’ themselves picking out the tribal guards who have undergone a cultural reorientation under the tutelage of the cultural experts (Canoy, E. *et al.* 2001).

Eco-cultural activities

School of Living Tradition

Home to the Talaandig community, Sitio Tulugan in Songco, Lantapan, showcases the community’s various products through the art of weaving, handicraft making, rituals, dance and music. People

entering sacred areas are required to participate in a cleansing ritual called “*pangawan*”.

The recreational zone of Mt. Kitanglad offers potential attractions to foreign and local mountaineering enthusiasts. Regulated and responsible ecotourism activities are allowed. Trekking at the summit, camping and bird watching are among the favorite activities.

Hiking

The mountains can be scaled all year round. Four trails lead to the mountain peaks. For the Mt. Kitanglad summit, the first trail is located at Intavas, La Fortuna, Impasug-ong town; the second at Barangay Lupiagan, Municipality of Sumilao. For Mount Dulang-dulang, the first trail starts at Bol-ogan, Songco and Kaatuan, Lantapan, Bukidnon, and the second trail is in Dalwangan, Malaybalay City.

Getting to Mt. Kitanglad summit

Intavas Trail. The first trail is located at Sitio Intavas, La Fortuna, Impasugong. Sitio Intavas can be reached by any type of vehicle. It takes about an hour ride from Malaybalay City or a two-hour ride from Cagayan de Oro City to reach the sitio. The jump-off point is at Crossing

Sta. Ana of Impasugong Municipality (located along Sayre Highway).

The Visitor's Center at Sitio Intavas is manned by the Barangay Council of La Fortuna through its Barangay Chairman. The Sitio is about five kilometers away from the foot of Mt. Kitanglad. From the foot to the summit, it is a three- to five-hour regular walk along the three-kilometer trail.

Lupiagan Trail. Lupiagan trail is located at Barangay Lupiagan, Sumilao, in Bukidnon. Sumilao is five kilometers away from the Kisolon Bus Terminal (along Sayre Highway). From Sumilao, an eight-kilometer road leads to Lupiagan, at the foot of Mt. Kitanglad.

Getting to Mount

Dulang-dulang summit

Bol-ogan Trail. Bol-ogan trail is located at Sitio Bologan, Songco, Lantapan. Public utility jeepneys ply the Malaybalay-Kibanggay route, which

passes through the national highway, the converging road network to the City of Iligan. From Malaybalay City, it takes an hour and a half to reach Crossing Bologan. Barangay Songgco is approximately eight kilometers away from Crossing Aglayan (Sayre Highway). Bol-ogan trail leads climbers to Mt. Dulang-dulang and a cross-country hike towards Mt. Kitanglad using the Intavas and or Lupiagan trails as the exit route (Information Hand Book, Mt. Kitanglad Range Natural Park).

Dalwangan Route. Although established, the trail is quite difficult to traverse as it is not often used. For normal hikers, it will take half a day to reach the peak. There are no facilities along this area, thus hikers are advised to bring their camping gear.

Camping at Cinchona Forest Reserve

Cinchona Forest Reserve at Kaatuan, Lantapan, Bukidnon is a favorite for



Mount Dulang-dulang



Philippine eagle

campers. The Reserve was established on 22 September 1936 per Presidential Proclamation No. 83 and covers an area of 1,914 hectares. It was declared as Kaatuan Forest Reserve for the experiment and propagation of quinine, forest protection and timber production. The forest is the habitat of the rare green maya and the *Ratus ratus rabori*, the only rat of its kind in the world. The Reserve formed part of the Mt. Kitanglad protected area on 24 October 1996. The Mt. Kitanglad PAMB manages the site.

Birdwatching

The nesting sites of the famous Philippine eagle are located in Sitio Mangasa, Dalwangan, Malaybalay City, and at the Cinchona Forest Reserve in Barangay Kaatoan, Lantapan. The Ecolodge at Sitio Lalawan, also at Dalwangan, offers bird watching and camping activities. A tourist guide for birdwatchers is available.



One of a series of seven waterfalls in Kaatuan, Lantapan, Bukidnon.

Lusok Falls at Kalanganan, Baungon

A series of three falls with a height of 30-50 meters can be reached in two hours along a jungle trail with a distance of approximately four to five kilometers. The local government unit proposed the area for ecotourism activities.

Nabitag Falls at Sitio Lantud, Brgy Sagarán, Talakag, Bukidnon

The Falls measure 200 meters. It takes a 45-minute walk to the Falls from Barangay Lantud through the forest. From Barangay Sagarán to Sitio Lantud, it is a one-hour walk.

Hot Spring at Sitio Alas-as, Licoan, Sumilao, Bukidnon

Located along the Culaman River, the water is very hot that it can hard-boil a chicken egg in less than 5 minutes. Although there is no trail going to the site, it can be reached from Barangay Licoan through a two-hour walk in the forest. ■





SINGAPORE



City in a Garden

Singapore, a city-state of 4.9 million people, comprises a main island and 63 offshore islands, with a total land area of around 68,000 hectares. It is located close to the equator, and enjoys a tropical climate that is typically hot and humid. Though highly urbanized, Singapore is a prime example of how biodiversity can be maintained in the world's growing cities.

“Let’s Make Singapore our Garden” is the mantra of the environmental movement in the country. Government and private institutions work closely together to conserve, create and sustain the green infrastructure of the country. These institutions use creative urban planning to ensure the optimal use of land and satisfy competing land uses for residential, industrial and commercial developments. Park planning involves the creation of national parks, nature reserves and recreation areas, as well as the development of park connectors that maximizes all nature areas to allow the citizenry to better enjoy and appreciate nature.

The National Parks Board Act (2005) and the Parks and Trees Act (2005) provide the legal basis for conservation in this city-state. Singapore’s National Biodiversity Strategy and Action Plan (NBSAP) was developed to map out Singapore’s master plan for biodiversity conservation.

The five strategies that guide Singapore’s commitment to the conservation and sustainable use of its biodiversity resources are as follows:

Strategy 1: Safeguard our biodiversity

Strategy 2: Consider biodiversity issues in policy and decision-making

Strategy 3: Improve knowledge of our biodiversity and the natural environment

Strategy 4: Enhance education and public awareness

Strategy 5: Strengthen partnerships with all stakeholders and promote international collaboration

Nature Reserves

Singapore's nature reserves include Bukit Timah Nature Reserve, Labrador Nature Reserve and Sungei Buloh Wetland Reserve.

Bukit Timah Nature Reserve is one of the first forest reserves in Singapore. Established in 1883, the 163-hectare Reserve retains one of the largest tracts of primary rainforest left in Singapore. Bukit Timah Nature Reserve is also home to Singapore's highest hill at 163.63 meters.

Labrador Nature Reserve has a rich variety of flora and fauna, including 50 kinds of birds and 11 species of butterflies. Bird species include the blue-crowned hanging parrot, the rufous woodpecker (*Micropternus brachyurus*), and Abbott's babbler (*Malacocincla abbotti*). Tree species like *Symplocos adenophylla*, *Eugenia grandis* (sea apple), *Rhodamnia cinerea* (silverback), and *Ixonanthes reticulata* can be seen here. Many of the trees are rare, and of special interest is *Dracaena maingayi*, a monocotyledonous tree, estimated to be more than 80 years old.

Sungei Buloh Wetland Reserve is Singapore's first and only protected wetland reserve, and is home to over 500 species of tropical flora and fauna. In 2002, Sungei Buloh was recognized as a site of international importance for migratory birds, and was also declared



Bat plant



A perfect symbiotic relationship of a creeping vine and a tree.

as an ASEAN Heritage Park in 2003, the first for Singapore.

Habitats and biological resources

Inland water ecosystems consist of reservoirs, streams and rivers, and freshwater swamp forest. Surveys have revealed remarkable survival of marine and coastal biodiversity, with discoveries of previously unreported seagrass beds, and new records of a number of molluscs and polychaetes.

Forest biological diversity is maintained predominantly within the nature reserves. Monitoring and population studies have been conducted



Egret

in collaboration with the Centre for Tropical Forest Science, showing satisfactory resilience of timber volumes and species diversity.

Total species representation in Singapore is now better known, but records are continually being revised due to ongoing nature studies in the country. In terms of flora, 2,145 native plant species have been recorded, of which 29.8 percent are thought to have become locally extinct (Kwek, Tan, & Corlett, 2009). The *Orania silvicola* palm (presumed locally extinct) was rediscovered in 2006, and the *Dipterocarpus tempehes* tree was discovered wild in 2005. Approximately 6.7 percent of native plants are considered endangered and approximately 17.7 percent vulnerable (NParks, 2006). Current records of fauna indicate 58 species of mammals, 376 species of birds, 102 species of reptiles, 28 species of amphibians, 68 species of freshwater fish, and 294 species of butterflies.

Population studies of mammals such as the pangolin or scaly anteater, Malayan colugo or flying lemur, porcupine, leopard cat and slow loris show continuing survival, and discoveries in new areas.

From a Garden City to a City in a Garden

The National Parks Board (NParks) is responsible for providing and enhancing the greenery of Singapore. Beyond green infrastructure, NParks is committed to enhancing the quality of life of its citizens by creating memorable recreational experiences and lifestyles. NParks manages Singapore's green spaces including about 300 parks and four nature reserves, which make up almost 10 percent of the Republic's



Singapore Botanical Garden

total land area. An island-wide Park Connector Network is also being developed to link major parks and residential areas. About 112 kilometers of park connectors have been constructed, as of 2009, and NParks aims to develop a 300-kilometer island-wide network of green corridors by 2015.

NParks monitors the country's biodiversity. Its programs support the overall thrust of making Singapore as an urban biodiversity conservation model, which aims to conserve representative ecosystems in land-scarce country for future generations. Currently, NParks manages 1,844 hectares of parks, connectors and open spaces. The organization also monitors 3,326 hectares of nature reserves, and 4,326 hectares of roadside greenery and vacant state land.

Over the years, as NParks has successfully attained its vision of creating Singapore as a Garden City, the organization's vision has transformed to creating "A City in a Garden" where the island's seamless green infrastructure of parks and streetscapes play an essential part of the lives, homes, workplaces and playgrounds of those living in Singapore. NParks is building enduring partnerships with corporations and the community to initiate programs and activities that will inspire a love for the environment.

With this vision, Singapore continues to emphasize its national commitment to creating an environmental lifestyle for all Singaporeans, and emulate the best model for creating and maintaining biodiversity in harmony with human needs. ■



SUNGEI BULOH WETLAND RESERVE

Where mangroves and wetland wildlife thrive

The Sungei Buloh Wetland Reserve is Singapore's first and only protected wetland reserve, and is home to over 500 species of tropical flora and fauna. Sungei Buloh was first discovered by avid birdwatchers from the Malayan Nature Society (Singapore Branch), who then wrote a proposal to the government for its conservation. The development of the Park was undertaken by the Parks and Recreation Department (which is now the National Parks Board) with experts from the Wildfowl & Wetlands Trust from the United Kingdom and the Worldwide Fund for Nature. It is located on the northwest sector of Singapore, close to the Kranji Reservoir.



The Nature Park was officially opened on 6 December 1993. In 2002, the 130-hectare Park was officially gazetted as a nature reserve and was renamed the Sungei Buloh Wetland Reserve. The reserve was also declared an ASEAN Heritage Park in 2003.

Habitats

Sungei Buloh has a variety of wetland habitats. Mangrove forest is the main wetland type, and these are the most extensive mangroves remaining in Singapore. There are also mudflats in the intertidal areas, a network of brackish water ponds, freshwater ponds, areas of grassland and patches of secondary forest. A river fringed with mangroves and an island entirely covered with mangroves are also found within the Wetland Reserve.

The dominant mangrove species are *Sonneratia*, *Rhizophora*, *Bruguiera* and *Avicennia*.

Flora

Some of the significant flora in Sungei Buloh include:

- Sea hibiscus (*Hibiscus tiliaceus*)—a plant with heart-shaped leaves and beautiful flowers, and can grow up to 13 meters tall.
- Tui (*Dolichandrone spathacea*)—a small tree that grows 5 meters tall and has long fruits up to 45 centimeters long and curved like a beanpod.
- Sea teak (*Podocarpus polystachyus*)—a tree that grows up to 20

meters tall; as a conifer, it does not produce flowers but has reproductive structures as cones.

- Cattail or bulrush (*Typha angustifolia*)—an aquatic grass-like herb that can grow up to three meters tall. The sausage-looking inflorescence contains tiny fruits that are dispersed by the wind. Birds like munias gather these cotton-like fruits to line their nest.
- Water lettuce (*Pistia stratiotes*)—a floating plant that has soft velvety leaves and bears small, white flowers.
- Water banana (*Ludwigia adscendens*)—bears two types of roots; those that look like bananas and those that anchor the plant to the soil.

Epiphytes such as the orchid *Cymbidium bicolor* and the climber *Hoya verticillata* are present on some mangrove trees. Enrichment planting has resulted in more orchid species re-introduced to the mangrove wetland. Other interesting mangrove flora include the bird's nest fern (*Asplenium nidus*), which is an epiphytic fern with leaves that can grow up to 1.4 meters long and form a nest-like rosette adapted to collecting rainwater and trap nutrient-rich debris and dead leaves falling from surrounding trees. The buah cheri (*Muntingia calabura*) is a tall tree that can grow as tall as 13 meters, with sweet fruits that are sought by fruit eating birds, squirrels and bats. The Singapore rhododendron (*Melastoma malabathricum*) is a common shrub that, some believe, have medicinal properties that can cure diarrhea. Simpoh air (*Dillenia suffruticosa*) is a large shrub and can grow up to 7 meters tall. The ripe fruit is pink and splits into seven to 11 radiating segments. Fruit-eating birds love the fleshy portions that cover the seeds.

Biological richness of Sungei Buloh Wetland Reserve

- 223 species of birds
- 100 species of fish
- 35 species of dragonflies

Source: James Gan, Assistant Director, Sungei Buloh Wetland Reserve



A *Bruguiera* species



Collared scops owl



Dragonfly

Fauna

The smooth otter, crab-eating macaque, water monitor, estuarine crocodile and over 223 species of birds are known to occur in the wetland. At night, the palm civet, large-tailed nightjar, collared scops owl, lesser dog-faced fruit bat, dog-faced water snake and firefly are frequently encountered.

The Kranji Nature Trail area has grassland habitats, while the intertidal areas are partly covered by sea grass (*Halophila beccarii*). At the back of the mangrove areas, mounds created by mud lobsters are prominent, and are inhabited by the hairy foot mangrove trapdoor spider and the banded file snake. The coastal waters, brackish water ponds and rivers in the wetland teem with over 100 species of fish that include the spot-tailed needlefish, banded archerfish and sea bass. During the migratory season between September and March, thousands of shorebirds use the wetland as a stop-over site. Some stay for the duration of the northern winter, while others stay for just a day. Over 35 species of dragonflies have been recorded in the wetland and there is also an abundance of butterflies and other insect species.

The collared kingfisher and the stork-billed kingfisher are resident birds of Singapore and they can often be found flying among the mangrove trees. Waders or shorebirds can also be found as they feed and roost at the reserve during the northern winter. Common waders are plovers and sandpipers, and are so-called because they wade in the shallow water in search of food. Egrets, such as the little egret, are frequent visitors during the migratory season. The grey and purple heron can be seen at the reserve throughout the year, and they have been recorded to breed in colonies on the top of mangrove trees at the wetland. The

Marine Fish Programme

Sungei Buloh Wetland Reserve possesses one of Singapore's best habitats for observing coastal fish. A little-known fact is that over 100 species have been recorded in its waters. To create awareness, a Marine Fish Programme was launched in 2005. Intended to generate interest in the marine fish of the wetlands, the programme is part of wider efforts to reach out to local residents, particularly the youth, and encourage them to care for our shared natural heritage.

The Programme included free guided walks and talks on marine fish. It also incorporated educational materials such as a poster exhibit on marine fish and fish identification signs, both of which enable visitors to conduct self-guided walks. A full-color fish identification chart was also produced to aid the guides in improving the quality of their guided walks. It is also available for purchase.

The conservation outreach Programme was the joint effort of students from five schools—Canadian International, Commonwealth Secondary, Hillgrove Secondary, Peixin Primary and Yishun Junior College—together with Sungei Buloh volunteers and partners, as well as staff of National Parks Board and corporate sponsor, Underwater World Singapore. Apart from learning about marine fish, the students also practiced their skills in public speaking and learned to conduct public guided walks. Over 60 students from the five schools were committed to conducting at least three public guided walks for that year.

As a result of the Programme, public awareness of the fish species in the wetland has increased. Today, the Marine Fish Guided Walk continues to be popular and well received by visitors.



Smooth otter



Mudskipper



Monitor lizard

yellow bittern is commonly found at the freshwater pond, but is difficult to spot since it is well-camouflaged against the vegetation. Other interesting birds include the baya weaver and the copper-throated sunbird.

A variety of mollusks and gastropods, including the green and brown mussels, can be found in and on the mud and on the mangrove trees and other structures. A flat clam called the leaf oyster is usually attached to the roots of mangrove trees. An herbivorous snail called the common nerite, grazes on algae and during high tide can be seen on tree trunks and various structures.

The monitor lizard is the largest lizard found in Singapore and can grow up to two and a half meters long. Another lizard found in Sungei Buloh is the green-crested lizard, which is strikingly green.

Conservation issues

The site is vulnerable because of its relatively small size. Development and other external works (such as earth-moving activities) could rapidly affect the quality of freshwater entering the wetland. This may affect the ecosystem balance by driving out less tolerant native species from the mangrove habitat. A rise in sea levels could result in prolonged inundation of the wetland coastal areas and mangroves, to the detriment of the ecosystem.

A small wetland contains relatively small population numbers of certain flora and fauna. This may result in in-breeding and a consequent loss of vigor among mangrove plants and animals in the long run.

Pollution that is brought in with the tides continues to be an issue. Much litter is washed into the mangrove forest, and clearing it is time-consuming and re-

Wireless Learning Trail

The wireless learning trail at Sungei Buloh Wetland Reserve was inspired by the desire to enhance the learning experience for visitors, particularly students. Since 2007, young and technologically-savvy park visitors have had a new way to experience and access educational programs that are delivered and provided by the wetland using webcams installed on Ultra Mobile Personal Computers (UMPC). Park visitors can receive wetland information and pictures by scanning the 2-D barcodes that are positioned strategically alongside a boardwalk through the mangrove forest. With the UMPC, they can, for example, listen to birdcalls or observe the behavior of mudskippers. Students are also prompted with stimulating questions relating to sights along the trail, and can even participate in quizzes and worksheets provided on their UMPC.

With 20 individual 2-D barcodes positioned along the Mangrove Boardwalk, it would take about two hours to complete the entire learning trail. Upon completion, visitors can include their thoughts and observations to share with each other and also build their own personal learning trail. For students, this excellent platform truly makes the mangrove wetland their outdoor classroom. Through this interactive system, park visitors, and in particular students, can develop a better appreciation of the natural environment.



Mangrove boardwalk

quires substantial human effort. Another challenge is the presence of feral dogs, which roam the wetland, sometimes in packs. The dogs chase animals and sometimes cause disturbance to the roosting and feeding birds on the mudflats.

Alien invasive species also pose threats. Examples of these are the water

hyacinth and red-eared slider, which can adversely affect the native biodiversity when present in large numbers.

High levels of visitor use can pose management problems and become a threat if not managed properly. The wetland has measures in place to ensure that visitor numbers can be controlled.

Conservation Program

The wetland is managed by the National Parks Board, a statutory board in the Ministry of National Development. The programs in the wetland are implemented to meet the following objectives:

1. Conservation—As a migratory bird site along the East Asian-Australasian Flyway particularly for waterbirds, bird ringing and color flagging activities are regularly conducted. These activities are complemented with bird counts, in which students, visitors and volunteers can participate to observe the staff in action.
2. Education—The wetland serves as a center for outdoor nature learning for students and families. A variety of activities including coastal cleanups, reforestation, mangrove plantings and thematic guided walks are offered. A wireless learning trail, supporting infrastructure and wi-fi connectivity in the main sectors of the wetland cater to the IT-savvy generation of students and visitors.
3. Recreation—Visitors are encouraged to develop



Bird watching

their interests in nature and outdoor appreciation. Nature-guided walks, bird watching, photography, drawing and painting are some of the activities offered to visitors.

4. Research—Schools, institutions of higher learning and agencies are actively engaged in wetland-related research. The wetland staff also has research interests in dragonflies, fireflies, birds and mangroves. ■

Strides in Protected Area Management

The Sungei Buloh Master Plan aims to strengthen the conservation of the wetland's rich biodiversity and enhance outdoor learning and education facilities. The Kranji Nature Trail will be redeveloped as a buffer zone, with a focus on nature learning and recreation. This will be renamed as the Sungei Buloh Wetland Park, which aims to diversify the visitors' experience as well as reduce visitorship to the reserve. New facilities are in the pipeline, such as observation hides, coastal floating decks and educational play areas. Education trails with various themes will be developed to create a deeper understanding of the rich mangrove ecosystem. Additional visitor centers will have interactive exhibits and interpretative displays to educate the public on mangroves and conservation. Facilities will also be designed to encourage a shared experience by families and groups.





THAILAND





The Land of Smiles

The kingdom of Thailand lies in the heart of Southeast Asia, making it a natural gateway to Indochina, Myanmar and Southern China. Its shape and its geography divide into four natural regions: the mountains and forests of the North; the vast rice fields of the Central Plains; the semi-arid farm lands of the Northeast plateau; and the tropical islands and long coastline of the peninsula South.

The country comprises 76 provinces that are further divided into districts, sub-districts and villages. Bangkok is the capital city and the center of political, commercial, industrial and cultural activities. It is also the seat of Thailand's revered Royal Family, with His Majesty the King recognized as Head of State, Head of the Armed Forces, Upholder of the Buddhist religion and Upholder of all religions.

Thailand is a constitutional monarchy. His Majesty King Bhumibol Adulyadej, or King Rama IX, the ninth king of the Chakri Dynasty, is the present King. The King has reigned for more than half a

century, making him the longest reigning Thai monarch.

Thailand embraces a rich diversity of cultures and traditions. With its proud history, tropical climate and renowned hospitality, the Kingdom is a never-ending source of fascination and pleasure for international visitors.

Habitats and biological resources

Thailand is one of the countries with the richest biodiversity in Southeast Asia. With its climatic diversity, topographic complexity, long coastline (2,710 kilometers), and extensive fringing reef systems, the Kingdom

In ancient times, the Thais called their homeland, “Muang Thai”, while the seafarers took its name from the capital, “Aydhaya”. An Englishman, Sir James Lancaster, who voyaged to the Far East in 1593, first applied the name “Siam” to Thailand. The word “Siam” appeared for the first time in Thai language when the trade treaty was made between Thailand and England during the reign of King Rama IV. Siam was changed to Thailand on 24 June 1939.

Source: Ministry of Culture, Thailand website: webhost.m-culture.go.th/culture01/

is endowed with a wild variety of floral and faunal habitats and rich biodiversity. The country lies within two major biogeographical regions—the Indochinese region in the North and the Sundiac region in the South. Its flora

and fauna however, are also influenced by the Indian and the Palearctic biogeographical regions. These have resulted in six biogeographical units: North Highland, Korat Plateau, Central Plain of the Chao Phraya River, Southeast Upland, Tenassarim Hills, and Southern Peninsula. As a result, Thailand is home to 8-10 percent of all plant and animal varieties in the world.

Protected area management and conservation activities

The national parks of Thailand are government-restricted areas created by the Royal Forest Department and implemented following the B.E. 2504 National Parks Act. The Act aims to preserve and protect all existing natural resources such as fauna and

Inventory of Species¹ 2008

Amphibians	Birds	Butterflies	Dragonflies	Mammals	Plants	Reptiles	Total
139	936	1,338	331	269	3,730	401	7,144

Source: ASEAN Centre for Biodiversity

¹ACB database component of ARCBC Species Database 2004 and species recently added in the 2007 Red List of Endangered Species

Number of Endemic Species relative to the ASEAN region total (as of 2008)

Country	Amphibians	Birds	Butterflies	Mammals	Plants	Total
Thailand	11	3	41	4	1,948	2,007
ASEAN	396	734	1,143	380	23,744	26,397



The national flower of Thailand

The Ratchaphruek, a beautiful yellow flower of the Ratchaphruek family, is remembered more in Thailand for its color. The Thai people regard its yellow hue as the color of Buddhism and the color of glory. It has the right qualities for Thailand known to the world as the land of the yellow robe or the land of the saffron robe. The royal flag of the Thai monarch is also yellow.



Like its tree, the Ratchaphruek is unmistakably the national flower of Thailand. Its color represents the country's beloved monarch—H.M. the King. Ratchaphruek blooms annually from February to May and symbolizes the unity and harmony of the Thai people. While the flowers are blossoming, the tree sheds its leaves, leaving only bright yellow flowers hanging on its branches. The Ratchaphruek is widely known in Thailand and is grown in abundance along the roadsides. *Cassia fistula* Linn. tree bears beautiful yellow cluster-shaped flowers, thus the name "Golden Shower Tree".

Source: Ministry of Culture, Thailand website: <http://webhost.m-culture.go.th/>

The national bird of Thailand

Thailand is host to several hundred species of birds. But the majestic mountains in the north provide the habitat for numerous species of rare birds especially the large bright-colored birds like the pheasants. There are altogether six families with 10 species of pheasants in Thailand such as crested fireback pheasant, kalij pheasant,



silver pheasant, and Hume's pheasant. The Siamese fireback is a name given specially to a magnificent pheasant with a red face. On the male's head, are dark long feathers, which turn backwards. With red legs and bright flame-colored feathers on the upper back, the Siamese fireback is the rarest of all types of pheasants. The Siamese fireback pheasant is the national bird of Thailand.

Source: Ministry of Culture, Thailand website: <http://webhost.m-culture.go.th/>

flora including landscapes, forests and mountains, by avoiding damage from land reformation or detrimental activities.

Other significant laws include the following:

- Law for the Conservation of Wild Elephants (1921)
- Forestry Act (1941)
- Wild Animals Reservation and Protection Act (1960; revised 1992)
- National Parks Act (1961)
- National Forest Reserves Act (1964)
- Fishery Act (1994)

Through the enactment of these laws and regulations, Thailand now has 103 national parks covering a total area of 52,782.20 square kilometers (5,278,220 hectares) or 10.27 percent of the country's total area. Aside from national parks, the other protected areas are listed in the table below.

Of these national parks and wildlife sanctuaries, four are ASEAN Heritage Parks: Ao Phang-Nga—Mu Ko Surin—Mu Ko Similan Marine National Parks; Kaeng Krachan Forest Complex; Khao Yai National Park, and Tarutao National Park. ■



Elephants



Orchid

Multilateral Environmental Agreements ratified

- Convention on the International Trade of Endangered Species – 1983
- World Heritage Convention – 1987
- Ramsar Convention – 1998
- Convention on Biological Diversity – 2003
- Cartagena Protocol – 2006

Number and Area of National Parks, Protected Areas, and Botanical Gardens in Thailand

Category	Total Number	Total Area (sq km)	% Total Country Area
National Park	103	52,782.20	10.27
Forest Park	84	958.40	0.19
Wildlife Sanctuary	55	35,748.81	6.96
Non-hunting Area	56	4,346.46	0.85
Botanical Garden	16	65.32	0.0071
Arboretum	55	40.52	0.008
Biosphere Reserve	4	216.00+	0.05+
RAMSAR Site	10	3,705.99 ^B	0.72
World Natural Heritage Site	2	12,582.00 ^A	2.45
ASEAN Heritage Site	4	8,703.00 ^C	1.69

^A Having areas overlapping with other categories, e.g., national parks, etc.

^B 8 out of 10 RAMSAR site are protected areas;

^C The World Heritage Sites and ASEAN Heritage Sites are either wildlife sanctuaries or national parks.



AO PHANG-NGA— MU KO SURIN— MU KO SIMILAN NATIONAL PARK

Thailand's most famous marine protected area

Mu Ko Surin, Mu Ko Similan and Ao Phang-nga National Parks are the most well-known marine protected areas in Thailand. These parks are located in Phang-nga province. Mu Ko Surin is popular for its shallow reef; Mu Ko Similan, for scuba diving; and Ao Phang-nga, for its mangrove ecosystem and karst topography. This group of ASEAN Marine Heritage Parks is managed by the National Park, Wildlife and Plant Conservation Department.



AO PHANG-NGA MARINE NATIONAL PARK

Ao Phang-Nga Marine National Park is one of the most frequently visited marine national parks of Thailand. It is one of two sea coast national parks in Thailand—the other is Tarutao National Park.

Famed for its rich folklore, prehistoric rock arts, and natural beauty, Ao Phang-Nga was established as a National Park in 1981 and covers an area of 40,000 hectares. The Park encompasses coastal forests and a series of strikingly scenic karst limestone hills flooded by the sea to form some 42 sheer islands with high cliffs, rock overhangs and formations, caves, coral gardens, and some scrub.

The mangrove forest of Ao Phang-Nga in the sheltered Phangnga Bay close to Phuket, is thought to be the largest expanse of healthy and original primary mangroves remaining in Thailand. One can find crab-eating macaques on the beaches and islands, dusky leaf monkeys and gibbons in the deeper inland forests,

Biodiversity richness of Ao Phang-Nga National Park

- 17 species of mammal
- 88 species of birds
- 18 species of reptiles
- 3 species of amphibians
- 24 species of fish
- 14 species of shrimp
- 15 species of crab
- 16 species of manta ray and shark

Biodiversity richness of Mu Ko Surin National Park

- 91 species of birds
- 22 species of mammals
- 12 species of bats
- 6 species of reptiles

Biodiversity richness of Mu Ko Similan National Park

- 31 species of small mammals
- 16 species of bats
- 3 species of squirrels
- 4 species of rats
- 36 species of reptiles and amphibians
- 73 species of birds

giant fruit bat roosts, monitors and other lizards, and a variety of marine, coastal and forest birds.



James Bond island



Kayaking



Cave paintings

Ecotourism destinations and activities

The most fascinating way to get around the Park is a boat ride to various islands like Ko Panyi, a small island of limestone hills and plains. It is also known as the village of sea gypsies although there are no sea gypsies anymore.

Ko Phanak is a lovely island with caves that house stalactite and stalagmite formations as well as a small cascade, which flows onto several tiers. Khao Phing Kan (literally means “*the leaning island*”) is so named because of its nature of being split into two halves. The smaller rock slid down, with its foundation stuck under the ground and the upper parts still lean against each other. Behind the mountain is superb scenery.

Pre-historical artifacts found around Khao Tao indicate that the caves and cliffs in Phangnga and Krabi were occupied by humans 10,000 years ago. Archeologists found rock tools, broken ceramics in different patterns, rough ceramics, parts of a stone axe and a sharpened fish bone at Ko Phra Art Thao. Cave paintings in Ao Phangnga appear in different patterns

and shapes such as a man carrying fish, crab, langure, bird, elephant, alphabet-like shapes, arrow, fishing tool and boat.

Tham Lot is a limestone grotto sculpted by weather and the sea water. There are numerous stalactites and stalagmites inside the grotto.

Ko Hong has big and small mountains. Sailing to this island gives one a feeling of being inside a large theater with two doors, and providing an immense feeling of the power of nature. Those who plan to take a sea-canoeing trip should bring binoculars as some birds and wild animals such as hornbills, Brahminy kites, and colagos can be sighted during the trip.

Visitors who want to learn more about aquatic life can take a trip into the mangrove forests and observe the behavior of various animals such as soldier crabs, mud gobies, and Meder’s mangrove crabs, along the canals and muddy shores. Other activities that the Park offers are camping, canoeing or kayaking, cave touring, cultural sightseeing, and snorkeling.

MU KO SURIN NATIONAL PARK

Mu Ko Surin National Park is situated in the Andaman Sea, approximately 65 kilometers from the coast of Phangnga Province in the southern peninsula region of Thailand, and only a few kilometers from the border of Myanmar. The Park covers an area of approximately 14,125 hectares (141.25 square kilometers) of which 76 percent is sea. There are five main islands—Ko Surin Nua, Ko Surin Tai, Ko Ree, Ko Klang and Ko Khai. In 2007, the Park's area was extended to cover Riche lieu Rock, which is located between Mu Ko Surin and the Phangnga coast. About 100 kilometers south is Mu Ko Similan National Park.

Wildlife

There are a total of 91 types of birds including about 57 species of local birds. The others are migratory, such as little heron, common sandpiper, and little tern (DNP, 2007). Mu Ko Surin is just about the only place in Thailand where the beach thick-knee (*Esacus giganteus*) can be found. Also, the forests of the Surin Islands support a fairly rich avifauna with abundant populations of green imperial, orange-breasted, large green and nicobar pigeons. The white-bellied sea eagle and Brahminy kite are common birds here. A number of tern species and possibly frigate birds can also be seen on the crossing from Kuraburi. Other forest birds include hornbills, drongo, babblers, sunbirds and flower peckers.

Some 22 species of mammals were recorded and include the pig-tailed macaque and the common wild pig. There are 12 species of bats such as the island flying fox, black-bearded tomb bat, and horseshoe bat. Six types of reptiles found there include Indian or Bengal monitor, water monitor, skink, and reticulated python. In the mature forest, Malayan flying



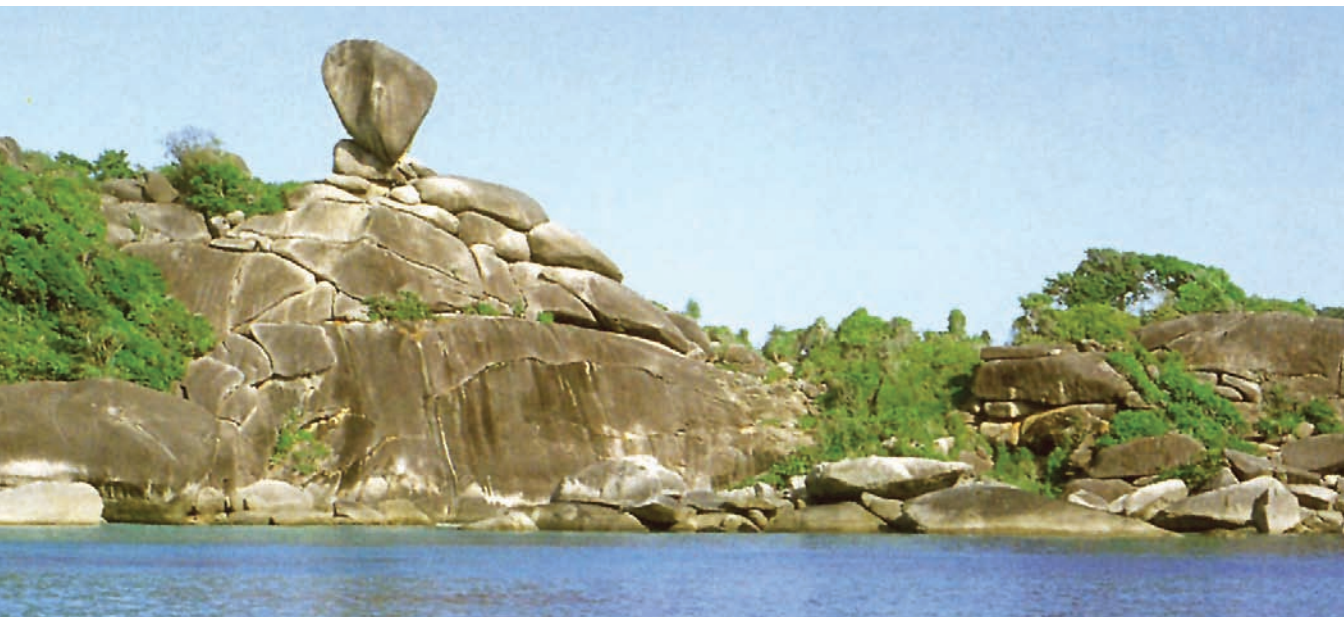
Dive sites and breathtaking landscapes make this marine



Butterfly fish



Pig-tailed macaque



protected area a popular destination.

lemur, crab-eating macaque, mouse deer, and grey bellied squirrels have also been recorded.

The sea around the islands is very rich in marine life as well as numerous types of hard and soft corals, seafeathers, starfish, spiny lobster, giant clam, sea anemone and seapens. This richness of life is reflected in the many species of fish found inhabiting the reefs, which include parrotfish, triggerfish, clownfish, black tip shark, lion fish, angel fish and groupers. Rare marine life occasionally spotted are whale sharks and whales. Sea turtles still nest on the Surin islands. The three species recorded to be coming ashore during the rainy season to lay their eggs are hawksbill, Olive Ridley and green sea turtles. Needle coral, damselfish, wrasse, butterfly-fish and Midas blenny are abundant (DNP, 2007).

The islands are covered in three different types of forest. From the coast up to the summit, the larger islands are covered with tropical evergreen forest. Tree species occurring in this forest type

are *Dipterocarpus* sp., *Hopea odorata*, *Anisoptera cochinchinensis*, *Michelia champaca*, *Sterculia foetida* and several species of rattan. There are also patches of beach forest on the larger islands, which are dominated by *Barringtonia asiatica* and *Thespesia populnea*. Patches of mangrove forest are found in the more sheltered areas and around the mouths of some of the streams where there is brackish water. The dominant species are *Rhizophora apiculata* and *Bruguiera gymnorrhiza*.

The real value of the Park is under the sea where rich coral reefs are found with a multitude of species of dazzling fishes. The reefs are considered among the most diverse in Thailand. Marine fauna is estimated at 126 species (Suk-sawang, 2007).

MU KO SIMILAN NATIONAL PARK

About 100 kilometers south of Mu Ko Surin National Park is Mu Ko Similan National Park. It is situated along the western coastline of the Andaman Sea and Indian Ocean. Established in 1982,



Lion fish

the Park covers an area of 14,000 hectares that include 1,600 hectares of land and 11 islands—Ko Hu Yong, Ko Pa Yang, Ko PaYan, Ko Miaeng, Ko Ha, Ko Hok, Ko Pa Yu, Ko Similan, Ko Ba Ngu, Ko Bon and Ko Ta Chai. These granite islands were created by upwellings of hot magma during the Tertiary-Cretaceous Period some 65 million years ago, and then smoothed by glacial ice and the wave action of the sea.

Wildlife

The environment of Mu Ko Similan National Park is obviously that of a small island. Natural fresh water reserves are few, and as a result, large mammal species cannot inhabit the island. The Park has 31 species of small mammals, 16 species of bats, three species of squirrels and four species of rats. Species include the bushy-tailed porcupine, common palm civet, flying lemur, bottle-nosed dolphin, yellow Lajah rat, vampire bat, and black-

beared tomb bat.

There are 36 species of reptiles and amphibians recorded in Mu Ko Similan. Among these are the banded krait, reticulated python, white-lipped pit viper, hawksbill turtle, leatherback turtle, Bengal monitor lizard, common water monitor lizard, and ornate froglet.

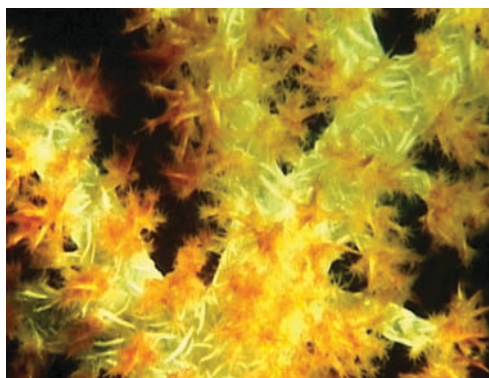
About 73 species of birds have been recorded on the islands, with resident species such as Brahminy kite, and white-breasted water hen. Migratory species include pintail snipe, grey wagtail, and roseate tern. The most commonly seen species are the Pacific reef-egret, nicobar pigeon, pied imperial pigeon, white-bellied sea-eagle and the collared kingfisher.

Another interesting species located in Similan is the hairy leg mountain land crab, which is found in such large numbers.

Beneath the sea at Mu Ko Similan lies a complex ecosystem, commonly

called the rainforest of the sea: the coral reef, with both hard and soft corals. These include deep water species of mostly staghorn coral types (*Acropora echinata*) and the smaller cauliflower-shaped types (*Seriatopora hystrix*). Many other species of marine life co-exist within the coral reef: gorgonian sea fans, flower-like soft coral, several species of crabs, spiny painted lobsters, sponges, sea cucumbers and giant clams.

Terrestrial vegetation is mainly beach forest, which steadily becomes tropical forest further inland. Important tree species are *Manilkara* sp., *Cordia subcordia*, *Terminalia catappa*, *Barringtonia asiatica*, *Calophyllum inophyllum* and *Tournefortia argentea*. There is also dry evergreen forest on the hills with tree species such



Corals

Strides in Protected Area Management

Studies on carrying capacity have been conducted in Mu Ko Similan National Park to limit the number of tourists. This will help ensure that park resources are well managed and conserved.

as *Cereus*, *Dracaena*, *Memecylon caeruleum*, *Ixora ebarbata*, *Leea indica*, *Actephilla ovalis*, *Glycosmis pentaphylla*, *Dipterocarpus costatus*, *Sterculia foetida*, *Derris indica*, and *Palaquium obovatum*.

Conservation issues

Mu Ko Surin is relatively far from the mainland, thus the influence of mainland impacts is quite minimal. In addition, the water around the islands is more than 50 meters deep (DNP, 2007). Park management however is carefully managing the impacts of increased tourism to the islands. With the lack of mooring buoys, anchors could damage the coral reefs.

Conservation programs

The National Parks Office, Wildlife and Plant Conservation Department has undertaken many activities to halt logging, resettle local people, protect the reefs and develop visitor accommodation and facilities.

A turtle hatchery has been developed to protect eggs during the hatching period; when ready, the young turtles are released back to the sea. Surveys of coral reef conditions and the distribution of giant clams and edible invertebrates have also been conducted on Mu Ko Surin and Mu Ko Similan National Parks.

Other interests

Visitors have the opportunity to enjoy the beach life, swim with wild turtles as well as snorkel and scuba dive to as low as 35 meters. Birdwatching is also a popular activity. A visit to the Chaw Le fishing village on Koh Surin Tai Island provides the rare chance to learn about the traditional culture of sea gypsies and witness ancestor worship ceremonies during the full moon in March. ■

KAENG KRACHAN FOREST COMPLEX

Jewel of the Tenasserim

The Kaeng Krachan Forest Complex has a total area of 437,300 hectares and covers three national parks and one wildlife sanctuary. These are Kaeng Krachan National Park (291,500 hectares), located just four hours away from Bangkok; Kui Buri National Park (96,900 hectares); Maenam Phachi Wildlife Sanctuary (48,900 hectares) (Suksawang, 2007); and Chaloem Phrakiat Thai Pra Chan National Park.





Kaeng Krachan National Park

Established in 1981, Kaeng Krachan is Thailand's 28th national park and the largest in the country. The Park forms part of a continuous forest complex spanning the border with Myanmar, and encompassing forests in the watersheds of the Phetchaburi and Pranburi rivers. It includes portions of Nong Ya Plong, and Kaeng Krachan districts in Phetchaburi Province and of Hua Hin district in Prachuap Khiri Khan Province. The Park lies at the junction of biogeographic zones thus, biodiversity in the area is a mix of Indo-Burmese and Malaysian forms.

Wildlife

Dry dipterocarp, mixed deciduous, and evergreen forests cover 80 percent of the Park. The vast forest supports ecologically, economically and scientifically valuable plants and animals including many wild elephants. The Park's location on the border with Myanmar means it is part of a much larger forest complex and thus provides an excellent refuge for a huge number of species.

The Phetchaburi and Pranburi rivers form two major watersheds within the Park that support a variety of wildlife and lowland agricultural activities. The healthy forest cover in these watersheds and the abundant rainfall makes the streams, waterfalls and rivers of Kaeng Krachan flow year round. The Park also features a reservoir and caves.

Humidity remains high throughout the year with heavy rains during the rainy season, and cool weather for much of the year. The steep forested areas of the Park are even more humid than the young forest and cleared lands in the lower elevations.

Spanning elevations ranging from 300 meters to 1,513 meters above sea level, Kaeng Krachan hosts a diversity

Biological richness of Kaeng Krachan Forest Complex

- 2,500 - 3,000 species of flora
- 450 species of birds
- 250 species of butterflies
- 80 species of mammals
- 87 species of fish

of flora and fauna species. The Park's flora is estimated at 2,500–3,000 species. The forest is rich and complex, with hanging lianas, ferns and orchids, and an abundance of fruiting trees and vines. The diversity of species in the Park is largely due to its location at the juncture of continental Asia and the Malaysian Peninsula. Continental species such as oaks, chestnuts, and maples are also found here. Some of the valuable trees include makhamong (*Azelia*), takhian (*Hopea*), chanthana (*Tarena*), yang (*Dipterocarpus*), taback (*Lagerstroemia*), pradu (*Pterocarpus*), and kritsana (*Aquilaria*).

Recorded fauna includes 450 species of birds, 250 species of butterflies, 80 species of mammals, and 87 species of fish. Larger mammals include elephants, gaur (*Bos gaurus*), sambar deer (*Cervus unicolor*), banteng (*Bos javanicus*), serow, bears, Indo-Chinese tigers, leopards, and Fea's muntjac (*Muntiacus feae*). Malayan tapir, white-handed gibbon, dusky and banded langurs, Asian wild dog, otter, and wild boar are also found here. Among the birds recorded are hornbills, red junglefowl, both the Kalij pheasant and grey peacock pheasant, woolly-necked stork, black eagle, and many species of songbirds, woodpeckers and other forest birds. The ratchet-tailed treepie, first seen here by members of the Bangkok Bird Club (Bird Conservation Society of Thailand) in 1991, has not been recorded anywhere else in Thailand (DNP, 2007).



Wreathed hornbill

Many species of squirrel can be found like the amazing black giant squirrel. A number of exciting ground-dwelling species such as the grey peacock pheasant, ferruginous wood-partridge, blue pitta and eared pitta, inhabit the lush forests but are hard to find. Giant pitta has been seen here but sightings are also extremely rare. There is a wide range of bird families that can be found at the middle and upper storeys of the forest. The great slaty woodpecker, orange-breasted trogon and banded broadbill are all regularly seen and more species are being added to the Park's list every year as more bird watchers explore the Park. Hornbills are some of the most memorable birds in Thailand. Kaeng Krachan presents the opportunity to see great, oriental pied and wreathed hornbills. Brown hornbills are present but are scarcely seen. There

is also the chance of spotting the little-known plain-pouched hornbill.

With the wealth of biodiversity in the Park, it is possible to see more species at different altitudes.

Kui Buri National Park

Kui Buri National Park covers an area of 96,900 hectares in Pranburi, Samroi-yod and Prachuap Kiri Khan Districts of Prachuap Kiri Khan province. Kui Buri sits on the steep Tanao Sri mountain range, which runs north-south along the Thailand-Myanmar border. The Park is the headwater of many river streams, and protects valuable natural resources and wildlife. Kui Buri harbors dry evergreen and moist evergreen forest, and important trees include *Dipterocarpus tuberculatus*, *Hopea odorata*, *Terminalia chebula* and palm species (DNP, 2007).

Wildlife that are known to be found in the Park are elephants, gaur, tapir, wild pigs, serow, gibbons, macaques, langurs, sambar deer, bears, barking deer, banteng and lesser mouse deer (DNP, 2007).

Kui Buri supports a population of 150 Asian elephants (Srikrachang, 2005), which is accordingly raiding the neighboring pineapple plantations. The site also supports a population of Fea's muntjac, which is endemic to the Tenasserim range. Tigers are thought to persist in at least 50 percent of the Park (Steinmetz, *personal communication*) while other large carnivores include clouded leopard (*Pardofelis nebulosa*), Asiatic black bear (*Ursus thibetanus*), sun bear (*Ursus malayanus*), Asiatic jackal (*Canis aureus*) and dhole (*Cuon alpinus*) (Parr, J.W.K., *et al. Undated*). Notable herbivores include Asian tapir (*Tapirus indicus*), gaur, banteng, red muntjac (*M. muntjac*), sambar and southern serow (*Capricornis sumatraensis*) (Parr, J.W.K., *et al. Undated*).

Chaloem Phrakiat Thai Prachan National Park

The Chaloem Phrakiat Thai Prachan National Park is part of the national forest reserve that is located on the left bank of Phachi river in Yang Huk sub district, Pak Tho district; Tanaosi sub district and The Khoei sub district, Suan Phueng district; Ban Kha sub district and Ban Bueng sub district, Ban Kha district, Ratchaburi province. The Park's highest peak is Khao Yuet or Khao Phra Lop, which is 834 meters high.

Mixed deciduous forests cover most areas on the western portion of the Park. The main species are *Pterocarpus macrocarpa*, *Xylia kerrii* and *Lagerstroemia* sp., and different bamboo species. Dry evergreen forests are abundant on the northern area and some portions on the west. The major species are *Dipterocarpus alatus*, *D. turbinatus*, *Anisoptera costata*, and varied species of bamboo, rattan, palm and fern.

Animals that have been seen are sambar deer, mouse deer, common muntjac, gaur, wild boar, Asian black bear, langur, civet, porcupine and Siamese hare. Bird species spotted are hornbills (such as great hornbill, oriental-pied hornbill, wreathed hornbill), bulbul, coucal, hill myna, drongo, roller, woodpecker, leaf bird, paradise flycatcher, and green mal-koha. Amphibians and reptiles include



Leopard

several species of frogs, turtles, snakes, and lizards.

Maenam Phachi Wildlife Sanctuary

Maenam Phachi Wildlife Sanctuary covers 48,900 hectares at the northern portion of peninsular Thailand in Rat Buri province. The Sanctuary is one of the most important watersheds in the country since it is the source of both the Phet Buri and Pran Buri Rivers.

The Wildlife Sanctuary comprises semi-evergreen and dry evergreen forest, with dry dipterocarp and mixed deciduous formations. Commercially valuable trees include *Dipterocarpus alatus*, *Hopea odorata*, *Azelia xylocarpa*, *Pterocarpus macrocarpus*, *Xylia kerii*, *Shorea obtusa* and *Pentacme suavis* (DNP, 2007).

Recorded fauna include elephants that have been estimated at between 25 and 75 individuals in 1985. The combined population with Kaeng Krachan National

Strides in Protected Area Management

The Geographic Information System has been used extensively in the Park's "smart patrol" program. All smuggling activities during the patrol are recorded and mapped so that the Park authorities can analyze the intensity of smuggling in the area and prioritize their actions.

Park may exceed 200 individuals, including seasonal migrants from Burma. Other large mammals seen include tiger, leopard, sambar (*Cervus unicolor*), Indian muntjac (*Muntiacus muntjak*), gaur (*Bos gaurus*), serow (*Capricornis sumatraensis*) and tapir.

Conservation issues

Infrastructure development and road construction create habitat fragmentation that affects wildlife and contributes to the fragility of the ecosystem. Expanding agricultural activities, illegal logging, wildlife poaching, and impacts from increasing tourism activities, also pose major threats to the Park. Agricultural expansion destroys the forest area, increases monoculture, and may increase toxicity in soil if chemical fertilizers, insecticides or other toxic substances are applied. Illegal logging and hunting may create long-term effects if dominant tree species are cut or rare animal species are hunted (DNP, 2007).

Conservation management program

The National Parks, Wildlife and Plant Conservation Department (DNP) manages the Park. The Department implements proper zoning, with well-defined areas designated for various activities, including accommodation and camping zones.

Other attractions of the Kaeng Krachan Forest Complex

Popular destinations within and around the Forest Complex include the Hanuman Plain or Khao Pakarang, which looks like a piece of coral. Here, one can find monkeys, langurs and gibbons. The area is a perfect area for enjoying the wonderful natural landscape or scenery. The Panoen Thung Mountain (1,207 meters above sea level) is the Park's second highest peak. On the mountain top, areas

within the grassland and the evergreen forest are good camping spots, with cool temperatures all year round.

There are several waterfalls in the Park, and include Thor Thip, Hua Pa Ngao, Pala-U, Huy Par Lao, Hin Lard, Kradang Nga, Mae Laliang and Pranburi. The Chollanat Waterfalls has three levels and is the highest at about 150-200 meters. The popular Pala-u Waterfalls has 16 levels, and is located in Amphur Hua Hin, Prachuap Khiri Khan Province, in the southern part of the National Park.

Other attractions include the Kaeng Krachan Dam and Reservoir, which is about 53.5 kilometers from Phetchaburi Township. The reservoir of Thailand covers an area of 46.5 square kilometers and has a capacity of 710 million cubic meters. There are 20 to 30 islands dotting the water surface. The largest island is approximately 0.75 square kilometers and many tourists often hire a boat to go around the Lake. Others use canoes or kayaks to go around the reservoir. The banks of the Lake are also popular camping areas.

Visitors can also visit the Khao Tao Mo Cave, which covers a vast area in the Tha Yang District. Marvelous stalagmites and stalactites are found within the Cave's hall-like chamber.

One of the most popular activities is bird watching. Kaeng Krachan National Park is home to a huge number and range of species. Some species that are rarely seen anywhere else in Thailand can be sighted, if one waits patiently.

At Kui Buri National Park, visitors can go camping, elephant watching, bird watching and trekking. At Chaloeem Phrakiat Thai Prachan National Park, an added attraction is the Pong Krathing Hotspring located at Phu Nam Ron village in Ban Bueng sub district, Ban Kha district. ■



KHAO YAI NATIONAL PARK

The 'Big Mountain'

Khao Yai, which means "Big Mountain", is the third largest natural park of Thailand. The highest peak rises 1,351 meters above sea level. Established in 1962, Khao Yai was the first to be declared a national park in the country.



The 216,800-hectare Park is one of the most important watersheds for surrounding provinces. The Park covers portions of the provinces of Nakhon Ratchasima, Saraburi, Nakhon Nayok and Prachinburi. It is situated near the most westerly part of the Dongrak Mountain Range, with its highest region lying north and west of the Park. The lowest lying areas, ranging from 60 to 160 meters above sea level, are found along the valleys of the Khlong Wang Takhrui in the southwest and Lam Phraya Than and lower Sai Yai in the east.

Khao Yai National Park covers complicated mountains such as Khao Rom, the highest at about 1,351 meters, Khao Lam (1,326 meters), Khao Keaw (1,292 meters), Khao Sam Yod (1,142 meters), Khao Far Pha (1,078 meters), Khao Kampang (875 meters), Khao Samor Poon (805 meters) and Khao Kaew (802 meters).

Habitats

The Park boasts towering trees draped in mosses, climbers and epiphytes, tangled trunks of the strangling figs, drooping lianas and spiny rattan palms, delicate ferns, multi-colored lichens and an ever-changing array of fungi. The Park has a diverse plant community, comprising five main vegetation types (DNP, 2007):

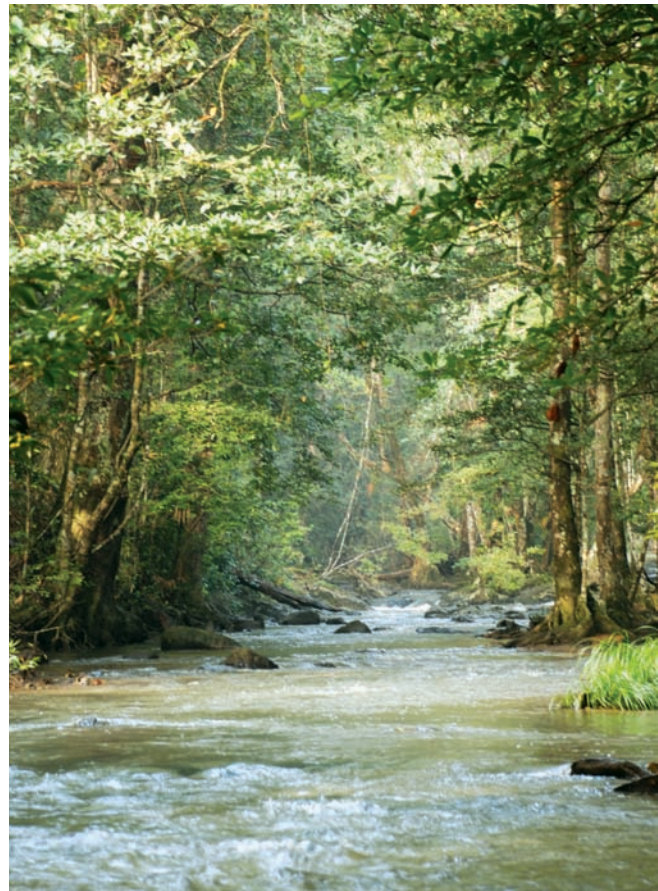
1. Dry evergreen forests. These forests cover the lower slopes of Khao Yai, and important plant species include dipterocarps, *Hopea*, and bamboos.
2. Dry deciduous forests. These forests also cover the lower slopes of Khao Yai with species such as *Azelia*, *Xylia* and *Lagerstroemia*.
3. Tropical moist evergreen forests. These forests cover about 70 percent of the Park, including

Biological richness of Khao Yai National Park

- 71 species of mammals
- 38 species of reptiles
- 23 species of amphibians
- 318 species of birds
- 215 species of insects

its central area. Dipterocarps are among the important species found within these forests.

4. Hill evergreen forests. Located about 1,000 meters above sea level, hill evergreen forests and trees are shorter. Ferns, mosses and epiphytes abound in this level. *Lithocarps* and *Catanopsis* are among the most important species found here.





Barking deer



Wild flower



Serow

5. Grasslands. These grasslands provide a year-round grazing area for animals such as sambar and barking deer, elephants and gaur.

Wildlife

Species recorded in Khao Yai include 71 mammal species, 38 reptile species, 23 amphibian species, more than 318 bird species and more than 215 insect species (Suksawang, 2007).

Encounters with a wide range of animals such as elephants, tigers, deer, gibbons and hornbills are possible. Larger mammals include the Asian jackal, Asiatic black bear, Malayan sun bear, Javan mongoose, hog badger, clouded leopard, marbled cat, barking deer, serow and slow loris.

Some of the primates spotted are the white-handed or lar gibbon and the more secretive pileated gibbon. Along the



Park rangers demonstrate their newly-acquired skills after a law enforcement training course.



Hew Narok Waterfall

roadside, one could encounter groups of pig-tailed macaques in the early mornings and late evenings.

Migrant and resident bird species identified include the silver and Siamese fireback pheasants, mountain imperial pigeon, Hodgson's hawk cuckoo, spot-bellied eagle owl, orange-breasted and red-headed trogons, banded kingfisher, large scimitar babbler, brown needletail, possibly the world's fastest bird, and the rare silver pheasant. Hornbills include the great hornbill, wreathed hornbill, the smaller noisy oriental pied hornbill, and the more secretive and quiet brown hornbills.

Conservation issues

Some protection units in Khao Yai National Park cannot work efficiently due to funding issues, and lack of proper

equipment and supplies for regular patrols in the area. Although air patrols are carried out often, land patrols, apprehension of violators, and evidence transportation are major concerns. Transportation and patrols are major issues due to the immense size of the protected area (DNP, 2007).

Strides in Protected Area Management

Studies on carrying capacity have been conducted in Khao Yai National Park to limit the number of tourists. This would also ensure that Park resources would be well managed and conserved.



Ecotourism activities

A number of marked trails are confined to a relatively small, central area to keep the rest of Khao Yai as pristine as possible. These are among the best-developed nature trails in Thailand, and present opportunities to admire the great variety of landscapes, vegetation and wildlife in the Park. The sudden appearance of an elephant, the tracks of tigers at salt licks, a stunning view over grasslands towards more distant peaks and the constant sense of teeming life are some of the enduring pleasures of these tropical byways.

Other attractions are the Hew Narok and Hew Suwat waterfalls, both extremely popular with visitors and very accessible. A large fence near the Hew Narok Waterfall was constructed in 1993 to prevent elephants from falling into the deep gorge. During the wet season, the

volume of water in the two waterfalls becomes a spectacular view but would be dangerous for swimmers.

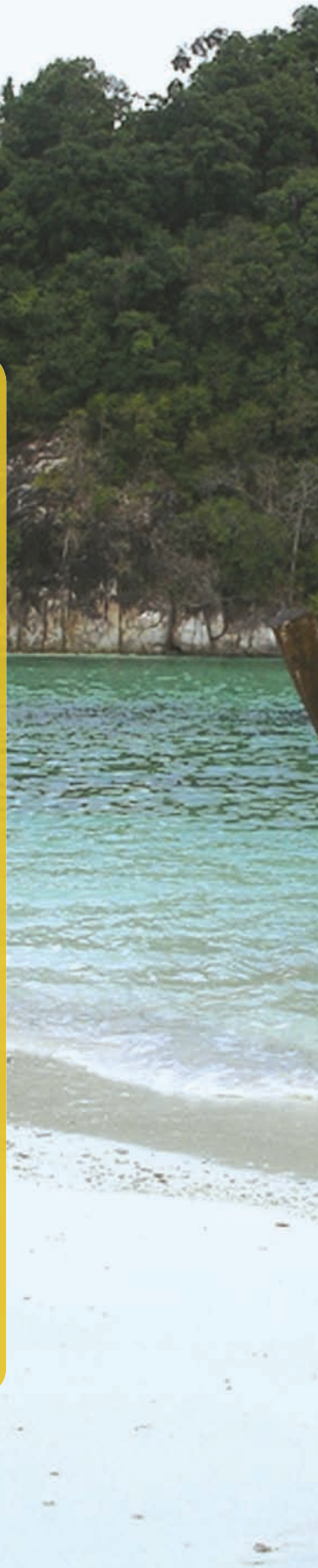
Bird watching is quite popular as well. Nesting reaches a peak during the hottest months while most species sing at their best during the early breeding season, in March or April. Well represented at Khao Yai are dwellers of lowlands and hill slopes; grasslands and scrub; evergreen forests and the forest edge, along with some montane birds.

After sunset, the Park staff could arrange for groups to go out to selected sites for “shinings” during which one is likely to see a sambar, barking deer or civet, and occasionally, an elephant, and very rarely, tiger. Searchlights on Park vehicles are turned on to “capture” these animals as they prowl or scurry through the darkness. ■

TARUTAO NATIONAL PARK

Old, mysterious and primitive

“**O**ld, mysterious and primitive”, which in the dialect of Southern Thailand means Tarutao (Rainat, 1999; P. Tongsom, pers. comm. 2002), describes this island that has been the home for centuries of the Chao Lay, more commonly called Sea Gypsies. Gray *et al.* (1994) added: “These islands have long been hidden from the rest of the world, denied peace or prosperity because of a curse imposed by a beautiful princess of Langkawi who was wrongly executed for adultery. Perhaps the curse was a real one: for hundreds of years, few vessels ventured into the area.” During World War II, it became a pirates’ haven, until a 300-man volunteer group from the Royal British Navy landed in March 1964 and quelled these pirates, who preyed on the cargo, fishing and passenger ferryboats that plied the Malacca Strait (Gray *et al.* 1994). The island later became a penal colony and place of detention for political prisoners.





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Tarutao National Park, which has a major marine component, was declared a national marine park in 1974 (DNP, 2007). The Park encompasses a land and sea area of about 149,000 hectares in Tambon Ko Sarai, Amphoe Muang (Suk-sawang, 2007) in the province of Satun. It lies just 26 kilometers off the southwest corner of peninsular Thailand in the Andaman Sea, a short distance from the Malaysian Sea (Rainat, 1999), and extends over an area of 1,490 square kilometers at the mouth of the Straits of Malacca, in the Indian Ocean (Gray *et al.* 1994).

Tarutao National Park covers 51 islands and can be divided geographically into two main parts: the Tarutao Archipelago, located 30 kilometers away from the coast, and the Adang-Rawi Archipelago, another 45 kilometers to the West. There are several large islands in the Tarutao/Adang-Rawi archipelagos: Tarutao, Klang, Lek, Adang, Rawi, Lipe, Batuang and Bissi. In the Adang Archipelago, the small island of Lipe is the most important. With water available year-round, it is the home of the largest permanent settlement, of approximately 800, and the gateway for boat transportation in and out of the Adang group (DNP, 2007).

The largest of the islands is Ko Tarutao (*Ko* means island), which is 26.5 kilometers long and 11 kilometers wide. Ko Tarutao's highest point is over 2,000 feet (609.6 meters). Semi-evergreen forest covers over 60 percent of the island. There

Biological richness of Tarutao National Park

- 13 insular sub-species of fauna (e.g. 9 species of squirrels; 5 species of common treeshrew; 3 species of lesser mouse deer)
- over 100 species of birds (resident and migratory)
- 25% of the world's fish species (e.g. 92 species of coral-reef fishes)

Ties to democracy

The history of Tarutao is tied to the history of democracy in Thailand. The need for an isolated and forbidding environment to lock away enemies of the State caused the Corrections Department to build a penal colony there in 1939. Two important revolutionary groups were imprisoned on the island: the Bowondet coup group and the Petty Officers' coup group. Their coup attempts were unsuccessful, but ushered in change nonetheless, and soon a democratic constitution was drafted in the country. The political prisoners spent much of their time on useful projects, including agriculture, plant propagation and translation and dictionary-writing. After being released from imprisonment, many returned to their government posts.

are only few plains on the island, like at Talo Wao Bay and Talo U-dang Bay, which were used for planting seasonal crops and coconut plantations. Important beaches are at Phante Malacca Bay, Chak Bay and Son Bay that are all located on the western coast (DNP, 2007).

Habitats and wildlife

The bio-climate of Tarutao is influenced by its position just north of the "Kangar-Pattani line", which approximates the transition from rain to monsoon forest. Further complications of geology and azonal soil types create a mosaic of both Thai and Malayan forest species in the Park. The dominant vegetation type is moist evergreen forest. Other types are dry evergreen forest, mixed deciduous forest, mangrove forest, secondary forest and old agricultural land, beach forest, coconut plantation and scrub forest.

As is typical of island fauna, there are relatively few terrestrial vertebrates and resident birds. Dusky langurs, crab-eating macaques, mouse deer and wild pig are common. Due to prolonged isolation, over 13 insular subspecies occur on the islands. There are at least nine (9) insular subspecies of squirrels, five common treeshrew species and three lesser mouse deer species. Other wildlife include slow



Slow loris



Leatherback turtle



Reef life

loris, otters, civets, flying lemurs, fishing cats, soft-shelled turtles, monitor lizards, pythons, cobras, coral snakes and vipers (DNP, 2007).

Over 100 bird species are likely to be seen, either as residents or migrants. The reef egret, which has both a light and dark color phase, is a commonly seen bird in both the rocky and sandy coasts. Majestic white-bellied sea eagles and ospreys have been seen soaring over the Park in search for fish. There are three species of hornbills, as well as more rarely encoun-

tered species such as frigate birds, dusky grey herons, pied imperial pigeons and masked finfoot. Just off the southwest tip of Tarutao is Ko Rang Nok (Birds' Nest Island), where a limestone cavern harbors a large colony of edible nest swiftlets (DNP, 2007)

The area of Adang-Rawi contains many coral reefs of high species diversity. Degradation of some reefs is significant but has not affected the Park's overall ecological value. The Park is estimated to contain about 25 percent of the world's fish species. Some of the more important species include members of families such as shark, grouper, eel, carp, catfish, salmon, flying perch, angelfish and butterflyfish. One study had identified 92 species of coral-reef fish in the area. Marine mammals that can be spotted include dugong, the common dolphin, the Irawaddy dolphin, sperm whale and minke whale. Three species of migratory sea turtles nest on several of the island's beaches from September to April (DNP, 2007)

What to see and do

A number of nature trails lead to panoramic views and superb beaches. Closest to the headquarters is Toe-Boo Chief Trail, which is relatively short and ends atop a cliff, where one can have a panoramic view of the surrounding island. A much longer trail that takes about four hours walking, leads to the old prison site at Talo Wao. The more adventurous can take the tough jungle trail to Talo Udang Bay, which is a five-hour walk (16 kilometers) from Talo Wao Bay (DNP, 2007)

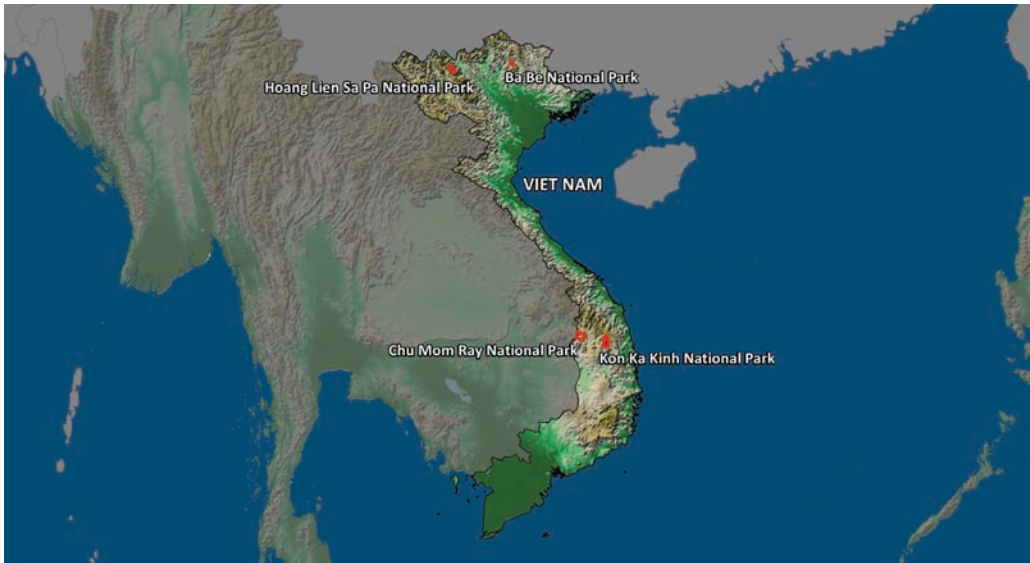
Visitors can also enjoy the many pristine beaches, ride boats or kayaks and go island hopping, snorkeling and scuba diving. Spelunkers will also enjoy the Park's vast cave systems. Bird watchers and avid photographers will also enjoy the tremendous wildlife inhabiting the Park. ■





VIET NAM





Extraordinary biological richness and new discoveries

Lying on the eastern part of the Indochinese peninsula, Viet Nam is a strip of land shaped like the letter “S”. The country borders China to the north, Lao PDR and Cambodia to the west, the Eastern Sea to the east and the Pacific Ocean to the east and south. The country’s climate is generally tropical monsoon to sub-tropical and temperate montane. Inland, the country has three climate types with 10 typical regions representing different ecoregions.

Viet Nam’s territory stretches 1,650 kilometers long, and its total inland area covers 329,241 square kilometers (32,924,100 hectares). The marine territory is large with a coastline of 3,260 kilometers and thousands of islands. Viet Nam’s territorial waters cover around one million square kilometers, with a coastline that is over 3,000 kilometers long.

Mountains and hills cover two thirds of the mainland. Areas above 500 meters in altitude account for 70 percent of the

mainland. The most grandiose and highest mountain ranges lie in the west and northwest of the country.

Viet Nam lies along the Indochinese Peninsula and circles the old southeastern part of the Asian continent with its back turned to the Eastern Sea (Pacific Ocean). These mountain and sea areas boast diverse and rich natural resources including minerals.

In the southwest area of Central Viet Nam, there is a huge “mountain-high-

Multilateral Environmental Agreements Ratified

- World Heritage Convention – 1987
- Ramsar Convention – 1989
- Convention on Biological Diversity – 1994
- Convention on the International Trade of Endangered Species – 1994
- Cartagena Protocol – 2004

land” at over 1,000 meters high, covered by basalt soil that is ideal for growing tropical and temperate industrial crops such as rubber, tea, coffee and cacao.

Ecosystems and biological resources

Ecosystems in Viet Nam range from mountains to lowlands, river basins, lakes, coastal lagoons, oceans and islands. Forests range from the closed evergreen to deciduous, needle, limestone, mangroves, and bamboo. Wetlands may be found all over the country but most are in the Mekong and the Hong river deltas.

Most scientists divide the ecosystems of Viet Nam into three major groups: ter-



Flowers of wild orchid plants add color to the forest

Some biodiversity resources of Viet Nam

- 1,402 species of algae in 259 genera belonging to 9 phyla
- 782 species of aquatic invertebrate, with 48 crustacean species belonging to 4 genera
- 52 species of two groups of shrimps and crabs, of which 2 genera and 27 species (52 percent of total species) are endemic to Viet Nam or the Indo-Chinese area (Dang Ngoc Thanh, 1999)
- 15 species of seagrass
- 94 species of mangrove flora
- 6,337 species of benthos, 225 species of marine shrimps, 298 species of hard corals (*Scleractinia*)
- 2,038 species of fish belonging to 717 genera and 178 families
- 50 species of marine snakes, 4 species of tortoise, and 16 species of marine mammals
- 43 species of waterfowl
- 13,766 species of plants, of which 2,393 are lower plant species; around 10 percent of the plant species are reported to be endemic
- 15,000 to 20,000 species of vascular (flowering) plants (Nguyen Nghia Thin, 1999)
- 15 species of primates, of which 7 species and subspecies are endemic
- 840 species of birds, of which 100 may be endemic
- 310 species of mammals

Source: <http://www.nea.gov.vn/>

restrial, freshwater, and marine. Typical terrestrial ecosystems include the forest, grassland, savannah, dry land, and limestone mountains. The forest ecosystem has the highest diversity of fauna and flora, with high economic and scientific values. Other natural ecosystems have lower species diversity.

The wetland ecosystem covers the lakes, reservoirs, ponds, lagoons, water rice fields, rivers, streams, and canals, with the mountain rivers and peat swamps having higher biodiversity than the others in the group. Many animals that are new to science have been discovered, but the ecosystems of underground rivers and lakes in karst caves have not yet been fully studied.

There are 20 typical marine ecosystems belonging to nine natural regions with different marine biodiversity characteristics. Three marine areas—Mong Cai-Do Son, Hai Van-Dai Lanh and Dai

Lanh-Vung Tau—have higher biodiversity than the others (Fourth National Report of Viet Nam to the CBD).

Results from a number of studies show that the country has four major biodiversity centers: Hoang Lien Son, Northern Truong Son, Central highland, and South Eastern. In these areas, some new mammals, birds and plants were discovered at the end of the last century.

The total number of endangered wildlife species in Viet Nam has risen to 882 (Viet Nam Red Book, 2007), an increase of 161 species when compared to the number given in the 1992-1996 edition of the Red Book. In particular, there are nine animals and two Lady's slipper orchid (*Paphiopedilum*) species that are being considered as extinct in the wild. The number of many other valuable and rare species has been seriously decreasing. Species that have joined the endangered list include the banteng (*Bos javanicus*); Asiatic wild dog or dhole (*Cuon alpinus*); grey-shanked douc langur (*Pygathrix nemaeus*); and black-shanked douc langur (*Pygathrix nigripes*).

Though not globally threatened, the woolly-necked stork (*Ciconia episcopus*) is vulnerable due to loss of habitats and pollution of food sources.

Protected area and conservation management activities

As a party to the Convention on Biological Diversity for almost 15 years,



Woolly-necked stork



Barking deer

Viet Nam is successfully implementing its Biodiversity Action Plan, under which it has achieved several positive results. A protected area system and an *ex-situ* conservation program have been established and expanded, resulting in the increase of forest cover. In addition, the budget for biodiversity conservation, especially from foreign funds, is increasing significantly. Biodiversity management capacity has thus been enhanced and the contribution of natural resources to the economy is increasing.

A number of laws have also been enacted to protect the environment as a whole, and include the following:

- Biodiversity Action Plan (1995)
- Land Law (2003)
- National Strategy on Environmental Protection (2003)
- Law on Fisheries (2003)
- Law on Forest Protection and Development (2004)
- Law on Environmental Protection (2005)
- Law on Biodiversity

Viet Nam environmental programs aim to conserve and effectively develop genetic resources, species and ecosystems to achieve sustainable development;

contribute to conserving global and regional biodiversity, and fulfill obligations to international agreements. These programs are guided by principles that include promoting the sustainable use of resources, focusing on communities and poverty alleviation, and equitable sharing of benefits from genetic resources.

Viet Nam is now considered one of the world's plant breeding centers, among 11 other centers worldwide, with 16 cropping groups and more than 800 different species. The country's national

Some medicinal herb gardens in Viet Nam

- Sa Pa Medicinal Herb Station with 63 species
- Tam Dao Medicinal Herb Station with 175 species
- Van Dien Medicinal Herb Station (Ha Noi) with 294 species
- Ha Noi University of Pharmacy's Garden with 134 species
- Military Medical Institute's Garden with 95 species
- A Garden of Medicinal Plants, located 400 meters high in Ba Vi Mountain with 150 species
- Centre of Plants for Breeding in Da Lat with 88 species

Source: Report on reviewing special use forest planning, MARD (2006)



bank of plant genes has 12,307 varieties of 115 species, many of which are indigenous. Several breeds of domestic livestock and poultry are also being conserved.

Current priorities for biodiversity management and conservation in the country include the following actions:

- Complete the organizational structure and management system in biodiversity;
- Finalize the policy and legislation framework on biodiversity;
- Strengthen measures to ensure the effectiveness of biodiversity conservation;
- Promote reasonable use and development of biological resources;
- Enhance community participation and accountability in biodiversity conservation and development activities;
- Improve capacity in biodiversity conservation and development;
- Stimulate investments in biodiversity conservation and sustainable use of resources; and
- Expand international and regional cooperation.

To encourage greater protection of the region's rich natural heritage and propel the ASEAN to greater economic development, Viet Nam is also committed to

collaborating with other ASEAN Member States on the protection of ASEAN Heritage Parks and other protected areas.

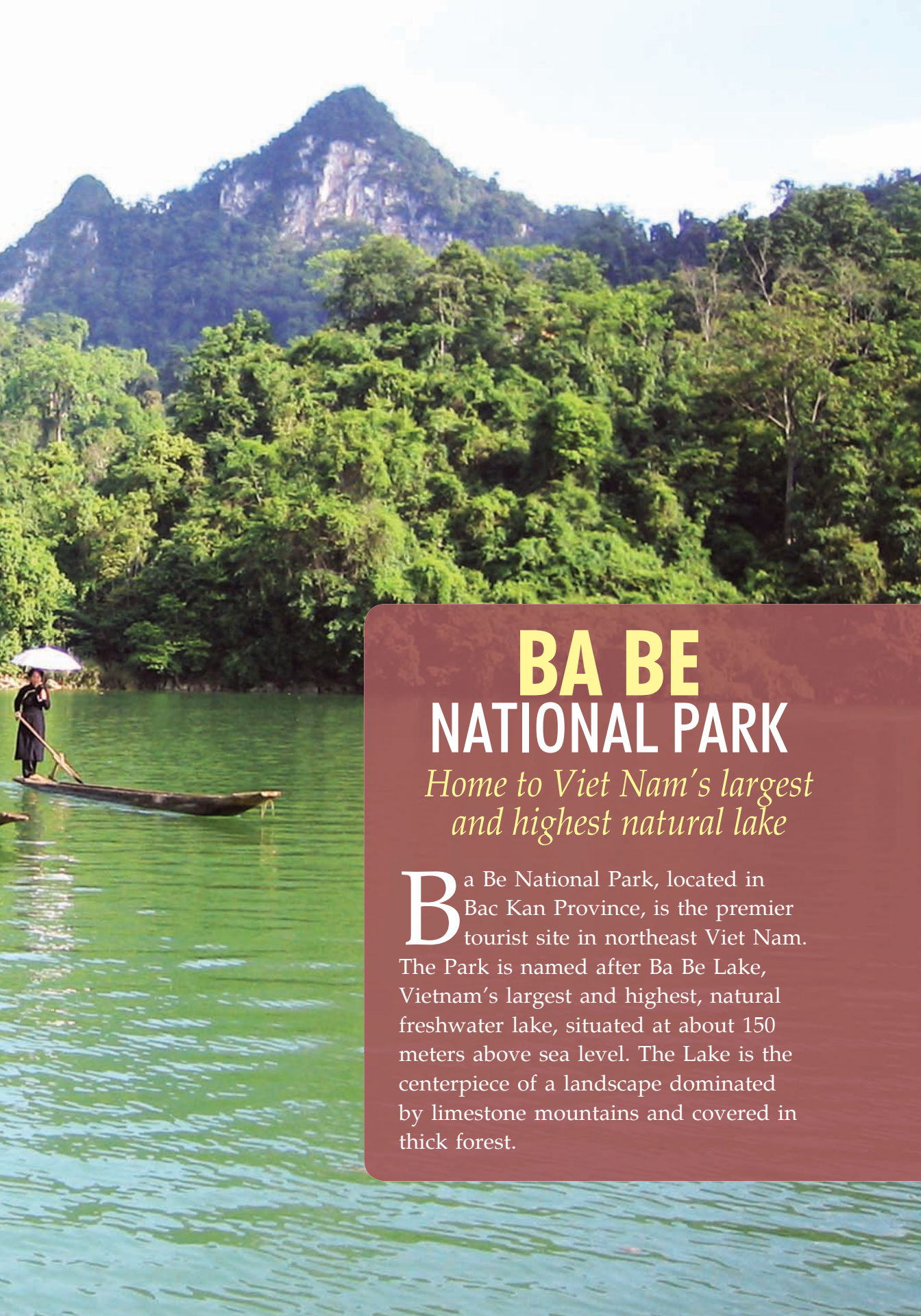
By 2006, Viet Nam had 128 protected areas (presently known as Special-Use Forest being managed by the Ministry of Agriculture and Rural Development), and situated in different eco-regions of the country. These protected areas include 30 national parks, 48 nature reserves, 11 species/habitat conservation areas, and 39 landscape protection areas, comprising a total area of 2.5 million hectares or 7.6 percent of the natural area of the country. In late 2008, the Prime Minister approved a system of 45 interior protected wetlands. Another system of 15 marine protected areas has also been planned and submitted to the Government for approval.

Some of these nature reserves have been granted international and regional recognition. There are two World Heritage Sites: Ha Long Bay (Quang Ninh) and Phong Nha-Ke Bang National Parks (Quang Binh); six Biosphere Reserves (Can Gio, Cat Tien, Cat Ba, Red River delta coastal wetland, Western Nghe An, and Kien Giang); two Ramsar sites: Xuan Thuy National Park and Cat Tien National Park; and four ASEAN Heritage Parks: Ba Be National Park, Hoang Lien National Park, Chu Mom Ray National Park and Kon Ka Kinh National Park. ■

Strides in Protected Area Management

Park managers cooperate closely with local governments to develop strong collaboration in conservation activities. They have strengthened their efforts in improving communication activities to create greater awareness of the need to conserve and manage forest resources, particularly among students and the communities living in the buffer zones. Local communities, in particular, are also encouraged to participate in the management of the protected areas, which are facilitated through benefit-sharing mechanisms in ecotourism projects and reforestation activities.





BA BE NATIONAL PARK

*Home to Viet Nam's largest
and highest natural lake*

Ba Be National Park, located in Bac Kan Province, is the premier tourist site in northeast Viet Nam. The Park is named after Ba Be Lake, Vietnam's largest and highest, natural freshwater lake, situated at about 150 meters above sea level. The Lake is the centerpiece of a landscape dominated by limestone mountains and covered in thick forest.

Ba Be actually means ‘three lakes’ or ‘Slam Pe’ in the local Tay language. These lakes are Pe Leng, Pe Lu and Pe Lam. Ba Be is a continuous body of water with numerous small inlets and islets, stretching nearly 8 kilometers from north to south. Because of its rugged splendor, Ba Be is sometimes referred to as the “Ha Long Bay of the mountains”. Ba Be was declared a national park in 1992 and covers 10,048 hectares. The National Park was established to conserve important ecosystems, rare plant and animal species and, in particular, the special landscapes centered on Ba Be Lake.

Habitats

Typical habitats are the freshwater lake, and the limestone and the lowland evergreen forests. The forests play an important role in watershed protection. This mosaic of plants protects the land from being eroded due to intensive water flows that could cause floods, and threaten the lives of local communities downstream of the Nang River.

Wildlife

Aside from protecting the watershed, Ba Be National Park plays an important role in wetland biodiversity and habitat conservation. Among the Park’s fauna, the most important mammal species for conservation are Francois’ langur (*Trachypithecus francoisi*) and Owston’s

Biodiversity richness of Ba Be National Park

- 65 species of mammals
- 27 species of bats
- 233 species of birds
- 43 species of reptiles and amphibians
- 106 species of fish
- 345 species of butterflies



Night heron

banded civet (*Hemigulus ownstoni*). The Vietnamese salamander (*Paramesotriton deloustali*) was recently discovered in

Surveys have recorded 233 bird species, including the following biome-restricted species:

Sino-Himalayan sub-tropical forest	Indochinese moist tropical forest	Indo-malayan tropical dry zone
<ol style="list-style-type: none"> 1. Pied falconet 2. White-winged magpie 3. Black-breasted thrush 4. Light vented bulbul 5. Black bulbul 6. Mountain bulbul 7. Streaked wren babbler 	<ol style="list-style-type: none"> 1. Grey peacock pheasant 2. Red-vented barbet 3. Hainan blue flycatcher 4. Grey-eyed bulbul 5. Black-throated laughingthrush 6. Lesser necklaced laughingthrush 	<ol style="list-style-type: none"> 1. Lineated barbet 2. Racket-tailed treepie 3. Sooty-headed bulbul



Snub-nosed monkey

streams in the buffer zone. A total of 65 mammal species including 27 bat species have been recorded so far.

Raptors recorded include six diurnal species (oriental honey buzzard, crested serpent eagle, Shikra, sparrow hawk, pied falconet, and common kestrel) and three nocturnal species (Asian barred owl, collared owl, and mountain scops owl).

Reptiles and amphibians number a total of 43 species. The discovery of the Vietnamese salamander is a significant record, since this species was previously known only in the Tam Dao National Park.

Ba Be Lake can be considered as one of the richest natural lakes for fish biodiversity in Viet Nam. As of this publication, 106 species of fish have been recorded, belonging to 61 genera, 17 families and five orders.

Butterfly diversity is also significant, as 345 species have already been recorded.



White-cheek gibbon

Conservation issues

Local habitats and wildlife are largely threatened by human activity, including over fishing and destructive fishing practices that use dynamite and electricity. Hunting of wildlife for domestic use and its trade for use in traditional medicine, ornaments, and restaurant fare have decimated the local wildlife.

Forest areas have also been cleared for agriculture, and trees have been cut for fuelwood. These activities are degrading the forest ecosystem, causing forest fires and promoting soil erosion and siltation of the Lake.

Conservation programs

Park management activities include training local fishermen on more sustainable fishing techniques and educating them about the values of the Lake's biodiversity. Fishermen have also been asked to increase the mesh size of their nets so that only the more valuable adult fishes will be caught, and the young fish

will not be caught but remain free to grow into adults and reproduce. Most significantly, the formation of a Lake Management Cooperative composed of fishermen from local communities and some Park staff has led to greater cooperation and success in addressing these issues.

Park management also assists local communities to improve their living conditions and reduce pressure on the forests and biodiversity. Guns are banned in the Park to prevent hunting.

The Ba Be National Park Operational Plan was one of the management's efforts that clearly identified and detailed the conservation management activities from 2001 to 2005. In 2004, the Ba Be Ecological Research Station (BBERS) was established to increase understanding of ecological aspects within the National Park and the surrounding region to support conservation management, broaden the knowledge base, and help Vietnamese researchers gain experience through practice.

Another significant effort is the creation of the Ba Be Lake Management Cooperative in 2004 that provides tourism services and helps in sustainably managing the natural resources around Ba Be Lake.

Park attractions and activities

Aside from its beautiful natural landscapes, and wildlife, the Park offers other interesting features such as waterfalls and ponds, and a wide range of activities within and around the Park.

- Boat tours around Ba Be Lake and Nang River. The section of the Nang River between Puong cave and Dau Dang village offers a wonderful view of tropical limestone forest and numerous limestone formations. The boat tours also offer a glimpse of local residents going about their daily lives.
- Treks through the valleys, forests and visits to caves, such as the Puong Cave. This Cave forms a stunning 50-meter high gateway



Boats for hire, mostly owned by villagers.



The Park offers leisurely hikes as well as mountain climbing.

- toward the northwest portion of Ba Be Lake and is home to 5,000 to 10,000 bats belonging to 18 species.
- Visits to local villages, markets and musical performances.
 - The Dau Dang Waterfall, sometimes called Ta Ken, is a natural rapid formed as the waters of the Nang River drop on their way west into the neighboring Tuyen Quang Province and is nearly one kilometer long.
 - The Fairy Pond is a small water body in a rock basin isolated from the main lake. The Pond is fed from waters seeping underground through the surrounding rock.
 - One can also visit Widow Island, a small island in the middle of the southern part of the lake.
 - Hikers can also climb Pac Ngoi Mountain. Rising up to 787 meters, it forms an impressive guardian where the Leng River enters Ba Be Lake. ■





CHU MOM RAY NATIONAL PARK

Legendary paradise in Kon Tum

Chu Mom Ray National Park is situated in western Kon Tum province, in the Central Highlands, close to the point where Viet Nam, Cambodia and Lao PDR meet. Located in an area of medium high mountains, the Park is named after Chu Mom Ray, which is the highest (1,773 meters) mountain in the region.



Chu Mom Ray was established as a National Park in 2001. The Park covers a total land area of 56,621 hectares, comprising a strict protection area of 40,566 hectares, a forest rehabilitation area of 12,137 hectares and an administration and services area of 3,918 hectares.

The National Park is adjacent to Virachey National Park in the Stung Treng and Ratanakiri provinces of Cambodia and the Southeast Ghong Natural Reserve in the Attapeu province of Lao PDR. Chu Mom Ray is also an important forest watershed for the Ya ly-Se san-Plei Krong hydroelectric plant and Kon Tum province.

Habitats

Chu Mom Ray has two major forest types: the lowland evergreen forest, which is distributed below the 1,000-meter elevation, and the lower montane evergreen forest, which is distributed above the 1,000-meter elevation. In addition, there are smaller areas of lowland semi-evergreen forest, distributed at elevations below 700 meters.

The Park also has large areas of bamboo and grassland that support wild cattle.

Biodiversity richness of Chu Mom Ray National Park

- 1,494 species of plants
- 425 medicinal plant species
- 115 species of mammal
- 272 species of birds
- 62 species of reptiles and amphibians
- 20 species of freshwater fish
- 179 species of insects

The forest is an important source of forest products for local communities. These include fuelwood, bamboo, rattans, honey, resin and some medicinal plants.

Wildlife

Current records indicate that 620 animal species belong to 158 families and 47 orders:

- 115 mammal species
- 272 bird species
- 62 reptile and amphibian species
- 20 freshwater fish species
- 179 insect species

Studies show that Chu Mom Ray may be one of the best remaining areas for a number of endangered species, such as tigers, the Asian elephant, gaur and banteng. The National Park also supports significant populations of globally threatened and restricted-

The Legend of Chu Mom Ray

Once upon a time, there were two sisters living very happily in the village close to the mountain. One day, the elder sister lost her local scarf and thought the younger sister took it. The younger sister got angry and ran away to another place. During the village festival, the villagers killed a cow and saw the scarf in the cow's stomach. The elder sister then went searching for her sister and found her in another place where they then both established the new village and lived long lives. After their death, the elder sister vanished into Mom stream, and the younger sister vanished into Ray stream. The highest mountain where two streams meet is now called Chu Mom Ray, which means Mom Ray Mountain.



Gray laughingthrush



Green imperial pigeon



Red-throat barbet

range bird species, including Germain's peacock pheasant (*Polyplectron germaini*) and the black-hooded laughingthrush (*Garrulax milleti*). Both are restricted-range species, indicating that Chu Mom Ray may lie in a transitional zone between the Kon Tum Plateau and South Vietnamese Lowlands Endemic Bird Areas.

Surveys of flora recorded 1,494 plant species (belonging to 541 branches, 166 families, in which 131 species are listed as rare). A total of 425 medicinal plant species, both vascular plants and fungi, and belonging to 326 genera and 127 families, were also identified. The Park also harbors two orchid species believed to be endemic to southern Indochina: *Coelogyne schltesii* and *Bulbophyllum amitinandii*.

Conservation issues

Forest fires, hunting, and clearance of forests for shifting cultivation are major threats to wildlife resources. There is also increasing encroachment from human settlements bordering the Park. Illegal logging, increasing harvest of non-timber forest products such as rattans, dipterocarp resins and fruits are also issues that need to be addressed.

These activities often result from increased migration, poverty and high demand for wildlife products. Added to these issues are the unclear Park boundary, which is not readily recognizable in the field, vague classification of land use, poor conservation awareness, growing demand for land, and low agricultural yields. Internal to Park management, human



Pygmy loris



Agamid lizard

resources constraints also add to the problem and result in insufficient patrol and poor law enforcement.

Park management and conservation activities

Park management activities focus on protection, research and monitoring, environmental education, and ecotourism. To protect the Park's resources, the management board works with the army and police forces to prevent illegal activities. Green clubs are also organized to create environmental awareness among secondary school pupils. Club activities often include establishing plant gardens in schools, writing and painting competitions on environmental themes, development of signs and other visual

materials, and training courses to raise the environmental consciousness of local community members. Such projects are envisioned to raise public awareness of environmental issues and biodiversity conservation and encourage greater participation in the protection and sustainable use of natural resources.

Other interests

Many other interesting sights and hill tribe villages on the fringes of the Park are among the added attractions within and around the Park. The Seminary, the Ethnic Hill Tribe Museum, the Wooden Church and Kontum Prison on the bank of Dakbla River are worth a visit. A number of nearby villages also provide insights into the life of the ethnic tribes. ■







HOANG LIEN SA PA NATIONAL PARK

Site of Fansipan, Viet Nam's highest point

The Hoang Lien Sa Pa National Park was created in 2002, covering 29,845 hectares in Viet Nam's mountainous province of Lao Cai. The Hoang Lien Son range of mountains dominates the district, which is at the eastern extremity of the Himalayas. The Park borders Phong Tho District in Lai Chau Province to the east, the communes of Ho Mit, Pac Ta, Nam Can in Than Uyen District to the south and the Ta Giang Phin, Ta Phin, Ban Khoang, Trung Chai communes in Sa Pa District to the north. The Park has been demarcated into 11,800 hectares of strictly protected area; 17,900 hectares of ecology recovery area; and 38,724 hectares as buffer zone.

The Park contains Viet Nam's highest mountain, Phan Xi Pang or Fansipan, which has an elevation of 3,142 meters above sea level. The lowest point is 380 meters but most of the nature reserve lies above 1,000 meters. The flanks of the mountains are very steep and many areas are inaccessible. Between Fansipan Mountain and Sa Pa town, lies the Muong Hoa valley, which has been terraced for wet rice agriculture. This valley becomes wider towards the east of the nature reserve. The climate in the area is moderate and rainy in summer (May-August), and foggy and cold with occasional snowfalls in winter.

Habitats

The ecology of the Park is characterized by the interface between montane and subtropical climate, so the vegetation cover and the wildlife are rich in biodiversity.

Forest type and quality change with increasing altitude. The natural undisturbed forest is apparent at 2,000 meters above sea level. Above 2,500 meters, dwarf conifers and rhododendrons predominate in the harsh "elfin forest", where fully mature trees grow to only a few meters in height because of a lack of topsoil and nutrients. On Fansipan's summit (3,000 meters), only dwarf bamboo has been seen there.

The Park has three types of forest: submontane dry evergreen forest, tropical montane deciduous forest, and sub-alpine forest. The sub-montane dry evergreen forest, which can be found at lower altitudes, is the most disturbed by human activities. There are also large areas of agricultural land, scrub land and savannah.

Agriculture is concentrated at altitudes below 1,500 meters in the valley bottoms. Scrub land and savannah

Biodiversity richness of Hoang Lien Sa Pa National Park

- 2,850 species of plants, of which 400 species have medicinal value
- 350 species of birds

are found where the forest has been cleared.

Wildlife

The Park is a valuable biosphere with nearly 2,850 floral species. Of its diverse flora, over 400 species are considered to have medicinal properties. Rare plant species include the globally-threatened Fujian cypress (*Fokienia hodginsii*) and the Bac Xanh (green cypress) tree, which sur-



Fujian cypress

vive on cliffs that are 300 to 700 meters high. With less than 20 Bac Xanh trees on Hoang Lien Son and their low regeneration, Park management is focusing its efforts to maintain and protect this valuable tree. Other prevalent trees include the endemic Van Sam Hoang Lien pine, *Thich Xi Pan*, and *Thich Sa Pa*. Endemic conifers include the *Amentotaxus yunnanensis*, *Calocedrus macrolepus*, *Cupressus duclouxiana*, and *Taiwania cryptomeriodes*.

Among the endemic animal species are the soc trau (squirrel), doi tai so (bat), and vuon den tuyen tay bac (gibbon), which are all on the brink of extinction. There are also several endemic and globally threatened amphibians.

The birds of Fansipan has several

Himalayan species not found elsewhere in Viet Nam, such as the slender-billed scimitar babbler, sapphire flycatcher, Gould's shortwing, yellow-billed blue magpie, crested finchbill and white-colored yuhina. The species richness of birds recorded in the Sa Pa area is higher than at any other site in Viet Nam, with around 350 species recorded, as of this writing. Although bird richness is high, the number of medium-sized species of birds is low, relative to other forest areas of the country. A considerable amount of effort is needed to see a high proportion of the area's bird species.

The National Park supports approximately one third of Viet Nam's known amphibian species, the highest recorded



Atlas moth



Fukien flycatcher



Red-tailed laughingthrush



Black bear

amphibian species richness of any protected area in Viet Nam. Around 10 percent of the Park's amphibian species are globally threatened (BirdLife, 2004).

Conservation issues

Hunting, logging and agricultural production have threatened local resources. Areas that have been logged or farmed by local communities need careful recolonization. Forest clearance and accidental fires are rapidly destroying the Park's natural vegetation cover.

Some areas where land mines have been placed during the Chinese incursion in 1973 need clearing. Ironically, the known presence of these land mines may have saved some accessible forests from logging.



Even young boys carry guns to hunt wildlife.

The impact of global warming on plant species is now becoming more evident in the Park. Results of a survey conducted from 2003 to 2007 revealed that some indigenous plant species are moving higher and higher in elevation as a reaction to rising temperatures. The Van Sam Hoang Lien pine tree, which used to grow on altitudes between 2,200 – 2,400 meters, has now moved up to 2,400 – 2,700 meters. The Thich Xi Pan and Thich Sa Pa, which normally grow at 1,700 meters, are now found growing at higher elevations.

Unsustainable tourism development is now a potential threat to biodiversity at Hoang Lien. The neighboring town of Sa Pa is already a major tourist destination, and there are plans to develop it into a resort city. Specific potential threats include infrastructure development, such as trails and roads within the Park. Such developments could facilitate the exploitation of natural resources, and increase the number of hikers and campers within the Park, which could lead to an increased risk of accidental forest fire, and increased demand for forest products like orchids (BirdLife, 2004).

Other interests

With its various natural landscapes, Sa Pa hosts different kinds of community-based tourism.

Visitors can go see the following:

- Fansipan Mountain, where all three trails to the summit (from Cat Cat village, Sin Chai village and Tram Ton pass) pass through



Thac Bac Waterfalls

montane forests, particularly at higher elevations. The trails are difficult in some areas and dangerous during bad weather. Trekkers are advised against attempting to pass any of these routes without a guide, in particular, during the rainy season. Clouds cover the mountains all year round and temperatures in high elevations often drop below zero.

- Ham Rong Orchid Garden is located behind Sa Pa town, which can be accessed along the road behind the local church. Ham Rong features a series of ornamental gardens, linked by pathways, all of which offer careful exploration for birds. With a bit of searching, brownish-flanked bush warbler, white-browed laughingthrush and

ashy-throated and vinous-throated parrotbills can be sighted year-round, but during winter, several migrant species could be sighted.

- Sa Pa town is famous for its flowers and is known as the capital town for orchids. During the Tet Spring Festival, the valleys around the town glow with the pink flowers of peaches. Flower and fruit gardens make Sa Pa an ideal mountain resort. Yellow peaches and Tan Van plum are local specialties. Since time immemorial, Sa Pa has also been known near and far for its valuable medicinal herbs, which almost remain untapped.
- Other natural sites include the Thac Bac Waterfalls, Thuy Cong Grotto, Gio Cave, Troi Gate and Truc Forest. ■

KON KA KINH NATIONAL PARK

*Scenic landscapes and globally
significant biodiversity*

Kon Ka Kinh was established as a National Park in 2002, with a total area of 41,780 hectares, and then declared an ASEAN Heritage Park in 2003. It is located in the northeastern region of Gia Lai province within the administrative boundaries of Dak Roong, Kroong and Kon Phe communes (Kbang rural district), Ha Dong commune (Dac Doa rural district) and Ayun commune (Mang Yang rural district).





The ASEAN Heritage Park has an important role in upstream watershed protection for several large rivers that provide water for irrigation and domestic use for a number of districts in Gia Lai and Kon Tum provinces. The west of the Park forms part of the catchment of the Yaly hydroelectric power station.

The Park straddles two catchments. Streams originating east of the Park feed the Ba River, which flows east, into the South China Sea, while west of the Park lies within the catchment of the Mekong River. Because of the steep topography, rivers and streams originating from the Park are often short, narrow and fast flowing, with many waterfalls.

The Park has high, steep mountains in the northeast and flatter areas in the southwest. The highest point is the Kon Ka Kinh Mountain at 1,748 meters above sea level (asl) while the southwest area is below 700 meters asl.

Local people depend on the Park's resources for their firewood, honey and rattans. They also use at least 110 plant species with traditionally-known medicinal values. Use of plants in traditional medicine is widespread amongst local people, although the commercial potential of most of these species remains untapped.

Habitats

Kon Ka Kinh protects 33,565 hectares of forest, which is equivalent to 80 percent of the total area, and supports a range of mountain habitat types. A large range of mountain evergreen forest can be found from 700 meters asl to 1,784 meters asl. Of particular importance are 2,000 hectares of mixed coniferous and broadleaf forest containing po mu (*Fokienia hodginsii*) or Fujian cypress, which is listed as near-threatened. The Park is also

Biological richness of Kon Ka Kinh National Park

- 652 species of vascular plants
- 42 species of mammals
- 160 species of birds
- 29 species of reptiles
- 22 species of amphibians
- 209 species of butterflies

Source: Le Trong Trai *et al.* 2000

part of a contiguous landscape of natural habitats that supports some of the most intact faunal and floral communities in the central Annamites.

Flora

The development of an investment plan for the Park required a survey of its natural resources. The survey recorded 652 vascular plant species in 450 genera and 130 families. Of these species, 238 are timber, 110 have known medicinal uses, and 38 have potential economic value as ornamentals. Many species have high economic value, such as the timber species—*Fokienia hodginsii*, *Decussocarpus fleuryi*, *Afzelia xylocarpa*, *Pterocarpus macrocarpus*, *Dalbergia cochinchinensis* and *Chukrasia tabularis*, and the medicinal plant species—*Aquilaria crassna*, *Cosciniium fenestratum*, *Fibraurea tinctoria*, *Anoectochilus lylei* and *A. roxburghii* (Le Trong Trai *et al.* 2000).

Of the recorded plant species, 10 are endemic to Viet Nam: *Pinus dalatensis*, *Craibiodendron scleranthum*, *Afzelia xylocarpa*, *Calamus poilanei*, *Dalbergia cochinchinensis*, *Dialium cochinchinensis*, *Alchornea annamica*, *Baccaurea silvestris*, *Dendrobium ochraceum* and *Bulbophyllum hiepii*.

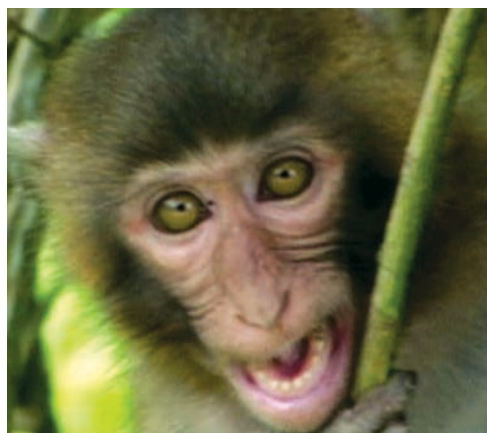
Several specimens were also collected that may represent new records for Viet Nam or new species for science. These specimens await final identification (Le Trong Trai *et al.* 2000).



Douc langur



Tiger



Macaque

Fauna

A total of 253 vertebrate species, including 42 mammal species, 160 bird species, 29 reptile species and 22 amphibian species were recorded in the survey. Some 209 butterfly species were listed as well.

Mammals included seven species listed in the IUCN Red List of

Threatened Animals (1996) as globally threatened. Of the seven, three are endemic to Indochina and these are buff-cheeked gibbon, douc langur (*Pygathrix nemaeus*) and truong son muntjac (*Muntiacus truongsonensis*).

Bat species recorded totalled 14, including one new record for Viet Nam—

Globally threatened mammals recorded at Kon Ka Kinh National Park

- Pig-tailed macaque
- Bear macaque
- Douc langur
- Buff-cheeked gibbon
- Asiatic black bear
- Tiger
- Truong son muntjac
- Southern serow
- Malayan porcupine

Source: Le Trong Trai *et al.* 2000

Globally threatened and restricted-range birds at Kon Ka Kinh

- Siamese fireback
- Yellow-billed nuthatch
- Black-hooded laughingthrush
- White-cheeked laughingthrush
- Short-tailed scimitar babbler
- Grey-faced tit-babbler

Source: Le Trong Trai *et al.* 2000



Hibiscus

the Molocuan whiskered bat. This figure represents approximately 20 percent of the known bat fauna of Viet Nam (Le Trong Trai *et al.* 2000).

Birds listed in the survey totalled 160 species, which included five restricted-range species and four species listed as globally threatened. Other species included the maroon oriole (*Oriolus traillii*),

cutia (*Cutia nipalensis*), red-tailed minla (*Minla ignotincta*), grey-headed parrotbill (*Paradoxornis gularis*) and green-tailed sunbird (*Aethopyga nipalensis*).

Conservation issues

Major threats to the Park's biodiversity are illegal logging, exploitation of forest products, hunting and illegal wildlife trade. Endangered doucs are still hunted for food and for making traditional medicine. Logging activities have damaged local habitats and forests in the buffer zones.

Park management objectives

Kon Ka Kinh National Park was established to:

1. Preserve the model ecological system of the tropical evergreen rainforest, and wild flora and fauna on Plei Ku highlands;
2. Protect the headwaters of rivers in the region, ensuring environmental security and sustainable development; and
3. Build up technical and material bases in training, scientific research, environmental education and ecotourism development, and thus contribute to socio-economic development and create jobs for local communities.

Other interesting features

The National Park offers scenic landscapes and other natural features for visitors. Trekking and bird watching are very popular activities in the Park.

In Gia Lai province, other attractions include waterfalls, springs, lakes, particularly Bien Ho (To Nung Lake), which is located on top of an extinct volcano. It is called the "Pearl of Pleiku", since its waters are so clear that fish can be seen swimming underwater. ■

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References

BRUNEI

Brunei Tourism Website: www.bt.com.bn.

FAO website: www.fao.org/ . FAO Corporate Document Repository. Tropical forest resources assessment project – Forest resources of tropical Asia. Country Briefs: Brunei.

MacKinnon, J.R and G.B. Villamor. 2004. ASEAN's Greatest Parks: The ASEAN Heritage Parks Programme. M.T. Uriarte and E.M. Lopez, (Eds). ASEAN Regional Centre for Biodiversity Conservation, Los Banos, Philippines.

Tasek Merimbun Heritage Park

ASEAN Heritage Parks and Reserves. 1992. Published by ASOEN in collaboration with the Japan International Cooperation Agency and the United Nations Environment Programme.

BirdLife International and IUCN-WCPA Southeast Asia (2007). Gap analysis of protected areas coverage in the ASEAN countries. Cambridge, U.K.: BirdLife International.

Brunei Tourism Website: www.bt.com.bn.

Explore Brunei. A Visitor's Guide, 6th Edition.

Government of Brunei Darussalam Website: <http://brunei.gov.bn/>.

Museum Heritage Park. 2000, (Published by the Museums Department, Ministry of Culture, Youth and Sports, Brunei Darussalam).

New 7 Wonders Website: www.new7wonders.com

Nyawa, S.B. 2007. Brunei Country Report. Presented at the 2nd ASEAN Heritage Parks Conference and the 4th Regional Conference of Protected Areas in Southeast Asia. 23-27 April 2007, Sabah, Malaysia.

Personal Communication with Haji Daidin Bin Salleh. August 2001. Forestry Department, Ministry of Industry and Primary Resources, Negara Brunei Darussalam. (BSB) 02-381012/SG LIANG) 03-230384

Personal Communication with Shahrill HJ Shahbudin. 25 August 2001. Forestry Department, Ministry of Industry and Primary Resources, Negara Brunei Darussalam. (BSB) 02-381012/SG LIANG) 03-230384

The Brunei Times. 2009. "Dusun community marks Adau Gayoh festival", IN: The Brunei Times, 11 May 2009: www.bt.com.bn/.

The Brunei Times. 2008 "Trip to Tasek Merimbun", IN: The Brunei Times, 18 November 2008. www.bt.com.bn/.

Yasuda, M. 2003. Mammals of Tasek Merimbun Heritage Park. IN: <http://cse.affrc.go.jp/myasuda/merimbun/>.

CAMBODIA

FFI, 2005. Status review of pileated gibbon (*Hylobates pileatus*) and yellow-cheeked crested gibbon (*Nomascus gabriellae*), in Cambodia.

IUCN Red List Report.

Ministry of Environment. 2009. Fourth National Report of Cambodia to the Convention on Biological Diversity.

Ministry of Environment, 2002. National Biodiversity Strategy and Action Plan. Royal Government of Cambodia.FAO/UNDP/GEF Project CMB/98/G33.

Preah Monivong (Bokor) National Park

Bokor Conservation Project: Increasing Ranger Protection in Bokor National Park, Cambodia. 2005 Report. 21st Century Tiger and Wild Aid.

Environment News Network. 2008. *Chainsaws Cut into Cambodia's Preah Monivong National Park*. 12 March 2008. IN: www.enn.com/ecosystems/article/32842

Government of Cambodia Website: www.cambodia.gov.kh/

MacKinnon, J.R and G.B. Villamor. 2004. ASEAN's Greatest Parks: The ASEANHeritage Parks Programme. M.T. Uriarte and E.M. Lopez, (Eds). ASEAN Regional Centre for Biodiversity Conservation, Los Banos, Philippines.

Socheat L.S. Indicating Success: Evaluation of Community Protected Areas in Cambodia. Department of Nature Conservation-Protection, Ministry of Environment, Phnom Penh, Cambodia.

Wild Aid. www.wildaid.org.

Virachey National Park

ASEAN BISS: www.aseanbiodiversity.org/.

Asian Turtle News. News from the Frontlines of Conservation. The Asian Turtle Conservation Network: www.asianturtlenetwork.org/.

Biodiversity and Protected Areas Management Project (BPAMP): www.bpamp.org.kh/.

Biodiversity and Protected Areas Management Project. 2006. Virachey National Park Ecotourism Strategy 2006–2010. Department of Nature Conservation and Protection of the Ministry of Environment. Cambodia.

Conservation International–Cambodia. 2007. Preliminary Report: Virachey National Park Rapid Assessment Program 2007. Cambodia.

Hong, D. 2007. Country Report on Cambodia. Presented at the 2nd ASEAN Heritage Parks Conference and the 4th Regional Conference of Protected Areas in Southeast Asia, 23-27 April 2007, Sabah, Malaysia.

MacKinnon, J.R and G.B. Villamor. 2004. ASEAN's Greatest Parks: The ASEAN Heritage Parks Programme. M.T. Uriarte and E.M. Lopez, (Eds). ASEAN Regional Centre for Biodiversity Conservation, Los Banos, Philippines.

INDONESIA

ACB 2009. ASEAN Biodiversity Brochure.

IBSAP 2003.

Ministry of Environment, Indonesia, 2009. Fourth National Report of Indonesia to the Convention on Biological Diversity, 2009.

National Geographic: Travel and Cultures, Indonesia, Indonesia facts: IN: <http://travel.nationalgeographic.com/>

Research Centre for Biology, LIPI, 2008.

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ASEAN/JICA/UNEP, *undated*. ASEAN Heritage Parks and Reserves. Published by the ASEAN Senior Officials on the Environment in collaboration with Japan International Cooperation Agency and United Nations Environment Programme.

Country Report of Indonesia, 2010. Presented at the 3rd ASEAN Heritage Parks Conference. 23-25 June 2010. Brunei Darussalam.

Country Report of Indonesia, 2007. Presented during the 2nd ASEAN Heritage Parks Conference and the 4th Regional Conference for Protected Areas. 23-27 April 2007, Sabah, Malaysia.

Giesen and Sukotjo, 1991, as cited in the KSNP (Kerinci-Seblat National Park) Management Framework (2002-2006), 34 pp. www.kerinci.org.

Hartana, A.T. and D.J. Martyr, *undated*. Report on Activities and Progress, 2001-2002, Kerinci-Seblat Tiger Protection Project, Fauna and Flora International. IN: www.nfwf.org/.

Indonesia Tourism. Ministry of Culture and Tourism: www.my-indonesia.info/

Indonesia Tourism: www.indonesia-tourism.com/jambi/kerinci_seblat.html.

Kerinci-Seblat National Park Integrated Conservation and Development Project. 1999. IN: www.kerinci.org.

Komunitas Konservasi Indonesia (KKI) WARSI: www.warsi.or.id/.

Laumonier, 1994, as cited in the Kerinci-Seblat National Park Management Framework (2002-2006), 34 pp.

Sandbukt, Oyvind. 1995. The Kerinci-Seblat National Park and the Kubu People: Preliminary Assessment and Recommendations. *IN*. Tourism: Kerinci-Seblat National Park. www.kerinci.org.

GUNUNG LEUSER NATIONAL PARK

Country Report of Indonesia, 2010. Presented at the 3rd ASEAN Heritage Parks Conference. 23-25 June 2010. Brunei Darussalam.

Country Report of Indonesia, 2007. Presented at the 2nd ASEAN Heritage Parks Conference and the 4th Regional Conference for Protected Areas. 23-27 April 2007, Sabah, Malaysia.

Indonesia Tourism. Ministry of Culture and Tourism: www.my-indonesia.info/

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Sumatra Travel: www.sumatra-indonesia.com/gunungleuser.htm.

Sumatran Tiger Reserves and National Parks: www.lairweb.org.nz/tiger/.

UNESCO World Heritage Site: <http://whc.unesco.org/en/list/1167>.
Leuser National Park.

Van Beukering, P., J.H. Herman, S.J. Cesar, M.A. Janssen. 2002. Economic Valuation of the Leuser National Park on Sumatra, Indonesia.

World Conservation Society: www.wcs.org/globalconservation/Asia/.

World Wildlife Adventures: www.world-wildlife-adventures.com/.

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ASOEN/JICA/UNEP, *undated*. ASEAN Heritage Parks and Reserves, Published by the ASEAN Senior Officials on the Environment (ASOEN) in collaboration with the Japan International Cooperation Agency (JICA) and the United Nations Environment Programme (UNEP).

MacKinnon, John R., 2002. Personal communication, 23 May 2002.

Natural Site Datasheet from WCMC (World Conservation Monitoring Centre). 2001.

Ngudi, N. and Y. Rumbarar. 2007. The Largest Protected Area in South East Asia: Lorentz National Park—Challenges and Opportunities. Country Report of Indonesia. 2nd ASEAN Heritage Parks Conference and the 4th Regional Conference of Protected Areas in Southeast Asia. 23-27 April 2007, Sabah, Malaysia.

Protected Areas Programme, 2001, *IN*: UNESCO Website: www.unesco.org.

Protected Areas Programme, UNEP World Conservation Monitoring Centre:
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The World Bank Staff Appraisal Report, 1996. Kerinci-Seblat National Park- Integrated Conservation and Development Project (KSNP-ICDP). Report No. 14989-IND. A Document of the World Bank, Agriculture Operations Division, Country Department III, East Asia and Pacific Region. IN: <http://users.bart.nl/~edcolijn/irian.html>.

WCMC, *undated*. Cagar Alam Gunung Lorentz (Mount Lorentz Nature Reserve): Indonesia. IN: www.wcmc.org.uk/latenews/emergency/gunung_lorentz/.

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Fourth National Report of Lao PDR, 2010. Assessing Progress Towards the 2010 Biodiversity Target: The 4th National Report of Lao People's Democratic Republic to the Convention on Biological Diversity.

Lao National Tourism Administration: www.tourismlaos.org/.

Lao PDR MDG Report, 2008.

Ramsar Convention on Wetlands, 2010. Lao People's Democratic Republic becomes the 160th Contracting Party of the Ramsar Convention on Wetlands, IN: News: Ramsar Convention on Wetlands website: www.ramsar.org/.

WREA, 2009 as cited in the Fourth National Report of Lao PDR, April 2010.

Nam Ha National Protected Area

Ecotourism Laos: Lao National Tourism Administration: www.ecotourismlaos.com/.

Luang Namtha Provincial Tourism Department, 2008: www.luang-namtha.org/.

Lytleton, C. 2002. *"Tourism as a Tool for Development"*. Nam Ha Ecotourism Project: External Review. UNESCO-Lao National Tourism Authority.

MacKinnon, J.R and G.B. Villamor. 2004. ASEAN's Greatest Parks: The ASEAN Heritage Parks Programme. M.T. Uriarte and E.M. Lopez, (Eds). ASEAN Regional Centre for Biodiversity Conservation, Los Banos, Philippines.

Nam Ha National Protected Area (courtesy of the IUCN Lao Programme).

Tizard, R., P. Davidson, Khamkhoun and K. Salivong. 1997. A Wildlife and Habitat Survey of Nam Ha and Nam Kong Protected Areas, Luang Namtha Province, Lao PDR. Department of Resource Conservation/Wildlife Conservation Society Cooperative Program, Department of Forestry, Ministry of Agriculture and Forestry, Lao PDR.

Thamlasine, P. *undated*. Biodiversity Conservation and Ecotourism in the Nam Ha National Protected Area, Lao PDR. Nam Ha NPA, Provincial Agriculture and Forestry Office, Luang Namtha Province.

The Wildlife Conservation Society: www.wcs.org/international/Asia/laos/.

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Ministry of Natural Resources and Environment, 2009. Fourth National Report to the Convention on Biological Diversity, Government of Malaysia.

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ASEAN/JICA/UNEP, *undated*. ASEAN Heritage Parks and Reserves. Published by the ASEAN Senior Officials on the Environment in collaboration with Japan International Cooperation Agency and the United Nations Environment Programme.

Brook, B.D. *et al.* 1982. Caves of the Limestone. *IN: The Sarawak Museum Journal* xxx (51): 95-119.

Clark, B. and W. Landong. 2007. Country Report – Sarawak, Malaysia. Presented at the 2nd ASEAN Heritage Parks Conference and the 4th Regional Conference of Protected Areas in Southeast Asia, 23–27 April 2007, Sabah, Malaysia.

Geographia website: www.geographia.com/malaysia/gunung.html.

Gunung Mulu World Heritage Area: www.mulupark.com/.

Hazebroek, H.P., A. Kashim B., and A. Morshidi, 2000. National Parks of Sarawak. Natural History Publications (Borneo), Kota Kinabalu.

Protected Areas Programme, UNESCO website: www.unesco.org.

World Heritage Centre: <http://whc.unesco.org/en/list/1013/>.

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Basintal, P. 2007. Country Report of Sabah, Malaysia. Presented at the the 2nd ASEAN Heritage Parks Conference and the 4th Regional Conference of Protected Areas in Southeast Asia, 23-27 April 2007, Sabah, Malaysia.

Endemic Guides: www.endemicguides.com.

MacKinnon, J.R and G.B. Villamor. 2004. ASEAN's Greatest Parks: The ASEAN Heritage Parks Programme. M.T. Uriarte and E.M. Lopez, (Eds). ASEAN Regional Centre for Biodiversity Conservation, Los Banos, Philippines.

Sabah Tourism Board: www.sabahtourism.com.

Taman Negara National Park

Ecology Asia: <http://ecologyasia.com/html-loc/tamannegara.htm>.

Endemic Guides: <http://www.endemicguides.com/>.

MacKinnon, J.R and G.B. Villamor. 2004. ASEAN's Greatest Parks: The ASEAN Heritage Parks Programme. M.T. Uriarte and E.M. Lopez, (Eds). ASEAN Regional Centre for Biodiversity Conservation, Los Banos, Philippines.

Tourism Malaysia: <http://www.tourism.gov.my/en/destinations/item.asp?item=tamannegara>.

World Heritage Center: <http://whc.unesco.org/en/tentativelists/1921/>.

Zainuddin Ab Shukor and Burhanuddin Mohd. Nor. 2007. Country Report of Peninsular Malaysia: Status of ASEAN Heritage Park (Taman Negara National Park). Presented at the 2nd ASEAN Heritage Parks Conference and the 4th Regional Conference of Protected Areas in Southeast Asia. 23-27 April 2007, Sabah, Malaysia.

MYANMAR

BirdLife International, 2005. Myanmar Investment Opportunities in Biodiversity Conservation, Yangon, November 2005.

Fourth National Report, 2009. Country Report of Myanmar to the Convention on Biological Diversity.

Ministry of Hotels and Tourism: www.myanmar-tourism.org.

Myanmar Tourism Promotion Board: www.tourismmyanmar.org.

van Dijk, *et al.* 2004, as cited in the Myanmar Investment Opportunities in Biodiversity Conservation, 2005 and the Fourth National Report of Myanmar to the Convention on Biological Diversity, 2009.

Alaungdaw Kathapa National Park

MacKinnon, J.R and G.B. Villamor. 2004. ASEAN's Greatest Parks: The ASEAN Heritage Parks Programme. M.T. Uriarte and E.M. Lopez, (Eds). ASEAN Regional Centre for Biodiversity Conservation, Los Banos, Philippines.

MekongTravel.com: <http://www.mekong-travel.com/b-ecotours/alaungdaw.htm>.

Myanmar Bird & Nature Society: <http://myanmarnature.org/tour/>.

Myanmar Travel Information: www.myanmar-travel-information.com/.

Oo, U. H.P. 2007. Country Report of Myanmar. Presented at the 2nd ASEAN Heritage Parks Conference and the 4th Regional Conference of Protected Areas in Southeast Asia. 23-27 April 2007, Sabah, Malaysia.

Wild Aid, 2002. Alaungdaw Kathapa Conservation Project: Surviving Together – Myanmar (Burma). Second Half Report 2002. IN: www.wildaid.org.

Indawgyi Lake Wildlife Sanctuary

Eames, J.C. and U. Uga. 2005. Darwin Initiative for the Survival of Species: Building constituencies for site-based conservation in Myanmar, Annual Report 2004/2005. BirdLife International and Biodiversity and Nature Conservation Association (BANCA). United Kingdom.

Myanmar Travel Information: www.myanmar-travel-information.com/.

Oo, U.H.P. 2007. Country Report on Myanmar. Presented at 2nd ASEAN Heritage Parks Conference and the 4th Regional Conference of Protected Areas in Southeast Asia. 23-27 April 2007, Sabah, Malaysia.

Trek Thailand: www.trekthailand.net/myanmar/parks/indawgyi/.

Inle Lake Wildlife Sanctuary

Tu, S. *undated*. Under threat: A paradise of wildlife and culture. *IN: Myanmar Times: www.myanmar.gov.mm/myanmartimes.*

U Htuin Paw Oo. 2007. Country Report on Myanmar. Presented at 2nd ASEAN Heritage Parks Conference and the 4th Regional Conference of Protected Areas in Southeast Asia. 23-27 April 2007, Sabah, Malaysia.

www.myanmartravelinformation.com.

www.visitmyanmar.com/Pages/EcoTours.html.

Hkakaborazi National Park

Adventurous Expeditions in Myanmar: www.myanmars.net/.

Gold Backed Travel and Tours: www.goldbacked-lynn.com/ecotourism_hkakaborazi.html.

Golden Rock Travel and Tours: www.visitmyanmar.com/Pages/EcoTours.html.

Oo, U.H.P. 2007. Country Report on Myanmar. Presented at the 2nd ASEAN Heritage Parks Conference and the 4th Regional Conference of Protected Areas in Southeast Asia. 23-27 April 2007, Sabah, Malaysia.

Rao, M., A. Johnson, and N. Bynum, *undated*. Assessing Threats in Conservation Planning and Management. Wildlife Conservation Society.

Trek Thailand: www.trekthailand.net/myanmar/parks/khakaborazi/.

Lampi Marine National Park

Adventurous Expeditions in Myanmar: www.myanmars.net/myanmar.

Gold Backed Travel and Tours: www.goldbacked-lynn.com/ecotourism_hkakaborazi.html.

Golden Rock Travel and Tours: www.visitmyanmar.com/Pages/EcoTours.html.

Myanmar Travel Information: www.myanmartravelinformation.com/.

Oo, U.H.P. 2007. Country Report on Myanmar. Presented at the 2nd ASEAN Heritage Parks Conference and the 4th Regional Conference of Protected Areas in Southeast Asia. 23-27 April 2007, Sabah, Malaysia.

Rao, M., A. Johnson, and N. Bynum. *undated*. Assessing Threats in Conservation Planning and Management. Wildlife Conservation Society.

Trek Thailand: www.trekthailand.net/myanmar/parks/khakaborazi/.

Meinmahla Kyun Wildlife Sanctuary

Ministry of Hotels and Tourism: www.myanmar.gov.mm/.

Oo, U.H.P. 2007. Country Report on Myanmar. Presented at the 2nd ASEAN Heritage Parks Conference and the 4th Regional Conference of Protected Areas in Southeast Asia, 23-27 April 2007, Sabah, Malaysia.

Wildlife Conservation Society. Myanmar Reptile Survey. IN: www.wcs.org/globalconservation/Asia/.

www.myanmar.com/Ministry/ecotourism/eco13.htm.

www.trekthailand.net/myanmar/parks/meinmahla/.

PHILIPPINES

BirdLife International: www.birdlife.org/news/news/2004/08/.

Protected Areas and Wildlife Bureau, 2009. Country Report of the Philippines: Fourth National Report to the Convention on Biological Diversity.

Mt. Apo Natural Park

ASEAN Heritage Parks and Reserves. 1988. Published by the ASEAN Senior Officials on the Environment in collaboration with the Japan International Cooperation Agency and the United Nations Environment Programme.

CPPAP-PMU, 2002. Draft General Management Plan for Mt. Apo. North Ave. Diliman, Q.C.

DENR/PAL Foundation, *undated*. Our Natural Heritage: The Protected Areas of the Philippines. Published by the DENR/PAL Foundation.

Libosado Jr., C.M. 2000. 26 Days Around the Philippines.

Molinyawe, N.A. 2007. Status of Protected Areas: A Philippine Report. Presented at the 2nd ASEAN Heritage Parks Conference and the 4th Regional Conference of Protected Areas in Southeast Asia. 23-27 April 2007, Sabah, Malaysia.

Rivera, L.R. *undated*. Mt. Apo National Management Plan.

World Heritage Center: whc.unesco.org/en/tentativelists/5387/.

Mts. Iglit-Baco National Park

ASEAN Heritage Parks and Reserves, 1992. Produced by ASEAN Senior Officials on the Environment in collaboration with Japan International Cooperation Agency and United Nations Environment Programme.

Balcita, J., S. Bugna & J. Balogo. 2001. "Mts. Iglit-Baco National Park", IN: Suhay, a newsmagazine of the National Integrated Protected Areas Programme (NIPAP). DENR/PAWB and EU-funded project.

Mallari, N. A. D., B. R. Tabaranza and M.J. Crosby. 2001. Key Conservation Sites in the Philippines. A HARIBON Foundation and Birdlife International Directory of Important Bird Areas.

Molinyawe, N.A. 2007. Status of Protected Areas: A Philippine Report. Presented at the 2nd ASEAN Heritage Parks Conference and the 4th Regional Conference of Protected Areas in Southeast Asia. 23-27 April 2007, Sabah, Malaysia.

Mts. Iglit-Baco National Park Brochure. *undated*. Produced by the Protected Area Office of Mts. Iglit-Baco National Park.

Socio-Economic Profile. 1998. Municipality of Sablayan, Province of Occidental Mindoro.

Mt. Kitanglad Range Natural Park

ASEAN Biodiversity, 2003. Mt. Kitanglad Range Natural Park. pp.43-50.

Canoy, E. *et al.* "Mapping that matters". IN: PA Monitor special issue. February 2001.

CPPAP. 2001. A Brochure on the 10 Priority Sites of the Conservation of Priority Protected Areas Project (1994-2001).

Garrity, D. P., V. B. Amoroso, S. Koffa, D. Catacutan, G. Buenavista, P. Fay, and W. Dar. 2002. Landcare on the poverty-protection interface in an Asian watershed. *Conservation Ecology* 6(1): 12. IN: www.consecol.org/vol6/iss1/art12.

HARIBON Foundation, Inc.: <http://www.haribon.org.ph/>.

<http://clickmindanao.philcom.com/client/kin/aboutus/about.html>.

Information Hand Book, Mt. Kitanglad Range Natural Park.

NIPA: www.nipa.org.ph/.

Peria, E.V., Esq. Overview of the TRIPs Agreement and the Convention on Biological Diversity www.acts.or.ke/elpidio.doc.

Vanzi, S. J. 2000. *Tribes Move to Preserve Mt. Kitanglad*. Philippine Headline News Online. IN: www.newsflash.org/2000/06/tl/tl001165.htm.

www.inq7.net/inf/2001/jun/22/inf_7-1.htm.

www.psdn.org.ph/nbsap/mknp.

www.mindanews.com/2002/10/3rd/arn15bukid.html.

SINGAPORE

National Parks Board. 2006. Singapore: Third National Report to the Convention on Biological Diversity.

National Parks Singapore: www.nparks.gov.sg/cms/.

Sungei Buloh Wetland Reserve

Country Report of Singapore. 2007. Presented at the 2nd ASEAN Heritage Parks Conference and the 4th Regional Conference of Protected Areas in Southeast Asia. 23-27 April 2007, Sabah, Malaysia.

Kwek, Y.C., H.T.W. Tan & R.T. Corlett, 2009. A checklist of the total vascular plant flora of Singapore: Native, naturalised and cultivated species. Singapore, Raffles Museum of Biodiversity Research. Website: http://rmbnr.nus.edu.sg/raffles_museum/pub/flora_of_singapore_tc.pdf.

National Parks Board, 2003. Sungei Buloh Wetland Reserve - A Decade of Wetland Conservation, National Parks Board. 98pp.

National Parks Board, 2007. A Guide to Sungei Buloh Wetland Reserve, National Parks Board. 52pp.

Sungei Buloh Wetland Reserve: www.sbwr.org.sg.

Uniquely Singapore: www.visitsingapore.com/publish/stbportal/en/home/.

THAILAND

Office of Natural Resources and Environment Policy and Planning Thailand, *undated*. Third National Report to the Convention on Biological Diversity.

Suksawang, S. 2007. The Status of Protected Areas and AHPs in Thailand. Presented at the 2nd ASEAN Heritage Parks Conference and the 4th Regional Conference of Protected Areas in Southeast Asia. 23-27 April 2007, Sabah, Malaysia.

Thailand Country Report. 2007. Presented at the 2nd ASEAN Heritage Parks Conference and the 4th Regional Conference of Protected Areas in Southeast Asia. 23-27 April 2007, Sabah, Malaysia.

Ao Phang-Nga—Mu Ko Surin—Mu Ko Similan National Park

Comley, J., S. O'Farrell, S. Hamylton, C. Ingwersen and R. Walker, 2005. The Coral Reef Resources of Mu Ko Surin National Park, Thailand. Coral Cay Conservation. IN: www.coralcay.org/science/publications/thailand_2005_resources.pdf.

Department of National Parks, Wildlife and Plant Conservation (DNP). 2007. Country Report of Thailand. Presented at the 2nd ASEAN Heritage Parks Conference and the 4th Regional Conference of Protected Areas in Southeast Asia. 23-27 April 2007, Sabah, Malaysia.

MacKinnon, J.R and G.B. Villamor. 2004. ASEAN's Greatest Parks: The ASEAN Heritage Parks Programme. M.T. Uriarte and E.M. Lopez, (Eds). ASEAN Regional Centre for Biodiversity Conservation, Los Banos, Philippines.

National Park, Wildlife and Plant Conservation Department of Thailand: www.dnp.go.th

Royal Thai Government website: www.thaigov.go.th.

Suksawang, S. 2007. The Status of Protected Areas and AHPs in Thailand. Presented at the 2nd ASEAN Heritage Parks Conference and the 4th Regional Conference of Protected Areas in Southeast Asia. 23-27 April 2007, Sabah, Malaysia.

www.talaythai.com.

www.thaibirding.com.

Kaeng Krachan Forest Complex

Department of National Parks, Wildlife and Plant Conservation (DNP). 2007. Country Report of Thailand. Presented at the 2nd ASEAN Heritage Parks Conference and the 4th Regional Conference of Protected Areas in Southeast Asia. 23-27 April 2007, Sabah, Malaysia.

National Parks, Wildlife and Plant Conservation Department: www.dnp.go.th/.

Parr, J.W.K., S. Jitvijak, S. Saranet and S. Buathong, *undated*. 'Exploratory co-management interventions in Kuiburi National Park, Central Thailand, including human-elephant conflict mitigation', Int. J. Environment and Sustainable Development.

Suksawang, S. 2007. The Status of Protected Areas and AHPs in Thailand. Presented at the 2nd ASEAN Heritage Parks Conference and the 4th Regional Conference of Protected Areas in Southeast Asia. 23-27 April 2007, Sabah, Malaysia. thaibirding.com: www.thaibirding.com/.

ThaiForest Booking: www.thaiforestbooking.com/np_home.asp?lg=2&npid=113.

Thailand.com: Gateway to Southeast Asia: www.thailand.com/travel/natural/.

Tourism Authority of Thailand: www.tatnews.org/emagazine/3111.asp.

Trek Thailand: www.trekthailand.net/central3/index.html.

World Conservation Society: www.wcs.org/media/file/Thai_Eles.pdf.

World Wildlife Adventures: www.world-wildlife-adventures.com/thailand/.

Khao Yai National Park

ASEAN Heritage Parks and Reserves. 1988. Published by the ASEAN Senior Officials on the Environment, Japan International Cooperation Agency and United Nations Environment Programme.

Department of National Parks, Wildlife and Plant Conservation (DNP). 2007. Country Report of Thailand. Presented at the 2nd ASEAN Heritage Parks Conference and the 4th Regional Conference of Protected Areas in Southeast Asia. 23-27 April 2007, Sabah, Malaysia.

Gray, Dennis, Collin Piprell, Mark Graham, 1994. Khao Yai National Park. *IN: National Parks of Thailand, 1994 Revised Edition, 250pp.*

Natural Resources and Environmental Management Division, *undated*. Office of Environmental Policy and Planning, Bangkok 10400, Thailand.

Suksawang, Songtam. 2007. The Status of Protected Areas and AHPs in Thailand. Presented at the 2nd ASEAN Heritage Parks Conference and the 4th Regional Conference of Protected Areas in Southeast Asia. 23-27 April 2007, Sabah, Malaysia.

Tarutao National Park

ASEAN Heritage Parks and Reserves. 1988. Published by the ASEAN Senior Officials on the Environment, Japan International Cooperation Agency and United Nations Environment Programme.

Department of National Parks, Wildlife and Plant Conservation. 2007. Country Report of Thailand. Presented at the 2nd ASEAN Heritage Parks Conference and the 4th Regional Conference of Protected Areas in Southeast Asia. 23-27 April 2007, Sabah, Malaysia.

Gray, D., C. Piprell, M. Graham. 1994. Khao Yai National Park. *IN: National Parks of Thailand, 1994 Revised Edition, 250pp.*

Natural Resources and Environmental Management Division, *undated*. Office of Environmental Policy and Planning, Bangkok, Thailand.

Suksawang, S. 2007. The Status of Protected Areas and AHPs in Thailand. Presentation at the 2nd ASEAN Heritage Parks Conference and the 4th Regional Conference of Protected Areas in Southeast Asia. 23-27 April 2007, Sabah, Malaysia.

VIET NAM

Cuong, T.C.. 2007. Country Report of Viet Nam. Presented at the 2nd ASEAN Heritage Parks Conference and the 4th Regional Conference of Protected Areas in Southeast Asia. 23-27 April 2007, Sabah, Malaysia.

Government of the Socialist Republic of Viet Nam website: www.vietnam.gov.vn.

MARD 2006. Report on reviewing special use forest planning. *IN: www.nea.gov.vn/*.

Ministry of Culture, Thailand: <http://webhost.m-culture.go.th/culture01/en/>.

Ministry of Natural Resources and Environment and Viet Nam Environment Protection Agency, *undated*. Socialist Republic of Viet Nam: Third National Report to the Convention on Biological Diversity.

Socialist Republic of Viet Nam Government Web Portal: www.chinhphu.vn or www.vietnam.gov.vn.

Ba Be National Park

Ba Be National Park: www.babenationalpark.org.

MacKinnon, J.R and G.B. Villamor. 2004. ASEAN's Greatest Parks: The ASEAN Heritage Parks Programme. M.T. Uriarte and E.M. Lopez, (Eds). ASEAN Regional Centre for Biodiversity Conservation, Los Banos, Philippines.

Chu Mom Ray National Park

Asia King Travel: www.asiakingtravel.com.

Birdlife International. 2004. Sourcebook of Existing and Proposed Protected Areas in Viet Nam. 2nd edition.

Indochina Travel Service: www.indochinatravelservice.com.

World Wildlife Fund: www.wwf.org.uk.

Hoang Lien Sa Pa National Park

BirdLife Indochina: www.birdlifeindochina.org/birdlife/birdwatch/sapa.html.

BirdLife International. 2004. Sourcebook of Existing and Proposed Protected Areas in Viet Nam, Second Edition.

ICEM, 2003. Vietnam National Report on Protected Areas and Development. Review of Protected Areas and Development in the Lower Mekong River Region, Indooroopilly, Queensland, Australia. 60 pp.

MacKinnon, J.R and G.B. Villamor. 2004. ASEAN's Greatest Parks: The ASEAN Heritage Parks Programme. M.T. Uriarte and E.M. Lopez, (Eds). ASEAN Regional Centre for Biodiversity Conservation, Los Banos, Philippines.

Oostveen, T., N.M. Thu and N.V. Lam. *undated*. Community Based Tourism Development in Sapa/Viet Nam. SNV/IUCN Support to Sustainable Tourism Project.

VietNamNet Bridge. 29 January 2008: www.english.vietnamnet.vn/.

Viet Nam News, 2002. *Village minorities*. 29 July 2002. IN: www.vietnamnews.vnagency.com.vn/.

Kon Ka Kinh National Park

Asian Legal Information Institute: www.asianlii.org/vn/legis/laws/.

Le Trong Trai, L.V. Cham, T.Q. Ngoc, T.H. Minh, N.V. Sang, A.L. Monastyrskii, B.B. Hayes and J.C. Eames, 2000. An Investment Plan for Kon Ka Kinh Nature Reserve, Gia Lai Province, Vietnam: A Contribution to the Management Plan. BirdLife International Vietnam Programme, Hanoi, Vietnam.

Long, H.T. Distribution, population and conservation status of the grey-shanked douc (*Pygathrix cinerea*) in Gia Lai Province, Central Highlands of Viet Nam. Endangered Primate Rescue Center, Cuc Phuong National Park. IN: www.primare-sg.org/PDF/VJP1.1.cinerea.status.pdf.

Viet Nam News Agency: english.vietnamnet.vn/tech/2006/08/600117/.

Viet Nam News Service: www.vietnamnews.vnagency.com.vn/showarticle.

Vietnampathfinder Travel: www.vietnampathfinder.com/.

World Wildlife Adventures: www.world-wildlife-adventures.com/vietnam/.



Conserve Biodiversity, Save Humanity!

The ASEAN region hosts 20 percent of all known species that live deep in the region's mountains, jungles, rivers, lakes and seas. The region includes three mega-diverse states (Indonesia, Malaysia, and the Philippines); several bio-geographical units (e.g., Malesia, Wallacea, Sundaland, Indo-Burma and the Central Indo-Pacific); and numerous centers of concentration of restricted-range bird, plant and insect species. ASEAN has one-third, translating to 284,000 square kilometers, of all coral reefs, which are among the most diverse in the world. Common land and water borders have allowed the ASEAN states to share many species that are biologically diverse from the rest of the world. All these make the ASEAN region significant to global diversity. More importantly, all these are very crucial for the survival of humanity.

As an intergovernmental regional organization, the ASEAN Centre for Biodiversity (ACB) facilitates cooperation and coordination among the members states of ASEAN, and with relevant national governments, regional and international organizations, on the conservation and sustainable use of biological diversity, guided by fair and equitable sharing of benefits arising from the use of such biodiversity in the ASEAN region. ACB aims to contribute to the reduction of the current rate of loss of biological diversity by enhancing regional cooperation, capacitating stakeholders, promoting awareness for biodiversity conservation, and maintaining the regional biodiversity database. To help achieve socially responsible access, equitable sharing, use and conservation of natural ecosystems and the biodiversity these contain, ACB builds strategic networks and partnerships geared to mobilize resources towards optimally augmenting effective programs on biodiversity conservation.

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