



# Myanmar Protected Areas

Context, Current Status and Challenges



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In memory of U Uga

We, at the European Union, have been fully committed to environmental protection and conservation. Our engagement principles are embedded in *the European Union Consensus on Development* published in 2005 that outlines our support for biodiversity conservation, water and energy supply as well as the fight against climate change.

Environmental protection underpins sustainable development, the more so in a country as Burma/Myanmar where large parts of the population rely on natural resources for their food, shelter and energy needs. The world's poorest are those directly dependent on natural resources for their daily survival and therefore most vulnerable to environmental hazards. This is why the European Union has made the protection and sustainable management of natural resources a priority in its poverty reduction policies.

In Burma/Myanmar, a key instrument for cooperation has been the Non State Actors (NSA) Programme. The overall objective of the NSA programme is to support the emergence of civil society organizations and enable them to fight poverty across a range of sectors such as education, health and livelihoods. The project "Strengthening environmental NGOs in Burma/Myanmar" implemented jointly by Istituto Oikos and BANCA was the first environment initiative funded by the European Union under this programme. Sound environmental conservation is only effective if based on accurate data and analysis on the state of the environment. This project was a wonderful opportunity to build the knowledge base on biodiversity resources while, at the same time, building capacity for better data collection and analysis. In 2009-2010, the project brokered information exchange among 24 local environmental organisations, and the collection of data in line with internationally approved standards on the natural resources, management, land use, tourism and research in 30 protected areas.

Ultimately, BANCA and other local organisations will be better equipped with tools and methodologies to assess biodiversity resources. In addition, we will have a comprehensive database on the state of biodiversity and protected areas across the country. This will allow biodiversity resources to be better understood and we hope it will lead other actors to invest more and better in biodiversity protection and resources conservation.

Burma/Myanmar has a unique environment and we must all join forces to ensure that natural resources are sustainably exploited.

**David Lipman**

Ambassador

Head of Delegation of the European Union to Thailand, Cambodia, Laos and Myanmar

Istituto Oikos believes that biodiversity conservation and equitable natural resources management are crucial to ensure the livelihood of local people, where land degradation and poverty are strictly connected. The approach is based on the following assumption: a well conserved environment is the only guarantee for socio-economic development, poverty alleviation, food security, health and well-being for current and future generations. That is why the core of all Istituto Oikos' projects, whether they be technical-scientific assistance, environmental evaluations programs, fauna monitoring or support for youth or women's cooperatives, is the relationship between man and nature. Many actions focus on protected areas and on natural areas risking deterioration due to irrational and unplanned use of natural resources. Moreover, the projects never leave aside the awareness-raising factor, so that those involved can understand and share Istituto Oikos' objectives, as well as the training of local personnel to ensure the sustainability of work. After 15 years of field activities and more than 150 projects implemented, in Italy and abroad, on biodiversity conservation and sustainable development, Istituto Oikos has gained a wealth of experience in the definition and implementation of methodologies and strategies aimed at integrating the environmental dimension into the socio-economic processes. To reach concrete and sustainable results, as well as to ensure the highest standards of quality in its activities, Istituto Oikos has established firm collaboration with local and national governments, universities, research institutes, conservation, development organisations and business companies, both in Italy and worldwide. Istituto Oikos has been operating in Myanmar since 2006 in order to improve the conservation of natural resources and the capacity building of local NGOs as a tool of sustainable development. Myanmar is a country where natural resources are still well conserved, biodiversity is high and forests cover almost half of the territory. The protected areas of Myanmar conserve spectacular natural, cultural and spiritual values and provide communities with opportunities for recreation and education. As natural areas are progressively being destroyed under different types of human pressure, it becomes increasingly urgent to maintain and improve the condition and management of protected areas. The PA system of Myanmar is essential to continue providing environmental services at community and national level, to prevent climate change and the loss of biodiversity. The protection of cultural values is another important role of the PA system that contributes to spiritual life and Myanmar's historical traditions. Understanding the values within the PA system and evaluating the outcome of management is essential to being able to adapt and improve management practices. In the period 2009-2010, Istituto Oikos and BANCA, with the support of the European Union, the Lombardy Region and Stiftung Dritzens Millenium, have managed the project "Strengthening environmental NGOs in Burma/Myanmar" aimed at improving the capacity of local NGOs to engage in biodiversity conservation and sustainable development programs and coordinate sustainable environmental development investments and activities. The publication "Myanmar Protected Areas: Context, Current Status and Challenges", one of the outputs of the project, presents information on the status of the protected areas in Myanmar. We hope it will help to promote cost-effective initiatives and innovative approaches, to provide technical inputs for policy review processes and to mobilise international awareness and financial support to conserve the unique heritage of Myanmar's protected areas.

**Rossella Rossi**  
President  
Istituto Oikos

Among South-East Asian countries there is no doubt that Myanmar is the most biologically diverse country on the mainland. It possess a long coastal line of 2,000 kilometers, over 800 islands, mangroves, high mountains of the Eastern Himalayas in the north, a dry zone in the center, Sundaic forest in the south and many types of habitats and ecosystems. There are only few types of habitats left on earth that cannot be found in Myanmar. It still has a high percentage of natural forest cover which is home to a rich diversity of flora and fauna. It is also one of the least explored countries in the world. There have been expressions like "after walking two days we found nothing but primeval forest", "we barely see a person coming along during our exploration" and "there is one new bird found in every step we took" from nature lovers and bird watchers who have visited Myanmar. The Leaf deer *Muntiacus putaoensis* and the Myanmar Snub-nosed Monkey *Rhinopithecus strykeri* are some of the new discoveries within recent years in the Northern part of Myanmar. Other species of reptiles and amphibians new to science have also been reported. The Ministry of Forestry has been trying to protect representative type of forests and up till now has gazetted, nominated and proposed 43 protected areas which cover 7.3 % of total land. But as a developing nation, Myanmar has financial as well as environmental issues. Unfortunately conserving biodiversity and environment is not the top priority of the government. Out of 43 protected area systems only a few have been properly gazetted and have a management system in place. Some are nominated and some are only in a proposal stage. Very few of the gazetted protected areas have full management resources and staff. Even big national parks are short of resources. For them top priorities like regular biodiversity surveys and patrolling are beyond their capacity. As a result very few parks have a comprehensive checklist of flora and fauna. Lampi Island Marine National Park falls in the category that does not have a proper management system and a checklist of flora and fauna that exist in the park. We BANCA and Oikos do sincerely feel honored to conduct this much needed survey which we hope will help the forest department to form a proper management system and serve as a baseline for further evaluation and monitoring of this park. Moreover, we also hope that this publication will serve as a good reference for all existing parks of Myanmar. During recent years people have changed. Their new lifestyle has become more advanced and sophisticated. New changes need new solutions. Population has also increased dramatically and consequently more space becomes essential for their livelihoods and sustainability. The more space they need the more destruction was made to nature and the environment. The lifestyle of people and the changes in the environment have become more interconnected. Issues have become too big and complicated to be handled by a single department or organization alone. Therefore people in the conservation field also have to change. All stakeholders including governments, private and public sectors have to work together to have successful conservation programs. BANCA and Istituto Oikos as stakeholders look forward to assist Myanmar within our capacity especially in the field of biodiversity for successful conservations programs. BANCA appreciates the support of international organizations and the European Union to meet the conservation challenge.

**Dr Htin Hla**  
Chairman  
BANCA

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Chapter 2 “Protected Areas” is co-authored by Lara Beffasti, Valeria Galanti and Tint Tun (Project Manager, BANCA). The maps were produced by Simone Bianchi (GIS expert, Istituto Oikos), Mi Mi Choe (GIS expert, Forest Department) and Thein Ko (GIS expert, BANCA) thanks to data provided by Forest Department and Wildlife Conservation Society, and data collected in the field. Photographs are by project staff in Myanmar during project period 2009-2010.

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## Acronyms used in the text

ASEAN	Association of South East Asian Nations
BANCA	Biodiversity And Nature Conservation Association
BLI	BirdLife International
CAS	California Academy of Science
CBD	Convention on Biological Diversity
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
DOF	Department of Fisheries
EIA	Environmental Impact Assessment
EBA	Endemic Bird Area
ENGO	Environmental Non-governmental Organisation
FAO	Food and Agricultural Organization
FD	Forest Department
FRA	Forest Resource Assessment
GEF	Global Environment Facility
IBA	Important Bird Area
IUCN	International Union for Conservation of Nature
KBA	Key Biodiversity Area
MFA	Ministry of Foreign Affairs
MOF	Ministry Of Forestry
MPA	Marine Protected Area
MoU	Memorandum of Understanding
NCEA	National Commission for Environmental Affairs
NFMP	National Forest Master Plan
NGO	Non-governmental Organization
NSDS	National Sustainable Development Strategy
NWCD	Nature and Wildlife Conservation Division
PA	Protected Area
PFE	Permanent Forest Estate
SEAFDEC	Southeast Asian Fisheries Development Center
SI	Smithsonian Institution
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
WCPA	World Commission on Protected Areas
WCS	Wildlife Conservation Society
WR	Wildlife Reserve
WS	Wildlife Sanctuary

## Introduction

Protected areas (PAs) are important tools for biodiversity conservation and sustainable development. PAs safeguard ecosystems and their services, such as water provision, food production, carbon sequestration and climate regulation, thus improving people's livelihoods. They preserve the integrity of spiritual and cultural values placed by indigenous people on wild areas and offer opportunities of inspiration, study and recreation. Due to a long period of isolation, Myanmar has conserved an extraordinary natural and cultural heritage that is in part represented in its protected area system. The expansion of agriculture and industry, pollution, population growth, along with uncontrolled use and extraction of resources, are causing severe environmental and ecosystem degradation. Loss of biodiversity is the most pressing environmental problem because species extinction is irreversible. Realising the urgency of Myanmar environmental challenges, several stakeholders, at national, international and regional level, have committed to support conservation and management of PAs. However, baseline information on natural resources, threats, management, staff, infrastructure, land use, tourism and research in Myanmar PAs was hardly ever updated and not systematically organised, thus limiting the subsequent planning and management of resources. Therefore, the aim of this publication is twofold: to raise awareness on the condition of the conservation of PAs and to mobilise national and international support for cost-effective initiatives, innovative approaches and targeted research in priority sites. The document provides background information on Myanmar natural features, environmental, government and non-government frameworks (Chapter 1). The core section makes available the information retrieved in the period 2009-2010 on the status of Myanmar PAs (Chapter 2) and the results of the research conducted in Lampi Island Marine National Park (Chapter 3) and Rakhine Yoma Elephant Range Wildlife Reserve (Chapter 4). Data collection, analysis and organisation were part of the larger Myanmar Environmental Project (MEP) managed by Istituto Oikos in partnership with BANCA. Conclusion and recommendations for the management of Myanmar PAs (Chapter 5) were jointly formulated by stakeholders during the MEP closing workshop held on March 17th 2011 in Yangon. The information presented in this publication is also organised in a database available to stakeholders that will be updated with new data provided by PA managers, academic institutions, environmental organisations and community-based groups working in Myanmar PAs to fill the existing gaps.

## Executive summary

This publication presents the information collected on Myanmar protected areas (PAs), with the objective of mobilising national and international support for cost-effective initiatives, innovative approaches and targeted research implemented by non-State actors in collaboration with authorities and communities in sites needing priority conservation actions. Myanmar presents a great variety of habitats and ecosystems, from snow-capped mountains to coral reefs, supporting a rich biodiversity. Demographic and socio-economic pressures have been identified as the main causes of environmental degradation and biodiversity loss. The environmental protection framework set up by Myanmar during the 1990s shows legal and institutional constraints. Environmental laws are very sector-specific and institutions lack capacity and resources for their implementation. Nonetheless, progress has been made towards the integration of environmental issues in the national development process and stakeholders consultation mechanisms have increased coordination in planning. A small but growing number of Myanmar environmental NGOs has emerged and is playing an important role to facilitate environmental education, research work and co-management of resources at local level.

In Myanmar there are currently 43 officially-recognised PAs but so far the information on their status has been poor, scattered and not updated. A comprehensive datasheet was prepared to organize in a systematic way the information collected on natural resources, management, staff and infrastructure, tourism, land use and human activities and research, following internationally approved criteria and standards. Existing information was first retrieved from authorities, organisations and academic institutions; then it was verified and integrated through field visits and meetings with stakeholders for 30 PAs while maps were produced for all 43 PAs. All information is organised in a database available to stakeholders. Myanmar PA system currently covers 7.3 % of the country. Despite the long coastline there are only 4 marine protected areas and there is little capacity to conserve and manage marine resources. The number and size of PAs have increased over the years but also some terrestrial habitat types are still underrepresented, in particular beach and dune, mangrove and swamp forests. Human encroachment in PAs is common and requires intervention to limit it, however in most cases the conservation status is considered to be within an acceptable range of variation. Only half of the PAs have partial biodiversity inventories and an operational or management plan including actions that are regularly implemented despite inadequate human, technical and financial resources. Seventeen PAs are only paper parks. Religious tourism and ecotourism exist in many PAs but most lack the resources and skills to invest in effective tourism management and consequently forego the opportunity to generate revenues from it. Scientific research has been conducted in 28 PAs by national and international organisations and universities without a coordinated research programme.

Two PAs were selected for in-depth studies: Lampi Island Marine National Park and Rakhine Yoma Elephant Range Wildlife Reserve. Lampi Island Marine National Park (MNP) is the only MNP in Myanmar and the only protected area of the Myeik archipelago. Very little information was available on this area and it had not been updated since 1995. Collecting data on this area was considered very important to raise the awareness of Myanmar and international stakeholders on the importance of conserving the archipelago and involving the local heterogeneous population composed by indigenous minorities and migrants from different areas of Myanmar in participatory resources management. The rapid



L.Beffasti

assessment survey conducted in January 2009 confirmed the great value of the archipelago in terms of biological and cultural attributes, threatened by the uncontrolled and rapid increase of human settlements and activities. Field surveys identified 195 species of plants of the evergreen forest, 63 mangroves and associates, 19 mammals, 228 birds, 19 reptiles, 10 amphibians. Among the marine resources, 333 plankton species, 73 seaweeds, 11 seagrass, 50 gastropods, 42 crabs, 41 bivalves, 35 sea cucumbers and 42 fish species. 29 species are new records for Myanmar (1 phytoplankton, 7 zooplanktons,

2 seagrasses, 1 mangrove tree, 7 fishes, 3 amphibians, 8 birds). Furthermore, the issues of the Salone (or Moken) people were collected, as well as those of other human settlements in the area. As population grows inside and outside the park, the natural resources are increasingly threatened by unsustainable use. Consultations among authorities, organisations and communities were initiated to launch the participatory development of a management plan for the MNP to ensure the incorporation of the needs and aspirations of local communities along with conservations goals. The Rakhine Yoma Elephant Range Wildlife Reserve encompasses a great variety of habitats supporting high biodiversity and many endemic and endangered species, but it is one of the most encroached PAs. Local communities are dependent on natural resources for their livelihoods and are often damaging the environment and using its resources without due regard to sustainability. A GIS database was set up to propose a preliminary classification of vegetation types, which was then verified through a ground-truthing campaign. Ten vegetation classes were identified and land cover maps produced. The vegetation change between 1974 and 2003 was analysed showing the conversion of natural forests to agricultural areas and vice-versa. The main finding is the invasion of *Melocanna bambusoides* in the area, probably subsequent to forest fires and shifting cultivation practices; creation of a buffer zone and implementation of environmental education and sustainable development activities are crucial to prevent the degradation of the last patches of forest. New data and maps on vegetation change and land use can thus support sustainable development plans and activities, and raise awareness on the current threats to this ecosystem.

According to project findings, Myanmar PA system should be reviewed giving emphasis to the management objective and strategically expanded to address gaps in coverage of globally threatened species, underrepresented mangrove and marine habitats, Key Biodiversity Areas and wildlife corridors. It is crucial to improve coordination between Forest Department (FD) and other departments and it is also advisable to pilot joint governance initiatives at local level in collaboration with NGOs and communities. While public awareness needs to be raised, from top to grass root level, on the role and benefits of protected areas in order to achieve comprehensive stakeholder participation in conservation, FD staff, especially young generations, should receive intensive training in ecology and management. This would enable the preparation of a management plan and a biodiversity inventory for every PA to be organised in a central database to facilitate coordination and information sharing at national and international level, also to develop coordinated research programmes. The human impacts of PAs should be measured in order to identify and implement innovative poverty reduction strategies that can contribute to meet the conservation and development goals. To ensure the allocation of adequate resources, sustainable financing mechanisms should be identified, including grants and donations and local business development.

# Executive summary (Myanmar language)

## အလုပ်အမှုဆောင်အကျဉ်း

ယခုအစီရင်ခံစာသည်မြန်မာနိုင်ငံ၏ သဘာဝနယ်မြေများနှင့်စပ်လျဉ်းသည့် အချက်အလက်များအား တင်ပြထားခြင်းဖြစ်ကာ၊ ဦးစားပေး ထိန်းသိမ်းစောင့်ရှောက်ရေးလုပ်ငန်းများ လိုအပ်နေသည့်ဒေသများတွင် ဒေသခံများ၊ သက်ဆိုင်ရာအာဏာပိုင်များနှင့် အတူပူးပေါင်း၍ အစိုးရမဟုတ်သောသူများ၏ ကုန်ကျစရိတ်နှုန်းပါးကာ ဆန်းသစ်သော နည်းပညာများဖြင့် တိကျသောသုတေသနလုပ်ငန်းများအား ဆောင်ရွက်နိုင်စေရန်အတွက် ပြည်တွင်းပြည်ပမှ အထောက်အပံ့များရရှိရန် ရည်ရွယ်ထားသည်။ မြန်မာနိုင်ငံသည် မြောက်ပိုင်း၊ ဆီးရီးများလွှမ်းမိုးနေသော တောင်တန်းများမှစ၍ တောင်ပိုင်းသန္တာကျောက်တန်းများအဆုံး စီမံခန့်ခွဲမှုကြွယ်ဝမှုကို အထောက်အကူ ပြုလုပ်ပေးရမည်။ အမျိုးအစားစုံလင်လှသော နေထိုင်ကျက်စားရာဒေသများနှင့် ဂေဟစနစ်များစွာရှိနေပါသည်။ လူဦးရေနှင့် လူမှုစီးပွားရေးဆိုင်ရာစီးအားများကို သဘာဝပတ်ဝန်းကျင်ယိုယွင်းလျက်စီးမှုများနှင့် စီမံခန့်ခွဲမှုများ ဆုံးရှုံးမှုများ၏ အဓိကကြောင်းအရင်းများအဖြစ် သတ်မှတ်ထားကြသည်။ ၁၉၉၀ပြည့်နှစ်များအတောအတွင်း မြန်မာနိုင်ငံ၏ သဘာဝပတ်ဝန်းကျင်ထိန်းသိမ်းရေး ကန့်သတ်မှုဆောင်သည့် ဥပဒေရေးရာနှင့် အဖွဲ့အစည်းဆိုင်ရာ အကန့်အသတ်ဖြစ်စေခဲ့သည်။ ဘာဝပတ်ဝန်းကျင်ဆိုင်ရာဥပဒေများသည် ကဏ္ဍအလိုက် အလွန်ပင်တိကျပြတ်သားပြီး ၎င်းတို့ကိုအကောင်အထည်ဖော်ဆောင်ရွက်ရန်အတွက်၊ အဖွဲ့အစည်းများမှာ စွမ်းဆောင်ရည်နှင့် အရင်းအမြစ်များ ကင်းမဲ့နေသည်။ မည်သို့ပင်ဆိုစေကာမူ ပတ်ဝန်းကျင်ဆိုင်ရာပြဿနာများကို အမျိုးသားဖွံ့ဖြိုးတိုးတက်ရေးလုပ်ငန်းများနှင့် တစ်သားတည်းကျစေရန် ဦးတည်လာသည့် တိုးတက်မှုများဆောင်ရွက်နိုင်ခဲ့ပြီး အကျိုးကျေးဇူးတင်ဆောင်ရွက်မှု ယန္တရားသည်လည်း စီမံကိန်းအစီအစဉ်များအမှတ်ရေဆွဲရာတွင် ပူးပေါင်းဆောင်ရွက်မှုအား တိုးတက်စေခဲ့သည်။ သေးငယ်သော်လည်း အရေးအတွက်များလားနေသော သဘာဝပတ်ဝန်းကျင်ဆိုင်ရာ အစိုးရမဟုတ်သော မြန်မာအဖွဲ့အစည်းများလည်း ပေါ်ထွက်ကာ ၎င်းတို့သည် ဒေသအဆင့်ရှိ ပတ်ဝန်းကျင်ရေးရာပညာပေးလုပ်ငန်း၊ သုတေသနလုပ်ငန်းနှင့် အရင်းအမြစ်ပူးတွဲစီမံရေးရာများတွင် အရေးပါသည့်ကဏ္ဍမှ ပါဝင်ဆောင်ရွက်လျက်ရှိနေသည်။ မြန်မာနိုင်ငံတွင် ယခုအချိန်အထိ အစိုးရတရားဝင်အသိအမှတ်ပြုထိန်းသိမ်းထားသော သဘာဝနယ်မြေ(၄၃)ခု ရှိသော်လည်း ၎င်းတို့နှင့်ပတ်သက်သည့် သတင်းအချက်အလက်များမှာမူ ကျိုးတိုကျွတ်မပြည့်မဖြစ်နေကာ အချိန်နှင့်တစ်ပြေးညီ မှတ်တမ်းတင်ထားခြင်းမရှိသေးပေ။ သဘာဝနယ်မြေများ၏ သဘာဝသယံဇာတများ၊ စီမံခန့်ခွဲမှု၊ အခြေခံအဆောက်အအုံနှင့်လမ်းဆင်းအား၊ ခရီးသွားလာခြင်း၊ မြေအသုံးချမှုနှင့်လူသားများ၏လုပ်ဆောင်ချက်များ၊ သုတေသနတို့နှင့်ပတ်သက်သော အခြေခံသတင်းအချက်အလက်များကို၊ နိုင်ငံတကာဆံသတ်မှတ်ချက်များအတိုင်း နေစံတကျ ကောက်ယူဖြန့်ဖြူးရန်အတွက်၊ ပြည်ပသို့ ကွန်ပျူတာသုံး သတင်းအချက်အလက်စာရင်းစာဖတ်စနစ်များ စီစဉ်ခဲ့သည်။ လက်ရှိသတင်းအချက်အလက်များကို ပထမဦးဆုံးအနေဖြင့် သက်ဆိုင်ရာအာဏာပိုင်များ၊ အဖွဲ့အစည်းများနှင့် တက္ကသိုလ်များမှ ရယူဆောင်ရွက်ခဲ့သည်။ ထို့နောက် သဘာဝနယ်မြေ(၄၃)ခုစလုံး၏ မြေပုံများကို ရေးဆွဲရေးရာ၊ သဘာဝနယ်မြေ(၃၀)သို့ သွားရောက်လေ့လာတွေ့ဆုံဆွေးနွေးမှုများဖြင့် ကွင်းဆင်းလေ့လာစုစည်း အတည်ပြုခြင်းများ ပြုလုပ်ခဲ့ကြသည်။ သတင်းအချက်အလက်များအားလုံးအား အကျိုးတူဆောင်ရွက်သူများအားလုံး အသုံးပြုနိုင်သည့် ကွန်ပျူတာသုံးသတင်းအချက်အလက် စာရင်းစာဖတ်စနစ်အဖြစ် စုစည်းပြုစုထားသည်။

မြန်မာနိုင်ငံ၏ သဘာဝနယ်မြေသည် လက်ရှိအချိန်တွင် နိုင်ငံတစ်ခုလုံး၏ ၇.၃ ရာခိုင်နှုန်းရှိသည်။ ရှည်လျားသောကမ်းရိုးတန်းရှိသော်လည်း၊ အဏ္ဏဝါဥယျာဉ်(၄)ခုသာရှိပြီး အဏ္ဏဝါသယံဇာတများကို ထိန်းသိမ်း စောင့်ရှောက်ရန်နှင့် စီမံခန့်ခွဲရန်အတွက် ဆောင်ရွက်နိုင်စွမ်း အနည်းငယ်သာရှိသည်။ သဘာဝနယ်မြေများသည် နှစ်ကာလပြာသည့်နှင့်အမျှ အရေးအတွက်နှင့်အလွယ်အစား တိုးလာသော်လည်း အချို့သော ကုန်သွင်း နေထိုင်ကျက်စားရာဒေသများ (အထူးသဖြင့်ကမ်းခြေနှင့်သဲသောင်တော၊ ဒီရေတောနှင့် ရေပင်သစ်တောများ) ပါဝင်မှု နည်းပါးနေသေးသည်။ သဘာဝထိန်းသိမ်းရေးဒေသများအတွင်း လူများချဉ်းနင်းဝင်ရောက်နေထိုင်မှုသည် ဖြစ်ရုံဖြစ်စဉ်တစ်ခုဖြစ်ကာ ကန့်သတ်မှုများပြုလုပ်သွားရန် လိုအပ်သည်။ သို့ရာတွင် ကိစ္စတော်တော်များများ၌ ထိန်းသိမ်းရေးအနေအထားသည် လက်ခံနိုင်မှုရှိသော အဆင့်အားလုံးအလွန်အမင်းအထက်တွင်သာရှိသည်ဟု ယူဆရသည်။ ထိန်းသိမ်းထားသောသဘာဝနယ်မြေများ၏ တစ်ဝက်တွင်သာ စီမံခန့်ခွဲမှုကြွယ်ဝမှု တစ်စိတ်တစ်ပိုင်းစီမံကိန်းကောက်ယူမှု ရှိကာ လူအင်အားနည်းပညာနှင့်ဘဏ္ဍာရေးပြည့်စုံလုံလောက်မှု မရှိသော်လည်း ပုံမှန်ဆောင်ရွက်လျက်ရှိသော လုပ်ငန်းလည်ပတ်မှု သို့မဟုတ် စီမံခန့်ခွဲမှုများရှိသည်။ သဘာဝနယ်မြေ(၁၇)ခုသည် အရေးယူ ဆောင်ရွက်မှုမရှိသော စာရွက်ပေါ်တွင်သာသတ်မှတ်ထားသည့် နယ်မြေများဖြစ်နေကြသည်။ ဘာသာရေးဆိုင်ရာခရီးသွားလာရေးနှင့် သဘာဝအခြေခံခရီးသွားလာရေးတို့သည် သဘာဝနယ်မြေများစွာတို့၌ ရှိသော်လည်း အများစုသည် ထိရောက်သော ခရီးသွားလာရေးစီမံခန့်ခွဲမှုတွင် ရင်းနှီးမြှုပ်နှံရန် သယံဇာတများကင်းမဲ့လျက်ရှိပြီး အကျိုးဆက်အားဖြင့် ယင်းခရီးသွားလုပ်ငန်းများမှ ဝင်ငွေအခွန်အခများ ရရှိမည့်အခွင့်အရေးမှာ လက်လွတ်ဆုံးရှုံးလျက်ရှိသည်။ အတူအကွ ပူးပေါင်းသုတေသနပြုသည့် အစီအစဉ်တစ်ခုမျှမရှိသော်လည်း ပြည်တွင်းနှင့်နိုင်ငံတကာ အဖွဲ့အစည်းများနှင့် တက္ကသိုလ်များသည် သဘာဝထိန်းသိမ်းရေးနယ်မြေ(၂၈)ခုတွင် သိပ္ပံနည်းကျ သုတေသနပြုခဲ့ကြသည်။

လန်ပီအဏ္ဏဝါအမျိုးသားဥယျာဉ်နှင့် ရခိုင်ရိုးမဆင်ဘေးမဲ့တော သဘာဝနယ်မြေနှစ်ခုကို အသေးစိတ် လေ့လာရန်အတွက်ရွေးချယ်ခဲ့ပါသည်။ လန်ပီအဏ္ဏဝါအမျိုးသားဥယျာဉ်သည် မြန်မာနိုင်ငံရှိ တစ်ခုတည်းသော အဏ္ဏဝါအမျိုးသားဥယျာဉ်ဖြစ်ကာ မြိတ်ကျွန်းစုတွင် ထိန်းသိမ်းစောင့်ရှောက်ထားသည့် တစ်ခုတည်းသောနယ်မြေ ဖြစ်သည်။ ယင်းဒေသနှင့်ပတ်သက်၍ သတင်းအချက်အလက်များသည် မရှိသလောက်ပင်နည်းပါးကာ ၁၉၉၅ခုနှစ်မှစ၍ အချက်အလက်သစ်မှတ်တမ်းတင်ထားရှိမှုမရှိတော့ချေ။ ယင်းဒေသနှင့်ပတ်သက်သည့်အချက်အလက်များ စုစည်း မှတ်တမ်းတင်ခြင်းသည် မြိတ်ကျွန်းစုအားထိန်းသိမ်းစောင့်ရှောက်ခြင်း၏ အရေးပါအရာရောက်မှု၊ ဌာနလူမျိုးစုများနှင့် မြန်မာပြည်၏ဒေသစုံမှ ရွှေ့ပြောင်းနေထိုင်သူများပါဝင်သည့် လူမျိုးစုံပါလူထုကြီးက ပါဝင်ဆောင်ရွက်သည့် သယံဇာတများစီမံခန့်ခွဲမှုအား မြန်မာနိုင်ငံနှင့် နိုင်ငံတကာအကျိုးတူပူးပေါင်းဆောင်ရွက်သူများ အလေးထားလာစေရန် လွန်စွာအရေးပါလှသည်။ ၂၀၀၉ခုနှစ် ဇူလိုင်လလဆောင်ရွက်ခဲ့သော လျှပ်တပြက်သုတေသနတစ်ခုအရ မြိတ်ကျွန်းစုနှင့် လန်ပီအမျိုးသားအဏ္ဏဝါဥယျာဉ်သည် စီမံခန့်ခွဲမှုနှင့် ယဉ်ကျေးမှုဆိုင်ရာ

အလွန်အဖိုးတန်သောနယ်မြေဖြစ်ကြောင်း အသေအချာသိရှိခဲ့ရပြီး အထိန်းအကွပ်မဲ့ လျင်မြန်စွာတိုးပွားလာသော အခြေခံနေထိုင်သူများကြောင့် ခြိမ်းခြောက် ခံနေရကြောင်း သိရှိရသည်။ ကွင်းဆင်းလေ့လာမှုများမှ အမြဲစိမ်းသစ်တောပေါက်ရောက်ပင်(၁၉၅)မျိုး၊ ဒီရေတောနှင့် ဆက်စပ်အပင်(၆၆)မျိုး၊ ၎က်အမျိုးပေါင်း(၂၀၀)၊ နို့တိုက်သတ္တဝါ(၁၃)မျိုး၊ တွားသွားသတ္တဝါ(၁၇)မျိုး၊ ကုန်းနေရေနေ သတ္တဝါ(၁၁)မျိုးတို့အား မှတ်တမ်းတင်နိုင်ခဲ့သည်။ ပင်လယ်သယံဇာတများတွင် မျောလှော်(၂၇၉)မျိုး၊ ပင်လယ်ရေမှော် (၈၄)မျိုး၊ ခရုအမျိုး(၅၀)၊ ကဏန်း(၄၂)မျိုး၊ ခွံခွံကောင်(၄၁)မျိုး၊ ပင်လယ်မျှော(၃၂)မျိုးတို့ကို ပညာရှင်ပေါင်းစုံပါဝင်သည့် သုတေသနအဖွဲ့များက မှတ်တမ်းတင်နိုင်ခဲ့ပါသည်။ ယင်းတို့အနက် မြန်မာနိုင်ငံအတွက် မျိုးစိတ်သစ်(၂၉)ခုအား မှတ်တမ်းတင်နိုင်ခဲ့သည်။ အပင်မျှောလှော်(၁)မျိုး၊ အကောင်မျှောလှော်(၇)မျိုး၊ ပင်လယ်မြိတ်(၂)မျိုး၊ ဒီရေတောအပင် (၁)မျိုး၊ ငါး(၇)မျိုး၊ ကုန်းနေရေနေသတ္တဝါ(၃)မျိုး၊ ၎က်(၈)မျိုး တို့ဖြစ်ကြသည်။ ထို့အပြင် ဆလုံ(မော်ကင်း) လူမျိုးများ၏အရေးနှင့် ဒေသအတွင်းအခြားအခြေခံနေထိုင်မှုများ၏ အရေးကိုစွဲလုပ်များကိုလည်း စုဆောင်း မှတ်တမ်းတင်ခဲ့သည်။ ဥယျာဉ်၏ အတွင်းနှင့်အပြင်တွင် လူဦးရေတိုးလာသည်နှင့်အမျှ ပရမ်းပတာထုတ်ယူသုံးစွဲမှုများက နယ်မြေ၏သဘာဝသယံဇာတများကို တိုး၍တိုး၍ ခြိမ်းခြောက်လျက်ရှိသည်။ ထိန်းသိမ်းစောင့်ရှောက်ရေးပန်းတိုင်များနှင့် ဒေသခံအဖွဲ့များ၏ လိုအပ်ချက်များနှင့် အနှစ်သာရများပေါင်းစပ်မှု သေချာရေးစေရန်အတွက်၊ အားလုံးပါဝင် ပြုစုသည့် လန်ပီအဏ္ဏဝါအမျိုးသားဥယျာဉ်သဘာဝနယ်မြေ စီမံခန့်ခွဲမှုအစီအစဉ်တစ်ခု စတင်ပေါ်ထွန်းလာစေရန်၊ အာဏာပိုင်များ၊ အဖွဲ့အစည်းများနှင့် အစုအဖွဲ့များ ပါဝင်သည့်ဆွေးနွေးညှိနှိုင်းမှုများ အစပျိုးဆောင်ရွက်ခဲ့သည်။

ရခိုင်ရိုးမဆင်ဘေးမဲ့တောသည် မြန်မာပြည်တွင်သာတွေ့ရှိနိုင်သည့်မျိုးစိတ်များ၊ မျိုးသုဉ်းရန်အန္တရာယ် ရှိနေသည့်မျိုးစိတ်များနှင့်၊ အမျိုးအစားများပြားစုံလင်လှသည့် စီမံခန့်ခွဲမှုကြွယ်ဝမှုများကို အထောက်အပံ့ပြုလျက်ရှိသည့် အမျိုးမျိုးသောနေထိုင်ကျက်စားရန် နေရာဒေသများစွာရှိသည့်နယ်မြေဒေသဖြစ်သည်။ သို့ရာတွင် ယင်းဒေသသည်လည်း အခြေခံနေထိုင်သူအများဆုံးတည်ရှိသည့် သဘာဝနယ်မြေများအနက် တစ်ခုဖြစ်သည်။ ဒေသခံလူများသည် ၎င်းတို့အသက်မွေးဝမ်းကျောင်းအတွက် သဘာဝသယံဇာတများအပေါ်တွင် မှီခိုနေကြရကာ ရေရှည်တည်တံ့ရေးကို လွန်လျှံလျက် ယင်းသယံဇာတများအားအသုံးချပြီး ပတ်ဝန်းကျင်ကို ကြိမ်းဖန်များစွာခံ ဖျက်ဆီးမိနေကြသည်။ အပင်ပေါက်ရောက်မှုများအား ပထမအမျိုးအစားခွဲခြားရန် ဂျီအိုင်အက်စ်ကွန်ပျူတာအချက်အလက်တစ်ခုအား ထူထောင်ကာ မြေပြင်ကွင်းဆင်းလေ့လာတိုက်ဆိုင်စစ်ဆေးမှုဖြင့် လေ့လာဆန်းစစ်မှုများလုပ်ခဲ့သည်။ အပင်ပေါက်ရောက်မှု အမျိုးအစားဆယ်မျိုးအား အမျိုးအမည်သတ်မှတ်ကာ မြေပြင်ဖုံးလွှမ်းနေမှု မြေပုံများအား ရေးဆွဲခဲ့သည်။ (၁၉၇၄)ခုနှစ်မှ(၂၀၀၃)ခုနှစ်အတွင်း အပင်ပေါက်ရောက်မှုပြောင်းလဲပုံအား လေ့လာဆန်းစစ်ကာ၊ လေ့လာမှုက သဘာဝသစ်တောစရိယာများမှ စိုက်ပျိုးခြင်းစရိယာများ အဖြစ်သို့လည်းကောင်း၊ စိုက်ပျိုးခြင်းစရိယာများမှ သစ်တောစရိယာများ အဖြစ်သို့လည်းကောင်း၊ အပြန်အလှန်ပြောင်းလဲပုံကို ပြသခဲ့သည်။ အဓိကတွေ့ရှိရမှုမှာ *မြသေညောင်* ဘာသာကျသင့်မှု ဝါးမျိုး ဒေသအတွင်း တိုးဝင်ရပြုပေါက်ရောက်လာခြင်းနှင့်၊ ယင်းဖြစ်စဉ်သည် တောမီး လောင်ကျွမ်းမှုနှင့် ရွှေ့ပြောင်းတောင်ယာများကြောင့် ဖြစ်နိုင်ပွယ်ရာရှိသည်။ ကျန်ရှိနေသေးသော သစ်တောကွက်များ လျော့ပါးပျက်စီးခြင်းမှကာကွယ်ရန်အတွက် ကြားခံနယ်မြေထူထောင်ခြင်း၊ ပတ်ဝန်းကျင်ဆိုင်ရာပညာရေးခြင်းနှင့် ရေရှည် ဖွံ့ဖြိုးတိုးတက်မှုဆောင်ရွက်ချက်များမှာ အရေးကျလှသည်။ အပင်ပေါက်ရောက်မှုပြောင်းလဲခြင်းဆိုင်ရာ မြေပုံများနှင့် အချက်အလက်သစ်များသည် ရေရှည်ဖွံ့ဖြိုးမှုစီမံကိန်းများနှင့် ဆောင်ရွက်မှုများအတွက် အထောက်အကူပြုကာ ယင်းအဟန့်အား လက်ရှိခြိမ်းခြောက်နေသည့်အချက်များကိုလည်း ပိုမိုသတိပြုစိတ်ဝင်စားစေသည်။

ဤစီမံကိန်းမှလေ့လာတွေ့ရှိချက်များအရ မြန်မာနိုင်ငံ၏သဘာဝနယ်မြေစနစ်ကို စီမံခန့်ခွဲမှုရည်မှန်းချက်အထူးပြု၍ ပြန်လည်သုံးသပ် သင့်ပါသည်။ တစ်ကမ္ဘာလုံးအတိုင်းအတာဖြင့် မျိုးသုဉ်းပျောက်ကွယ်မည့်အရေး ခြိမ်းခြောက် ခံနေရသောမျိုးစိတ်များ၊ ပါရှိသည့်သတ်တက် လေ့လာနည်းနေသော ဒီရေတောနှင့်အဏ္ဏဝါရှိနေထိုင်ကျက်စားရာနေရာများ၊ အဓိကစီမံခန့်ခွဲမှုကြွယ်ဝမှုများ၊ သားငှက်များ ဖြတ်သန်းသွားလာနေထိုင်ကျက်စားရာနေရာများ၊ အဆက်ပြတ်ကွက်လပ် ဖြစ်နေခြင်းများကို အလေးဂရုပြု၍ မြန်မာနိုင်ငံ၏သဘာဝနယ်မြေစနစ်ကို မဟာဗျူဟာကျကျ တိုးချဲ့ဆောင်ရွက် သင့်ပါသည်။ သစ်တောဦးစီးဌာနနှင့် အခြားသောဌာနဆိုင်ရာများ ညှိနှိုင်းဆောင်ရွက်မှု တိုးတက်လာရေးမှာ အလွန် အရေးကြီးသည်။ ဒေသဆိုင်ရာအဆင့်တွင် အစိုးရမဟုတ်သောအဖွဲ့အစည်းများနှင့် လူထုအဖွဲ့အစည်း တို့ ပူးပေါင်း ဆောင်ရွက်သည့် ရေရှည်စီမံခန့်ခွဲမှုအုပ်ချုပ်မှုကို အစပျိုးဆောင်ရွက်ခြင်းများကိုလည်း အကြံပြုလိုပါသည်။ သက်ဆိုင်သူများအားလုံးပါဝင်သော ထိန်းသိမ်းစောင့်ရှောက်ရေးအောင်မြင်စေရန်အတွက် သဘာဝနယ်မြေများ၏ အခန်းကဏ္ဍနှင့်အကျိုးကျေးဇူးများကို အောက်ခြေမှသည်အထက်အထိ လူထုစိတ်ပါဝင်စားအလေးထားမှု မြှင့်တင်ရန် လိုအပ်နေချိန်တွင်၊ သစ်တောဌာနဝန်ထမ်းများ၊ အထူးသဖြင့် လူငယ်မျိုးဆက်များမှာ ဂေဟဗေဒနှင့်စီမံခန့်ခွဲမှုဆိုင်ရာ သင်တန်းများကို သင်ကြားခွင့်ရရှိသင့်ပါသည်။ ဤသို့ဖြင့် စီမံခန့်ခွဲမှုစီမံကိန်း ပြုစုရေးဆွဲခြင်း၊ အမျိုးသားအဆင့်နှင့် နိုင်ငံတကာအဆင့်များတွင် သတင်းအချက်အလက်ပလွယ်ခြင်းနှင့် ညှိနှိုင်းဆောင်ရွက်ခြင်းကို အထောက်အကူဖြစ်စေရန် အတွက်လည်းကောင်း၊ ညှိနှိုင်းသုတေသနအစီအစဉ်များ တိုးတက်ဖွံ့ဖြိုးလာစေရန်အတွက်လည်းကောင်း၊ ဗဟိုသတင်း အချက်အလက်တစ်ဌာနတွင် စုစည်းထားရှိမည့် သဘာဝနယ်မြေတစ်ခုခုအဖွဲ့အစည်းကို စီမံခန့်ခွဲမှုကြွယ်ဝမှုအစိုးရအဖွဲ့အစည်းအဖြစ် ဖွဲ့စည်းတိုးတက်ရေး ပန်းတိုင်များသို့ရောက်ရှိနိုင်ရန် အထောက်အပံ့ဖြစ်စေသည်။ ဆင်းရဲနွမ်းပါးမှုလျော့ကျရေး မဟာဗျူဟာများကို သတ်မှတ်တီထွင်အကောင်အထည်ဖော်ဆောင်ရွက်ရန်အတွက် သဘာဝနယ်မြေများတွင်ရှိ လူပုယောဂ အကျိုး သက်ရောက်မှုများကို တိုင်းတာလေ့လာသင့်ပါသည်။ လုံလောက်သောသယံဇာတများ သတ်မှတ်ခွဲဝေချထားမှု သေချာရေးစနစ်အတွက်၊ ခွင့်ပြုငွေများလှူဒါန်းမှုများနှင့်ဒေသ၏စီးပွားရေးဖွံ့ဖြိုးတိုးတက်မှုများအပါအဝင်၊ ရေရှည် တည်တံ့နိုင်သည့် ငွေကြေးခိုက်ထုတ်မှုစနစ်ယန္တရားများကို ပေါ်ထုတ်ချမှတ်သင့်ပေသည်။





# 1 Background on Myanmar

## 1.1 Natural Features

### Introduction

Myanmar, the largest country in South East Asia, is part of the Sundaic subregion of the Indo-Malayan Realm (MacKinnon and MacKinnon 1986). Due to the combination and interaction of geography, topography, climate, pattern of seasonal rainfall, presence of high mountains and major rivers, Myanmar presents a great variety of different habitats and ecosystems supporting a rich biodiversity. With about half (48%) of mainland covered by forests (FAO 2010), Myanmar ranks 6 out of 11 among the Southeast Asian countries in terms of percentage of land area covered by forest (FAO 2009).

Figure 1 Myanmar Land Area (Source: NCEA 2009b)



Northern Myanmar presents the highest mountains with permanent snow and glaciers, with Mount Khakaborazi (6,000 m) being the highest in Myanmar and in South East Asia. The country includes extensive lowland plains, major rivers running parallel to each other, one of the largest river deltas in Asia (Ayeyawaddy Delta) and plateau around 1,000 m above sea level like the Shan Plateau. Myanmar, with its 2,280 km long coast and more than 800 small islands, has important coast and marine habitats supporting an abundance of species. The climate is a tropical monsoon climate with three distinctive seasons: hot season from March to May, rainy season from June to October, cold season from November to February, with high rainfall variability, from 500 mm in the Dry Zone up to over 6,000 mm in Tanintharyi Region and northern Rakhine State.

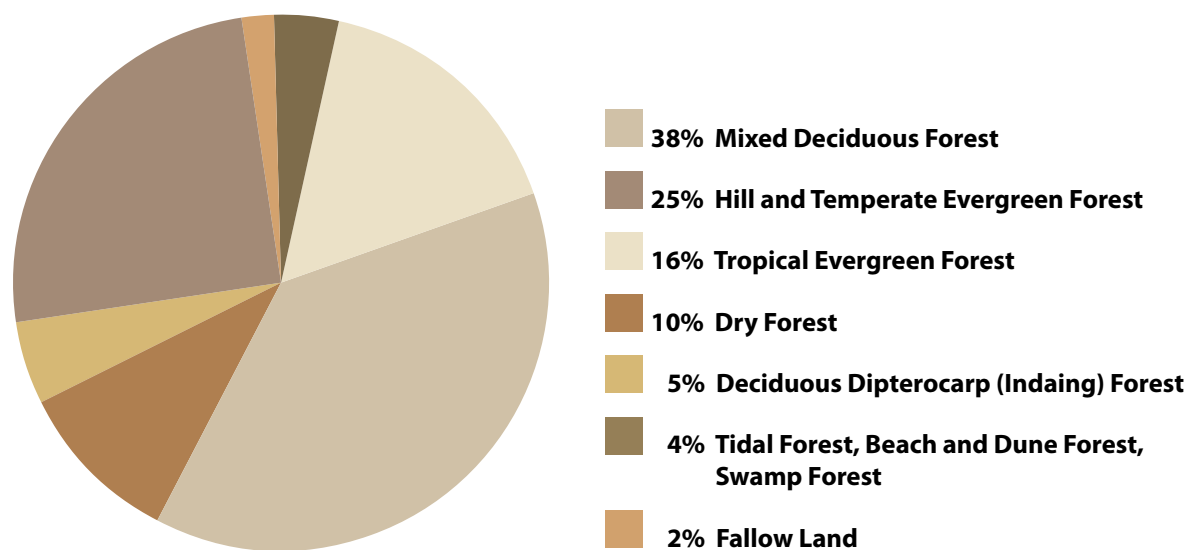
### Biodiversity

About 250 mammal species, more than 1,000 birds, 370 reptiles and 7,000 plants are recorded in Myanmar, including 39 species of mammals, 45 of birds, 21 of reptiles and 38 of plants which are globally threatened (NCEA, 2009a). More species could be added since new discoveries continue to be made every year, including the exceptional discovery, during a survey of FFI and BANCA in Kachin state, of a new species of primate in 2010, the Burmese snub-nosed monkey *Rhinopithecus strykeri*, immediately classified as critically endangered by IUCN. 76 Key Biodiversity Areas (KBAs) have been identified, out of which 54 are recognized as Important Birds Areas (IBAs) (BLI 2005). Endemism is relatively low compared to other countries in South East Asia. There are seven Endemic Birds Areas EBAs and secondary endemic areas (BLI 2005 and IUCN-WCPA 2007), three exclusively located in Myanmar (Eastern Himalayas, Irrawaddy plains and North Myanmar Lowlands), two stretching across Myanmar and Thailand (Myanmar-Thailand mountains and Peninsular Thailand lowland forests) and two others centered mainly in other countries but extending in Myanmar (Andaman Islands and Yunnan mountains). Natma Taung National Park is a particular area of local endemism.

## Habitats

Important habitat types represented in Myanmar are forests, wetlands and the marine habitat. Eight different forest types are found in Myanmar: tropical evergreen forest, mixed deciduous forest, dry forest, deciduous dipterocarp forest, hill and temperate evergreen forest, tidal forest or mangrove forest, beach and dune forest, swamp forest (Tint, 1995).

**Figure 2 Forest Types of Myanmar** (Source: NCEA 2009b)



The tropical evergreen forest is mainly represented in Myanmar by the lowland wet evergreen forest, a lush vegetation forest dominated by high value commercial species like the evergreen *Dipterocarpus* species. This forest is found quite well conserved along the coast of the Tanintharyi Region. The mixed deciduous forest is the major forest type of Myanmar and is characterized by the high-value timber species of *Tectona grandis*, commonly known as teak, often found in association with *Xylia dolabriformis* and different species of *Terminalia*. The presence of *Tectona grandis* makes this forest also the most economically important forest of the country. The mixed deciduous forest is strictly associated with bamboo species, which represent an important source of food for many wildlife species, and supports endangered species like the Hoolock Gibbon. The dry forest, represented by thorn scrub and forest, it is found in the Central Dry Zone, characterized by dry and seasonal climate, where the rainfall is usually under 1,000 mm. The dominant species are *Terminalia oliveri* and *Tectona hamiltoniana*, with a number of thorny *Acacia* species. The deciduous dipterocarp forest is found only in five countries in the world, namely Myanmar, Laos, Cambodia, Vietnam and Thailand. Also known as Indaing forest in Myanmar, is commonly found at higher altitudes in the northern part of the country. It is characterized by open canopy of deciduous species of Dipterocarpaceae. This forest type has remained isolated from other similar forests of South East Asia, making it one of the centres of endemism in Myanmar. It hosts endemic species like the critically endangered Burmese Star Tortoise and many threatened species like the vulnerable Eld's Deer. The hill and temperate evergreen forest is found in high rainfall areas, on slopes between 900 m and 1,800 m (hill forests) and over 1,800 m (montane forest). Dominated by tree species of *Quercus*, *Castanopsis*, *Schima*, Fagaceae, Magnoliaceae, Lauraceae and Ericaceae, this forest type is characterized by many climber species and rich and lush undergrowth. Beyond the coniferous forests, sub-alpine forest and



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alpine meadows are found at the highest elevations on the mountains, before the level of permanent snow and ice. Mangrove forests (or tidal forests), found along alluvial flats of river deltas and on muddy coastal areas, are salt tolerant and are flooded by seawater during high tide. This type of forest has a very important ecological function since it stabilises the shoreline, protects the coast from erosion and is a particularly important habitat for migratory waterbirds. Mangroves offer a variety of forest and aquatic products to many coastal people and largely support fish production. Myanmar hosts 8.8% of the total mangrove forests area of South East Asia, being the third richest country after Indonesia and Malaysia. Of the total mangroves area in Myanmar, 46% is located in Ayeyawaddy Region, 37% in the Tanintharyi Region and 17% in the Rakhine State (Giesen et al. 2006). They are all considered under threat, although many areas are nominally protected. Beach and dune forest represents a minority of total forest area in Myanmar, and it is found in narrow strips on beaches and dunes along the coasts, usually dominated by *Casuarina equisetifolia*. The swamp forest, found in the Ayeyawaddy Delta and in the floodplains of other rivers and lakes, and wetlands are of high ecological importance for many bird species which have suffered dramatic population declines across their global distributions. Many of these wetland sites have been recognized as Important Bird Areas and some proposed as Ramsar sites. The marine habitat, supporting a high biomass of fish and other aquatic organism, represents an important source of income for the country, with the fishery sector as the fourth largest sector in Myanmar, and shrimp export accounting for nearly 50% of the total value of fishery export. Coral reefs are extensive on the south east coast of Myanmar (fringing reefs and patch) and around the islands, extending further south into Thailand, covering 1,870 km<sup>2</sup>, with the majority of coral reefs found in the Myeik Archipelago of the Tanintharyi Region. Coral reefs in Myanmar need to be more fully surveyed and better protected since they provide many functions, services and goods in terms of coastal protection and sediment retention, nurseries and habitats for aquatic organism, feeding grounds for economically important species of fish and other seafood products, potential revenues from tourism. Seagrasses are mainly found in Rakhine and Tanintharyi marine areas, while they are absent in the Ayeyawaddy Delta because of high turbidity. Seagrass beds represent a food source and shelter habitat for many economically important species of marine invertebrates and fishes, and globally threatened species like the Dugong (*Dugong dugon*). Seagrass habitat has an important role in stabilizing the coast, reducing waves and the effects of currents and trapping the sediments, thus protecting coral reefs from sedimentation.

### Environmental problems

In 2001, a report of the Myanmar Ministry of Forestry identified the following major threats to forest and biodiversity: conversion of closed forests to other land uses, shifting cultivation, invasive species, illegal fishing and water pollution, wildlife and timber trade, lack of environmental impact assessment (EIA) for development projects. The 4th National Report on Biodiversity (2009) confirms that Myanmar is losing biodiversity due to socio-economic pressure, with the main threats identified in habitat destruction, especially related to forest depletion, degradation and cover change, hunting and illegal wildlife trade. Invasive alien species are considered a minor threat. The net loss of 435,000 hectares of forest per year reported for the period 1990–2000, corresponding to a loss of 1.17%, was reduced to 310,000 hectares per year in the period 2000–2010, corresponding to a loss of 0.93%. Despite this positive trend, Myanmar still remains one of the ten countries in the world with the largest annual net loss of forest area and among the five countries (Indonesia, Australia, Myanmar, Madagascar and Mozambique) with the largest net loss of mangrove area during the period 2000–2010 (FAO 2010). In the Ayeyawaddy Region, mangrove forest has been seriously degraded in recent years due to agricultural conversion and the high demand for firewood and charcoal from Yangon, with consequent decline of fish catches and increased vulnerability to natural disasters. In Tanintharyi Region the best conserved mangrove forests are found, especially in the Myeik Archipelago, but still a decrease of 2.4 % per annum is estimated (U Myint Pe 2003). In Rahkine, shrimp farming, representing 89% of all the shrimp farming in the country, has seriously contributed to mangrove depletion and prevented reforestation in many areas. Since shrimp farming is still encouraged without any proper planning, mangrove forests are expected to continue to decrease (Angell 2004). Agricultural expansion, shifting cultivation, conversion of forest to plantations are the main causes of habitat degradation and loss. Rubber plantations have almost doubled from 1990 to 2010 (FAO 2010) and together with large scale palm oil plantations are among the most impacting threats on biodiversity. Although accurate updated estimates are difficult to obtain, illegal wildlife trade in Myanmar is considered to be widespread, causing, with illegal hunting, a general decrease of wildlife population.



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## 1.2 Environmental Policy and Practice

### Introduction

After a period of intense exploitation of natural resources during the colonial and post-colonial period, Myanmar leaders showed their commitment to conserving the environment and promoting sustainable development with the creation in 1990 of *ad hoc* institutions in charge of preparing new environmental policies and legislation, of strengthening international cooperation on environmental issues and of improving the management of natural resources. However, the current environmental protection framework shows critical legal and institutional constraints, for instance very sector-specific laws that often exceed the technical and financial capability of the relevant government agencies.

The future success of environmental protection in Myanmar depends on the formulation of policies reflecting a more integrated approach to planning and management of resources, as well as on the improved coordination between stakeholders and the allocation of the necessary resources for policy implementation.

### Colonial period (1826-1948)

After an initial phase of uncontrolled overharvesting of forest resources, the colonial government gradually shifted to the systematic management of forests (Bryant 1994). The first Forest Rules (1856), later adopted for the whole Indian province (1865), promoted the adoption of a scientific forestry method set up by the German forester Dietrich Brandis including the adoption of 30-year felling cycles and the prescription of exploitable tree sizes to fix the annual sustainable yield. Brandis' guidelines were integrated into the Indian Forest Policy (1894) and Burma Forest Act (1902) and reviewed into the Myanmar Selection System for forest management in use since 1920, marking the government ownership of teak forests. Reserved forests and protected forests were created, whereas government timber-extraction was allowed, thereby restricting only resource access and use by local people. Shifting cultivation (*taungya*) practices, forest fires for hunting and non-timber forest products extraction were prohibited but difficult to control. To gain popular support for reserved forests, the government promoted the participation of local peasants, in particular Karen hill farmers, in forestry activities by encouraging them to sow teak trees in their *taungya* fields in exchange for tax exemption, paid labour and land, and thereby creating new plantations. The concern for wildlife conservation aroused only at the beginning of 20th century with the creation of the first wildlife sanctuary of Pidaung for the protection of Sumatran rhinoceros. At the end of the colonial period (1948), the protected areas system included 11 bird and wildlife sanctuaries<sup>1</sup> covering less than 0.3% of total country area.

### Development of Myanmar environmental governance and legislation

In the first thirty years following independence (1948-1978), little attention was paid to environmental protection because the country was facing economic and political struggles. In the 1980s the Forest Department initiated, in collaboration with UNDP and FAO, the "Nature Conservation and National Parks project (1981-1984)" for the expansion of the protected area system<sup>2</sup> and the establishment of a new institution with specific competence on conservation and PA management.

In the 1990s the legal and institutional framework of environmental governance was completely reviewed and updated resulting in the creation of new institutions and the formulation of new policies for forest and protected areas management (a list of environmental laws and policies is given in Appendix 1).

**Table 1: Chronology of Environmental Governance in Myanmar**

1990	Creation of the National Commission for Environmental Affairs (NCEA) within the Ministry of Foreign Affairs (MFA) with competence on environmental policy and management with the objective of promoting environmental awareness, sustainable use of natural resources and collaboration with international organisations and foreign governments on environmental matters.
1990	Creation of the Nature and Wildlife Conservation Division (NWCD <sup>3</sup> ) within the Forest Department to supervise protected areas and wildlife conservation.
1992	Creation of the Ministry of Forestry constituted by four entities: 1) Forest Department (FD) which is responsible for conservation and sustainable management of forest, 2) Myanmar Timber Enterprise (MTE) in charge of commercial forest activities, 3) Dry Zone Greening Department coordinating reforestation activities in central Myanmar, 4) Planning and Statistics Department in charge of overall supervision.

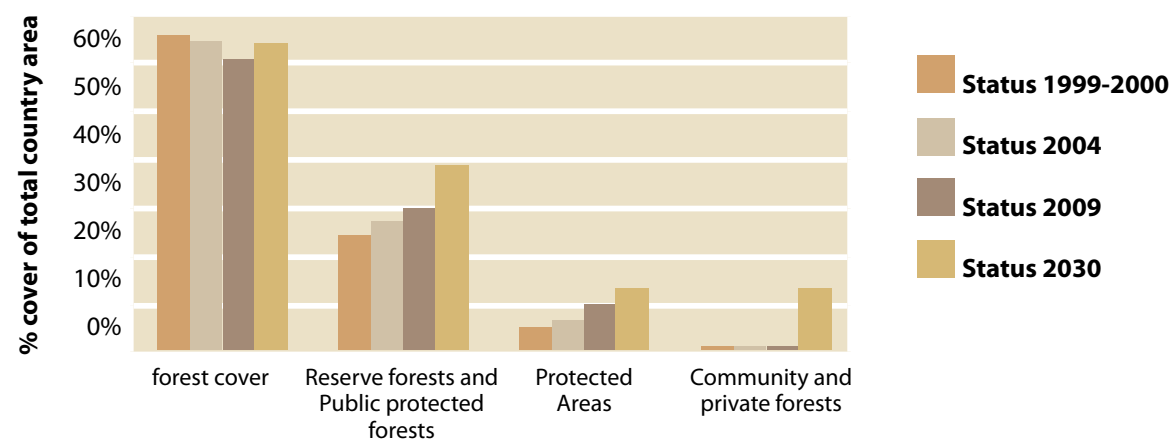
<sup>1</sup> Chatthin, Kahilu, Kelatha, Moscos Islands, Mulayit, Pidaung, Pyin-O-Lwin, Shwesettaw, Shwe-U-Daung, Taunggyi, Wenthtikan.

<sup>2</sup> 14 designated protected areas (Htamanti, Minwuntaung and Thamil Kyun were established in the 1970s) for a total area of 4150 km<sup>2</sup>, representing 0.6% of total country area.

<sup>3</sup> The original name was Nature Conservation and National Parks Division (NCPD).

The Ministry of Forestry (MOF) gradually took over the coordination of environmental protection in Myanmar, especially after the nomination of the Minister of Forestry as chairman of the Environmental Conservation Committee in 2004 and the transfer of NCEA from MFA to MOF in 2005. As a consequence, the environmental policies and laws are very sectoral and focused on forest management and nature conservation instead of considering environmental issues as cross-cutting within the economic and social development of the country. Furthermore, MOF inherited the extractive mentality of the colonial government and its first priority remains the commercial exploitation of forests. NWCD and NCEA are the lowest institutions in the internal hierarchy of MOF, thus they have little capacity, opportunity and resources to mainstream environmental protection at national level. Nevertheless, both agencies have collaborated in the formulation of the Forest Law (1992) which regulates forest protection and management, establishment of forest plantations, extraction of forest products, as well as administrative action towards offences, replacing the old Burma Forest Act (1902). The importance given to public participation in forest management as well as to private sector involvement is highlighted in the Forest Rules and Community Forestry Instructions issued in 1995 to fulfill this law. In the same year the national Forest Policy was promulgated with the assistance of FAO, aiming for a more integrated approach towards environmental protection. The Forest Policy (1995) recognises different categories of forest: i) reserve (reserved) forests which are fully protected for commercial and local supply, watershed protection and biodiversity conservation, ii) public protected forests protecting trees but allowing other activities, iii) unclass (unclassified) forests where access is open to local people. The protected area system falls under the "Protection of Wildlife and Wild Plants and Conservation of Natural Areas Law" (1994), which replaced the old "Wildlife Protection Act" (1936). This law regulates the establishment of six categories of PAs (scientific nature reserve, national park, marine national park, nature reserve, wildlife sanctuary, geo-physically significant reserve) and of other nature reserves determined by the Minister of Forestry, which can be compared to international categories as further explained in chapter 2. In 2001 a 30-year Forest Master Plan was approved mandating the increase of the Permanent Forest Estate PFE (constituted by reserved forests and public protected forests) to 30% and of PAs to 10% of the total country area. These targets reinforced and replaced those set by the Forest Policy (1995), respectively the increase of PFE to 30% and PA system to 5% of the total land area by 2010. Furthermore, the Forest Master Plan encourages the registration of unclassified forests into community or private forests. Data collected from combined sources<sup>4</sup> show that although in the 1999-2009 decade the forest cover of Myanmar has decreased, the area protected or managed under PFE, PA or community/private forestry has increased, which is indicative of the effort to prevent the conversion of unprotected forest areas to other land uses (see Figure 3).

**Figure 3 Trend of Forest and Protected Area<sup>4</sup>**



Since the 1990s Myanmar has also increased the participation in the international *fora* regarding environmental matters which resulted in the signing of several international environmental agreements which are given in Appendix 2.



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### Policy implementation

As for any other government policy, the effectiveness of environmental policies depends mostly on the political will and the availability of resources to implement it. Biodiversity conservation is hardly being given the first priority, especially in developing countries where it is generally perceived as a constraint to economic development. Furthermore, the legal and institutional constraints described above have an impact on the execution and enforcement of such policies. On one hand, the sector-specific policies leave gray areas (e.g. no procedures or rules for Environmental Impact Assessments) or produce overlapping (e.g. marine national parks fall under both Ministry of Forestry as protected areas and Ministry of Livestock and Fisheries for the conservation of marine resources). The lack of coordination is not only between different ministries or departments but also between centre and peripheries. Although Myanmar state is highly centralised and most decisions are taken from centre, localities have ways of blocking and influencing decisions, for instance through slow and inaccurate information flow. Alongside the legal and institutional framework, it is important to consider the attitudes of the individuals towards conservation. The conservation and management of PAs rest with forest officers who are specifically trained in planning and implementing forestry operations. Most forest officers are not knowledgeable of the ecological functions of ecosystems and recognize only a few tree species as valuable. Thus their professional judgment, summed up with the lack of incentives (low salaries and no travel allowance) and the low perceived control from the centre, reinforces the general attitude of neglecting PAs. However, many of NWCD staff are very dedicated to conservation, especially those who have received training abroad or from international agencies, and play a remarkable role

<sup>4</sup> Data for the period 1999-2000 are from FAO, Asia and the Pacific National Forestry Programmes: Update 34, December 2000. Data for 2004 are from Forest Research Institute, Status of forest genetic resources, their conservation and management in Myanmar, Presentation by Aung Zoe Moe 2004. Data for 2009 are from NCEA, Sustainable Forest Management: Perspectives on REDD development, Presentation by Htwe Nyo Nyo 2009.

<sup>5</sup> One example is the famous Buddhist monk Maing Fone of Par Sar, thanks to whom the protected area has been established and conserved so far without the allocation of staff and resources by FD.

<sup>6</sup> In 2010 the Forest Department reported international cooperation with the following organisations: Asian Wetland Census (AWC), Birdlife International (BLI), California Academy of Science (CAS), Global Tiger Forum (GTF), International Crane Foundation (ICF), Istituto Oikos, Makino Botanical Garden (MBK), Smithsonian Institute (SI), Wild Bird Society of Japan (WBSJ), Wildlife Conservation Society (WCS), World Conservation Union (IUCN), World Pheasant Association (WPA). Other organizations are working in Myanmar without official recognition.

in the protection of the areas where they are assigned. Other actors seem to have a positive influence on the effectiveness of conservation policies, for instance religious figures<sup>5</sup> and non-governmental organizations (NGOs). In particular, the cooperation with international organisations<sup>6</sup>, albeit limited by the economic sanctions and the complicated bureaucratic procedures that apply to foreign subjects in Myanmar, has supported research surveys that have resulted in the discovery of new species and the establishment of new PAs, and has provided funding and training for the management of PAs, including development actions to encourage grassroots support for conservation. International cooperation is also contributing to strengthen the civil society of Myanmar by building the capacity of national and local organizations to plan and manage conservation and development initiatives.

#### Recent developments and future trends

In 2009 NCEA published the National Sustainable Development Strategy (NSDS) for Myanmar which has been formulated in collaboration with UNEP through the combination of consultative forums and multi-stakeholders mechanisms. This represents an important step towards the improved coordination between relevant stakeholders and the integration of environmental considerations into development. Nevertheless, as of 2010 the members of the National Council for Sustainable Development, who shall be in charge of the implementation of NSDS, still have not been selected, thus deferring the promulgation and enforcement of detailed regulations.

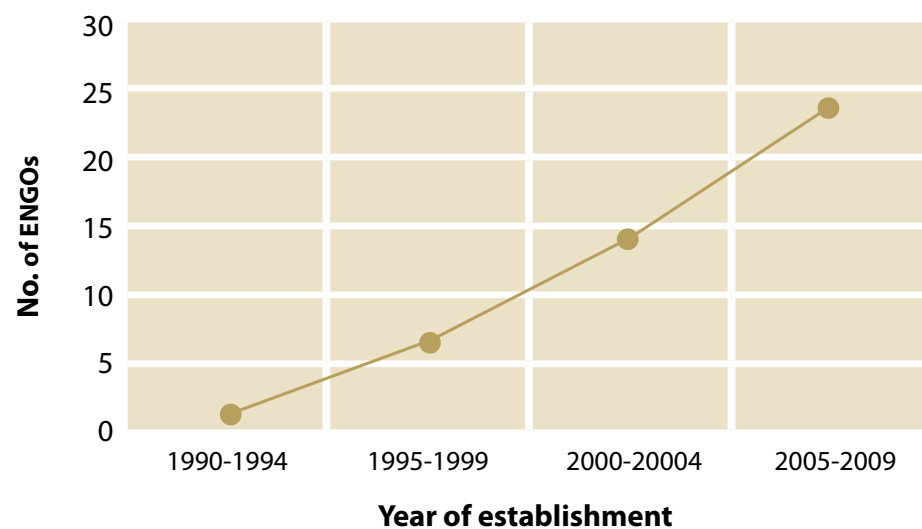
Further restructuring of the environmental policies and concerned institutions is expected in 2011, following the election of a new government in November 2010.

### 1.3 Environmental Non-governmental Organizations (ENGOS)

#### Introduction

Myanmar has a small but growing number of NGOs working in the field of biodiversity conservation and sustainable development. Not only the number but also the capacity of ENGOS has increased, with bigger projects in the field and emerging networks of coordination between them. The recent participation of Myanmar ENGOS in stakeholder consultation mechanisms at national level is an indicator of the mounting recognition of their role in the development and implementation of environmental policies, including research work, awareness raising and environmental education. If existing constraints to their operations are overcome, ENGOS can contribute to processes of co-management of resources and sustainable development by coordinating and channeling the opinions, problems and expectations of the most vulnerable groups living in and around key biodiversity areas of Myanmar.

Figure 4 Trend of Growth of Myanmar ENGOS (Source: MEP project)



#### Overview

The number of ENGOS operating in Myanmar is very small compared to neighbouring countries due to the existing restrictions to civil society and the shortage of funding for environmental activities. However, during project duration (2009-2010) 24 organisations working in environment-related sectors have been identified, starting from a baseline data of 10 organisations provided by Local Resource Centre of Yangon in 2009. The information collected is also organised in a directory available to stakeholders.

Most ENGOS were established by a strong charismatic leader. In particular, the bigger ones have been founded and managed by retired officials of the Forest Department, thus being able to implement their activities with lesser restrictions by township and district authorities. In addition, high-rank forest officers received during their career many opportunities of training and study abroad and collaboration with international agencies. With well-trained executives, direct access to local communities and easier collaboration with authorities, ENGOS seem to be in the best position to implement conservation activities in Myanmar and their potential is recognised by international organisations providing funding. On the other hand, ENGOS mirror to a certain extent some specific features of government departments, for instance very hierarchical management structure with low numbers of women and young people in high positions and weak strategic planning. The internal organisation is generally poor and, although most ENGOS have a management board, one third of them relies only on volunteers.

ENGOS coordination was initially based on personal relations among the executives, sharing common education or work patterns, but it has lately become more consistent. The project got underway in March 2010 with the organisation of monthly meetings of the Environmental Working Group within Myanmar NGO Network, chaired in succession by different ENGOS which can hold discussions among themselves in Myanmar language. Parallel to this, the bigger ENGOS have also participated since 2009 in the Environmental Thematic Working Group chaired by UNDP, where government and non-government actors discuss the most pressing Myanmar environmental issues.

Table 2 Facts about Myanmar ENGOS (Total number of ENGOS reviewed: 24)

<b>Category:</b>	
Non-governmental organisation	67%
Community-based organisation	17%
Professional organisation	8%
Association	4%
Consortium of NGOs	4%
Percentage of ENGOS formally registered	
50%	
Percentage of ENGOS with management board	
88%	
<b>Volunteers number:</b>	
No volunteers	20%
>10	15%
10-50	15%
Over 50	50%
<b>Staff number:</b>	
No staff	17%
>10	25%
10-50	29%
Over 50	29%
<b>Location of activities:</b>	
Ayeyawaddy Region	67%
Yangon Region	54%
Chin State	50%
Shan State	42%
Kachin State	33%
Mon State	21%
Rakhine State	21%
Tanintharyi Region	17%
Mandalay Region	17%
Sagaing Region	13%
Magwe Region	13%
Kayah State	4%
Kayin State	4%
Bago Region	4%
<b>Sectors of activities:</b>	
Forestry and Agroforestry	50%
General Environmental Protection	33%
Education	33%
Water supply	29%
Relief	21%
Energy	13%
Fisheries	8%
Health	4%
Banking and Financial Services	4%



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## 2 Myanmar Protected Areas

### 2.1 Methodology

In 2009 Forest Department provided a list of 43 sites, reported in Table 3, which has been updated with the recent designation in August 2010 of the proposed Hukaung Valley wildlife sanctuary extension, for a total of 35 designated and 8 proposed protected areas.

Existing information about all the 43 PAs was collected from authorities, universities and organizations in Myanmar, and verified during the years 2009-2010; rapid assessment surveys to fill the gaps and to verify on-site the existing data were conducted in 30 out of 43 PAs, mainly due to time and logistic constraints. Key information and maps are reported for all PAs. Detailed information is reported only for the 30 surveyed sites. Two in-depth studies were conducted in Lampi Island Marine National Park and Rakhine Yoma Elephant Range Wildlife Reserve and are presented respectively in chapters 3 and 4.

To collect information in a systematic way, a comprehensive datasheet was prepared, including sections on 1) general information of the protected area; 2) natural resources: type and status of biodiversity resources; key protected resources; type, extension and severity of threats; flora and fauna checklists; 3) management: availability of management/operational plans; implementation of management and development actions; type of management problems and respective required actions; 4) staff/resources: number and qualification of staff; existing infrastructure; needs; 5) tourism; accommodation and facilities; 6) land use and human activities; 7) research: type of activities carried out or in the PAs.

The information was collected following criteria and standards identified and/or approved by international organizations like IUCN (Hockings et al. 2006), WWF (Ervin, 2003), IUCN-CMP (2006) and FAO (Young 1994). The information collected is also organised in a database available to stakeholders.

### Operations and challenges

Environmental protection, forestry and public education are the main sectors of activities for Myanmar NGOs. These are increasingly being integrated with the provision of water, energy and other social services. Some NGOs also take part in relief operations following natural disasters.

Most NGOs have their main office in Yangon and field offices spread all over Myanmar, except for security-restricted areas. In particular, most operate in cyclone-affected areas<sup>7</sup> of Yangon and Ayeyawaddy Regions. Only four organisations are based in the ethnic states of Chin, Kachin and Rakhine, where they operate with a strong network of volunteers.

In the implementation of their programmes, NGOs face several constraints. First the funding for environmental activities, especially terrestrial and marine conservation, waste and recycling, climate change, is limited because of the international sanctions<sup>8</sup>. At present, funding comes mainly in form of partnership agreements with (or sub-granting by) international organisations. Larger NGOs have recently been awarded small grants locally from Embassies and other donors based in Yangon. Many NGOs do not meet the requirements to access either type of funding. Out of 24 organisations, only half are officially recognised by the Myanmar state as non-governmental organisations<sup>9</sup>, 2 are registered as professional organisations and the remaining 8 have not yet concluded the registration process. Moreover only registered NGOs can open a foreign currency bank account at Myanmar Foreign Trade Bank and be exempted from 10% tax that applies to all international transactions.

Indeed, the ultimate challenge for NGOs is to gain the trust of local communities. NGO workers may be regarded with some suspicion by local people, especially when they are not native to the area or are former forest officers. What is more, NGOs can work mostly in the least valuable forest areas, waste lands that have become unproductive after few years of intensive exploitation with many difficulties in raising local interest for participation. People start to trust NGOs only when they see that they are not after profiting from forests and that they are bringing solutions for the most pressing issues such as land rights, water and energy supply. However, trust has to be constantly renegotiated by encouraging local participation in planning and implementing sustainable development strategies with immediate effects on poverty reduction.

<sup>7</sup> Areas hit by the Nargis Cyclone in May 2008.

<sup>8</sup> EU adopted the Common Position on Myanmar in 1996 (tightened in 2009 and renewed in 2010) including suspension of all bilateral aid except humanitarian assistance; US sanctions are in force since 1997 (stiffened in 2003 and 2010), Canada sanctions since 2007.

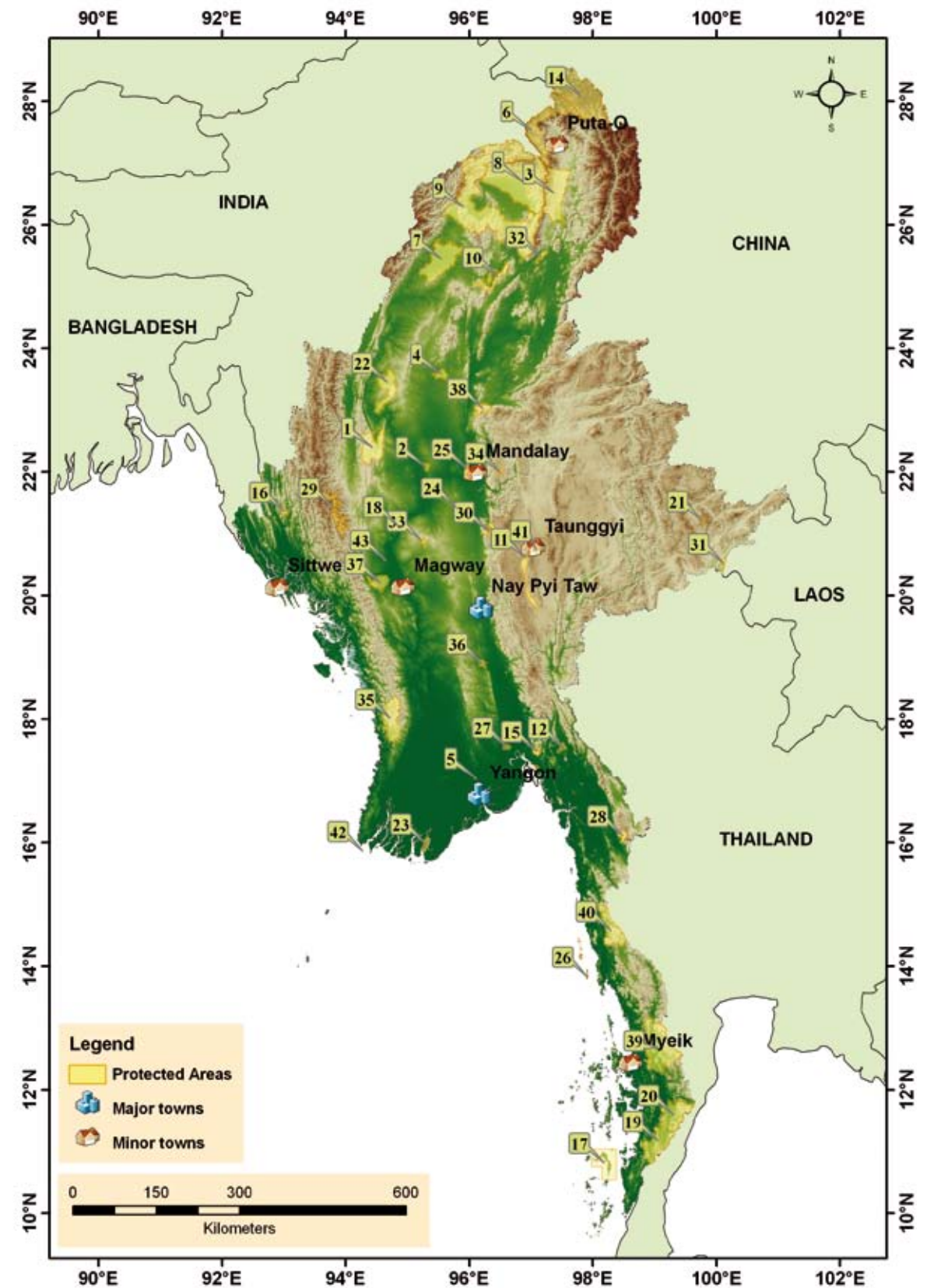
<sup>9</sup> Non-governmental organisations must register at the Home Affairs Ministry. The registration process is long and difficult, and must be renewed periodically (e.g. every other year) and submit monthly reports of their activities to the authorities at township level.



Table 3 List of Myanmar PAs\*

ID	Site name	National Designation	Status	Establishment Year	Area (km <sup>2</sup> )
1	<b>Alaungdaw Kathapa</b>	<b>National Park</b>	<b>Designated</b>	<b>1989</b>	<b>1597.62</b>
2	<b>Bawditataung</b>	<b>Nature Reserve</b>	<b>Proposed</b>	<b>2008</b>	<b>72.52</b>
3	Bumhpabum	Wildlife Sanctuary	Designated	2004	1854.43
4	<b>Chatthin</b>	<b>Wildlife Sanctuary</b>	<b>Designated</b>	<b>1941</b>	<b>269.36</b>
5	<b>Hlawga</b>	<b>Wildlife Park</b>	<b>Designated</b>	<b>1989</b>	<b>6.24</b>
6	Hponkanrazi	Wildlife Sanctuary	Designated	2003	2703.95
7	Htamanthi	Wildlife Sanctuary	Designated	1974	2150.73
8	<b>Hukaung Valley</b>	<b>Wildlife Sanctuary</b>	<b>Designated</b>	<b>2004</b>	<b>6371.37</b>
9	<b>Hukaung Valley (Extension)</b>	<b>Wildlife Sanctuary</b>	<b>Designated</b>	<b>2004</b>	<b>15431.16</b>
10	<b>Indawgyi Lake</b>	<b>Wildlife Sanctuary</b>	<b>Designated</b>	<b>2004</b>	<b>814.99</b>
11	<b>Inlay Lake</b>	<b>Wildlife Sanctuary</b>	<b>Designated</b>	<b>1985</b>	<b>641.90</b>
12	<b>Kahilu</b>	<b>Wildlife Sanctuary</b>	<b>Designated</b>	<b>1928</b>	<b>160.56</b>
13	<b>Kelatha</b>	<b>Wildlife Sanctuary</b>	<b>Designated</b>	<b>1942</b>	<b>23.93</b>
14	Khakaborazi	National Park	Designated	1998	3812.46
15	<b>Kyaikhtyoe</b>	<b>Wildlife Sanctuary</b>	<b>Designated</b>	<b>2001</b>	<b>156.23</b>
16	Kyauk-Pan-Taung	Wildlife Sanctuary	Proposed	2001	132.61
17	<b>Lampi Island</b>	<b>Marine National Park</b>	<b>Designated</b>	<b>1996</b>	<b>204.84</b>
18	<b>Lawkananda</b>	<b>Wildlife Sanctuary</b>	<b>Designated</b>	<b>1995</b>	<b>0.47</b>
19	<b>Lenya</b>	<b>National Park</b>	<b>Proposed</b>	<b>2002</b>	<b>1761.19</b>
20	<b>Lenya (Extension)</b>	<b>National Park</b>	<b>Proposed</b>	<b>2004</b>	<b>1398.59</b>
21	<b>Loimwe</b>	<b>Protected Area</b>	<b>Designated</b>	<b>1996</b>	<b>42.84</b>
22	Maharmyaing	Wildlife Sanctuary	Proposed	2002	1180.39
23	<b>Mainmahla Kyun</b>	<b>Wildlife Sanctuary</b>	<b>Designated</b>	<b>1993</b>	<b>136.69</b>
24	<b>Minsontaung</b>	<b>Wildlife Sanctuary</b>	<b>Designated</b>	<b>2001</b>	<b>22.60</b>
25	Minwuntaung	Wildlife Sanctuary	Designated	1972	205.88
26	<b>Moscov Island</b>	<b>Wildlife Sanctuary</b>	<b>Designated</b>	<b>1927</b>	<b>49.19</b>
27	<b>Moyingyi Wetland</b>	<b>Bird Sanctuary</b>	<b>Designated</b>	<b>1988</b>	<b>103.60</b>
28	Mulayit	Wildlife Sanctuary	Designated	1936	138.54
29	<b>Natma Taung</b>	<b>National Park</b>	<b>Proposed</b>	<b>1997</b>	<b>722.61</b>
30	<b>Panlaung-Pyadalain Cave</b>	<b>Wildlife Sanctuary</b>	<b>Designated</b>	<b>2002</b>	<b>333.80</b>
31	<b>Parasar (Par Sar)</b>	<b>Protected Area</b>	<b>Designated</b>	<b>1996</b>	<b>77.02</b>
32	<b>Pidaung</b>	<b>Wildlife Sanctuary</b>	<b>Designated</b>	<b>1918</b>	<b>122.08</b>
33	<b>Popa</b>	<b>Mountain Park</b>	<b>Designated</b>	<b>1989</b>	<b>128.54</b>
34	Pyin-O-Lwin	Bird Sanctuary	Designated	1918	127.25
35	<b>Rakhine Yoma Elephant Range</b>	<b>Wildlife Reserve</b>	<b>Designated</b>	<b>2002</b>	<b>1755.70</b>
36	Shinpinkyetthauk	Wildlife Sanctuary	Proposed	2006	71.90
37	<b>Shwesettaw</b>	<b>Wildlife Sanctuary</b>	<b>Designated</b>	<b>1940</b>	<b>552.70</b>
38	Shwe-U-Daung	Wildlife Sanctuary	Designated	1918	325.95
39	Tanintharyi	National Park	Proposed	2002	2071.81
40	<b>Tanintharyi</b>	<b>Nature Reserve</b>	<b>Designated</b>	<b>2005</b>	<b>1699.99</b>
41	<b>Taunggyi</b>	<b>Bird Sanctuary</b>	<b>Designated</b>	<b>1930</b>	<b>16.06</b>
42	Thamihla Kyun	Wildlife Sanctuary	Designated	1970	0.88
43	Wenthtikan	Bird Sanctuary	Designated	1939	4.40

\*PAs in bold have been visited by the MEP project staff in the period 2009-2010

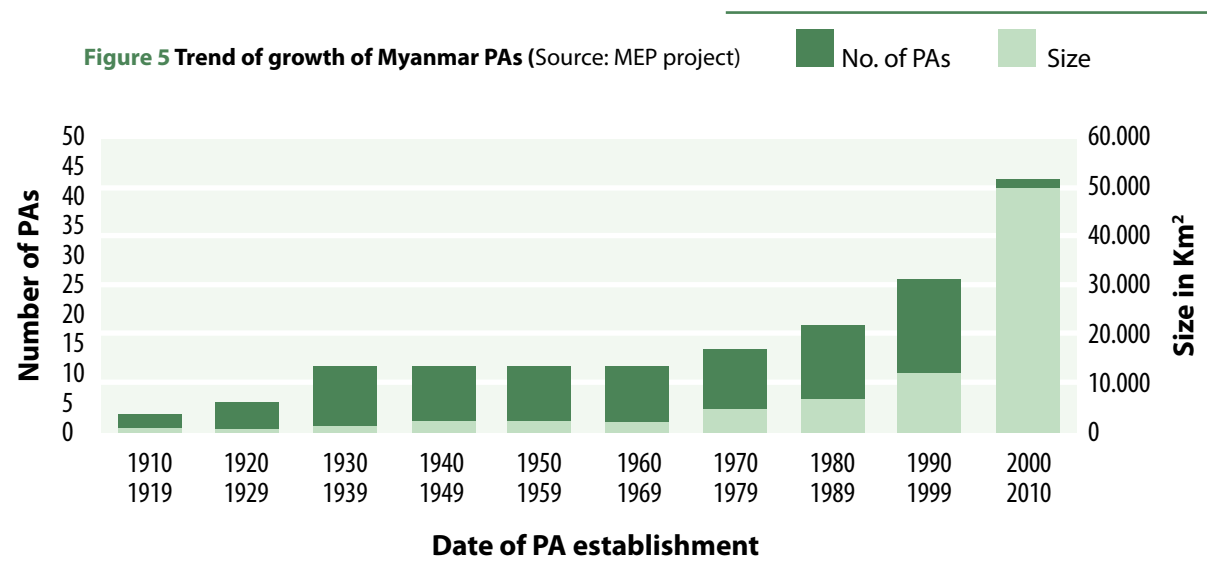


## 2.2 Results

### 1. General Information

#### Number and size

According to Forest Department (2009), 43 protected areas exist in Myanmar. Thirty-five sites were designated in the period 1918-2010, including the extension of Hukaung Valley wildlife sanctuary in 2010. Eight additional sites have been proposed in the period 1997-2008, also thanks to the efforts of international organizations and conventions, and are still at the proposal stage. Of these, the notification of Natma Taung National Park (proposed in 1997) is expected as soon as boundary demarcation is completed. There is no available information on the status of designation process of the remaining 7 proposed sites. The 35 designated protected areas cover approximately 42,000 km<sup>2</sup> of land, representing 6.2% of the total country area. With the establishment of 8 additional protected areas, proposed from 2001 to 2008, Myanmar would increase by 7,400 km<sup>2</sup> (1.1%) the total protected land, reaching 49,500 km<sup>2</sup> and representing 7.3% of the total land area, surpassing the 5% target set by the Myanmar's Forest Policy (1995), but still under the 10% set by the National Forest Master Plan (2001). PAs range in size from 0.5 km<sup>2</sup> (Lawkananda Wildlife Sanctuary) to 22,000 km<sup>2</sup> (Hukaung Valley Wildlife Sanctuary including extension), with 28% of PAs under 100 km<sup>2</sup> wide, 42% between 100 and 1,000 km<sup>2</sup>, and 30% over 1,000 km<sup>2</sup>. The average size is 930 km<sup>2</sup> and 1,200 km<sup>2</sup>, respectively for proposed and designated areas. Differences in size are largely reflected by the different years of establishment. Old protected areas were very small in size because they aimed at protecting specific resources. Later established protected areas are larger in order to protect entire landscapes and ecosystems and wide-ranging species (Rao et al. 2002). In particular, Hukaung Valley Wildlife Sanctuary (2010) covers 44% of the total protected area coverage. Eleven protected areas were established in the first half of the 20th century covering 1,336 km<sup>2</sup> of land, fourteen between 1970 and 2000 adding 9,110 km<sup>2</sup>, and nine new protected areas were declared in the first decade of the 21st century, adding 15,713 km<sup>2</sup> of protected areas to the system corresponding to an increase of 1.6% of national protected land. The trend is illustrated in the graph below.



#### Categories

Myanmar PAs fall under seven categories recognized by the Protection of Wildlife and Wild Plants and Conservation of Natural Areas Law (1994) which have been compared to international categories (Salter 1997).

**Table 4 Classification of Myanmar Protected Areas**

Myanmar categories	N. of PAs Designated	N. of PAs Proposed	TOT	IUCN categories
a. Scientific Nature Reserve	0	0	0	I (Strict Nature Reserve)
b. National Park	2	4	6	II (National Park)
c. Marine National Park	1	0	1	II (National Park)
d. Nature Reserve	1	1	2	VI (Protected Area with Sustainable Use of Natural Resources)
e. Wildlife Sanctuary	26*	3	29	IV (Habitat/Species Management Area)
f. Geo-physically Significant Reserve	0	0	0	V (Protected Landscape/Seascape)
g. Other Nature Reserve determined by the Minister	5**	0	5	NA

\* including 4 Bird Sanctuaries

\*\* including 1 Wildlife Park, 1 Mountain Park, 1 Wildlife Reserve, 2 Protected Areas

None of the existing PAs are classified in the two categories “Scientific Nature Reserve” and “Geo-physically Significant Reserve”, while the majority of PAs are included in the category wildlife sanctuary. The list includes five protected areas lying under the seventh category of “other Nature Reserve established by the Minister”. In particular Hlawga Wildlife Park and Popa Mountain Park were established with the main objective of education and recreation, Rakhine Yoma Elephant Range Wildlife Reserve aims to combine conservation and controlled timber extraction to meet the needs of wildlife and local communities; Loimwe Protected Area was established to preserve the scenic beauty of the landscape and Par Sar Protected Area was upgraded from the status of reserved forest thanks to the influence of a famous Buddhist monk willing to protect the area around the pagoda. Referred to IUCN categories (Dudley, 2008), the majority of Myanmar PAs belongs to category IV “Habitat/species management area”, where the PA is managed mainly for conservation through management interventions, while all the other IUCN categories are under-represented. In spite of the rich marine and coastal habitat, there are only 4 marine protected areas (MPA)<sup>10</sup> including 1 marine national park and 3 wildlife sanctuaries. Currently, only Thamihla Kyun Wildlife Sanctuary is classified as MPA while the remaining three are considered as both terrestrial and marine. Conservation efforts in all sites seem more focused on forest resources and terrestrial wildlife protection than on marine ecosystems.

#### Site governance

All Myanmar protected areas were until very recently government managed, in particular 22 by Forest Department and 21 by NWCD (which is the competent division for conservation within the Forest Department). In 2010 the site governance of Hlawga Wildlife Park has changed to joint management between government and private companies. The site was established in 1989 with the main objective of providing an environmental education centre near Yangon. The joint venture has strengthened the recreation purpose of the park by increasing tourist infrastructures and facilities. MOF is currently considering handing over the governance of other PAs, including Khakaborazi National Park, to private entrepreneurs, which raises greater concerns for biodiversity conservation. Indeed, Khakaborazi National Park could benefit from the establishment of a “Park for Peace” with the neighbouring protected areas in China and Nepal (UNEP-WCM 2007 Global List of Transboundary Protected Areas). Although some

<sup>10</sup>Lampi Island, Mainmahla Kyunn, Moscos islands, Thamiha Kyunn.



PAs are located close to national borders, like the Khakaborazi National Park, Lenya National Park with Namtok Huay Yang in Thailand, Tanintharyi Nature Reserve with Kaengkrachan Forest Complex in Thailand, there is no experience of transboundary protected area management which could play a crucial role in preserving biodiversity, as already noted by U Uga (in Henning 2007, 251). Lampi Marine National Park could also become part, together with the surrounding Myeik Archipelago, of the Ranong Biosphere Reserve already established in Thailand. There are at present no areas of government-delegated management to NGOs although, for instance, the role played by WCS in the management of Hukaung Valley Wildlife Sanctuary is very important, both in terms of provision of training and funding. There are also no examples of collaborative management with communities, nor areas established and run by indigenous groups.

**Boundaries**

About half of the 43 PAs have demarcated boundaries, most of them by road signs (boundary posts and board signals) or natural features like rivers and islands. The areas where the demarcation process is incomplete (Lenya, Lenya extension and Tanintharyi Nature Reserve) are not accessible by FD staff due to the presence of insurgents. The boundaries of Natma Taung National Park are also still under demarcation within the process of notification of the PA that is not yet concluded.

**Protection level**

Thirty-one of the PAs are totally protected and 12 are partially protected, whereas permanent settlements and activities like tourism, fishing, agriculture, logging and industry are explicitly allowed in the notification.

**Key resources**

All the designated and proposed protected areas support threatened species of mammal, bird and reptile (Appendix 3). Six PAs were designated/proposed to protect not only threatened species but their habitats. Specifically, Bawditataung Nature Reserve (proposed), Popa Mountain Park and Shwesettaw Wildlife Sanctuary have the main objective of protecting the dry forest of the central dry zone of Myanmar; Lampi Island Marine National Park was designated to protect coral reefs; Moyingyi Wetland Bird Sanctuary the wetland area; Chatthin Wildlife Sanctuary was designated to conserve the Indaing Forest (the only PA in Myanmar to support this type of forest).



L. Beffasti



L. Beffasti



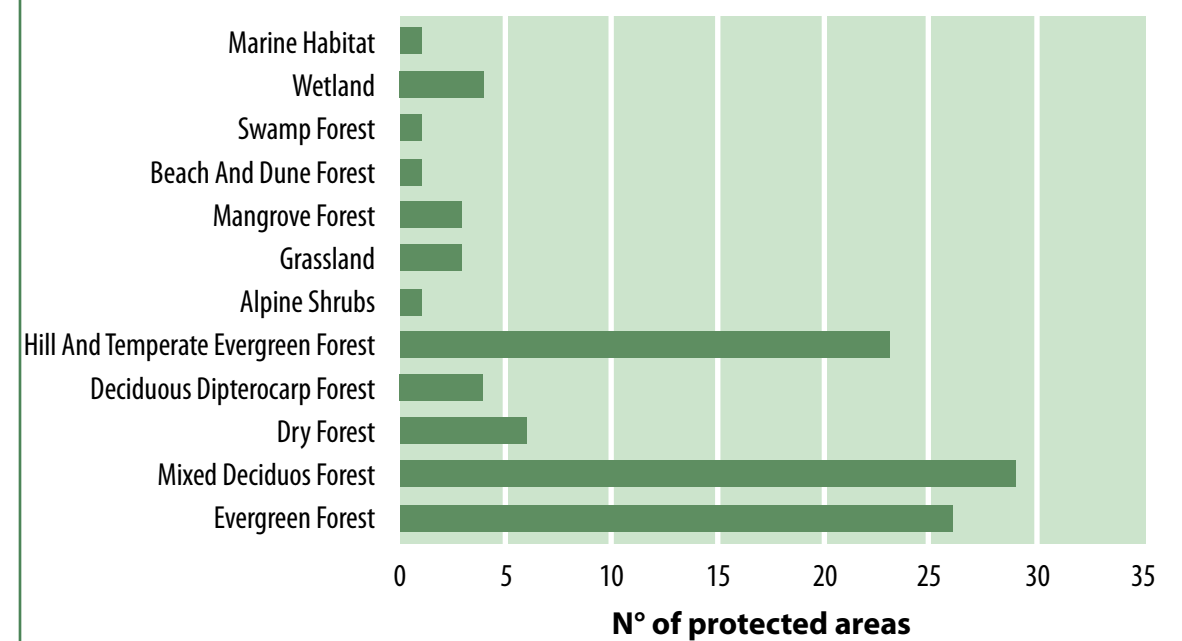
L. Beffasti

**2. Natural Resources**

**Habitat representation**

With an occurrence of 28%, the mixed deciduous forest is the main forest type in the PAs, with 17% represented by the moist upper type, followed by hill and temperate evergreen forest with an occurrence of 24%, hill forest (21%, of which 11% is coniferous forest ) and dry forest (6%). The mangrove forest is present only in the 3% of the sample PAs, in Mainmahla Kyun Wildlife Sanctuary, where mangrove forest cover is almost total, in Lampi Island Marine National Park, where mangrove forest cover is approximately only 2% of total forest cover, and in Tanintharyi National Park. Considering the importance of mangroves, this habitat type is still under represented in the protected area system. Hlawga Wildlife Park is the only PA containing swamp forest with an approximate cover of 20% of the site, thus leaving a gap in the conservation of this important habitat type.

**Figure 6 Representation of habitat types in Myanmar PAs** (Source: MEP project)



**Threats**

According to park staff, the conservation status of most protected area is good, i.e. within acceptable range of variation but requires some intervention. Significant concern has been expressed for areas like Kahilu, Lenya and Rakhine Yoma Elephant Range where large areas have been encroached or are not accessible to FD staff for security reasons. Information on the threats to biodiversity inside and outside the PAs have been collected following the classification proposed by IUCN-CMP (2006), that classifies threats into eleven main categories and from three to six subcategories as indicated in the table below.

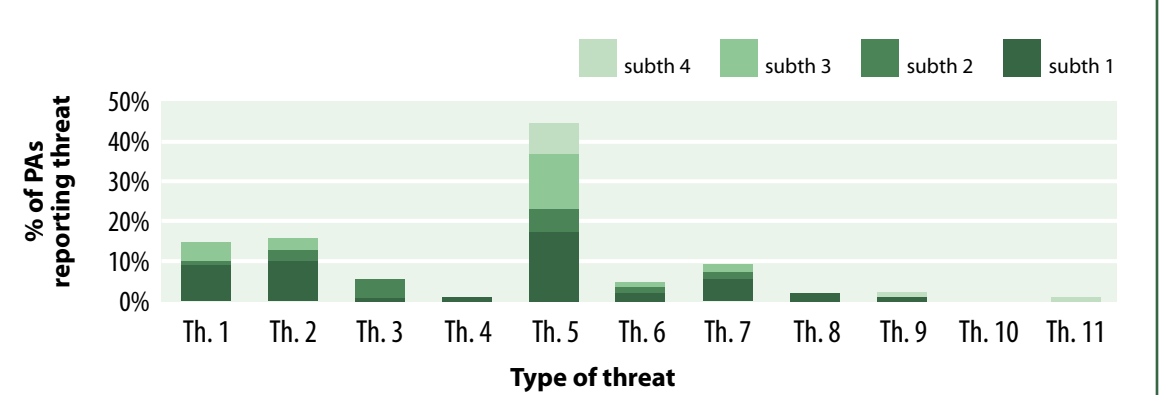
**Table 5 Classification of threats to biodiversity (IUCN – CMP 2006)**

<b>1 Residential &amp; Commercial Development</b>	1.1 Housing & Urban Areas 1.2 Commercial & Industrial Areas 1.3 Tourism & Recreation Areas
<b>2 Agriculture &amp; Aquaculture</b>	2.1 Annual & Perennial Non-Timber Crops 2.2 Wood & Pulp Plantations 2.3 Livestock Farming & Ranching 2.4 Marine & Freshwater Aquaculture
<b>3 Energy Production &amp; Mining</b>	3.1 Oil & Gas Drilling 3.2 Mining & Quarrying 3.3 Renewable Energy
<b>4 Transportation &amp; Service Corridors</b>	4.1 Roads & Railroads 4.2 Utility & Service Lines 4.3 Shipping Lanes 4.4 Flight Paths
<b>5 Biological Resource Use</b>	5.1 Hunting & Collecting Terrestrial Animals 5.2 Gathering Terrestrial Plants 5.3 Logging & Wood Harvesting 5.4 Fishing & Harvesting Aquatic Resources
<b>6 Human Intrusions &amp; Disturbance</b>	6.1 Recreational Activities 6.2 War, Civil Unrest & Military Exercises 6.3 Work & Other Activities
<b>7 Natural System Modifications</b>	7.1 Fire & Fire Suppression 7.2 Dams & Water Management/Use 7.3 Other Ecosystem Modifications
<b>8 Invasive &amp; Other Problematic Species &amp; Genes</b>	8.1 Invasive Non-Native/Alien Species 8.2 Problematic Native Species 8.3 Introduced Genetic Material
<b>9 Pollution</b>	9.1 Household Sewage & Urban Waste Water 9.2 Industrial & Military Effluents 9.3 Agricultural & Forestry Effluents 9.4 Garbage & Solid Waste 9.5 Air-Borne Pollutants 9.6 Excess Energy
<b>10 Geological Events</b>	10.1 Volcanoes 10.2 Earthquakes/Tsunamis 10.3 Avalanches/Landslides
<b>11 Climate Change &amp; Severe Weather</b>	11.1 Habitat Shifting & Alteration 11.2 Droughts 11.3 Temperature Extremes 11.4 Storms & Flooding

**Threats inside**

Hunting, logging, agriculture and human settlements are the most common threats occurring in the 30 PAs surveyed on the ground. Biological Resource Use (threat 5) is reported in 25 out of 30 surveyed PAs, with hunting and collecting terrestrial animals (sub-threat 5.1) as the main threat of the category followed by logging and wood harvesting (5.3). Fishing (5.4) and gathering terrestrial plants (5.2) occur respectively in 8 and 6 sites. Shifting cultivation and/or permanent agricultural fields (2.1) are present inside 11 PAs linked to the presence of housing and urban areas. Forest fires (7.1) are also reported in 6 PAs, connected to traditional agricultural and hunting practices of local people.

**Figure 7 Recorded threats inside the PAs.** (Source: MEP project)

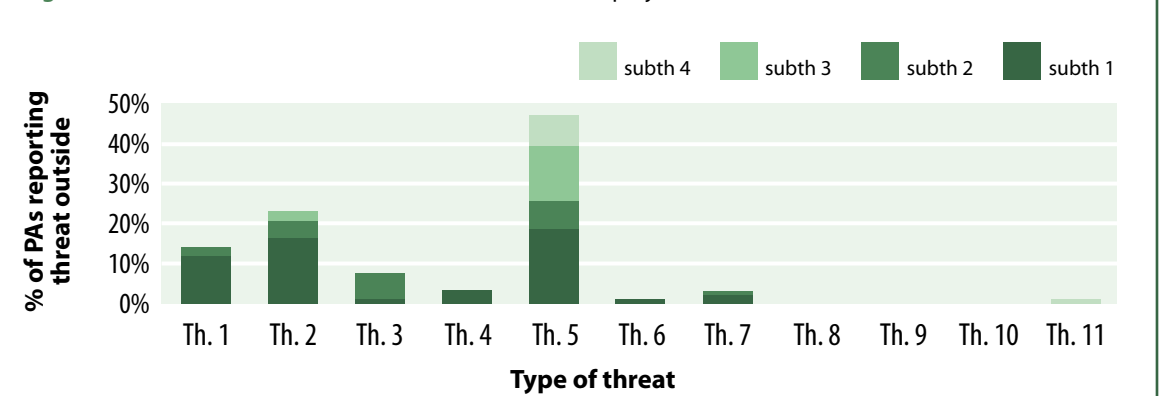


The mere presence of illegal activities inside the PAs does not necessarily mean that they are a serious threat to biodiversity. In fact, in terms of severity of threats, the most widespread threats like the n.5 (Biological Resource Use), are considered by local managers and staff of mild to moderate severity, while uncommon threats like n. 7 that includes dams and water management use and n. 8 including invasive non native species, are considered of high impact with a widespread extension.

**Threats outside**

The findings of threat occurrence outside the PAs reflect largely the trend inside the PAs (Fig.8). Among the main threats recorded outside, the most common threat is related to hunting and collecting terrestrial animals (5.1) and logging and wood harvesting (5.3), with an incidence of 18% and 14% respectively of all the threats recorded. Another important threat outside the PAs, with a frequency of 16% is related to commercial plantation (2.1). Threats n.8 (Invasive species) and n. 9 (Pollution) are not recorded outside PAs but this is probably due to a different perception of the problem.

**Figure 8 Recorded threats outside the PAs.** (Source: MEP project)



### Fauna and Flora checklist

Many PAs have partial or complete checklists of some natural resources, due to research activities on specific topics carried out, or because resources identification is part of the annual operational plan. The most common checklists are those on mammals, trees and birds owned respectively by 25, 23 and 22 of PAs. Fewer PAs (9-11) possess checklists on insects, amphibians and reptiles. The PAs which do more inventories of different biological resources are Indawgyi Lake Wildlife Sanctuary, Lampi Island Marine National Park, Alaungdaw Kathapa National Park, Chatthin Wildlife Sanctuary, Htamanthi Wildlife Sanctuary, Khakaborazi National Park, Panlaung-Pyadalin Cave Wildlife Sanctuary and Shwesettaw Wildlife Sanctuary. All these sites are managed by NWCD.

### 3. Management

In terms of management 20 PAs have a planning document, in most cases an annual operational plan, and park wardens have to report about its completion to headquarters at the end of every year. Patrolling, environmental education and wildlife surveys are implemented in approximately half of the surveyed PAs. Development actions performed by park staff include, in 23% of the visited sites, community based natural resources management and community forestry in the surroundings areas of the PA. Outreach programs are implemented in 30% of the PA visited, in form of collaboration and meetings with neighbouring communities, but also in terms of education programs. In 70% of the PAs visited, lack of budget and staff (both in numbers and quality) are mentioned as the main constraints to the implementation of management actions. Conflicts with local communities and insurgents are identified as main limit to management in 15% of the visited sites.

### 4. Staff/Resources

Over 65% of the sample has some infrastructure for management, at least the park warden office, and staff assigned with some level of training. In most cases physical and human resources were judged inadequate by PA authority or staff. There are 17 out of 43 PAs with no allocated staff and all are under the governance of FD. Staff is missing in all proposed areas except Bawditataung and Natma Taung. The number of staff allocated to remaining 26 sites ranges from a minimum of 4 for Kelatha to a maximum of 131 for Hlawga without any correlation to the size of the PA. For instance, only 17 staff are allocated to the largest (Hukaung Valley, 22.000 km<sup>2</sup>) and over 30 to the smallest (Lawkananda, 0,5 km<sup>2</sup>). In general, PAs governed under NWCD have more infrastructure and staff, and consequently perform more conservation and management activities than those governed by FD, where the office is in general quite far from the PA and management actions are limited to sporadic patrolling and gap planting. Lack of financial resources is reported as the main cause of insufficient monitoring and patrolling; staff is not paid any travel allowance and vehicles and tools are inadequate.

### 5. Tourism

Tourism is permitted in some PAs, especially those that are listed among the Myanmar ecotourism sites (Moyingyi, Popa, Shwesettaw, Inlay Lake, Alaungdaw Kathapa, Natma Taung, Khakaborazi, Hponkanrazi, Mainmahla Kyun, Lampi Island, Hukaung Valley, Chatthin). Furthermore, religious tourism is present in other areas such as Kyaikhtyoe, Bumhpabum and Par Sar. Tourism facilities are available in 19 sites but tourism statistics were not available at the park offices because they are managed under the Myanmar Travel and Tourism. No community-based tourism activities were recorded inside or in the proximity of protected areas except for Inlay lake, which is one of the main tourist destinations in Myanmar. Figures for international tourism are very small for Myanmar compared to neighbouring countries but more investments are expected in the future, with special attention to ecotourism.

### 6. Land use and Human activities

Land use classification consists of 10 categories according to Young (1994) namely: 1) not used 2) conservation 3) collection 4) forestry 5) agricultural production 6) fisheries production 7) recreation 8) mineral extraction 9) settlement 10) use restricted by security. Data confirm that agricultural production, forestry and fisheries production are implemented in the majority of protected areas. Tourism and recreation areas are present in 32% of the analysed PAs, mining activities are reported in 10 sites, and security issues related to the presence of either insurgents or army compounds inside 6 sites.

### 7. Research

Research surveys have been implemented in 65% of sites, mainly by local universities, local NGOs and a few international organisations (WCS, California Academy of Science, Smithsonian Institute, Istituto Oikos). There are no clear procedures to undertake research in the PAs. Local researchers make agreements with park wardens while international scientists are required to get security clearance from the central FD office. Furthermore, research results are often not available at the park office.

### 2.3 Protected Areas Datasheets

In the following section, we report the general information provided by Forest Department and the maps produced by project GIS experts for all 43 PAs and selected information collected by the project on natural resources, threats, management, tourism, land use and human activities, research, about the 30 surveyed sites. All the information retrieved during the project has been inserted in a database available to stakeholders upon request. Such database has been created using MS Access 2007 and comprises a Graphic User Interface to easily browse all the Protected Areas. The instructions on how to use the Database are present in the Database itself. The maps displayed in the present publication have been created using data retrieved from different sources such as: SRTM for the digital elevation model (USGS 2004, Shuttle Radar Topography Mission, Global Land Cover Facility); Landsat 5 and 7 for satellite images (NASA); the UN agency MIMU-OCHA for the administrative boundaries, towns and road connections (Myanmar Information Management Unit, <http://themimu.info/>). The boundaries of the Protected Areas have been retrieved from the Forest Department and the Wildlife Conservation Society. Such boundaries, as well as the position of the Head Quarters and Ranger Posts, have been corrected when necessary after the field trips in the PAs of the present project. The two resulting maps have the objective to display the general topographic location and characteristics of each PA, and give more detailed information on the vegetation cover from remotely sensed data. To appreciate such information a colour scale is provided: black means generally presence of water; cyan-white means bare soils or artificial surfaces; red, on the other side, means presence of any kind of vegetation.



A. Bonetti

# ALAUNGDAW KATHAPA

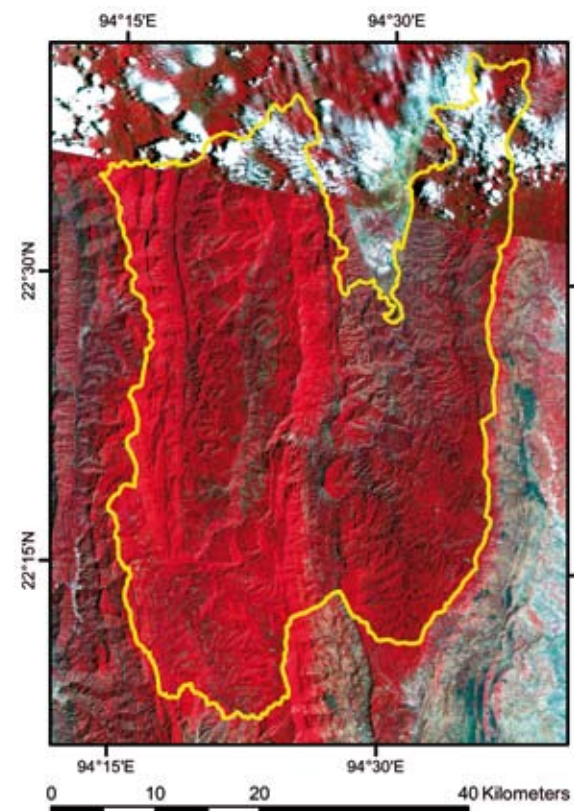
Site ID	1
Locality	Sagaing Region, Kani and Mingin Townships
Coordinates	N22° 23', E94°25'
Size (km <sup>2</sup> )	1597
Altitude (m. asl)	135-1335
Myanmar category	National Park
IUCN category	II
Site Governance	Nature and Wildlife Conservation Division
Boundaries	Demarcated
Year gazetted	1989
Protection level	Partial (Recreation/Tourism allowed)
Main purposes	Conservation, Cultural Heritage, Recreation/Tourism
Habitat	Evergreen Forest (Typical), Mixed Deciduous Forest (Moist and Dry Upper Forest, Lower Forest), Hill Forest (Pine)
Key resources	Asian Elephant, Leopard, Gaur, Sambar Deer, Serow, Asiatic Black Bear

### Legend of topographic maps

- Head Quarters
  - Ranger Post
  - Towns
  - Protected Areas
  - State/Region Boundaries
  - Roads
  - Water areas
  - Rivers
- Elevation**
- 5.800 m. asl
  - 0 m. asl

### Legend of satellite maps

- |  |   |
|--|---|
| <b>Water Depth</b>                               | <b>Vegetation Density</b>               |
| <span style="color: blue;">■</span> Deep         | <span style="color: red;">■</span> High |
| <span style="color: lightblue;">■</span> Shallow | <span style="color: pink;">■</span> Low |



### SITE DESCRIPTION

Alaungdaw Kathapa National Park is located in Kani and Mingin Townships of Sagaing Region in upper Myanmar. It is also an ASEAN Heritage Park. Sandy, gravel, very sticky clay, limestone, shale and rock are the ground types of the site. Average rainfall ranges from 25 to 50mm and average temperature is recorded as 10 to 40°C. Elevation ranges from 135 to 1335m in the site. Two rivers, Pahtolone and Taungdwin Chaung Magyi, flow in the park.

### NATURAL RESOURCES

Mixed deciduous forest (moist upper, dry upper and lower) is the typical forest type of the site. Other forest types are evergreen forest and pine forest. About 150 tree species, 42 orchid species, 10 bamboo species, 4 cane species and more than 50 medicinal plants have been recorded from the park. Regarding the wildlife, the Indian tiger (*Panthera tigris*) is probably not present anymore. Twenty to 40 leopards (*Panthera pardus*), about 50 Asian elephants (*Elephas maximus*), 40 gaurs (*Bos gaurus*), 300 sambar deers (*Cervus unicolor*), muntjac, bear, cat species, insects and aquatic animals have been observed by park staff. Thirteen reptile species, 240 butterfly species and more than 240 bird species are also recorded from the park.

### THREATS

- |   |
|---|
| <b>INSIDE</b>   |
| <ul style="list-style-type: none"> <li>• Tourism &amp; Recreation Areas</li> <li>• Oil &amp; Gas Drilling</li> <li>• Roads &amp; Railroads</li> <li>• Hunting &amp; Collecting Terrestrial Animals</li> <li>• Gathering Terrestrial Plants</li> </ul> |
| <b>OUTSIDE</b>  |
| <ul style="list-style-type: none"> <li>• Logging &amp; Wood Harvesting</li> <li>• Hunting &amp; Collecting Terrestrial Animals</li> <li>• Annual &amp; Perennial Non-Timber Crops</li> <li>• Oil &amp; Gas Drilling</li> </ul>                        |

### MANAGEMENT

- Annual management plan.  
Buffer zone designated.  
Management actions in place:
- Monthly patrolling by two patrol groups
  - Occasional special inspection by park warden
  - Meetings with the local communities
- Management problems:
- Insufficient budget
  - Insufficient manpower
  - Conflicts with local communities (such as poachers)

### STAFF / RESOURCES

A total of 86 staff is working for the site. Four ranger posts are built with 27 assigned staff. Local and international trainings are arranged for the staff.

### TOURISM

Alaungdaw Kathapa is the name of the legendary monk living there in historical times. The site is famous for the cave and pagoda and receives every year many local and pilgrims and tourists, especially during the annual pagoda festival.

### LAND USE AND HUMAN ACTIVITIES

- |  |
|--|
| <b>INSIDE</b>  |
| <ul style="list-style-type: none"> <li>• Conservation</li> <li>• Cultural heritage</li> <li>• Research</li> <li>• Recreation</li> </ul>      |
| <b>OUTSIDE</b>   |
| <ul style="list-style-type: none"> <li>• Management of natural forests by Myanmar Timber Enterprise</li> <li>• Permanent cropping</li> </ul> |

### RESEARCH

No information available.

# BAWDITATAUNG

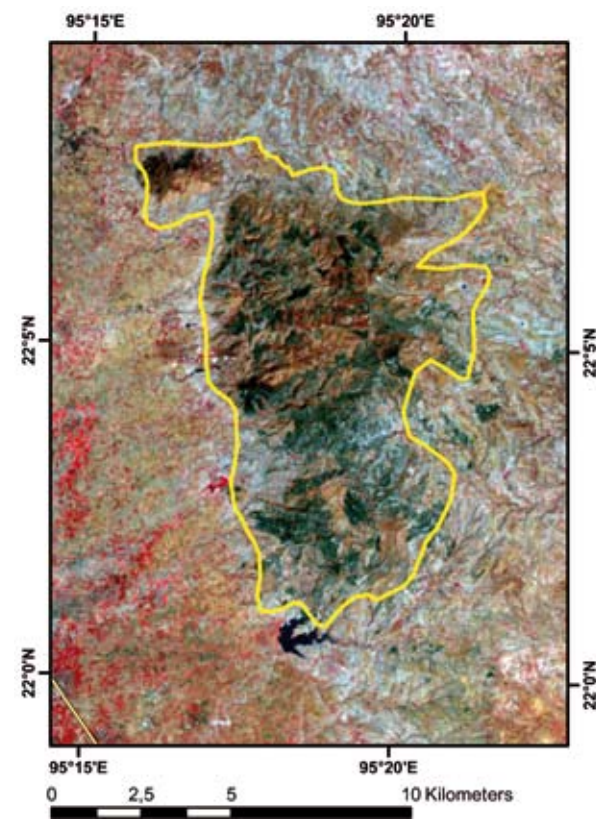
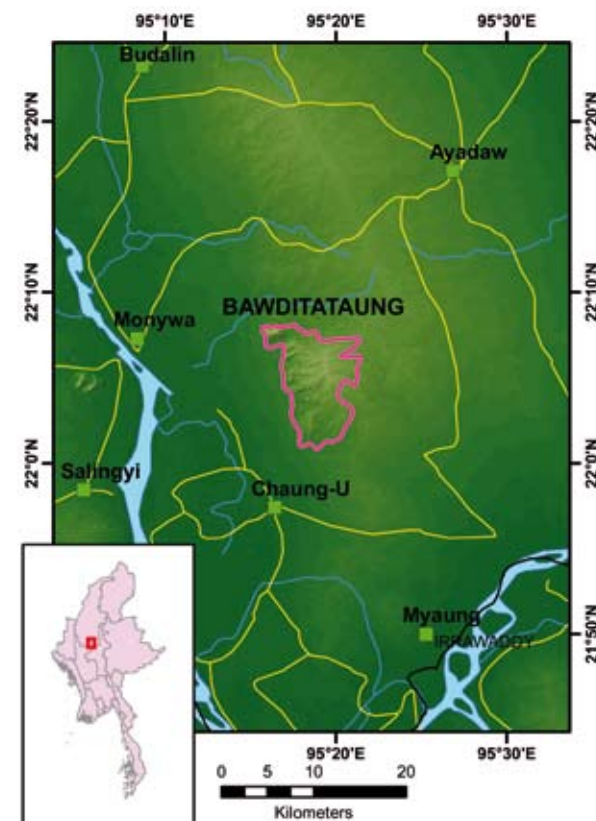
Site ID	2
Locality	Sagaing Region, Monywa and Chaung Oo Townships
Coordinates	N22° 04', E 95° 18'
Size (km <sup>2</sup> )	73
Altitude (m. asl)	85 – 375
Myanmar category	Nature Reserve
IUCN category	VI
Site Governance	Forest Department
Boundaries	Demarcated
Year proposed	2008
Protection level	Total
Main purposes	Conservation, Cultural heritage
Habitat	Dry Forest
Key resources	Dry Zone Ecosystem

### Legend of topographic maps

- Head Quarters
  - Ranger Post
  - Towns
  - Protected Areas
  - State/Region Boundaries
  - Roads
  - Water areas
  - Rivers
- Elevation**
- 5.800 m. asl
  - 0 m. asl

### Legend of satellite maps

- | Water Depth                                      |   | Vegetation Density                      |   |
|--|---|---|---|
| <span style="color: blue;">■</span> Deep         | <span style="color: red;">■</span> High | <span style="color: red;">■</span> High | <span style="color: red;">■</span> High |
| <span style="color: lightblue;">■</span> Shallow | <span style="color: red;">■</span> Low  | <span style="color: red;">■</span> Low  | <span style="color: red;">■</span> Low  |



### SITE DESCRIPTION

Bawditataung Nature Reserve is situated in Monywa and Chaung Oo Townships of Sagaing Region in middle Myanmar. The reserve is 20 km away from Monywa town. Kyaukkar (375 m) is the highest hill of the Bawditataung range. The site is marked with 21 boundary posts on the ground. Young sandstone is upper layer and old sand stone is lower layer of the ground. The site has ridges, slopes and streams. The site has been designed to conserve the dry zone ecosystem and to promote the cultural heritage site of the pagodas. It has a hot and a dry season and the temperature ranges from 8° to 40°C.

### NATURAL RESOURCES

Tropical dry forest is the forest type of the Reserve. About 40% of the area is covered by dry forest, 30% by agricultural fields and plantations, 25% by urban/industrial areas and 5% by geological formations.

### THREATS

#### INSIDE

- Housing & Urban Areas
- Tourism & Recreation Areas

The site is frequented by visitors from various parts of Myanmar, with consequent issues of pollution, littering and disturbance to the environment.

#### OUTSIDE

- Housing & Urban Areas
- Annual & Perennial Non-Timber Crops
- Livestock Farming & Ranching

There are many villages outside the PA. However, it is reported that the villagers respect the site because of its religious value and the presence of the monks.

### MANAGEMENT

Annual management plan  
Management actions in place:

- Reforestation
- Nature conservation

### STAFF / RESOURCES

2 rangers and 8 foresters from the Forest Department and Tropical Region Greening Department have been working for the site. There are no ranger posts in Bawditataung but there are some buildings in the Pagoda Compound, not too far from head office based at Monywa.

Access to the site is easy due to the presence of motor roads and nearby Monywa town.

### TOURISM

The Bawditataung Nature Reserve is a national cultural heritage site. Standing Buddha concrete image is built in the site and it is the tallest and biggest standing Buddha image in Myanmar. The site is visited by many local and foreign pilgrims and tourists every year. Various types of accommodation are located at nearby Monywa town

### LAND USE AND HUMAN ACTIVITIES

#### INSIDE

- Forest plantations
- Conservation
- Recreation
- Reforestation activities are carried out by FD and local authorities

#### OUTSIDE

- Agriculture

### RESEARCH

No information available.

# BUMHPABUM

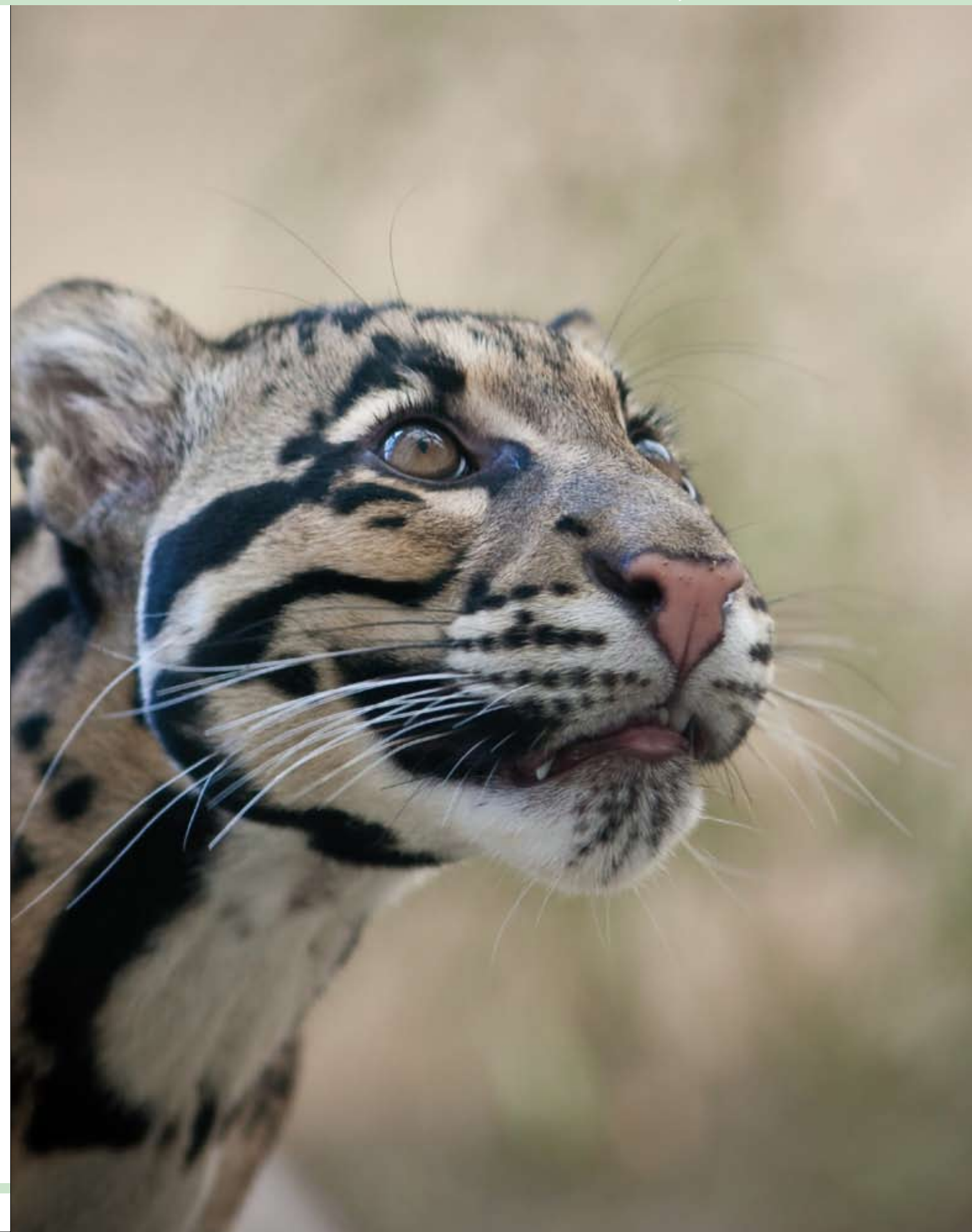
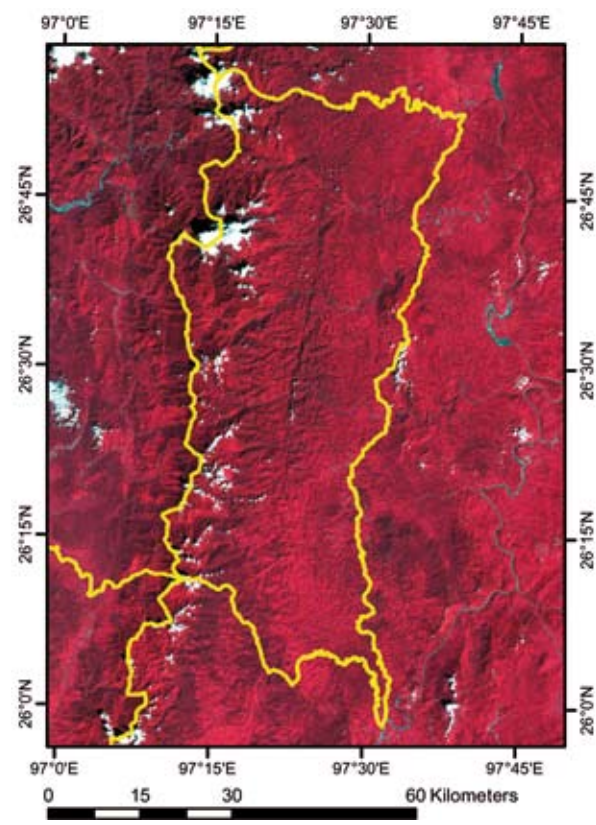
Site ID	3
Locality	Kachin State, Sumprabom Township
Coordinates	N 26° 31', E 97° 23'
Size (km <sup>2</sup> )	1,854
Altitude (m. asl)	140 – 3,435
Myanmar category	Wildlife Sanctuary
IUCN category	IV
Site Governance	Forest Department
Boundaries	Demarcated
Year gazetted	2004
Protection level	Total
Main purposes	Conservation
Habitat	Evergreen Forest (Typical), Hill Forest (Evergreen), Hill Forest (Pine Forest)
Key resources	Asian Elephant, Gaur, Serow, Deer Spp., Clouded Leopard, Asiatic Golden Cat, Golden Jackal, Red Goral, Leopard, Birds Spp.

### Legend of topographic maps

- Head Quarters
  - Ranger Post
  - Towns
  - Protected Areas
  - State/Region Boundaries
  - Roads
  - Water areas
  - Rivers
- Elevation**
- 5.800 m. asl
  - 0 m. asl

### Legend of satellite maps

- | Water Depth                                   |   | Vegetation Density                      |   |
|---|---|---|---|
| <span style="color: lightblue;">■</span> Deep | <span style="color: red;">■</span> High | <span style="color: red;">■</span> High | <span style="color: red;">■</span> High |
| <span style="color: cyan;">■</span> Shallow   | <span style="color: pink;">■</span> Low | <span style="color: pink;">■</span> Low | <span style="color: pink;">■</span> Low |



# CHATTHIN

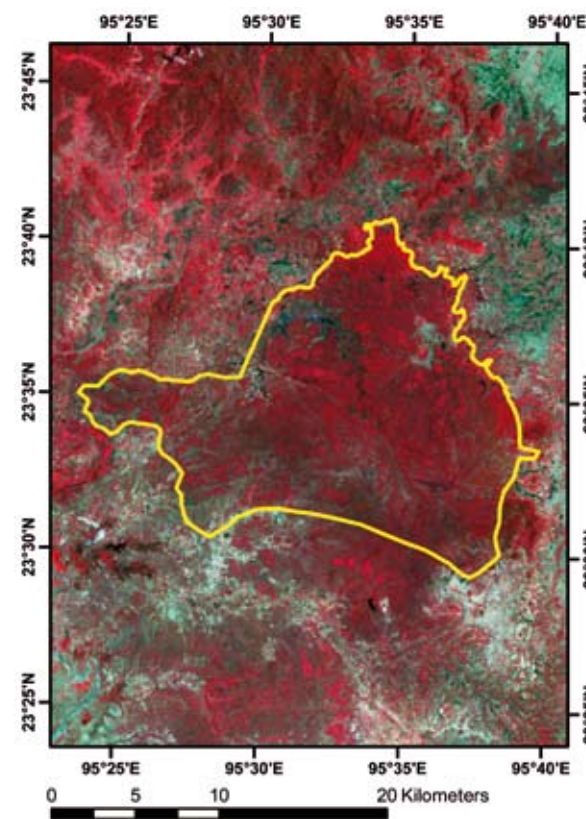
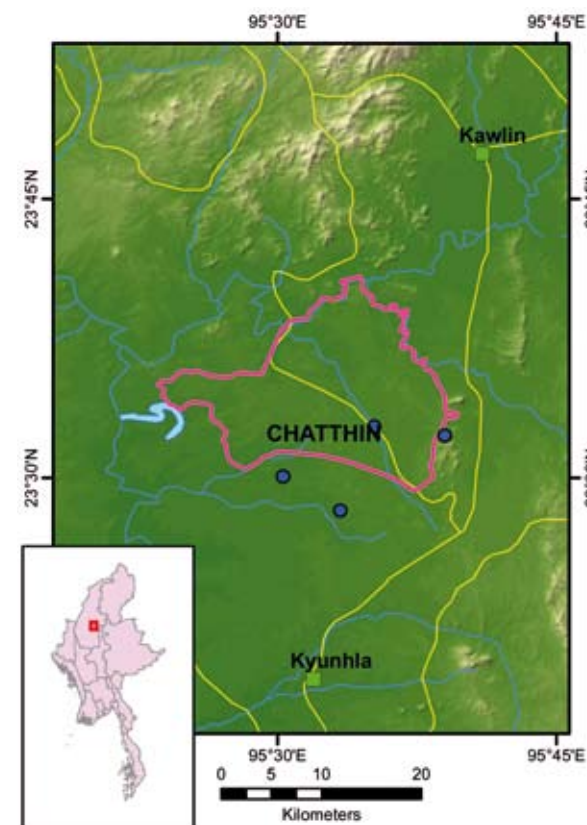
Site ID	4
Locality	Sagaing Region, Kanbalu and Kawlin Townships
Coordinates	N 23° 34', E 95° 32'
Size (km <sup>2</sup> )	269
Altitude (m. asl)	165 – 260
Myanmar category	Wildlife Sanctuary
IUCN category	IV
Site Governance	Nature and Wildlife Conservation Division
Boundaries	Demarcated
Year gazetted	1941
Protection level	Total
Main purposes	Conservation, Research/Education, Recreation/Tourism
Habitat	Indaing Forest, Mixed Deciduous Forest (Dry Upper), Grassland
Key resources	Eld's Deer, Sambar Deer, Barking Deer, Gaur

### Legend of topographic maps

- Head Quarters
  - Ranger Post
  - Towns
  - Protected Areas
  - State/Region Boundaries
  - Roads
  - Water areas
  - Rivers
- Elevation**
- 5.800 m. asl
  - 0 m. asl

### Legend of satellite maps

- |  |   |   |   |
|--|---|---|---|
| <b>Water Depth</b>                               |   | <b>Vegetation Density</b>               |   |
| <span style="color: blue;">■</span> Deep         | <span style="color: red;">■</span> High | <span style="color: red;">■</span> High | <span style="color: red;">■</span> High |
| <span style="color: lightblue;">■</span> Shallow | <span style="color: red;">■</span> Low  | <span style="color: red;">■</span> Low  | <span style="color: red;">■</span> Low  |



### SITE DESCRIPTION

Chatthin Wildlife Sanctuary is situated in Kanbalu and Kawlin Townships of Sagaing Region in upper Myanmar. Boundary of the site is marked with posts and board signals on the ground. Elevation of the site ranges from 165 to 260 m.

### NATURAL RESOURCES

Indaing forest is the main forest type covering about 90% of the site. Checklists of 263 tree species, 240 birds, 160 insects, 47 fishes, 38 reptiles, 15 amphibians and 13 mammals are available at the Zoology Department of the University of Yangon. Eld's deer (*Cervus eldi thamin*), is one of the three subspecies of Eld's deer and is native to Myanmar.

### MANAGEMENT

There is an annual management plan in place whose effectiveness is judged good. A buffer zone is present and the following activities are allowed in it: agriculture, fuel wood collection and fishing. Park staff patrol the buffer zone in cooperation with local villagers.

Management actions in place:

- Patrolling in order to reduce illegal hunting and logging
- Environmental education to reduce timber exploitation pressure
- Faunal surveys of Eld's deer, Birds, Dhole, Squirrel.

### THREATS

#### INSIDE

- Hunting & Collecting Terrestrial Animals (subsistence)
- Gathering Terrestrial Plants
- Logging & Wood Harvesting
- Fishing & Harvesting Aquatic Resources
- Fire & Fire suppression.

#### OUTSIDE

- Fishing & Harvesting Aquatic Resources
- Hunting & Collecting Terrestrial Animals

- Management of Natural Forests

- Forest replantation through Community forestry is also implemented.

Management problems:

- insufficient manpower
- insufficient budget

Required actions:

- Provision of GPS, binoculars and computer
- Training to staff for communication and awareness raising activities with local communities
- Training to local community for the management of community forests

### STAFF / RESOURCES

39 Staff from the Nature and Wildlife Conservation Division of the Forest Department are assigned to the site, including 1 warden, 8 rangers, 21 foresters and 9 labourers. 7 staff members have graduate level education. In addition, the warden and two rangers attended trainings. Only park warden can use computer at intermediate level.

Park Warden office is situated in Kanbalu Township of Sagaing Region. 5 ranger posts are located in the surrounding villages (San Myaung, Kin san, Nyaung Gon, Pe Tabin, Let Khot Pin) each with at least 1 ranger and 1 forest guard allocated.

### LAND USE AND HUMAN ACTIVITIES

#### INSIDE

- Forest plantations for reforestation
- Extensive grazing
- Shifting cultivation during rainy season
- Fishing with poison

#### OUTSIDE

- Permanent cropping
- Fishing

### RESEARCH

The NWCD and the Zoology Department of Yangon University have implemented research on the following subjects: Dipterocarp forest ecology, Myanmar hare habitat, ant and earthworm ecology, human impact assessment on fish species.

# HLAWGA

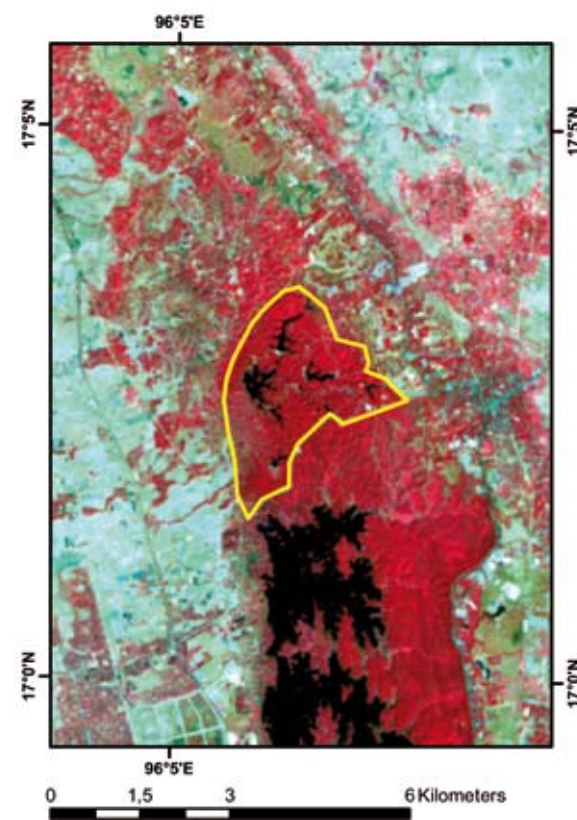
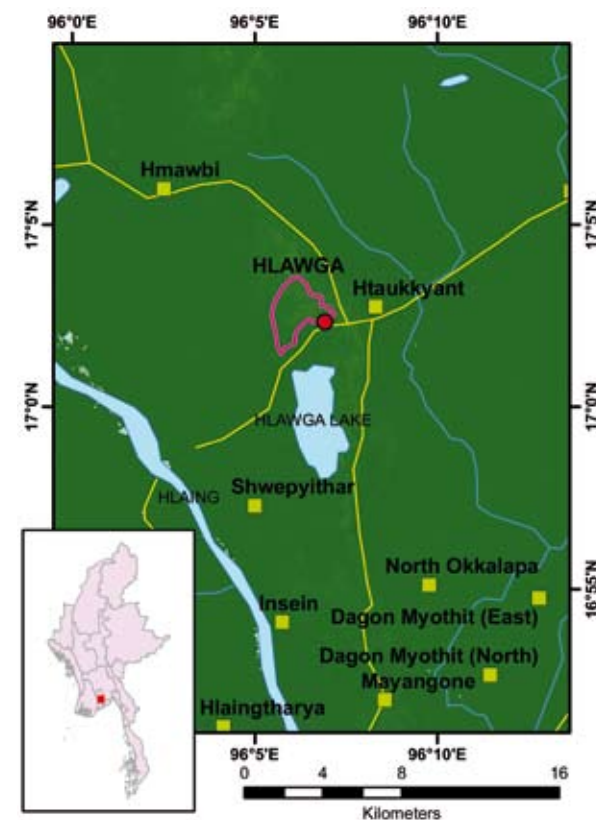
Site ID	5
Locality	Yangon Region, Mingaladon Township
Coordinates	N17°02'; E96°06'
Size (km <sup>2</sup> )	6
Altitude (m. asl)	20 – 55
Myanmar category	Wildlife Park
IUCN category	NA
Site Governance	Joint management by NWCD and private companies
Boundaries	Demarcated
Year gazetted	1989
Protection level	Partial (Recreation/Tourism allowed)
Main purposes	Research/Education, Conservation
Habitat	Evergreen Forest (Typical), Mixed Deciduous Forest (Lower), Swamp Forest
Key resources	Eld's Deer, Sambar Deer, Barking Deer, Hog Deer, Migratory birds

### Legend of topographic maps

- Head Quarters
  - Ranger Post
  - Towns
  - Protected Areas
  - State/Region Boundaries
  - Roads
  - Water areas
  - Rivers
- Elevation**
- 5.800 m. asl
  - 0 m. asl

### Legend of satellite maps

- |  |   |  |   |
|--|---|--|---|
| <b>Water Depth</b>   |   | <b>Vegetation Density</b>  |   |
| <span style="background-color: #008080; width: 10px; height: 10px; display: inline-block;"></span> Deep    | <span style="background-color: #FF0000; width: 10px; height: 10px; display: inline-block;"></span> High | <span style="background-color: #000000; width: 10px; height: 10px; display: inline-block;"></span> Low | <span style="background-color: #FF0000; width: 10px; height: 10px; display: inline-block;"></span> High |
| <span style="background-color: #ADD8E6; width: 10px; height: 10px; display: inline-block;"></span> Shallow | <span style="background-color: #FF0000; width: 10px; height: 10px; display: inline-block;"></span> Low  | <span style="background-color: #000000; width: 10px; height: 10px; display: inline-block;"></span> Low | <span style="background-color: #FF0000; width: 10px; height: 10px; display: inline-block;"></span> High |



### SITE DESCRIPTION

Hlawga Wildlife Park is an open zoo created in 1982 by the Forest Department in the proximity of Yangon with the objectives of providing environmental education facilities, protecting the forest and plant cover in the catchment of the Hlawga lake, and establishing a representative collection of Myanmar indigenous plants and wildlife species. In 2010 the site has passed to joint management of NWCD and private entities.

### NATURAL RESOURCES

The site preserves three types of habitat: evergreen forests, mixed deciduous forests and swamp forests. 108 tree species have been identified. Common tree species are Dipterocarps. Deciduous species like teak (*Tectona grandis*) are also found. Barking deer, hog deer and wild boar are the most common of the 12 mammal species from the retrieved checklist. The overpopulation of non-native macaques (*Macaca* spp.) is negatively influencing the ecological balance of the site. Resident and migratory birds are abundant inside the park, with 191 identified species.

### MANAGEMENT

Annual management plan

Buffer zone designated

Management actions in place:

- Weekly monitoring of animal populations and tree cover
- Regular patrolling of the Buffer Zone

Management problems:

- Introduction of non-native spp.

### THREATS

- Tourism & Recreation Areas
- Logging & Wood Harvesting
- Invasive Non-Native/Alien Species

The site is highly frequented by visitors from Yangon and is used as a set for shooting local movies which is the main cause of littering, security problems and wildlife disturbance.

- Park staff routinely allocated to other sites

Required actions:

- Increased patrolling

The park is zoned in 3 areas: the mini zoo (where the education and management buildings are located), the open zoo (with facilities for jungle trekking, bird watching and wildlife safaris) and the buffer zone (where plantations are allowed). Change in management strategies is expected after the change of governance of the site.

### STAFF / RESOURCES

At the time of the visit (2009) the site was well equipped with human resources (130 staff) and adequate infrastructure. The rangers (30) had been trained by Forest Department on forestry issues. Capacity building had been provided with the help from international organizations (Smithsonian Institute and WCS) to the Forest staff. The park facilities include one head office, 6 ranger posts, an education centre, an information centre, a veterinary clinic and an engineer section.

In 2010, as a result of the joint management of the park with a private company, the staff was reorganised (rangers were sent back to central offices) and infrastructures are under renovation.

### TOURISM

The site is visited every year by more than 100.000 local tourists and 400 foreigners, mainly coming from Yangon city. Tourists can use park facilities (tea shops, picnic sites, recreation sites, aviary, mini-zoo, biodiversity museum, environmental education centre and chalets).

### LAND USE AND HUMAN ACTIVITIES

- INSIDE
- Recreation

- OUTSIDE
- Agriculture
  - Army compound (restricted area)
- The site is surrounded by anthropical activities due to the closeness to the biggest city in Myanmar. To decrease the pressure on natural resources, a buffer zone has been designated where only plantations are allowed.



# HPONKANRAZI

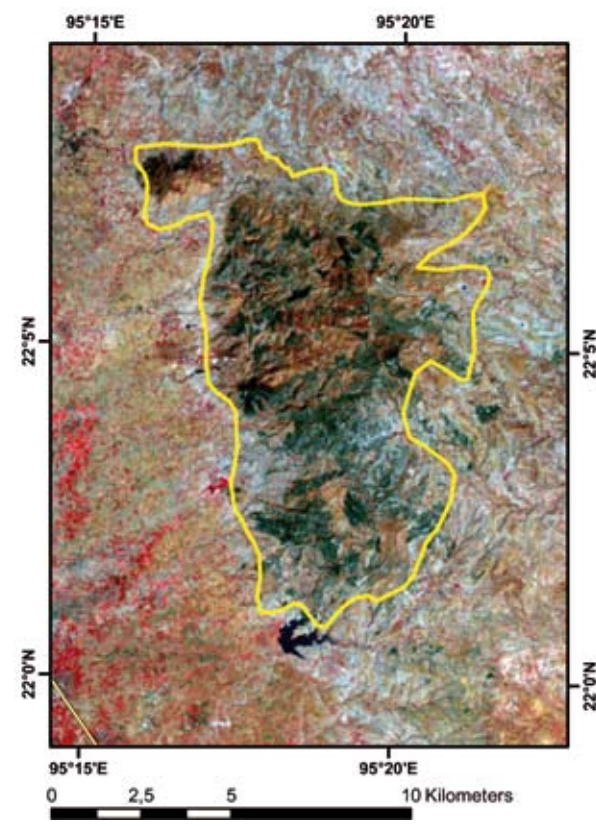
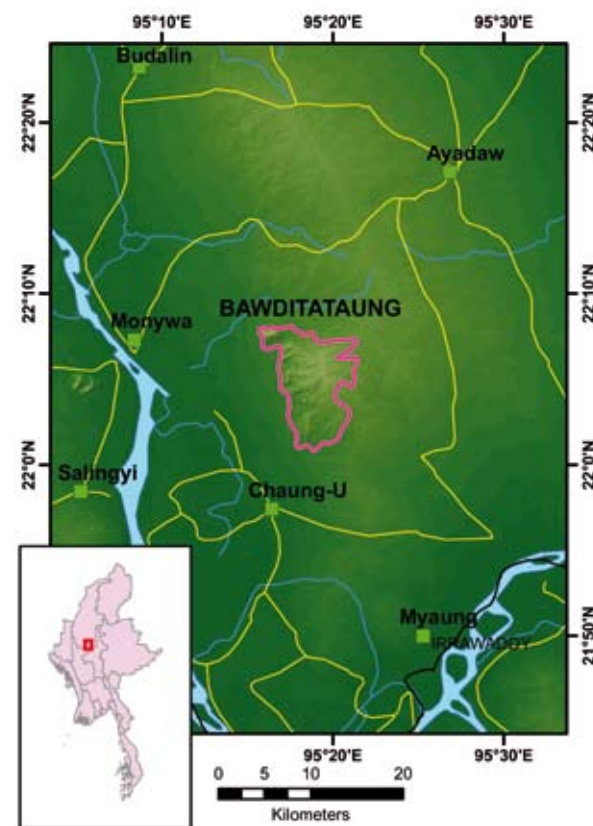
Site ID	6
Locality	Kachin State; Putao, Machanbaw and Naungmon Townships
Coordinates	N27° 38', E97° 16'
Size (km <sup>2</sup> )	2,704
Altitude (m. asl)	295 – 5,165
Myanmar category	Wildlife Sanctuary
IUCN category	IV
Site Governance	Forest Department
Boundaries	Demarcated
Year gazetted	2003
Protection level	Total
Main purposes	Conservation, Research/ Education, Recreation/ Ecotourism
Habitat	Alpine Shrubs, Mountainous Temperate Forest, Hill Forest (Pine), Mixed Deciduous Forest (Moist Upper)
Key resources	Barking Deer, Birds spp., Eastern Hoolock Gibbon, Red Goral, Small Asian Mongoose, Wild Dog

### Legend of topographic maps

- Head Quarters
  - Ranger Post
  - Towns
  - Protected Areas
  - State/Region Boundaries
  - Roads
  - Water areas
  - Rivers
- Elevation**
- 5.800 m. asl
  - 0 m. asl

### Legend of satellite maps

- |  |   |
|--|---|
| <span style="color: blue;">■</span> Deep         | <span style="color: red;">■</span> High |
| <span style="color: lightblue;">■</span> Shallow | <span style="color: pink;">■</span> Low |



# HTAMANTHI

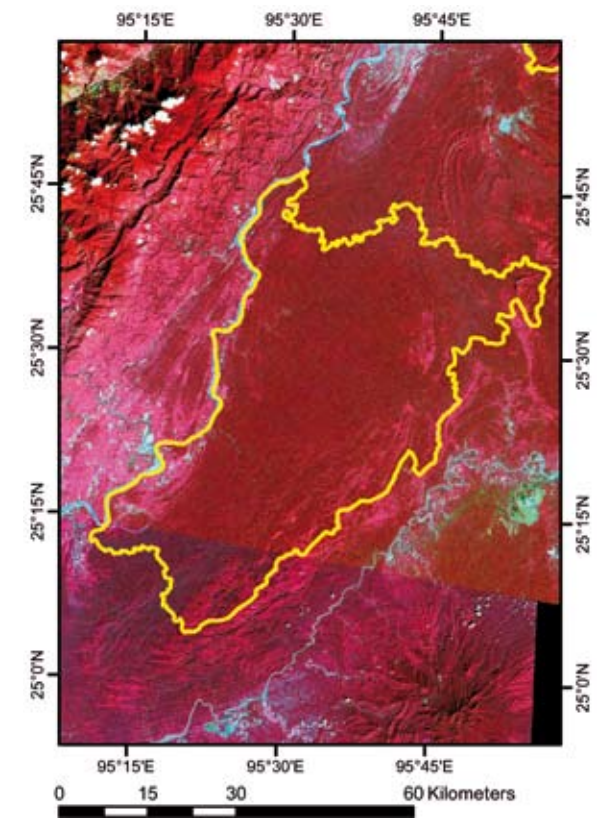
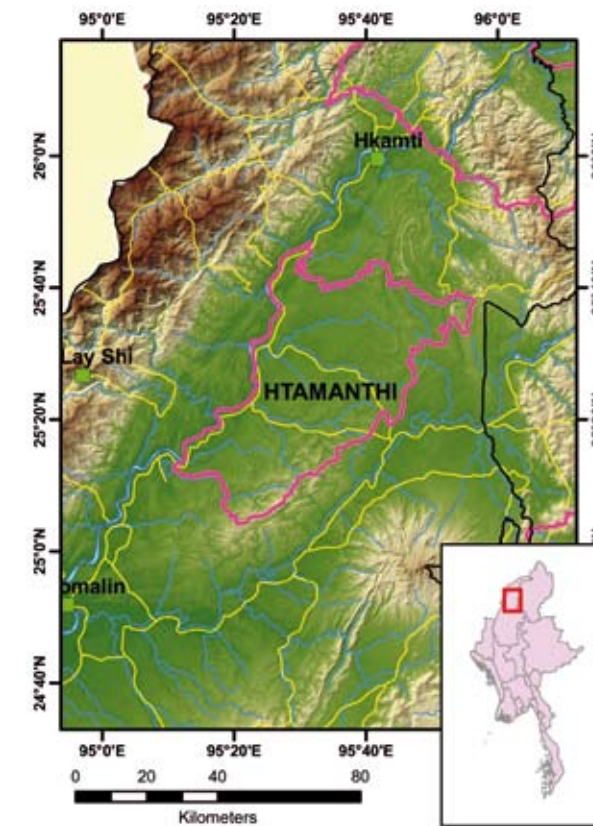
Site ID	7
Locality	Sagaing Region, Homalin and Kamti Townships
Coordinates	N25° 25', E95° 32'
Size (km <sup>2</sup> )	2,151
Altitude (m. asl)	105 – 2,465
Myanmar category	Wildlife Sanctuary
IUCN category	IV
Site Governance	Nature and Wildlife Conservation Division
Boundaries	Demarcated
Year gazetted	1974
Protection level	Total
Main purposes	Conservation, Research/Education
Habitat	Evergreen Forest (Typical), Mixed Deciduous Forest (Moist Upper)
Key resources	White-winged Duck, Asian Elephant, Tiger, Western Hoolock Gibbon, Masked Finfoot, Sumatran and Javan Rhinoceros (extinct since 1980)

### Legend of topographic maps

- Head Quarters
  - Ranger Post
  - Towns
  - Protected Areas
  - State/Region Boundaries
  - Roads
  - Water areas
  - Rivers
- Elevation**
- 5.800 m. asl
  - 0m. asl

### Legend of satellite maps

- |  |   |
|--|---|
| <span style="color: blue;">■</span> Deep         | <span style="color: red;">■</span> High |
| <span style="color: lightblue;">■</span> Shallow | <span style="color: pink;">■</span> Low |



## HUKAUNG VALLEY / HUKAUNG VALLEY (EXTENSION)

### HUKAUNG VALLEY

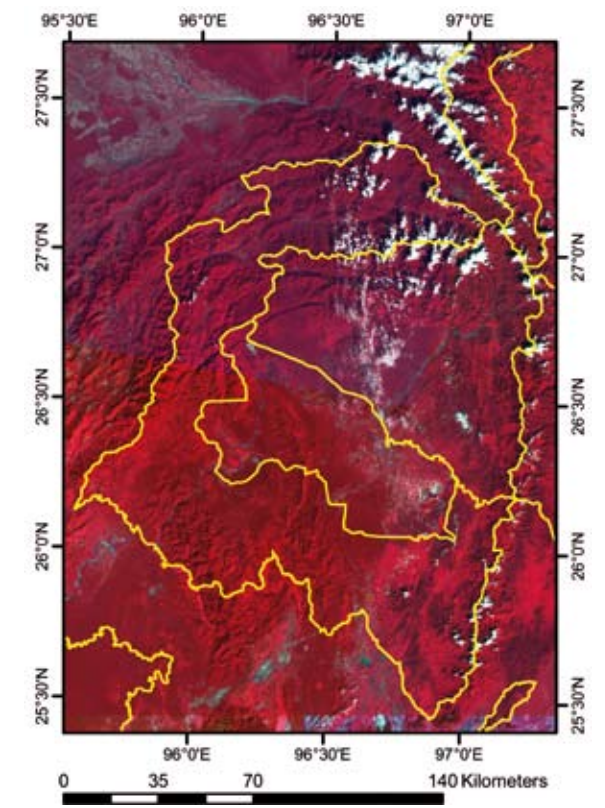
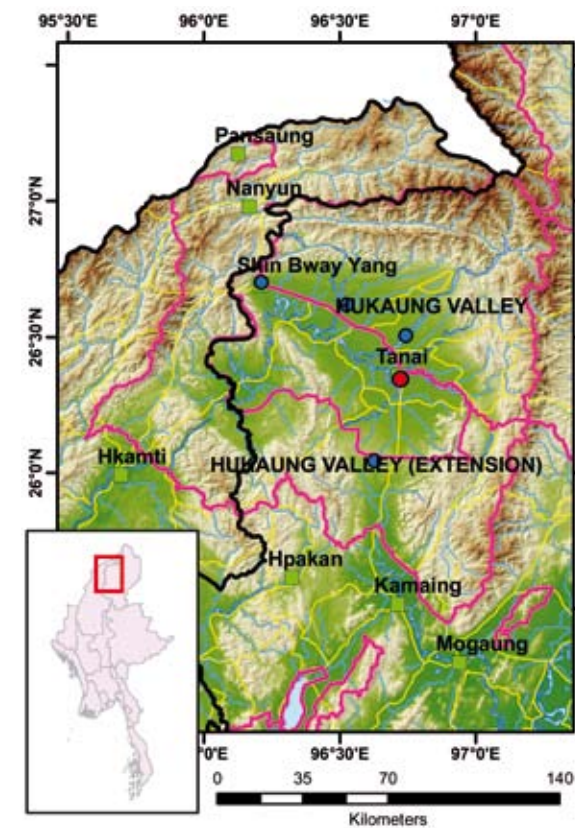
Site ID	8
Locality	Kachin State, Tanaing Township
Coordinates	N 26° 42', E 96° 49'
Size (km <sup>2</sup> )	6,371
Altitude (m. asl)	185 – 3,435
Myanmar category	Wildlife Sanctuary
IUCN category	IV
Site Governance	Nature and Wildlife Conservation Division
Boundaries	Demarcated
Year gazetted	2004
Protection level	Total
Main purposes	Conservation, Research/Education
Habitat	Evergreen Forest (Typical), Mixed Deciduous Forest (Moist Upper), Hill Forest (Evergreen And Pine)
Key resources	Tiger, Asian Elephant, Hoolock Gibbon, Sun Bear, Asiatic Black Bear, White-bellied heron, White-winged duck, Masked Finfoot, Green Peafowl

#### Legend of topographic maps

- Head Quarters
  - Ranger Post
  - Towns
  - Protected Areas
  - ▭ State/Region Boundaries
  - Roads
  - Water areas
  - Rivers
- Elevation**
- 5.800 m. asl
  - 0 m. asl

#### Legend of satellite maps

- |                    |                           |
|--------------------|---------------------------|
| <b>Water Depth</b> | <b>Vegetation Density</b> |
| Deep               | High                      |
| Shallow            | Low                       |



### HUKAUNG VALLEY (EXTENSION)

Site ID	9
Locality	Kachin State; Kamaing and Tanaing Townships. Sagaing Region, Nayun and Kamti Townships
Coordinates	N 26° 23', E 96° 25'
Size (km <sup>2</sup> )	15,431
Altitude (m. asl)	125 – 3,255
Myanmar category	Wildlife Sanctuary
IUCN category	IV
Site Governance	Nature and Wildlife Conservation Division
Boundaries	Demarcated
Year gazetted	2010
Protection level	Total
Main purposes	Conservation, Research/Education, Recreation/Ecotourism
Habitat	Evergreen Forest (Typical), Mixed Deciduous Forest (Moist Upper), Hill Forest (Evergreen and Pine)
Key resources	Tiger, Asian Elephant, Hoolock gibbon, Sun Bear, Asiatic Black Bear, White-bellied Heron, White-winged Duck, Masked Finfoot, Green Peafowl

#### SITE DESCRIPTION

Hukaung valley wildlife sanctuary is situated in Northern Forest Complex of Myanmar. In combination with its extension, the site is the world's biggest tiger reserved area. However, over 3,500 km<sup>2</sup> inside the PA extension are occupied by commercial plantations. The two sites are managed as one protected area and share staff and infrastructure.

#### NATURAL RESOURCES

The area has been created with the purpose of conserving the tigers and their habitat. The area is mostly covered by evergreen forest (typical). Mixed deciduous forest (moist upper), hill forest (evergreen) and hill forest (pine forest) are the other forest types of the site. Checklists of 40 mammals and 140 birds are available at the park warden's office.

#### MANAGEMENT

Soon after the declaration of the protected area, the FD made a cooperation agreement with the US-based Wildlife Conservation Society (WCS) for the conservation and management of the site.

An annual management plan with good effectiveness is in place including management and conservation actions, also supported by two international organizations (Panthera and WCS):

- Tiger survey
  - Elephant survey and protection
  - Bird survey
  - Patrolling
  - Conservation and environmental education
  - Community-based natural resources management
- Required actions:
- More human resources to perform patrolling in such a wide area.
  - More environmental awareness seminars for local community, also to raise knowledge of community forestry.

#### STAFF / RESOURCES

A joint project between FD and WCS has provided the site with the necessary infrastructure, equipment and tools. The park warden's office is situated at Tanaing town and the office

has 17 staff. Four ranger posts have been positioned with two forest guards at each station. An education centre has been set up.

Staff received specific training. They have basic IT knowledge. Staff and infrastructures have not been upgraded with the extension of the site. Consequently they are not sufficient to properly manage both sites.

#### TOURISM

Two guest houses were built in the office compound and two persons can stay at each house.

#### LAND USE AND HUMAN ACTIVITIES

##### INSIDE

- Management of natural resources
- Forest plantation
- Grazing
- Small-scale gold mining
- Agriculture (commercial farms)

##### OUTSIDE

- Agriculture (commercial farms)
- Fishing
- Mining
- Road and railroad

#### RESEARCH

Since 1999 tiger surveys have been undertaken in the Hukaung valley by the Forest Department in cooperation with WCS, facilitating the designation of the site and its extension.

#### THREATS

##### INSIDE

- Housing & Urban Areas (temporary human settlements)
- Mining & Quarrying (gold)
- Hunting & Collecting Terrestrial Animals

##### OUTSIDE

- Housing & Urban Areas
- Mining & Quarrying (commercial goldmine)
- Commercial & Industrial Areas (farms owned by one of the biggest Myanmar business groups)

# INDAWGYI LAKE

Site ID	10
Locality	Kachin State, Monyin Township
Coordinates	N 25° 07'; E 96° 22'
Size (km <sup>2</sup> )	815
Altitude (m. asl)	105 -1,400
Myanmar category	Wildlife Sanctuary
IUCN category	IV
Site Governance	Nature and Wildlife Conservation Division
Boundaries	Demarcated
Year gazetted	2004
Protection level	Partial (Recreation/Tourism and Fishing allowed)
Main purposes	Conservation, Cultural heritage, Research/Education, Recreation/Tourism
Habitat	Mixed Deciduous Forest (Moist Upper), Wetland, Evergreen Forest (Riverine), Mixed Deciduous Forest (Bamboo), Hill Forest (Pine Forest)
Key resources	Hoolock Gibbon, Burmese Bushlark, Hooded Treepie, Great Hornbill, Slender-billed Vulture, White-rumped Vulture, Himalayan Vulture

**Legend of topographic maps**

- Head Quarters
- Ranger Post
- Towns
- Protected Areas
- State/Region Boundaries
- Roads
- Water areas
- Rivers

**Elevation**

5.800 m. asl

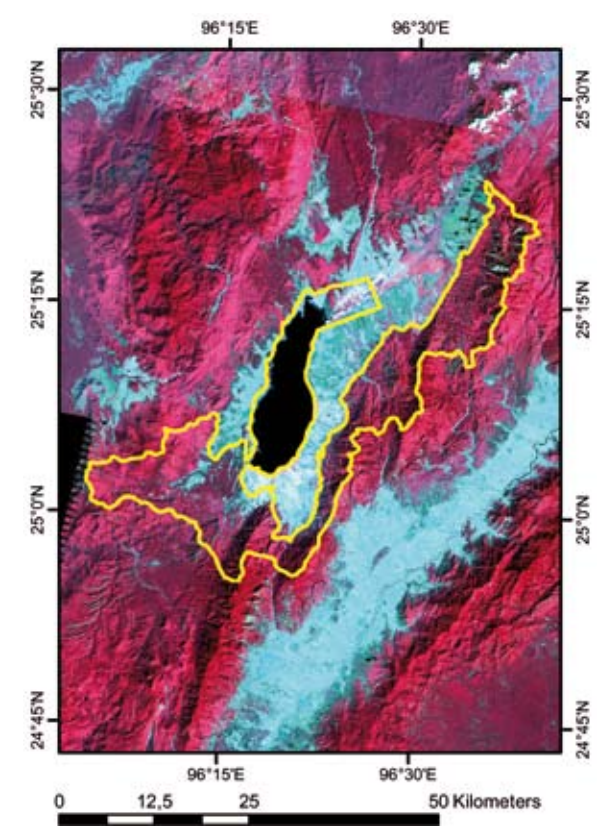
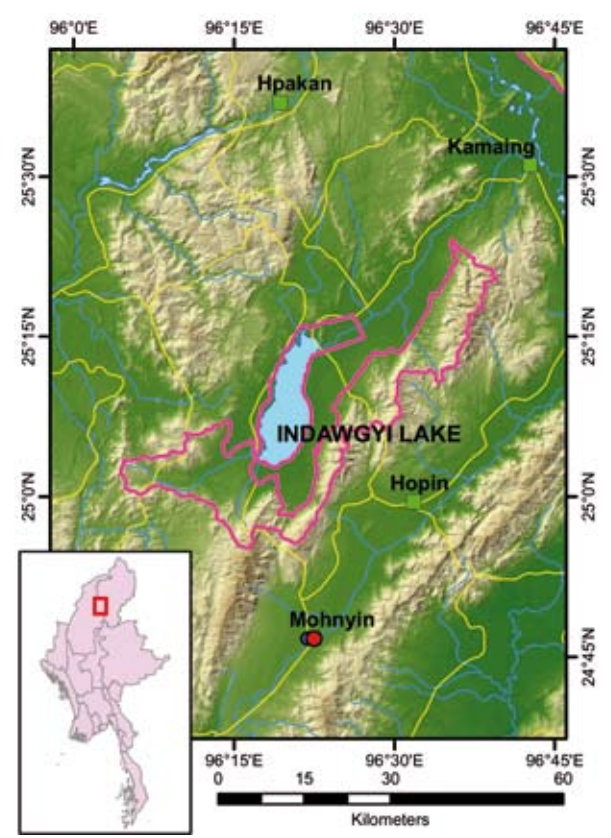
0 m. asl

**Legend of satellite maps**

**Water Depth**    **Vegetation Density**

Deep                      High

Shallow                  Low



**SITE DESCRIPTION**

Indawgyi Lake Wildlife Sanctuary is situated in Monyin Township of Kachin State in northern Myanmar. It is an Important Bird Area (IBA) and an ASEAN Heritage site.

**NATURAL RESOURCES**

50% of the site is covered by mixed deciduous forest and 30% is wetland. Evergreen forest (riverine), mixed deciduous forest (bamboo), hill forest (pine forest) are other forest types of the site.

Checklists of 165 different types of trees and medicinal plants, 38 mammals, 448 birds, 41 reptiles, 34 amphibians and 50 butterflies are available at the park warden's office. BLI has designated the area as IBA in 2004 for the presence of 10 threatened bird species, including the critically endangered White-rumped Vulture *Gyps bengalensis* and the near threatened Hooded Treepie *Crypsirina cucullata* endemic to Myanmar.

**MANAGEMENT**

- Annual management plan
- Buffer zone designated
- Management actions in place:
  - Patrolling
  - Environmental education
  - Participatory rural assessment
  - Biodiversity surveys
- Management problems:

**THREATS**

- INSIDE**
- Hunting & Collecting Terrestrial Animals
  - Gathering Terrestrial Plants
  - Logging & Wood Harvesting
  - Fishing & Harvesting Aquatic Resources
  - Mining & Quarrying (gold)
- OUTSIDE**
- Hunting & Collecting Terrestrial Animals
  - Gathering Terrestrial Plants

- Budget
  - Manpower
- Required equipment:
- computer, camera, GPS, binoculars, telescope, bird watching tower and rest house for departmental visitors
- Required actions inside
- Shifting cultivation control
  - Fishing regulation according to spawning seasons
  - Electric fishing prevention
- Required actions outside
- Gold mining control

**STAFF / RESOURCES**

A total of 14 staff has been working at the site. The park warden's office is situated in Monyin township. Ranger posts are situated at Monyin, Lonton sp. and Nantmon. Three ranger posts with four staff in Monyin, five buildings with six staff at Loneton and one building with four staff at Nantmon guard post. Staff attended local training and training in other countries.

**TOURISM**

The site is visited every year by local and foreign tourists but statistics on numbers of tourists are missing. A military guest house and a guest house which belongs to the local authority are present at the site. The pagoda at the site is famous in Myanmar.

**LAND USE AND HUMAN ACTIVITIES**

- INSIDE**
- Fishing
- OUTSIDE**
- Gold mining
  - Cultivation

**RESEARCH**

Gibbon project: evaluation of the status of Hoolock Gibbon conducted by BANCA in 2009-2010.

# INLAY LAKE

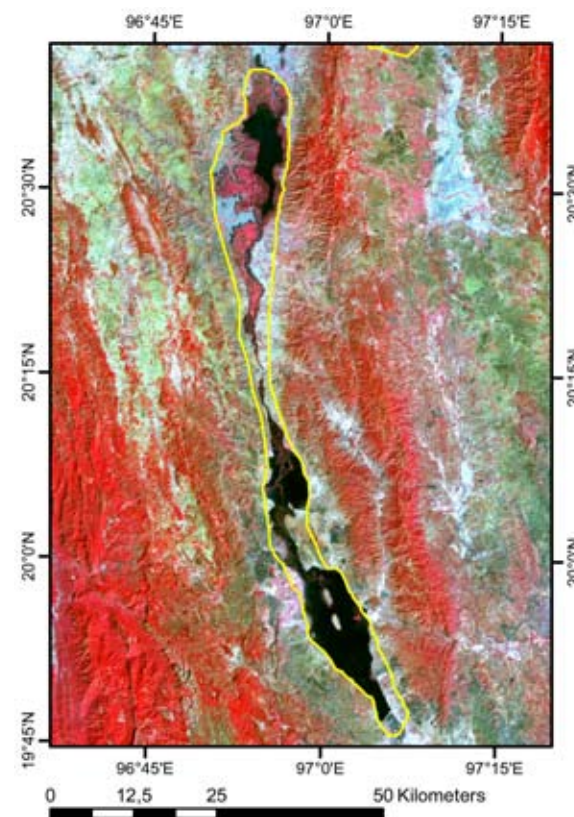
Site ID	11
Locality	Shan State (Nyaung Shwe, Pinlaung and Peh Kon Townships)
Coordinates	N20°13, E96°56'
Size (km <sup>2</sup> )	642
Altitude (m. asl)	830 -1,270
Myanmar category	Wildlife Sanctuary
IUCN category	IV
Site Governance	Nature and Wildlife Conservation Division
Boundaries	Demarcated
Year gazetted	1985
Protection level	Partial (Fishing and Agriculture allowed)
Main purposes	Conservation, Natural resources maintenance, Cultural heritage, Recreation/Ecotourism
Habitat	Wetland, Hill Forest
Key resources	Wetland Ecosystem; Migratory birds

### Legend of topographic maps

- Head Quarters
  - Ranger Post
  - Towns
  - Protected Areas
  - State/Region Boundaries
  - Roads
  - Water areas
  - Rivers
- Elevation**
- 5.800 m. asl
  - 0 m. asl

### Legend of satellite maps

- Water Depth**    **Vegetation Density**
- Deep
  - High
  - Shallow
  - Low



### SITE DESCRIPTION

The site is located on the Shan plateau of East Myanmar, in the Thanlwin river basin. The natural lake is fairly shallow and is located in a broad valley between two limestone ridges rising up to 1,200 m asl and covered by hill forest. The wetland sanctuary has been established to protect migratory birds and their habitats. It is famous for its traditional floating agriculture and it is also a major source of hydropower for Myanmar.

### NATURAL RESOURCES

The key resource of the site is a large population of many migratory and resident birds (according to the Park staff, 175 species have been recorded), besides native aquatic plants and freshwater fishes.

### MANAGEMENT

Annual operation plan

Buffer zone proposed

Management actions in place:

- Patrolling
- Census of aquatic species and resident and migratory bird species
- Plantations outside the PA
- Environmental education activities with schools
- Community forestry outside

### THREATS

The site is in a state of environmental emergency. Poor agricultural practices based on the inappropriate use of chemical fertilizers and pesticides are polluting the water. The growing tourism industry is an increasing threat to water quality due to the growing facilities that have been built inside and outside the protected area without due respect to environmental issues. Zoning recommendations are not respected by local fishermen that are increasingly abandoning traditional practices. Soil erosion in the surrounding slopes, which have been largely converted to agriculture, is the main cause of a severe sedimentation in the water body. All this is resulting in the alarming lowering of the water level and of its quality. Poaching, the collection of firewood and housepoles, gathering orchids, traditional gold mining are localized threats considered to be of limited impact.

Management problems:

- Budget constraints

Actions required:

- Zone management
- Equipment maintenance

### STAFF / RESOURCES

The human resources (13 staff) are barely sufficient to manage the site. More foresters are needed to carry out conservation activities on the surrounding slopes. Many infrastructures are present, such as office, ranger posts and a bird watching centre, and equipment is provided. Staff has a different level of training in environmental issues and computer literacy is higher than elsewhere.

Access to the site is easy due to the presence of motor roads around the lake and boat transportation inside.

### TOURISM

Inlay Lake is one of Myanmar ecotourism sites and ASEAN heritage site. It is visited every year by a large number of local and foreign visitors. Cultural highlights are the traditional Intha leg-rowing, fishing techniques, floating cultivations, traditional weaving and tobacco production, as well as important pagodas. Many accommodation and lodging facilities are provided around the lake as well as trekking opportunities in the surrounding hills. Community-based tourism options are available.

### LAND USE AND HUMAN ACTIVITIES

- Agricultural production
- Fisheries production
- Recreation

Floating plantations (tomato, flowers) and fishing represent the main income-generation strategy for the local communities. Tourism is a boost for the local economy.

### RESEARCH

Yangon University in collaboration with BANCA studied the sedimentation of the site and the use of pesticides. Taunggyi University studied the plankton.

# KAHILU

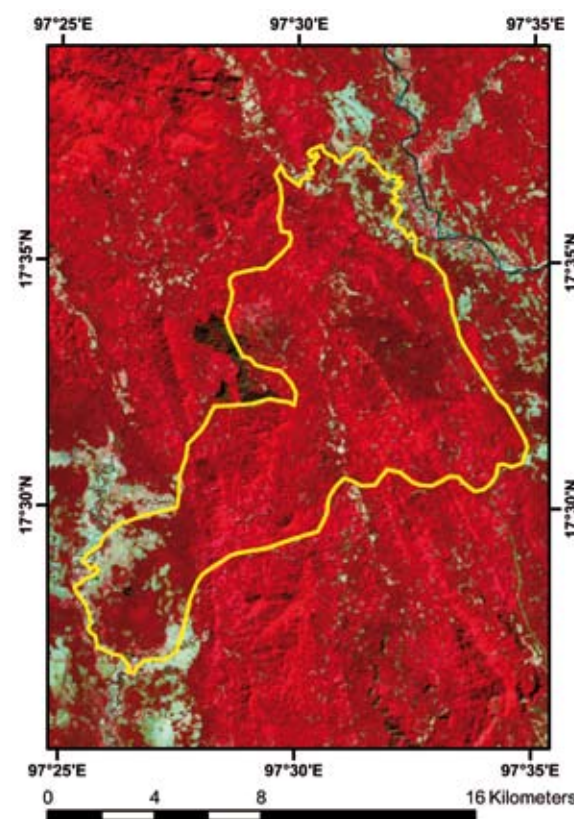
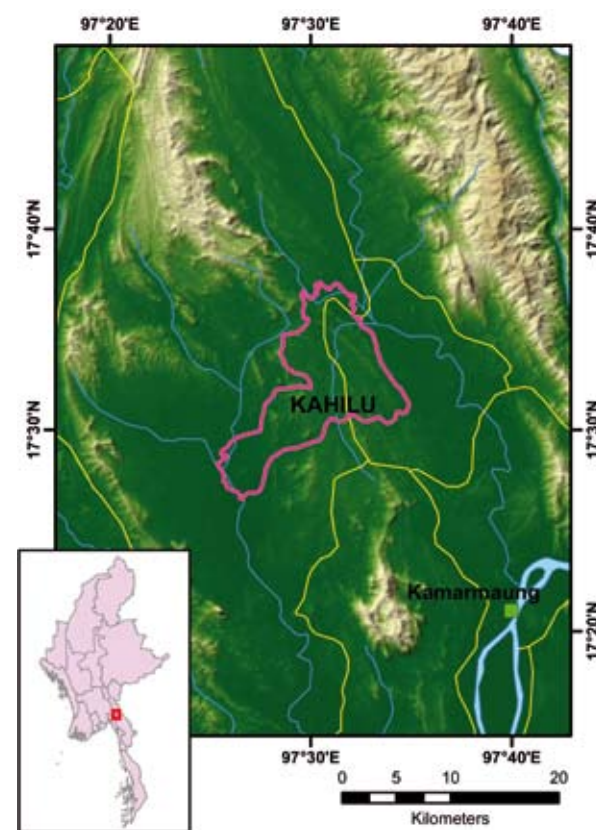
Site ID	12
Locality	Kayin State, Phapon and Paan Townships
Coordinates	N 17° 32', E 97° 30'
Size (km <sup>2</sup> )	161
Altitude (m. asl)	20 -260
Myanmar category	Wildlife Sanctuary
IUCN category	IV
Site Governance	Forest Department
Boundaries	Demarcated
Year gazetted	1928
Protection level	Total
Main purposes	Conservation
Habitat	Mixed Deciduous Forest (Moist Upper)
Key resources	Mouse Deer, Hog Deer, Serow

### Legend of topographic maps

- Head Quarters
  - Ranger Post
  - Towns
  - Protected Areas
  - State/Region Boundaries
  - Roads
  - Water areas
  - Rivers
- Elevation**
- 5.800 m. asl
  - 0 m. asl

### Legend of satellite maps

- | Water Depth                                      |   | Vegetation Density                      |   |
|--|---|---|---|
| <span style="color: blue;">■</span> Deep         | <span style="color: red;">■</span> High | <span style="color: red;">■</span> High | <span style="color: red;">■</span> High |
| <span style="color: lightblue;">■</span> Shallow | <span style="color: pink;">■</span> Low | <span style="color: pink;">■</span> Low | <span style="color: pink;">■</span> Low |



### SITE DESCRIPTION

Kahilu Wildlife Sanctuary is situated in Phapon and Paan Townships of Kayin State. The Sanctuary is located on the west side of the road which links between Kamamaung and Phapon. The topography of the Sanctuary is mostly flat with some hills gradually lowering from north-west to south-east. Two streams, Yepu chaung and Kayindone chaung, flow in the Sanctuary. Rainfall is recorded at about 3,800 mm per year.

### NATURAL RESOURCES

Moist upper mixed deciduous forest is the main forest type of the Kahilu Wildlife Sanctuary. Many bird species (junglefowl, parrot, myna, hornbill, woodpecker, dove, partridge, lapwing, drongos, kite and owl), monkeys and the Barking deer are found in the site. Teak and iron wood trees also occur inside the Sanctuary.

### THREATS

- Annual & Perennial Non-Timber Crops (shifting cultivation)
- Hunting & Collecting Terrestrial Animals
- Gathering Terrestrial Plants
- Dams & Water Management/Use

Occurrence of Sumatran rhinoceros was reported about 65 years ago. In 1946-47, tracks of two Sumatran rhinoceros were seen in the site. In 1947-48, one animal had still been spotted. But, no information later than 1948 is available.

### MANAGEMENT

The area is not managed because of security issues. The presence of insurgents is the main constraint to the occasional visits of forest staff and other researchers.

### Required resources:

electricity; phone line; field equipment.

### STAFF / RESOURCES

No human resources nor infrastructure is allocated to the site. At least 10 Park staff are considered necessary.

### TOURISM

No available information.

Access to foreign visitors is restricted.

### LAND USE AND HUMAN ACTIVITIES

A dam is to be built near to Myaingyingu, about 33 km downstream from the Salween-Moei River confluence. Here, there is a particularly powerful rapid that becomes a waterfall which belongs to the Kahilu Wildlife Sanctuary. Part of the sanctuary may be flooded if the development project is carried out.

### RESEARCH

No information available.

# KELATHA

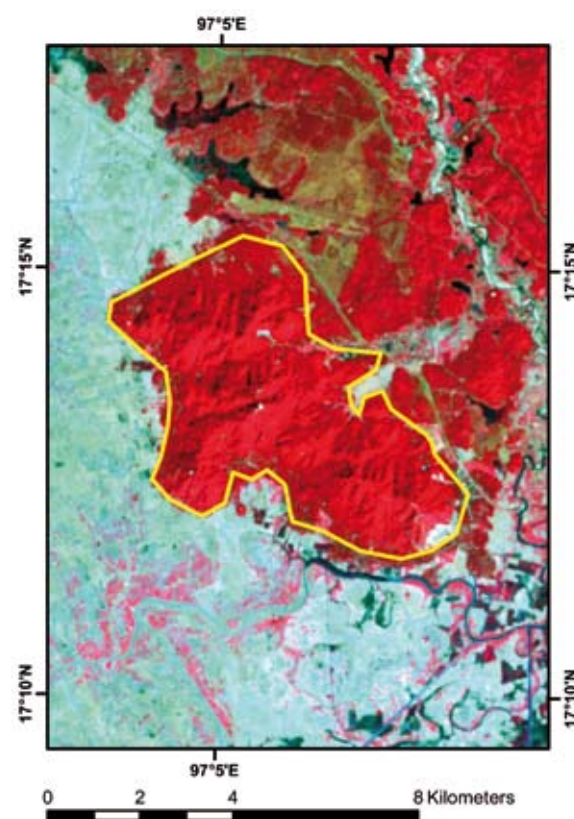
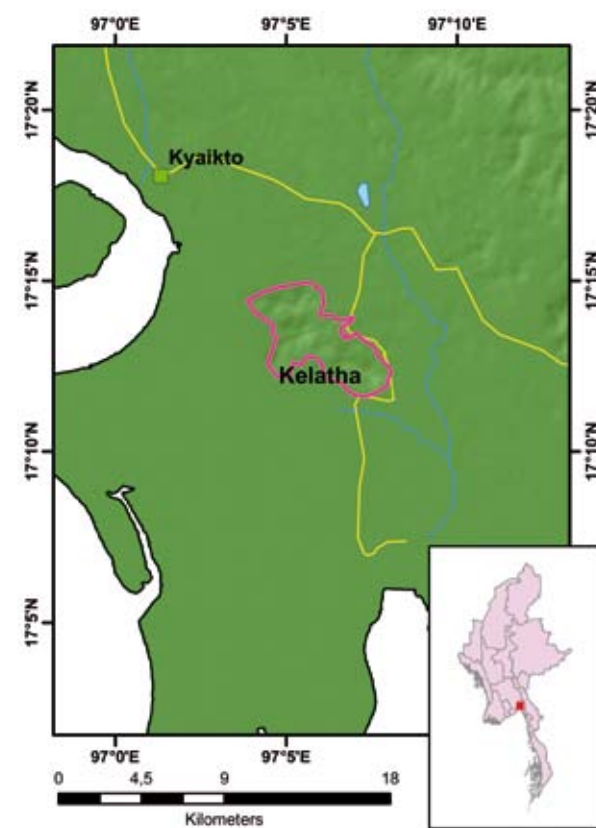
Site ID	13
Locality	Mon State, Belin Township
Coordinates	N17° 13', E97° 07'
Size (km <sup>2</sup> )	24
Altitude (m. asl)	0 – 355
Myanmar category	Wildlife Sanctuary
IUCN category	IV
Site Governance	Forest Department
Boundaries	Demarcated
Year gazetted	1942
Protection level	Partial
Main purposes	Conservation
Habitat	Mixed Deciduous Forest (Moist Upper), Evergreen Forest (Typical)
Key resources	Monkeys, Wild Cats, Pangolin, Barking Deer

### Legend of topographic maps

- Head Quarters
  - Ranger Post
  - Towns
  - Protected Areas
  - State/Region Boundaries
  - Roads
  - Water areas
  - Rivers
- Elevation**
- 5.800 m. asl
  - 0 m. asl

### Legend of satellite maps

- | Water Depth                                   |   | Vegetation Density                               |  |
|---|---|--|--|
| <span style="color: lightblue;">■</span> Deep | <span style="color: red;">■</span> High | <span style="color: lightblue;">■</span> Shallow | <span style="color: red;">■</span> Low |



### SITE DESCRIPTION

Kelatha Wildlife Sanctuary is situated in Belin Township, Mon State. It is a small sanctuary of about 24 square kilometers whose boundaries are demarcated by a road running all around the site. Settlements, farming and collection of non-timber-forest-products are allowed.

### NATURAL RESOURCES

Forest types of the Kelatha Wildlife Sanctuary are mixed deciduous and typical evergreen forest. According to the information obtained in the park, leopard, serow, barking deer, sambar deer, wild boar, different species of monkeys, wildfowl, pheasant, hornbill and peacock were observed in the site in 1996.

### MANAGEMENT

Forest Department Office is located at Belin town.  
 Management actions in place:  
 • No available information

### THREATS

- Annual & Perennial Non Timber Crops
  - Hunting & Collecting Terrestrial Animals
  - Logging & Wood Harvesting
- Shifting cultivation farmers are encroaching park borders. Poaching and illegal logging for subsistence are moderate and localized threats.

Management problems:

- No available information
- Required actions:  
 • No available information

### STAFF / RESOURCES

Two rangers and two foresters are assigned from FD office in Belin. There are no field office, ranger posts or any other buildings inside. Staff didn't receive any special training and doesn't have any field equipment. Accessibility to the site is good thanks to a concrete road taking to the Kelatha pagoda. No field office for the site. Access to the site is easy due to the presence of motor roads and tracks.

### TOURISM

The site receives many local pilgrims who visit the pagoda and monasteries. Visitor statistics are not available.

### LAND USE AND HUMAN ACTIVITIES

#### INSIDE

- Recreation
  - Mining
- In the area there are 42 monasteries and granite stone production for road construction is underway.

#### OUTSIDE

- Agricultural production
  - Human settlement
- The site is surrounded by villages and anthropical activities. According to a survey conducted in 1996, there were no villagers who earn their living from forest and forest products of the site. Paddy fields in the surrounding area are fertile and they produce a good harvest. Villages and horticulture farms are located almost continuously one beside another and villagers are very concerned by forest fire outbreaks.

# KHAKABORAZI

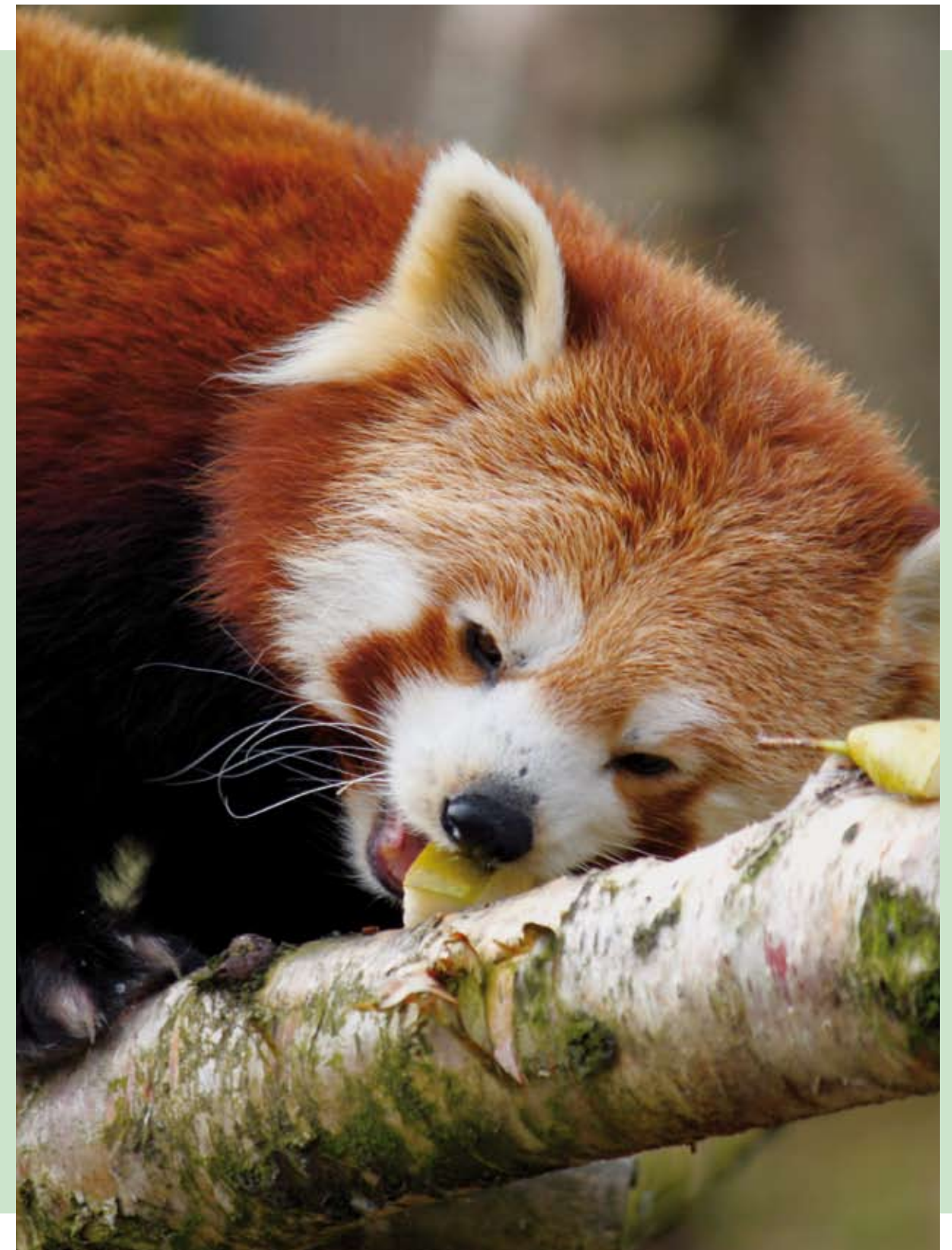
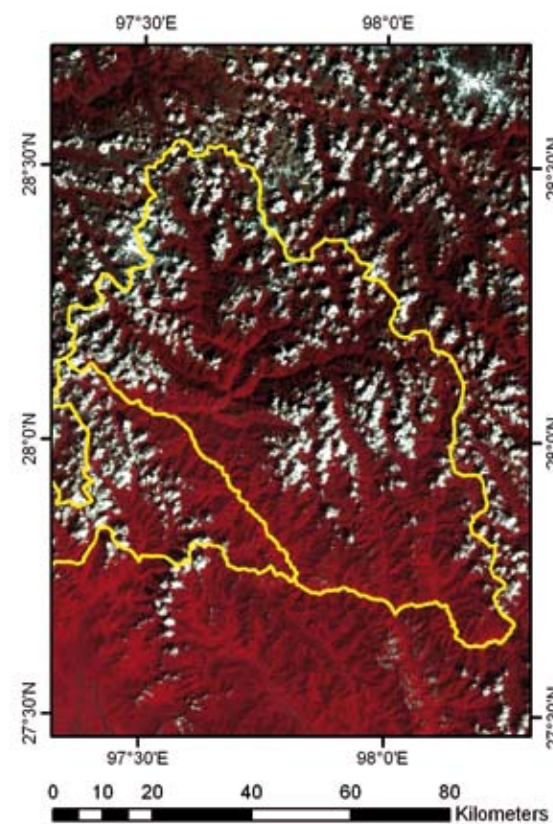
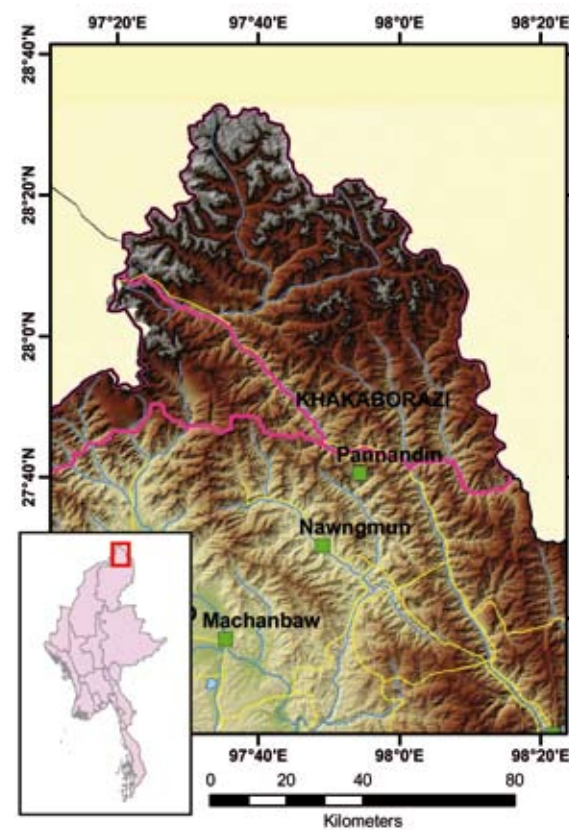
Site ID	14
Locality	Kachin State, Naungmon Township
Coordinates	N28° 04', E97° 50'
Size (km <sup>2</sup> )	3,812
Altitude (m. asl)	900 – 5,710
Myanmar category	National Park
IUCN category	II
Site Governance	Nature and Wildlife Conservation Division
Boundaries	Demarcated
Year gazetted	1998
Protection level	Total
Main purposes	Conservation, Research/ Education
Habitat	Evergreen Forest (Typical), Hill Forest (Pine Forest), Mixed Deciduous Forest (Moist Upper)
Key resources	Black Musk Deer, Red Panda, Takin, Red Goral

### Legend of topographic maps

- Head Quarters
  - Ranger Post
  - Towns
  - Protected Areas
  - State/Region Boundaries
  - Roads
  - Water areas
  - Rivers
- Elevation**
- 5.800 m. asl
  - 0 m. asl

### Legend of satellite maps

- |  |   |   |   |
|--|---|---|---|
| <b>Water Depth</b>                               |   | <b>Vegetation Density</b>               |   |
| <span style="color: blue;">—</span> Deep         | <span style="color: red;">—</span> High | <span style="color: red;">—</span> High | <span style="color: red;">—</span> High |
| <span style="color: lightblue;">—</span> Shallow | <span style="color: pink;">—</span> Low | <span style="color: pink;">—</span> Low | <span style="color: pink;">—</span> Low |



# KYAIKHTIYOE

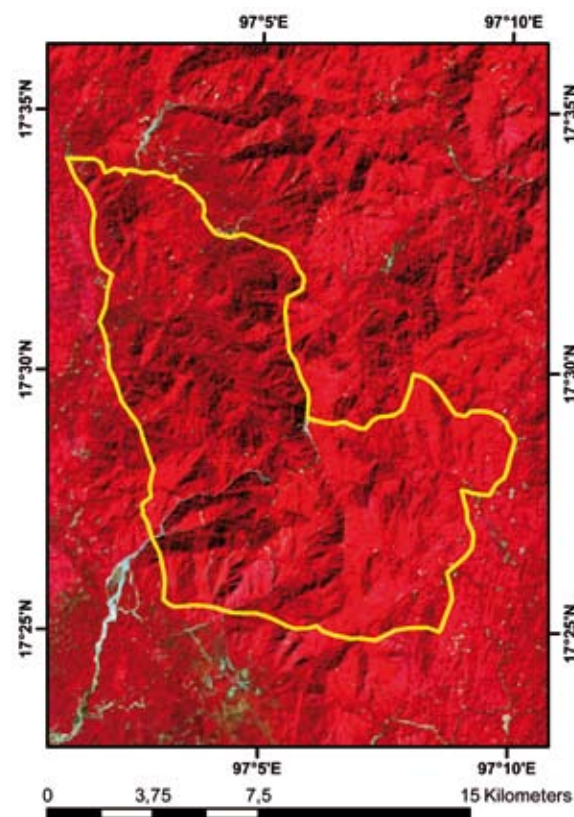
Site ID	15
Locality	Mon State, Kyaikhto Township
Coordinates	N17° 28', E97° 05'
Size (km <sup>2</sup> )	156
Altitude (m. asl)	50 -1,090
Myanmar category	Wildlife Sanctuary
IUCN category	IV
Site Governance	Nature and Wildlife Conservation Division
Boundaries	Demarcated
Year gazetted	2001
Protection level	Partial
Main purposes	Conservation
Habitat	Evergreen Forest (Typical), Mixed Deciduous Forest (Moist Upper)
Key resources	Leopard, Serow, Red Goral, Tiger

### Legend of topographic maps

- Head Quarters
  - Ranger Post
  - Towns
  - Protected Areas
  - State/Region Boundaries
  - Roads
  - Water areas
  - Rivers
- Elevation**
- 5.800 m. asl
  - 0 m. asl

### Legend of satellite maps

- |  |   |   |   |
|--|---|---|---|
| <b>Water Depth</b>                               |   | <b>Vegetation Density</b>               |   |
| <span style="color: blue;">■</span> Deep         | <span style="color: red;">■</span> High | <span style="color: red;">■</span> High | <span style="color: red;">■</span> High |
| <span style="color: lightblue;">■</span> Shallow | <span style="color: pink;">■</span> Low | <span style="color: pink;">■</span> Low | <span style="color: pink;">■</span> Low |



### SITE DESCRIPTION

The site was proposed as Wildlife Sanctuary in 1998 and gazetted in 2001 in order to conserve the flora and fauna of the surroundings of Kyaikhtiyoe Pagoda which is a National Heritage monument. The Kyaikhtiyoe Pagoda is built on a spectacular geological rock formation and has become a site of worship. The rock is a massive stone close to the top of the mountain and on the brink of a cliff. Now the rock has been covered by the golden leaves left by the Buddhist pilgrims and it is called the Golden Rock Pagoda.

### NATURAL RESOURCES

The wildlife sanctuary was established to protect globally threatened species (Leopard, Serow, Goral). Leopard is still spotted in the wildlife sanctuary while there is no other recent available information on the presence of other species in the Sanctuary.

### MANAGEMENT

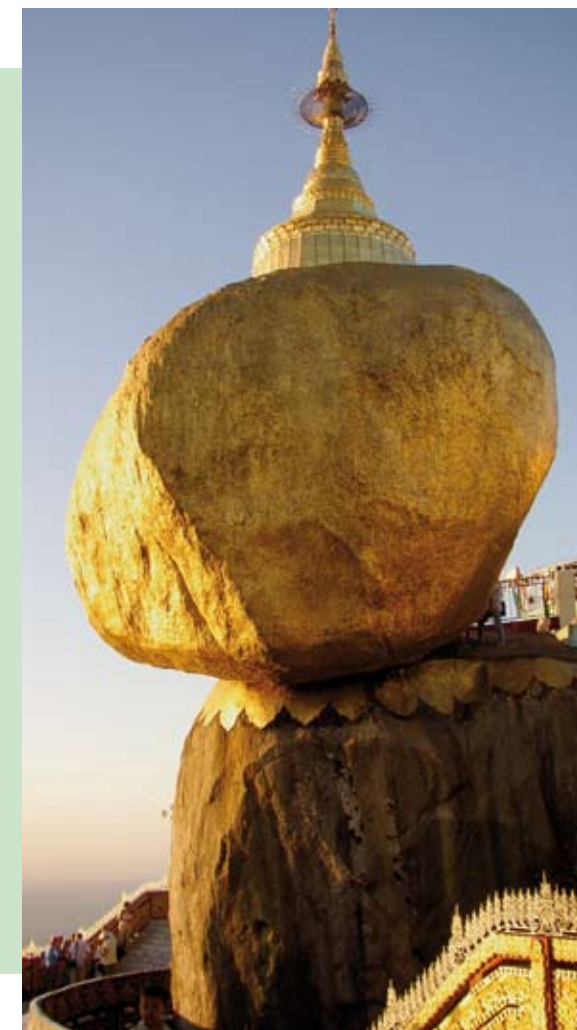
An annual operation plan is present. According to Park staff, more patrolling and inspecting is needed.

### STAFF / RESOURCES

Some staff is present (1 Park Warden, at least 2 rangers and 2 more foresters), but it is not sufficient: more administrative and field staff are needed. Only the Park Warden has received specific environmental training by Forest Department and local NGOs. The IT skills are low and digital equipment is required. One Park Office and 4 Ranger Posts are present.

### TOURISM

The Kyaikhtiyoe Pagoda on the Golden Rock (Golden Rock Pagoda) is considered one of the most famous tourist spots of Myanmar and is visited every year by thousands of pilgrims and tourists, especially during pagoda festival. Many facilities are present for tourists (hotels, restaurants and transport, etc.). A 15-km-long road crosses was built inside the sanctuary to take the pilgrims to the pagoda with trucks. Private vehicles are not allowed.



### THREATS

- Hunting & Collecting Terrestrial Animals
- Logging & Wood Harvesting
- Fire & Fire Suppression

The main dangers to the area are the illegal logging of bamboo and poles for housing and working tools, and the poaching of the protected populations of Barking Deer and Wild Boar for subsistence by local hunters. Forest fires during the dry season are becoming a serious threat.

### RESEARCH

Yangon university studied orchids and ferns (2005) and bamboo rats (2008). A bird survey was implemented by local NGO Myanmar Birds and Nature Society (2008) and an herpetology survey by CAS (2008).

### LAND USE AND HUMAN ACTIVITIES

#### INSIDE

- Recreation
- The site is highly used for the tourist activities and facilities.

#### OUTSIDE

- Agricultural production (Temporary and Permanent cropping)
  - Forestry (Forest Plantation)
- Apart from tourism, there are many agricultural activities, for subsistence (with crops like rice, peanuts, pepper and durian) and commercial rubber forest plantations



# KYAUK-PAN-TAUNG

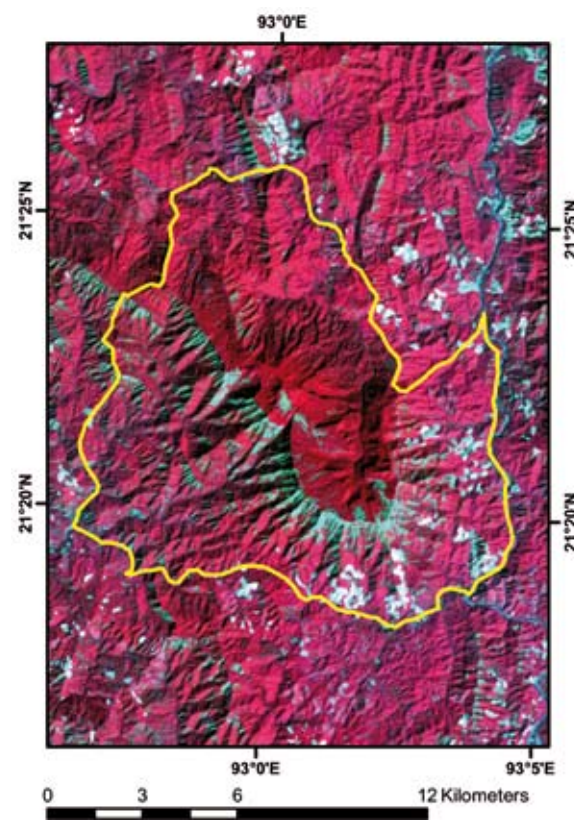
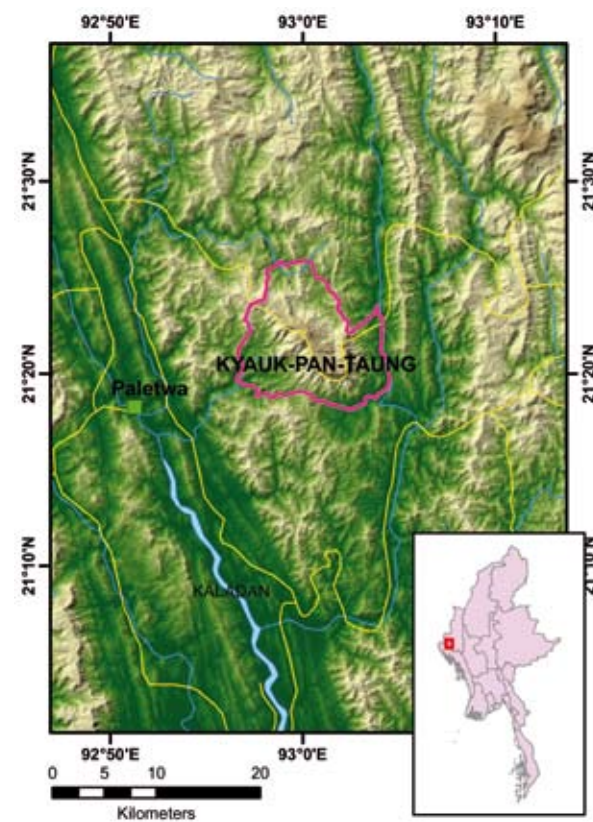
Site ID	16
Locality	Chin State, Paletwa Township
Coordinates	N 21° 21', E 93° 00'
Size (km <sup>2</sup> )	133
Altitude (m. asl)	25 – 1,310
Myanmar category	Wildlife Sanctuary
IUCN category	IV
Site Governance	Forest Department
Boundaries	Demarcated
Year proposed	2001
Protection level	Total
Main purposes	Conservation, Research/ Education, Recreation/ Ecotourism
Habitat	Evergreen Forest (Typical), Hill Forest (Evergreen)
Key resources	Wild Boar, Leopard, Jungle Cat, Barking Deer, Serow, Red Goral, Clouded Leopard, Barking Deer, Sambar Deer

### Legend of topographic maps

- Head Quarters
  - Ranger Post
  - Towns
  - Protected Areas
  - State/Region Boundaries
  - Roads
  - Water areas
  - Rivers
- Elevation**
- 5.800 m. asl
  - 0 m. asl

### Legend of satellite maps

- | Water Depth                                      |  | Vegetation Density                       |  |
|--|--|--|--|
| <span style="color: cyan;">■</span> Deep         | <span style="color: red;">■</span> High  | <span style="color: red;">■</span> High  | <span style="color: red;">■</span> High  |
| <span style="color: lightblue;">■</span> Shallow | <span style="color: white;">■</span> Low | <span style="color: white;">■</span> Low | <span style="color: white;">■</span> Low |



M. Karim

# LAMPI ISLAND

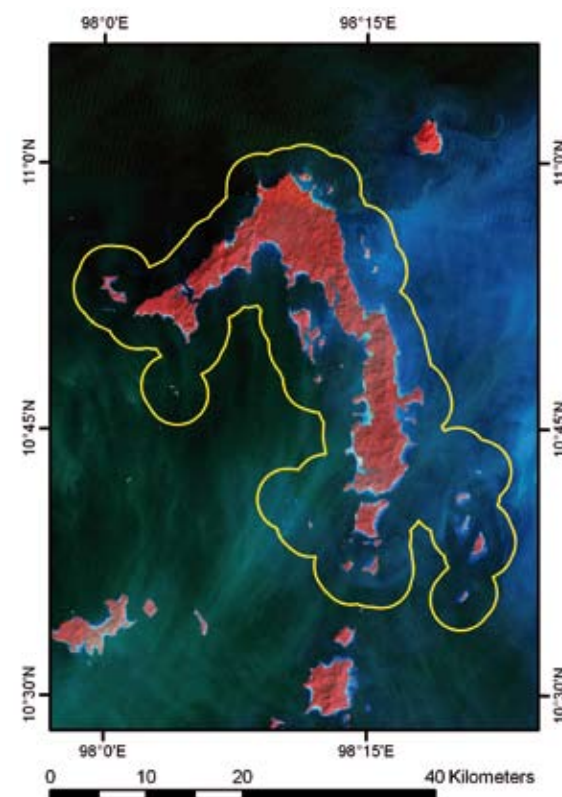
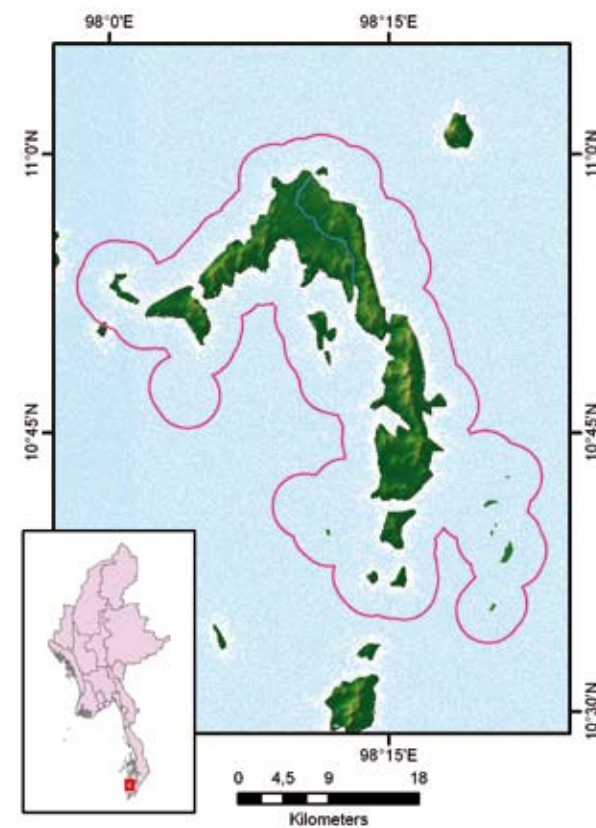
Site ID	17
Locality	Tanintharyi Region (Boke Pyin Township)
Coordinates	N 10° 50', E 98° 12'
Size (km <sup>2</sup> )	205
Altitude (m. asl)	0 – 455
Myanmar category	National Park
IUCN category	II
Site Governance	Nature and Wildlife Conservation Division
Boundaries	Demarcated
Year gazetted	1996
Protection level	Total
Main purposes	Conservation
Habitat	Evergreen Forest (Typical), Mangrove Forest, Beach and Dune Forest, Sea Grass Beds, Coral Reefs
Key resources	Coral Reefs, Mouse Deer and Salone Ethnic Groups

### Legend of topographic maps

- Head Quarters
  - Ranger Post
  - Towns
  - Protected Areas
  - State/Region Boundaries
  - Roads
  - Water areas
  - Rivers
- Elevation**
- 5.800 m. asl
  - 0 m. asl

### Legend of satellite maps

- Water Depth**    **Vegetation Density**
- Deep
  - High
  - Shallow
  - Low



### SITE DESCRIPTION

Lampi Island Marine National Park encompasses a section of the Myeik Archipelago including Lampi Island, several smaller islands and the seas around them. The sea between Lampi and the mainland is on average 12 m deep and nowhere deeper than 24 m. Lampi island is generally hilly and rises steeply from sea level up to 455 m. The majority of the coast is rocky, presenting also sandy beaches, bays and inlets. Lampi island has two major perennial rivers and many small seasonal streams. Lampi habitats are mostly intact, and if measures are put into place soon, the representativeness and key attributes of this vast island ecosystem can be conserved at this site. Lampi is an ASEAN heritage site, an Important Bird Area (IBA) and a designated Myanmar ecotourism site.

### NATURAL RESOURCES

Evergreen forest is the major forest type of the site. Mangrove and beach & dune forests are also present at the site. Coral reefs fringe the islands. Seagrass beds are present especially in the east side of the island.

### MANAGEMENT

In 2009 the MEP project initiated consultations among the different stakeholders aimed at launching the process for a participatory development of the management plan to ensure

### THREATS

- Housing & Urban Areas
  - Fishing & Harvesting Aquatic Resources
  - Hunting & Collecting Terrestrial Animals
  - Logging & Wood Harvesting
  - Wood & Pulp Plantations
  - Garbage & Solid Waste
- For a detailed list see chapter 3.

### LAND USE

- Residential (4 villages inside and 1 outside)
- Industrial (fish factory in War Kyunn)
- Fishing
- Temporary and permanent cropping

the involvement of local communities and the incorporation of their needs and aspirations. It has also supported field surveys to gather scientific data on the naturalistic and cultural features of the area, to enable participatory planning and management of natural resources.

### STAFF / RESOURCES

The planned staff will include 25 people but none has been assigned yet.

Istituto Oikos and BANCA have supported the construction of a field camp at Makyone Galet village on Bo Cho Island which is very near to the southern coast of Lampi island. The camp includes a basic office and a rest house and is equipped with 1 motorboat, 3 GPS, 2 binoculars, 1 laptop, 1 printer, camping equipment, field guides.

### TOURISM

At present there is no tourist accommodation on Lampi Island or on the other islands inside the marine national park, and visitors are not allowed to spend the night on these islands. Therefore, visitor opportunities to Lampi are limited to sailing cruises including diving opportunities. The few boats allowed to bring tourists in the Myeik Archipelago belong to Myanmar or Thai companies which have license from Myanmar Ministry of Hotel and Tourism.

### RESEARCH

Surveys to Lampi were conducted by FAO in 1983, WCS in 1995-96) and Ecoswiss in 2006-7. Since 2008 Istituto Oikos and BANCA have been conducting field research on several topics. In the Myeik Archipelago, marine biological surveys were conducted by the Department of Botany and Zoology of Moulmein (Mawlamyine) University. The Department of Marine Science at Mawlamyine and Myeik Universities also conducted marine biological studies

# LAWKANANDA

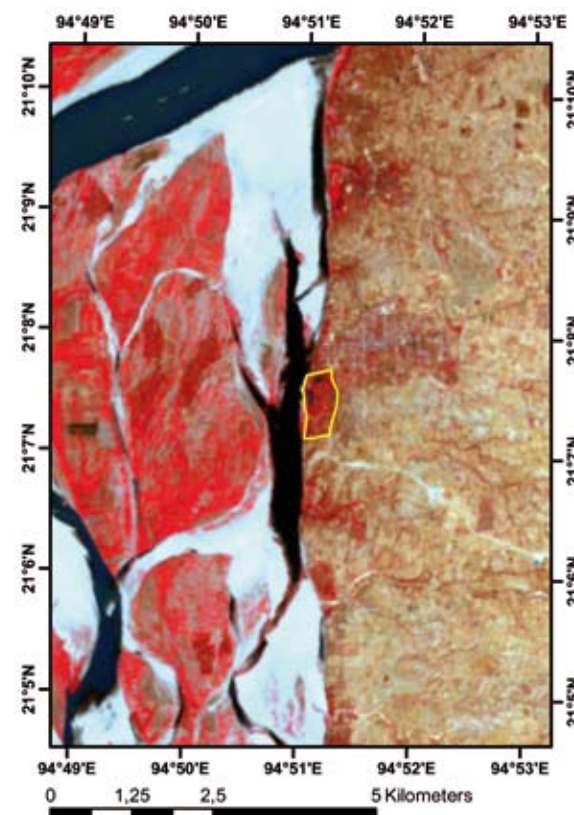
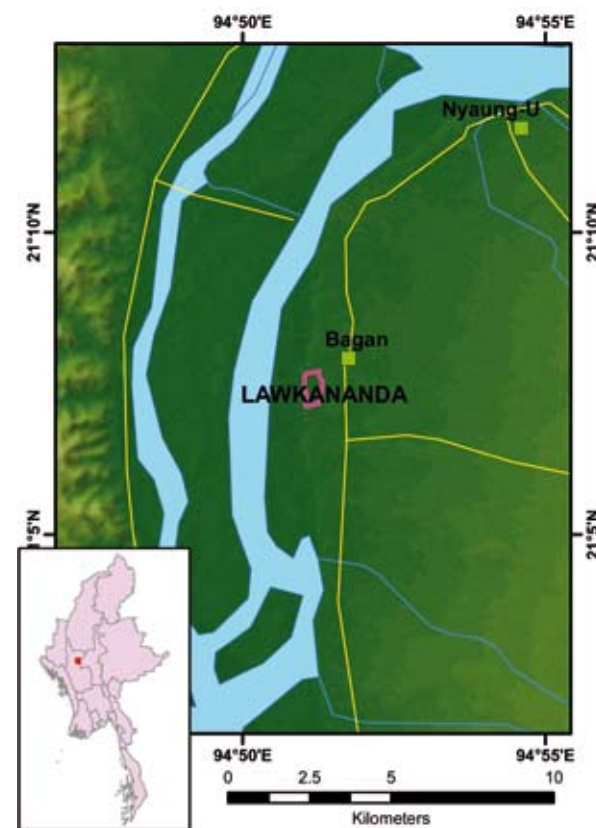
Site ID	18
Locality	Mandalay Region (Nyaung Oo Township)
Coordinates	N 21° 07', E 94° 51'
Size (km <sup>2</sup> )	0.47
Altitude (m. asl)	45 – 70
Myanmar category	Wildlife Sanctuary
IUCN category	IV
Site Governance	Nature and Wildlife Conservation Division
Boundaries	Demarcated
Year gazetted	1995
Protection level	Partial (Recreation allowed)
Main purposes	Conservation
Habitat	Dry Forest
Key resources	Burmese Star Tortoise and Rare Birds

### Legend of topographic maps

- Head Quarters
  - Ranger Post
  - Towns
  - Protected Areas
  - State/Region Boundaries
  - Roads
  - Water areas
  - Rivers
- Elevation**
- 5.800 m. asl
  - 0 m. asl

### Legend of satellite maps

- | Water Depth |         | Vegetation Density |      |
|-------------|---------|--------------------|------|
|             | Deep    |                    | High |
|             | Shallow |                    | Low  |



### SITE DESCRIPTION

Lawkananda wildlife sanctuary has been created with the main purpose of conserving the dry forest ecosystem of central Myanmar which is threatened by advancing desertification. This small protected area is strategically located close to the famous pagodas of Bagan and it borders with the Ayeyawaddy river which is one of Myanmar's major rivers.

### NATURAL RESOURCES

The protected area is entirely covered by dry forest hosting four types of deer (barking, sambar, hog and eld's deer), the endangered (but not native) star tortoise and rare birds.

### MANAGEMENT

The area doesn't have any management plan. Nevertheless the park staff implement several conservation activities, including conservation of commercial timber trees (*Tectona grandis*, *Dipterocarpus* species), captive animals breeding (star tortoise, eld's deer), bird annual survey, as well as management activities such as patrolling, cleaning, floods and fire protection. In addition, there is a mobile environmental education programme for the surrounding villages.

### STAFF / RESOURCES

The park has 31 staff members including 1 warden, 3 rangers, 4 foresters and 23 clerks and labourers. These are

### THREATS

Because of the advancing desertification and the local reliance on firewood, local people often encroach the park in search of dry wood. Besides, during the dry season they take their cattle to graze in the Ayeyawaddy river bed, thereby damaging the habitat for birds. However, drought periods, forest fires and the poaching of snakes represent the main threats to the dry forest ecosystem. Illegal fishing is reported in the park creek. In addition, some tourists try to access the park without paying entry fees, some of them also take away valuable relics. Most worryingly, tourism businessmen are very interested in building hotel facilities inside the area.

based at the park head office and park staff quarters. The park warden and the rangers have received several trainings from the Forest Department and the Smithsonian Institution. As yet, although they have some basic IT skills, there is no computer available.

### TOURISM

In 2008 the park received about 4,500 visitors, less than 10% were foreigners. Tourist statistics are kept at park head office. There are no tourist facilities except for a restaurant which is privately owned and managed.

### LAND USE

The only allowed land use within the park boundaries is recreation. There are several high value pagodas and archeological sites which are protected by the Forest Department and conserved by the Archeology Department. The population living in the surrounding areas is very poor and, except for those employed in tourism, most rely on subsistence agriculture, fisheries and livestock herding. All these activities have a high impact on the fragile dry forest ecosystem and are as well very vulnerable to the frequent droughts with consequent issues of water scarcity and food insecurity.

### RESEARCH

Research on the star tortoise has been implemented by a PhD student of Mandalay University. Furthermore, the Forest Department has further researched the ecology and biology of star tortoises in order to plan the reintroduction of 400 confiscated animals to the Minsontaung Wildlife Sanctuary.

## LENYA / LENYA (EXTENSION)

### LENYA

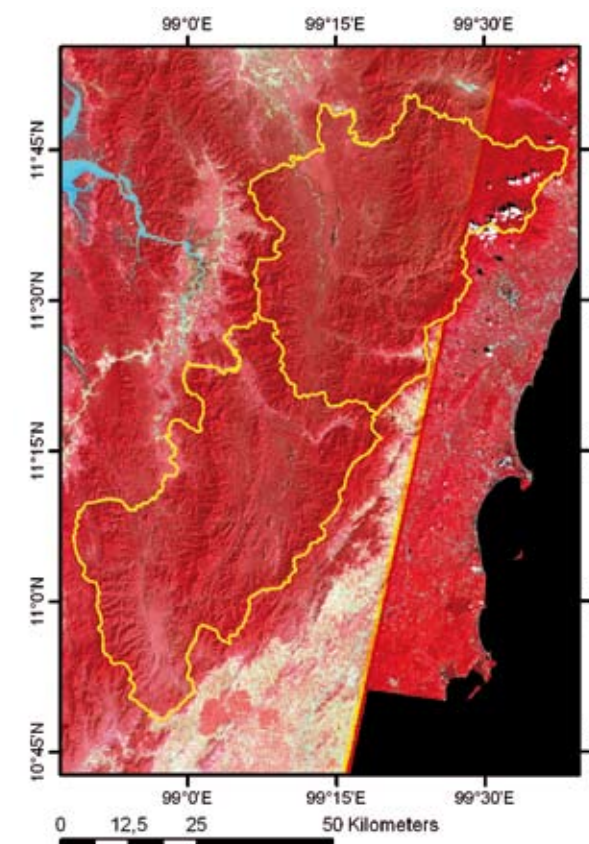
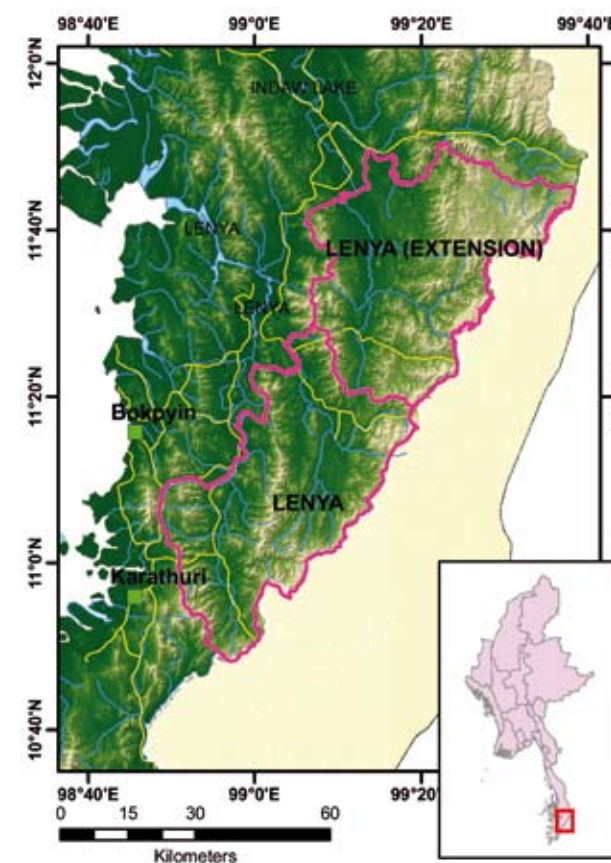
Site ID	19
Locality	Tanintharyi Region, Bokepyin Township
Coordinates	N 11° 08', E 99° 03'
Size (km <sup>2</sup> )	1,761
Altitude (m. asl)	10 – 855
Myanmar category	National Park
IUCN category	II
Site Governance	Forest Department
Boundaries	Demarcation in course
Year proposed	2002
Protection level	Partial (Tree logging, Forest plantations allowed)
Main purposes	Natural resources maintenance
Habitat	Evergreen Forest (Typical)
Key resources	Gurney's Pitta, Tapir, Asian Elephant, Barking Deer, Sambar Deer, Wild Boar, Bear, Pangolin, Hoolock Gibbon, Porcupine, Mouse Deer, Wild Cat, Civet

#### Legend of topographic maps

- Head Quarters
  - Ranger Post
  - Towns
  - Protected Areas
  - State/Region Boundaries
  - Roads
  - Water areas
  - Rivers
- Elevation**
- 5.800 m. asl
  - 0 m. asl

#### Legend of satellite maps

- |                    |                           |
|--------------------|---------------------------|
| <b>Water Depth</b> | <b>Vegetation Density</b> |
| Deep               | High                      |
| Shallow            | Low                       |



### LENYA (EXTENSION)

Site ID	20
Locality	Tanintharyi Region, Bokepyin Township
Coordinates	N 11° 35', E 99° 19'
Size (km <sup>2</sup> )	1,399
Altitude (m. asl)	15 - 1,240
Myanmar category	National Park
IUCN category	II
Site Governance	Forest Department
Boundaries	Demarcation in course
Year proposed	2004
Protection level	Partial (Tree logging, Forest plantations allowed)
Main purposes	Natural resources maintenance
Habitat	Evergreen forest (typical)
Key resources	Asian Elephant, Tapir, Gaur, Banteng, Sambar Deer, Gurney's Pitta

#### SITE DESCRIPTION

The creation of Lenya National Park and its extension was proposed after the rediscovery of the endangered bird species of Gurney's Pitta, but it has not been gazetted yet. Therefore, the area is still unprotected and its conservation status is considered only fair due to the presence of commercial plantations and human settlements within its borders.

#### NATURAL RESOURCES

The area is covered by evergreen forest of medium conservation value. The highlight is the discovery in 2008 by BLI of 9,300-35,000 Gurney's Pitta (*Pitta gurneyi*) territories in the Lenya area. This bird species was considered extinct until the rediscovery of a population in Thailand in 1986. After this discovery the species was downlisted by IUCN from "critically endangered" to "endangered" and 99% of the population is in Myanmar. The lowland extension of Lenya National Park will contain much of the Gurney's Pitta population, thus ensuring the species' long-term survival.

#### MANAGEMENT

The protected area is still only a proposal and there is neither management plan nor staff allocated. BLI received funding for the designation and protection of Lenya National Park and its extension which is still on hold pending the signing of a memorandum of understanding with FD. The staff of Kawthoung Forest Department is in charge of the management of both sites (Lenya and its extension) but they have no financial resources to implement any enforcement.

In addition, they haven't been able to conclude the boundary demarcation in the north-eastern part due to the alleged presence of insurgents.

#### STAFF / RESOURCES

No infrastructure is present in the site and its extension. No staff is assigned but the Forest Department of Kawthoung is in charge of inspections.

#### LAND USE

Although the area should be reserved for natural resources maintenance, a big portion of the land has been or is being converted to oilpalm and timber plantations.

#### THREATS

Loss of lowland Sundaic forest for the establishment of palm oil plantation along with encroachment from surrounding human settlements, is the main threat to the Gurney's Pitta and other wildlife.

#### RESEARCH

Ornithological research was funded by the UK government's Darwin Initiative and led by the Royal Society for the Protection of Birds, the British arm of BLI, in partnership with the Myanmar NGO, Biodiversity and Nature Conservation Association (BANCA) and the Indochina programme of BLI.

# LOIMWE

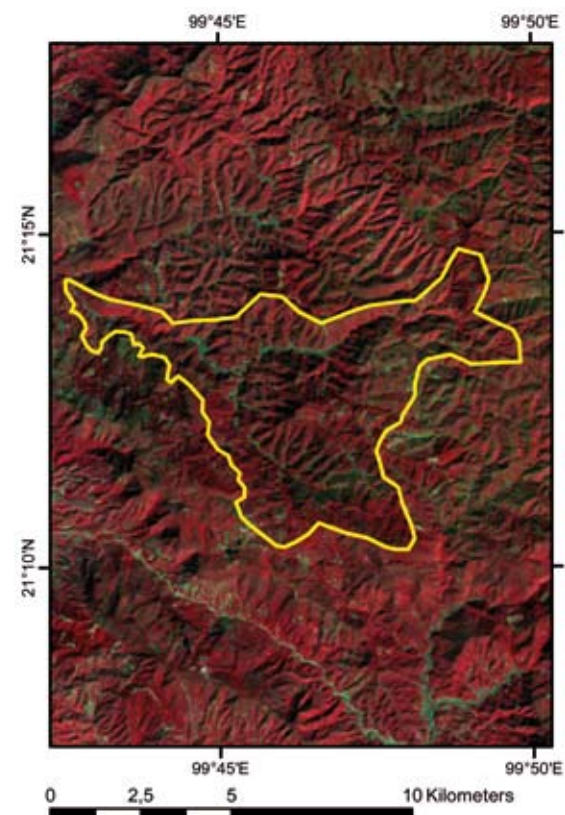
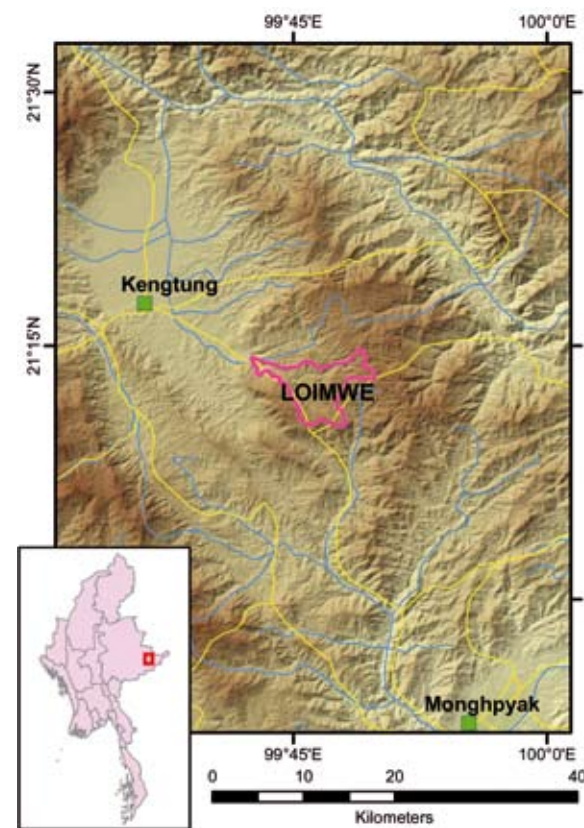
Site ID	21
Locality	Shan State, Kyaing Tong Township
Coordinates	N 21° 12', E 99° 46'
Size (km <sup>2</sup> )	43
Altitude (m. asl)	925 -1,920
Myanmar category	Protected Area
IUCN category	NA
Site Governance	Forest Department
Boundaries	Demarcated
Year gazetted	1996
Protection level	Total
Main purposes	Conservation
Habitat	Hill Forest (Dry), Hill Forest (Pine)
Key resources	Asiatic Black Bear, Pangolin, Pheasant

### Legend of topographic maps

- Head Quarters
  - Ranger Post
  - Towns
  - Protected Areas
  - State/Region Boundaries
  - Roads
  - Water areas
  - Rivers
- Elevation**
- 5.800 m. asl
  - 0 m. asl

### Legend of satellite maps

- | Water Depth |         | Vegetation Density |      |
|-------------|---------|--------------------|------|
| ■           | Deep    | ■                  | High |
| ■           | Shallow | ■                  | Low  |



### SITE DESCRIPTION

Loimwe is a Protected Area established in 1996 around a hill station which was built by the British government as a location for officers' summer vacations during colonial times. Old buildings are still present and some have been renewed. The site is endowed with beautiful mountain scenery, and the surroundings are inhabited by several ethnic tribes (Ann, Wa, Palaung, etc.).

### NATURAL RESOURCES

Dry hill forest is the forest type of the site as it covers 80% and the other forest type is pine forest which covers 20% of the site.

### MANAGEMENT

The site is managed from the Forest Department of Kyaing Tong Township. However, the only activities carried out are scattered tree planting in forest gaps. No management plan is present. Around the town of Loimwe, experimental agricultural plots are run from the Ministry of Agriculture and Irrigation and/or local NGOs.

### STAFF / RESOURCES

Proper staff needs to be allocated to the site. No facilities are present.

### TOURISM

From the town of Kyaing Tong it is possible to request a permit to visit the place and do trekking in the surrounding mountains, with the opportunity to meet the local tribes and buy traditional handicraft. Overnight stays are allowed only in the town of Kyaing Tong where a variety of hotels and other forms of accommodation are available.

### LAND USE AND HUMAN ACTIVITIES

#### INSIDE

- Permanent cropping
- Shifting cultivation
- Residential
- Security restricted areas

The most famous crops in the area are the paddy rice, tea, fruit plantation (apples), tomatoes. Other important sources of income are beekeeping and the production of local spirits. A few herds of cows are present over an extended area. The town of Loimwe is inhabited by local farmers and government officers.

#### OUTSIDE

The agricultural activities outside the site are similar. Human settlements increase in the proximity of Kyaing Tong.

### RESEARCH

No research records available at FD office.

### THREATS

- Logging & Wood Harvesting
- Annual & Perennial Non-Timber Crops
- Hunting & Collecting Terrestrial Animals

Even if the population density in and around the site is not high, increasing practices of shifting cultivation and conversion of slopes to paddy rice cultivation are becoming more dangerous threats. Another important problem is the exploitation of timber and the magnitude of the logs collected seems to be very high. Few poachers for their own subsistence are present.

# MAHARMYAING

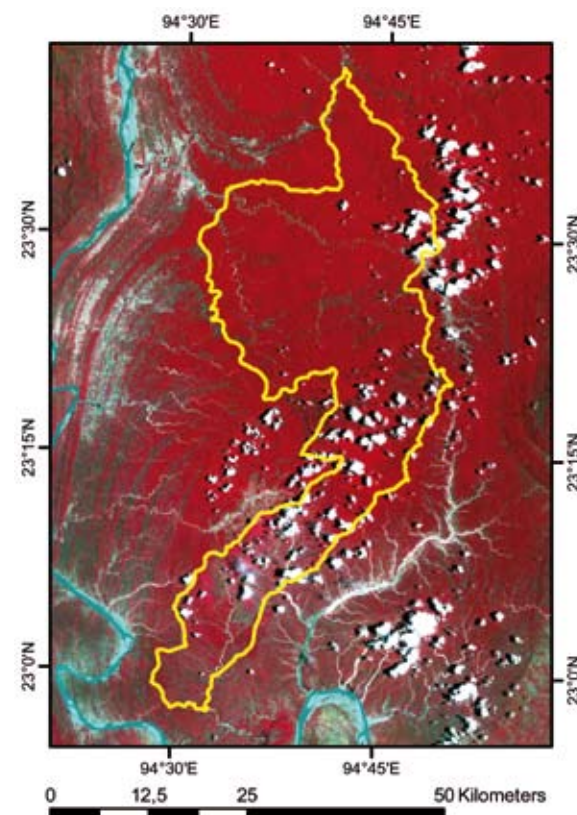
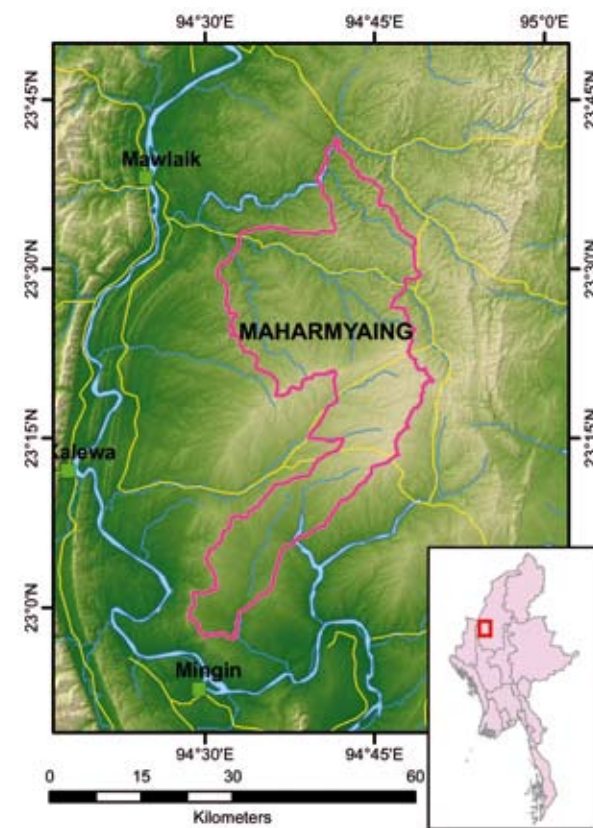
Site ID	22
Locality	Sagaing Region, Kalay and Mawlaik Townships
Coordinates	N 23° 21'; E 94° 40'
Size (km <sup>2</sup> )	1,180
Altitude (m. asl)	145 – 590
Myanmar category	Wildlife Sanctuary
IUCN category	IV
Site Governance	Forest Department
Boundaries	Demarcated
Year proposed	2002
Protection level	Total
Main purposes	Conservation, Research/ Education, Recreation/ Ecotourism
Habitat	Evergreen Forest (Typical), Mixed Deciduous Forest (Moist Upper)
Key resources	Banteng, Sambar Deer, Asiatic Wild Dog, Hoolock Gibbon, Small Asian Mongoose, Wild Boar, Mongoose, Asian Elephant, Jungle Cat

### Legend of topographic maps

- Head Quarters
  - Ranger Post
  - Towns
  - Protected Areas
  - State/Region Boundaries
  - Roads
  - Water areas
  - Rivers
- Elevation**
- 5.800 m. asl
  - 0 m. asl

### Legend of satellite maps

- |  |   |   |   |
|--|---|---|---|
| <b>Water Depth</b>                               |   | <b>Vegetation Density</b>               |   |
| <span style="color: cyan;">■</span> Deep         | <span style="color: red;">■</span> High | <span style="color: red;">■</span> High | <span style="color: red;">■</span> High |
| <span style="color: lightblue;">■</span> Shallow | <span style="color: pink;">■</span> Low | <span style="color: pink;">■</span> Low | <span style="color: pink;">■</span> Low |



# MAINMAHLA KYUN

Site ID	23
Locality	Ayeyawaddy Region, Bogale Township
Coordinates	N 15° 58', E 95° 17'
Size (km <sup>2</sup> )	137
Altitude (m. asl)	0 – 30
Myanmar category	Wildlife Sanctuary
IUCN category	IV
Site Governance	Nature and Wildlife Conservation Division
Boundaries	Demarcated
Year gazetted	1993
Protection level	Total
Main purposes	Conservation, Cultural heritage, Recreation/ Ecotourism, Research/ Education
Habitat	Mangrove Forest
Key resources	Mangroves, Salt-water Crocodile, Birds spp.

**Legend of topographic maps**

- Head Quarters
- Ranger Post
- Towns
- Protected Areas
- State/Region Boundaries
- Roads
- Water areas
- Rivers

**Elevation**

5.800 m. asl

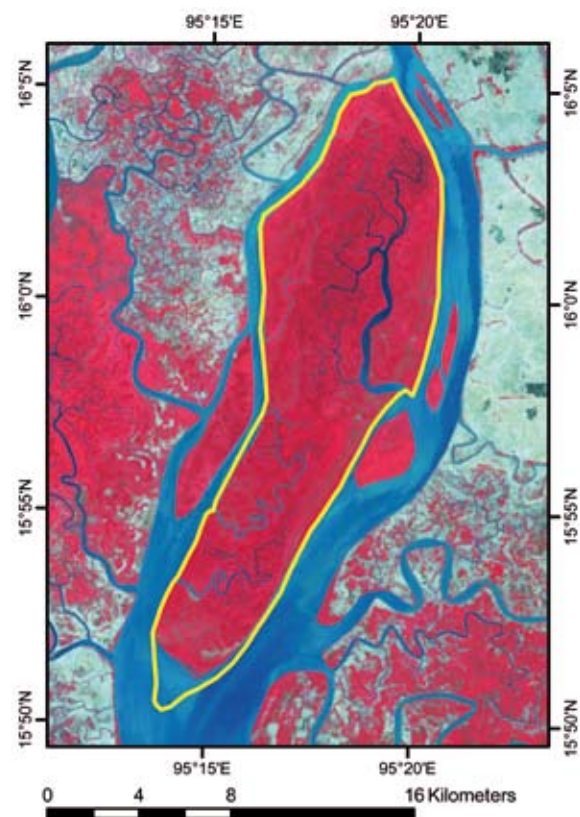
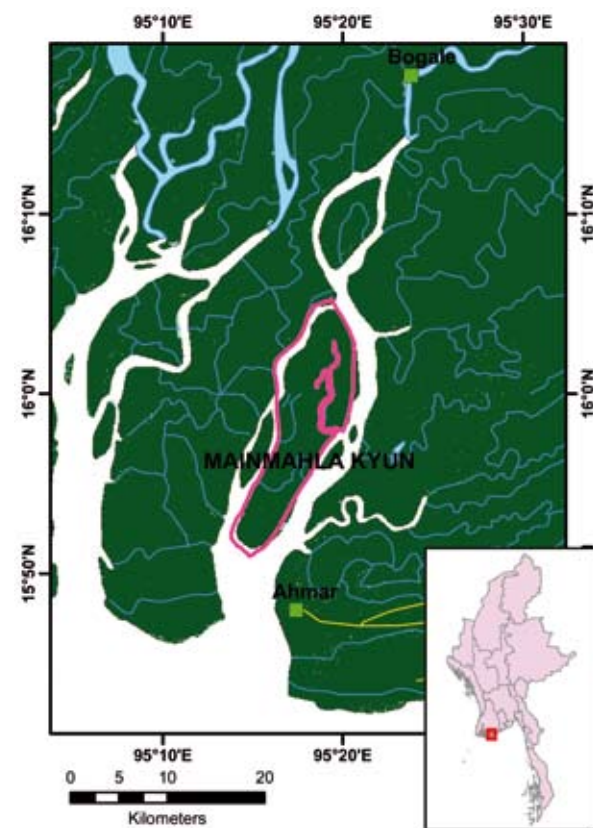
0 m. asl

**Legend of satellite maps**

**Water Depth**    **Vegetation Density**

Deep                      High

Shallow                  Low



### SITE DESCRIPTION

Mainmahla Kyun Wildlife Sanctuary is situated in Bogalay Township, Ayeyawaddy Region. It is an island of low flat land delta area and it is located very near to the open sea. The site is fringed by the Bogalay River in the east and by the Kadonkani River in the west. Many small streams are present as a network in the Sanctuary and accessibility into the streams is governed by the tide. The Sanctuary is covered with mangrove forest only. Soil type is tidal mud and silt. Annual rainfall of the site ranges from 2,500 to 3,000 mm. Myauktayar pagoda, a famous pagoda of the region, is situated to the south-east of the Sanctuary. Mainmahla Kyun is one of Myanmar's ASEAN Heritage sites.

### NATURAL RESOURCES

Mangroves are the main resources of the site. About 40 mangrove species have been recorded; 53 medicine plant species, 11 orchid species, 18 mammals, including Irrawaddy dolphin species, 117 bird species, 59 fish species, 12 shrimp species, 10 crab species, 35 butterfly species and 26 snake species have been recorded by the Sanctuary staff.

### MANAGEMENT

Annual management plan

Management actions in place:

- Fire protection and infrastructure renovation
- Crocodile conservation
- Monitoring animal populations and tree cover
- Regular patrolling
- Awareness raising

### THREATS

- Gathering Terrestrial Plants (collection of ferns, tha bot and nipa palm)
- Logging & Wood Harvesting (mangrove wood for charcoal and firewood)
- Fishing & Harvesting of Aquatic Resources (poison fishing practice)

Management problems:

- Budget
  - Inadequate staff
- Required actions:
- Increase patrolling
  - Communication equipments
  - Field equipments
  - Guard post

### STAFF / RESOURCES

The administrative office is located in Bogalay town which is 12 miles away from the site in the north. The conservation and research activities have been performed with 14 permanent forest staff and seven daily wages staff. Two crocodile conservation camps with natural pond are located on the west side of the island. Monitoring, research and capacity building activities have also been conducted in coordination and collaboration with both local and international organizations and agencies. The park facilities include one head office, 2 ranger posts, three small field camps, an education centre and a boat.

### TOURISM

The site is occasionally busy with pilgrims mainly from the villages of that area to the Myauktayar pagoda. The development of ecotourism is an objective of the site and a few foreign tourists have visited the site.

A guest house was built by a local environmental NGO, FREDA, on the Byone hmwe Island which is situated on the west side of the Kadonkani River facing the Sanctuary in the east.

### LAND USE AND HUMAN ACTIVITIES

#### INSIDE

- Conservation
  - Research
  - Recreation
- Conservationists, researchers and tourists are allowed to come to the Sanctuary with permission.

#### OUTSIDE

- Fishery
- Restricted area (reserved forest)
- Mangrove plantation

# MINSONTAUNG

Site ID	24
Locality	Mandalay Region, Nwahtogyi Township
Coordinates	N 21° 25', E 95° 47'
Size (km <sup>2</sup> )	23
Altitude (m. asl)	195 – 375
Myanmar category	Wildlife Sanctuary
IUCN category	IV
Site Governance	Nature and Wildlife Conservation Division
Boundaries	Demarcated
Year gazetted	2001
Protection level	Total
Main purposes	Recreation/Ecotourism, Research/Education, Conservation
Habitat	Dry Forest
Key resources	Burmese Star Tortoise

**Legend of topographic maps**

- Head Quarters
- Ranger Post
- Towns
- Protected Areas
- State/Region Boundaries
- Roads
- Water areas
- Rivers

**Elevation**

5.800 m. asl

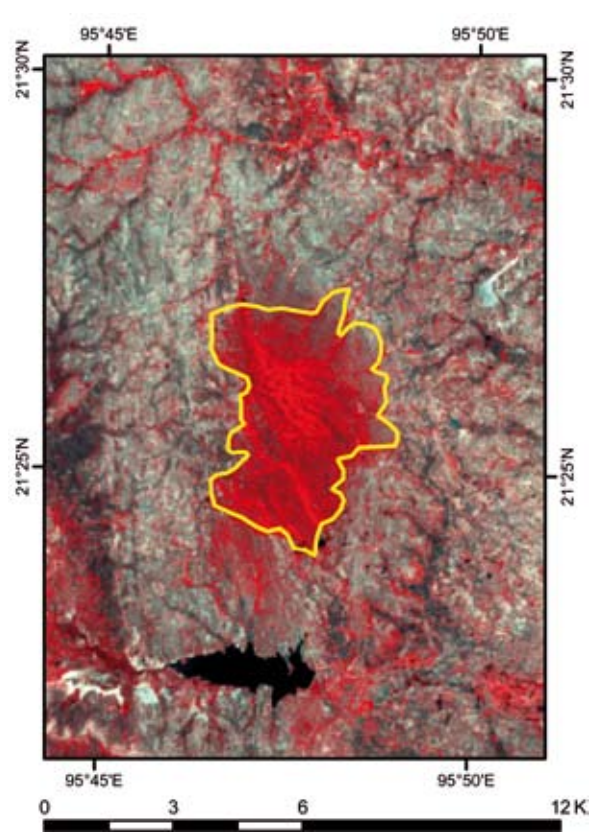
0 m. asl

**Legend of satellite maps**

**Water Depth**    **Vegetation Density**

Deep                      High

Shallow                  Low



**SITE DESCRIPTION**

Minsontaung Wildlife Sanctuary was established for the promotion of ecotourism, public education and the conservation of dry zone ecosystem.

**NATURAL RESOURCES**

The area is covered by dry forest hosting over seventy bird species, including 3 Myanmar endemic species (White-throated Babbler, Hooded Treepie and Burmese Bushlark). Barking deers, civets, rodents and bats can be found in the site. Furthermore, checklists of 9 species of amphibians, 26 reptiles, over 50 butterflies are available at park office. A highlight is the critically endangered Burmese Star Tortoise.

**MANAGEMENT**

A 5-year management plan is available at the site and conservation and management actions are implemented by park staff, in some cases, with the support of university and

international agencies. Park staff patrol the site twice a week and perform an annual bird survey. In 2008 the star tortoise was reintroduced from Lawkananda Wildlife Sanctuary. In addition, park staff are educating the population of neighbouring villages on environmental issues with the support of Conservation International.

**STAFF / RESOURCES**

10 staff members are permanently allocated to the site, including 1 warden, 2 rangers, 3 foresters and 4 clerks and labourers. All staff has been trained by Conservation International on the conservation of the star tortoises. Park infrastructure is constituted by a park warden office and five water ponds against droughts. The office needs electricity and computers.

**TOURISM**

No available information.

**THREATS**

The main threat to Minsontaung forest and biodiversity is the occurrence of bush/forest fire outbreaks. Another issue is the poaching of star tortoise to be sold to foreign markets, especially Japan, as a pet. Occasionally local people encroach the protected forest to collect firewood or in search of pasture land for their livestock.

**LAND USE AND HUMAN ACTIVITIES**

Conservation is the only land use allowed inside the area. Outside local people depend on shifting cultivation (sesame, peas, etc.).

**RESEARCH**

Herpetological research has been conducted by the California Academy of Science.



# MINWUNTAUNG

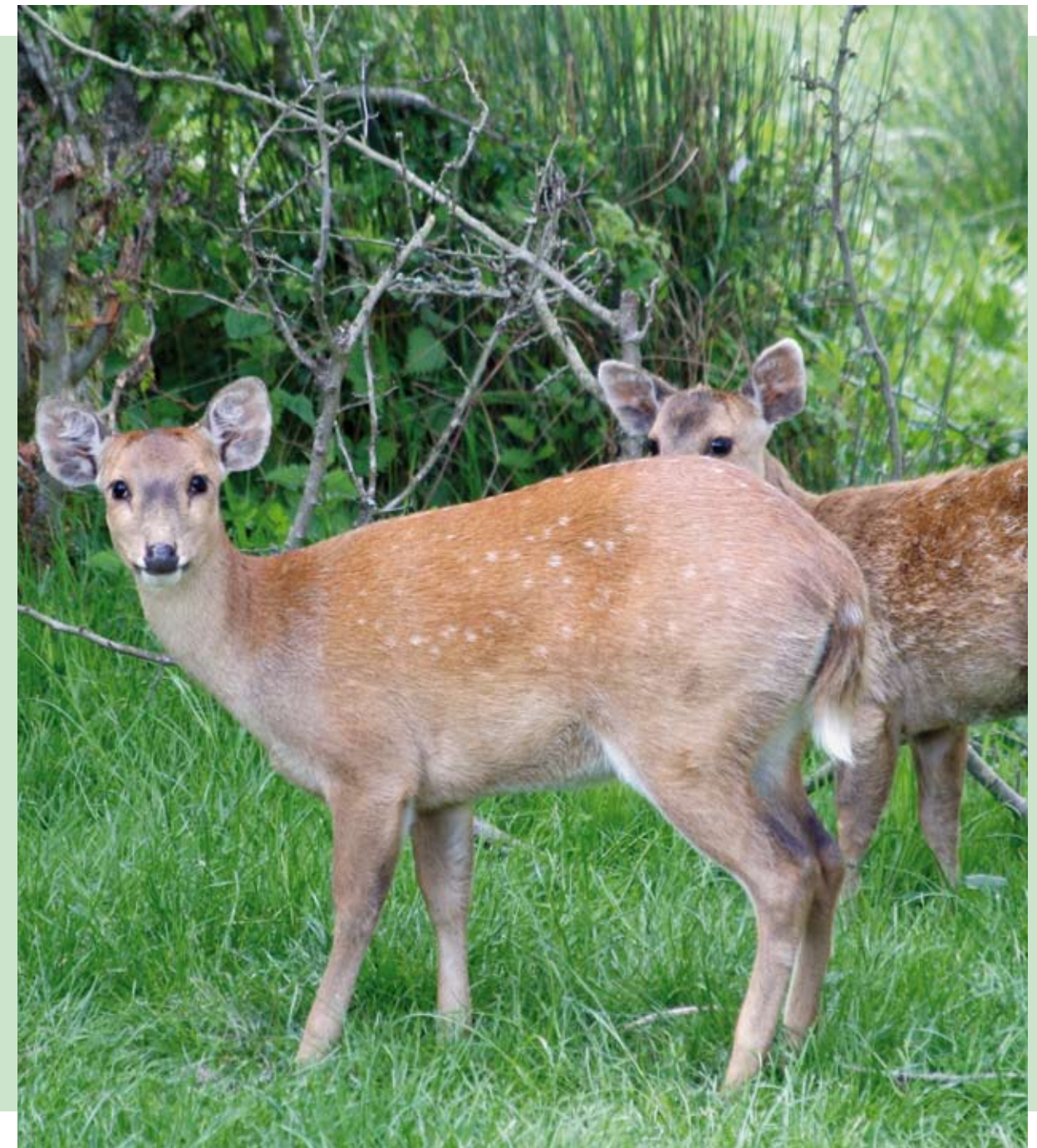
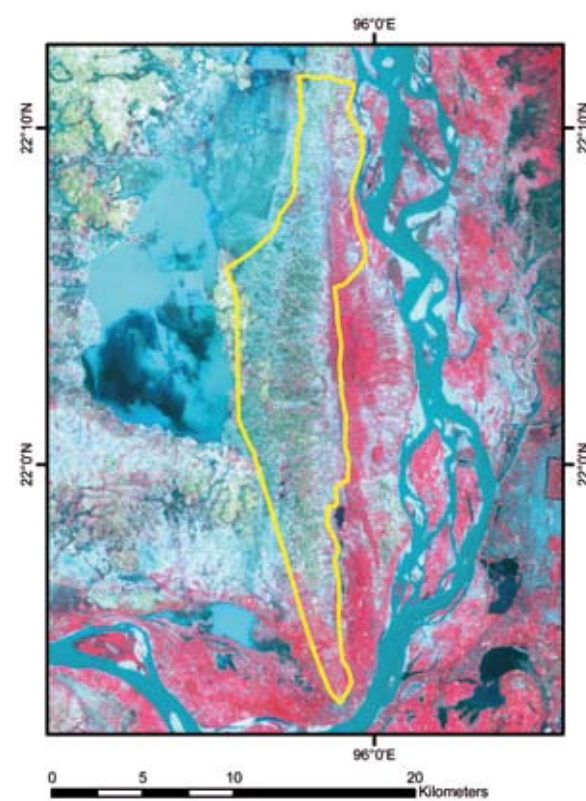
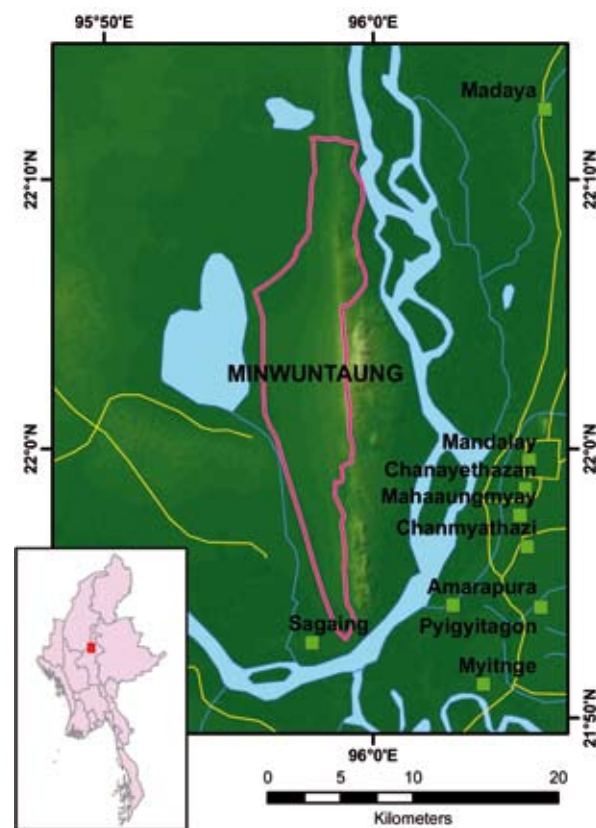
Site ID	25
Locality	Sagaing Region, Sagaing Township
Coordinates	N 22° 03', E 95° 57'
Size (km <sup>2</sup> )	206
Altitude (m. asl)	75 – 305
Myanmar category	Wildlife Sanctuary
IUCN category	IV
Site Governance	Forest Department
Boundaries	Demarcated
Year gazetted	1972
Protection level	Total
Main purposes	Conservation
Habitat	Dry Forest
Key resources	Barking Deer, Hog Deer, Birds spp.

### Legend of topographic maps

- Head Quarters
  - Ranger Post
  - Towns
  - Protected Areas
  - State/Region Boundaries
  - Roads
  - Water areas
  - Rivers
- Elevation**
- 5.800 m. asl
  - 0 m. asl

### Legend of satellite maps

- | Water Depth                              |   | Vegetation Density                          |  |
|--|---|---|--|
| <span style="color: cyan;">■</span> Deep | <span style="color: red;">■</span> High | <span style="color: cyan;">■</span> Shallow | <span style="color: red;">■</span> Low |



# MOSCOS ISLAND

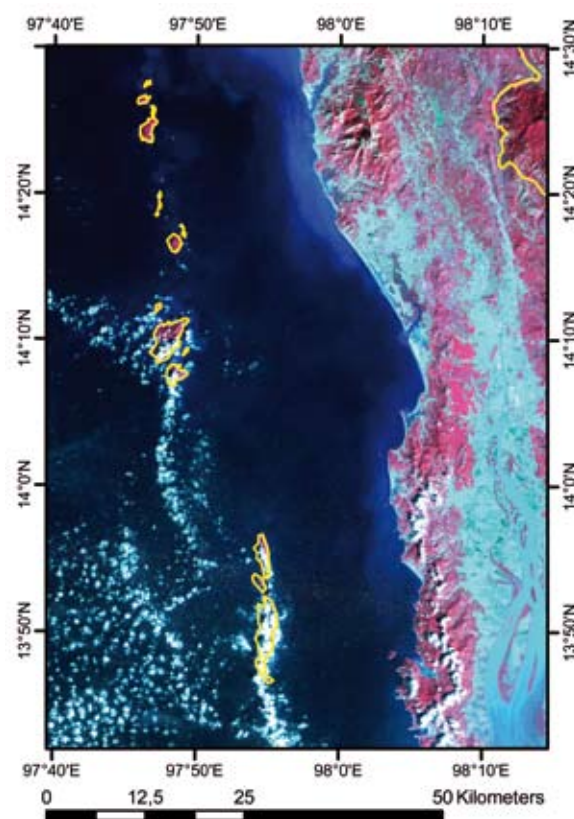
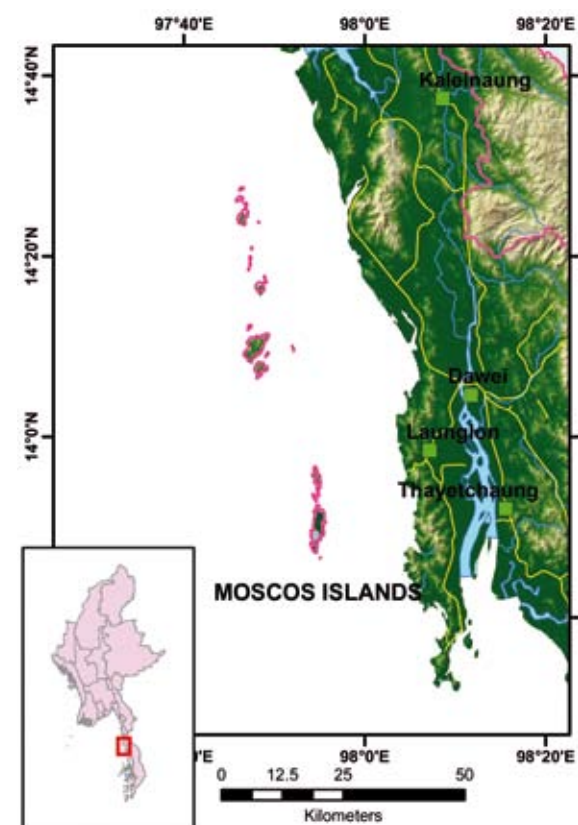
Site ID	26
Locality	Tanintharyi Region, Yebyu and Launglon Townships
Coordinates	N 14° 04', E 97° 50'
Size (km <sup>2</sup> )	49
Altitude (m. asl)	0 - 355
Myanmar category	Wildlife Sanctuary
IUCN category	IV
Site Governance	Forest Department
Boundaries	Demarcated
Year gazetted	1927
Protection level	Total
Main purposes	Conservation, Natural resources maintenance
Habitat	Evergreen Forest (Typical)
Key resources	Sambar Deer, Swiftlets, Barking Deer

### Legend of topographic maps

- Head Quarters
  - Ranger Post
  - Towns
  - Protected Areas
  - State/Region Boundaries
  - Roads
  - Water areas
  - Rivers
- Elevation**
- 5.800 m. asl
  - 0 m. asl

### Legend of satellite maps

- Water Depth**    **Vegetation Density**
- Deep
  - High
  - Shallow
  - Low



### SITE DESCRIPTION

Moscoss Island Wildlife Sanctuary is situated in Dawei District, Tanintharyi Region. The sanctuary comprises the south, middle and north Moscos group of islands in the northern part of the Andaman Sea. Except for some rocky islands, they are covered with evergreen forest. The size reported in the list provided by FD in 2009 (49 km<sup>2</sup>) is not consistent with the size calculated with the GIS boundary (17.5 km<sup>2</sup>).

### NATURAL RESOURCES

Although it is one of the four marine protected areas, mostly the terrestrial part of the islands is protected. The most common forest type (75%) is evergreen forest. Swiftlets, *Collocalia fuciphaga*, make nests on the rocky islands of the sanctuary which have a very high commercial value.

### MANAGEMENT

The site is not managed. Occasional visits by the Forester Department staff based in the coast are aimed at the collection of edible birdnests. No further information is available as we weren't given access to the site and local offices don't have any data.

### STAFF / RESOURCES

The site is situated on the remote island groups and it has no field office and staff. It can only be reached by boat after receiving permits from the Navy.

### TOURISM

No tourism is allowed in the island but Maungmagan scenic beach, which is situated on the coast in front of middle Moscos,

### THREATS

The islands of Maungma Kan (middle islands) are under the control of the Navy but fishing and harvesting of aquatic resources still represents the main threat together with the overextraction of birdnests.

is one of the most famous tourist attractions of Myanmar. It is 15 km south from Dawei town and airport, thus accessible in less than 2 hours travel from Yangon. There is only one beach resort in Kanton village, mostly hosting Myanmar tourists.

### LAND USE AND HUMAN ACTIVITIES

#### INSIDE

- Edible birdnest collection
- Turtle Conservation
- Restricted area
- Regional Development Project
- Military frontier base

Sea turtle conservation has been conducted by the Department of Fishery at the South Moscos (Longlon boak) Island. An army base is also stationed on the South Moscos Island. Birdnest collection at some rocky islands of the Sanctuary is permitted to the private sector by the Forest Department. Some northern Islands are included in the Dawei deepsea port and industrial zone development project area which has been jointly implemented with Thailand.

#### OUTSIDE

- Fishery
- Restricted area
- Regional Development Project

The site is surrounded by sea and some villages on the mainland are fish landing sites and they are busy with artisanal nearshore fishing boats

### RESEARCH

No information available.

# MOYINGYI WETLAND

Site ID	27
Locality	Bago Region, Bago and Waw Townships
Coordinates	N 17° 32', E 96° 36'
Size (km <sup>2</sup> )	104
Altitude (m. asl)	0 – 30
Myanmar category	Bird Sanctuary
IUCN category	IV
Site Governance	Nature and Wildlife Conservation Division
Boundaries	Demarcated
Year gazetted	1988
Protection level	Partial (fishing allowed)
Main purposes	Conservation
Habitat	Wetland
Key resources	Wetland Ecosystem, Water Birds

**Legend of topographic maps**

- Head Quarters
- Ranger Post
- Towns
- Protected Areas
- State/Region Boundaries
- Roads
- Water areas
- Rivers

**Elevation**

5.800 m. asl

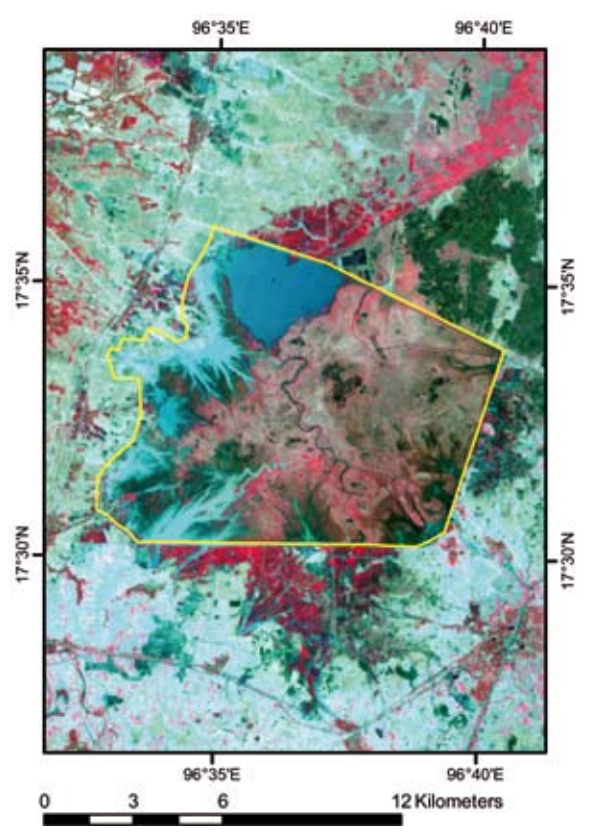
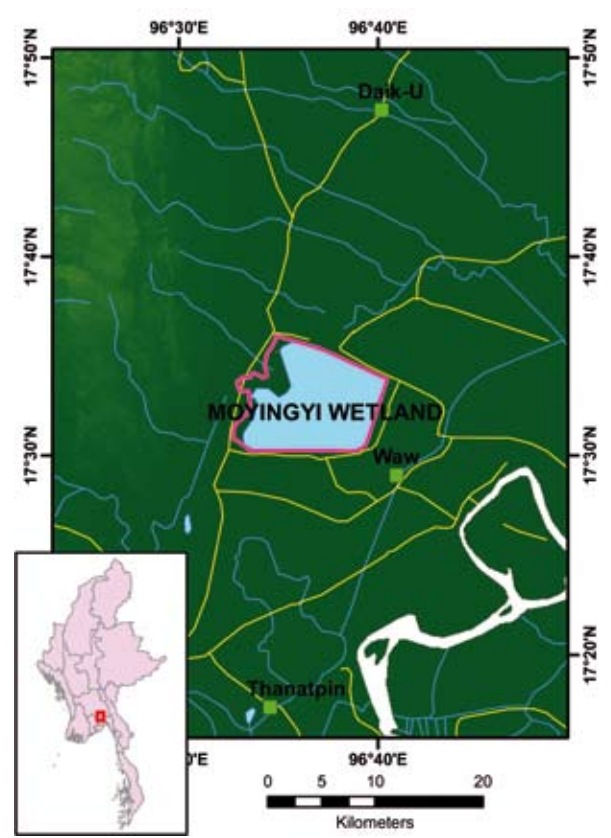
0 m. asl

**Legend of satellite maps**

**Water Depth**    **Vegetation Density**

Deep                      High

Shallow                  Low



## SITE DESCRIPTION

The site is located around an artificial lake constructed in 1904 in the Bago Region, 113 km far from Yangon City. The area is mostly flat. Therefore, it becomes flooded during the rainy season and dry during summer, although some permanent water bodies exist. It aims to conserve resident and migratory birds and their habitats, which also constitute the main attraction for tourists.

## NATURAL RESOURCES

The site supports several wetland habitats with high ecological value for resident and migratory waterbirds. More than 20 aquatic plants are present, including Kaing grass and Nwaysaba (*Oxyza officinalis*), growing especially in the shallow areas of the site, which are a breeding ground for water birds. Checklists of 130 bird species, 20 reptiles, 9 amphibians, 45 fish and 30 insects are compiled at the sanctuary office.

## MANAGEMENT

The site is managed according to an annual management plan that includes patrolling activities, maintenance of roads and building and zoning programme. No human access is allowed in the core zone which is delimited by nets. In addition, a no-fishing zone is marked by poles. Nevertheless increasing conflicts with the poor local communities are reported. More patrolling against illegal fishing, environmental education campaigns and the involvement of local authorities are necessary actions for the conservation of site.

## THREATS

Overfishing, including illegal fishing techniques such as electric fishing, is the main threat for the site. Of moderate concern is the large number of water buffaloes and other livestock grazing in the marshy areas of the sanctuary during the dry season. In addition, rice cultivation and human settlements are encroaching as the water level recedes within the basin.

## STAFF / RESOURCES

The sanctuary has eight staff. The staff training level is satisfactory. Park warden, rangers and clerks have university-level education in environmental subjects. In addition, warden and rangers have received further training from Forest Department and NGOs. Nevertheless the level of IT skills is very low.

In terms of infrastructure, the park warden office, where five staff are based, is located in the Pyin Bon Gyi village. Three ranger posts (1 staff each) are located in the villages of Kapin, Pyun Chaung and Pauk Taw. The information centre, nine boat houses and two rest houses are located close to the reservoir and are accessible by motor road. Another road (32 km) surrounds the reservoir but is accessible only during the dry season. Basic tools and equipment (binoculars, telescope, GPS, camera, etc.) are available in the site. The office doesn't have electricity or phone line for budget limitations. The bird-watching towers were destroyed by the Nargis cyclone in 2007 and need to be rebuilt.

## TOURISM

The site was visited by over 2,000 tourists in 2009. The potential is high for bird-watchers and nature lovers

## LAND USE AND HUMAN ACTIVITIES

Fishing is tolerated in the basin for daily subsistence of local communities. 17 villages surround the site and mainly rely on rice cultivation. Rice fields are expanding inside because they are allowed by local authorities against the recommendations of Forest Department.

## RESEARCH

Wetland biodiversity of the site has been studied by the Zoology Department of Yangon University, California Academy of Science, Wild Bird Society of Myanmar and the Forest Department.

# MULAYIT

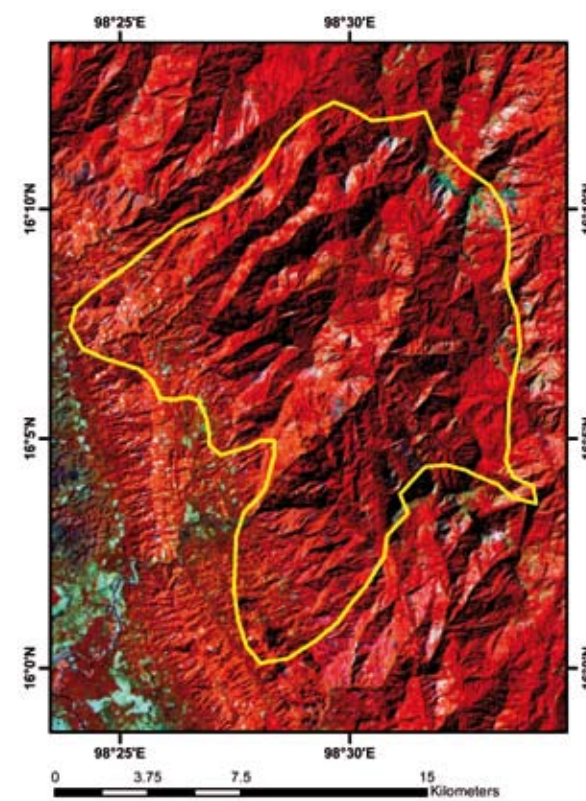
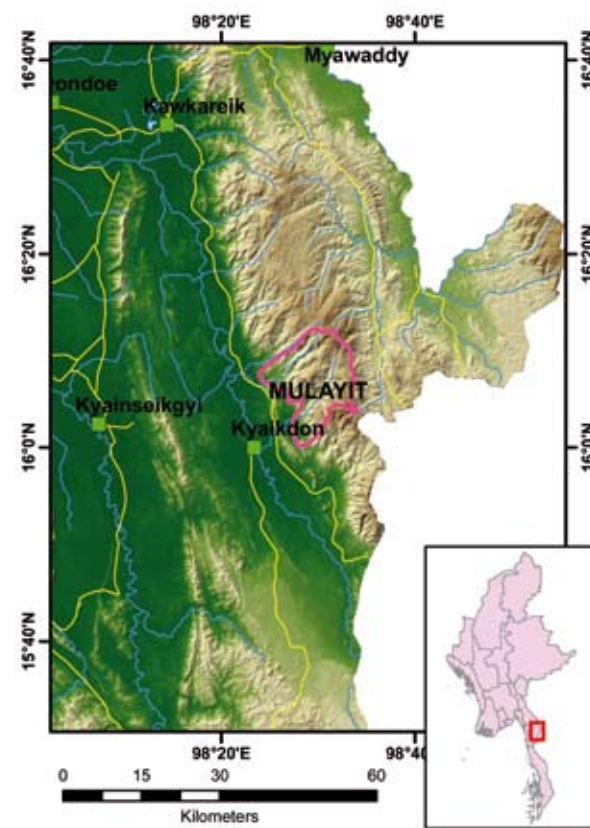
Site ID	28
Locality	Kayin State (Kya-in Seik-kyi Township)
Coordinates	N 16° 06', E 98° 29'
Size (km <sup>2</sup> )	139
Altitude (m. asl)	80 – 2010
Myanmar category	Wildlife Sanctuary
IUCN category	IV
Site Governance	Forest Department
Boundaries	Demarcated
Year gazetted	1936
Protection level	Unknown
Main purposes	Conservation
Habitat	Grassland, Evergreen Forest (Typical), Mixed Deciduous Forest (Moist Upper), Hill Forest (Evergreen)
Key resources	Barking Deer, Tiger, Leopard, Javan Rhinoceros (extinct since 1948)

### Legend of topographic maps

- Head Quarters
  - Ranger Post
  - Towns
  - Protected Areas
  - State/Region Boundaries
  - Roads
  - Water areas
  - Rivers
- Elevation**
- 5.800 m. asl
  - 0 m. asl

### Legend of satellite maps

- | Water Depth                                      |   | Vegetation Density                      |   |
|--|---|---|---|
| <span style="color: blue;">—</span> Deep         | <span style="color: red;">—</span> High | <span style="color: red;">—</span> High | <span style="color: red;">—</span> High |
| <span style="color: lightblue;">—</span> Shallow | <span style="color: pink;">—</span> Low | <span style="color: pink;">—</span> Low | <span style="color: pink;">—</span> Low |



# NATMA TAUNG

Site ID	29
Locality	Chin State; Matupi, Mindat and Kanpetlet Townships
Coordinates	N 21° 25', E 93° 47'
Size (km <sup>2</sup> )	723
Altitude (m. asl)	740 – 3,070
Myanmar category	National Park
IUCN category	II
Site Governance	Nature and Wildlife Conservation Division
Boundaries	Demarcation in course
Year proposed	1997
Protection level	Total
Main purposes	Conservation
Habitat	Hill Forest (Evergreen and Pine), Grassland
Key resources	Gaur, Serow, Goral, White-blowed Nuthatch, Avifauna

**Legend of topographic maps**

- Head Quarters
- Ranger Post
- Towns
- Protected Areas
- State/Region Boundaries
- Roads
- Water areas
- Rivers

**Elevation**

5.800 m. asl

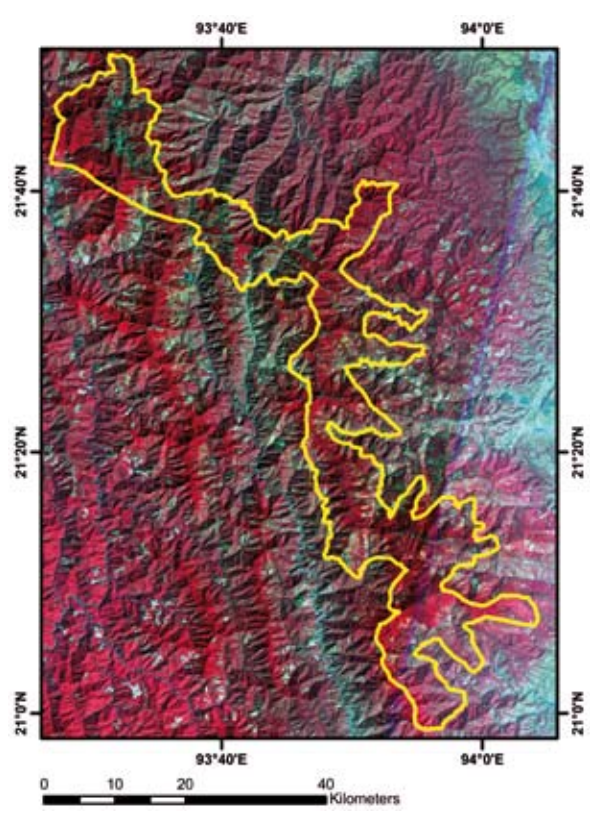
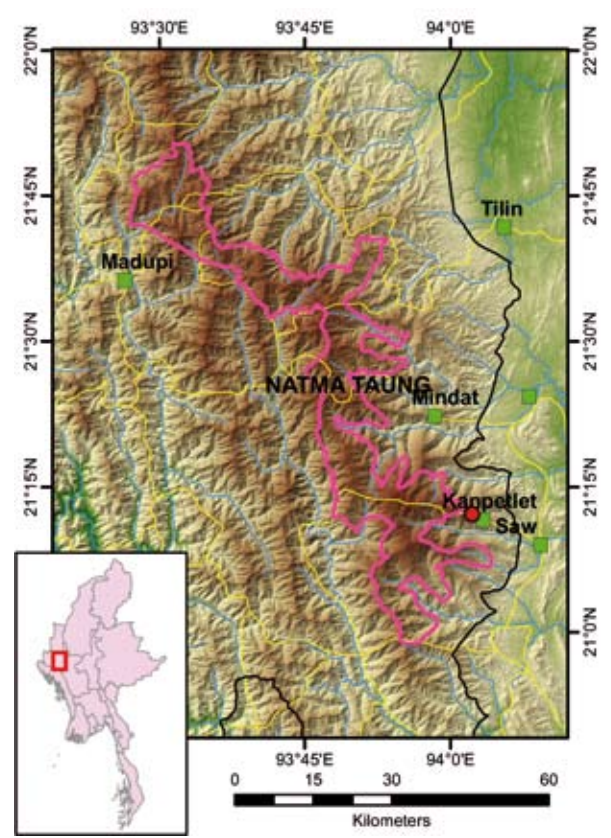
0 m. asl

**Legend of satellite maps**

**Water Depth**    **Vegetation Density**

Deep                      High

Shallow                  Low



**SITE DESCRIPTION**

The site has been proposed as a National Park in 1997 but the designation process along with boundary demarcation is still ongoing. The area preserves plant species endemism. It is an Important Bird Area (IBA, designated by BLI 2004) and one of the world's high plant diversity site (IUCN 2005). Natma Taung is also an important catchment of two big rivers and nine medium and small rivers, on which 3 million people depend for their livelihood. The highest elevation is 3,200 m at Natmataung Peak while Kanpetlet area is about 1,390 m which is the most populated area.

**NATURAL RESOURCES**

The forest cover is made up of hill forest and comprises dipterocarp forest, pine forest, laurel and stone oak forest, oak forests, oak and rhododendron forests and meadows. 808 species of plants (including 70 ferns), 299 birds, 23 amphibians, 65 reptiles and 77 butterflies have been identified and checklists are available at the park office. A rich variety of wild orchid species, including endangered medicinal orchids, occurs at altitudes between 1,000 and 2,000 m and are very important for the livelihood of local people in terms of local use and tourism.

**MANAGEMENT**

The park is managed according to an annual plan based on zoning principles. In the core zone, flora and fauna are

**THREATS**

The presence of human settlements inside and outside the site is increasingly impacting upon biodiversity and forests. Some villagers are poaching wildlife and illegally extracting forest products from Natma Taung forests. The fire from shifting cultivations is spreading also into the protected forests and is difficult to control. Furthermore, fallow period between two successive cultivation periods has been reduced to 3-4 years resulting in erosion, landslides, loss of land fertility and productivity.

regularly monitored by park staff and biodiversity surveys are occasionally conducted with international agencies. Patrolling is undermined by the lack of tools and financial resources. In the buffer zone, livelihood inputs have been provided to the local communities by a network of international and national agencies (JICA, UNDP, CARE, BLI, BANCA) in collaboration with park authorities and community-based organisations.

**STAFF / RESOURCES**

Although the site has not been officially designated yet, 32 staff members (1 Park warden, 5 rangers, 6 foresters, 3 clerks and 17 labourers) work in the park during the open season. The head office is located in Kanpetlet town where the warden and clerks are based. Remaining staff is allocated to two offices in Mindat and Matupi towns. Two guardposts, a colonial building and bungalows are present but are not currently in use.

**TOURISM**

The park is considered as an ecotourism site and is visited by a few hundred visitors every year. Three lodges can accommodate local and foreign tourists who are mostly interested in bird watching, trekking and meeting the local Chin communities. Foreigners need special permission to access the area which can be obtained only by local tour agencies.

**LAND USE AND HUMAN ACTIVITIES**

- Recreation
  - Agricultural production
- Natma Taung National Park and its buffer zone are populated by about 120 villages and 32 of which are located inside the park. Forest degradation is caused not only by forest fires and shifting cultivation but also by encroachment of government-promoted tea plantations.

**RESEARCH**

BLI, CAS, Makino Botanical Garden have undertaken research in the site in collaboration with the park authorities.

# PANLAUNG-PYADALIN CAVE

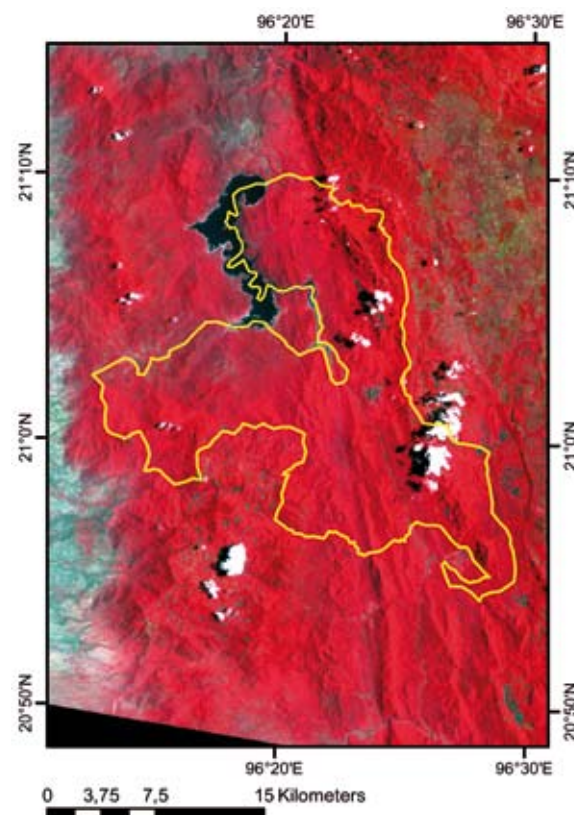
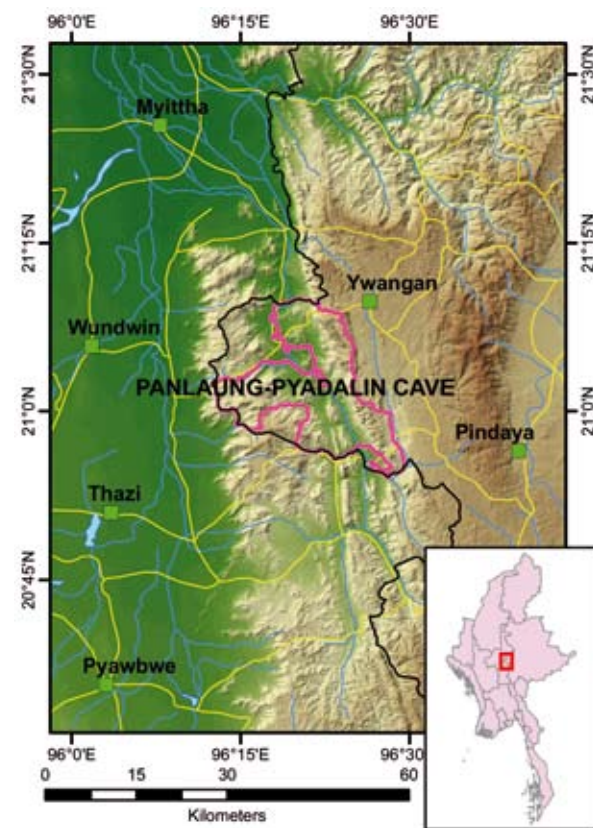
Site ID	30
Locality	Shan State, Ywa Ngan Township
Coordinates	N 21° 01', E 96° 21'
Size (km <sup>2</sup> )	334
Altitude (m. asl)	150 – 1,555
Myanmar category	Wildlife Sanctuary
IUCN category	IV
Site Governance	Nature and Wildlife Conservation Division
Boundaries	Demarcated
Year gazetted	2002
Protection level	Total
Main purposes	Conservation, Cultural heritage, Research/ Education, Recreation/ Ecotourism
Habitat	Mixed Deciduous Forest (Moist Upper), Mixed Deciduous Forest (Dry Upper), Indaing Forest
Key resources	Asian Elephant, Banteng, Gaur, Clouded Leopard, Serow

### Legend of topographic maps

- Head Quarters
  - Ranger Post
  - Towns
  - Protected Areas
  - State/Region Boundaries
  - Roads
  - Water areas
  - Rivers
- Elevation**
- 5.800 m. asl
  - 0 m. asl

### Legend of satellite maps

- Water Depth**    **Vegetation Density**
- Deep
  - High
  - Shallow
  - Low



### SITE DESCRIPTION

Panlaung-Pyadalin Cave Wildlife Sanctuary is situated in Ywa Ngan Township of Shan State. It was established with the purpose of preserving the archeological site of the Pyadalin limestone caves, to conserve the surrounding environment and habitat for mammals like Wild Elephants, Gaur, Leopard, Banteng, Sambar, many species of monkeys and many species of birds. The sanctuary is an important watershed area for the Kingda dam. The climate is hot and dry in lower elevation and moderate in higher elevation, with average rainfall recorded between 1,250 – 2,000 mm per year.

### NATURAL RESOURCES

Moist upper and dry upper mixed deciduous forests and deciduous dipterocarp (Indaing) forest are the forest types of the site. A new species of lizard, *Cyrtodactylus chrysopylos*, was discovered in 2003 by the California Academy of Science.

### MANAGEMENT

- Annual operation plan  
 Management actions in place:
- Environmental education
- Management problems:
- Budget

### THREATS

- INSIDE**
- Logging & Wood Harvesting
- OUTSIDE**
- Housing & Urban Areas

- Man power
- Required actions:
- To build a field office and guard posts
  - Settlement for the encroaching people
  - Provision of communication and field equipments

### STAFF / RESOURCES

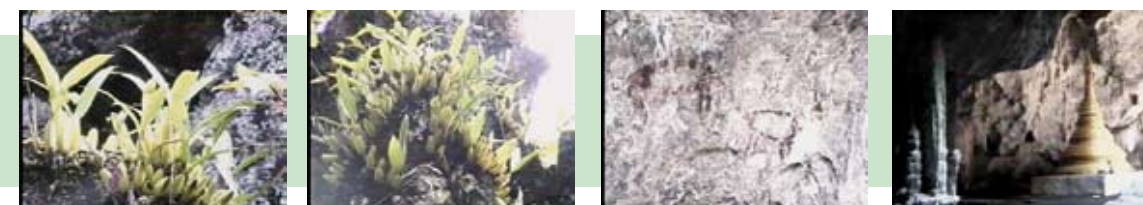
The site is administered by the Nature and Wildlife Conservation Division of the Forest Department. The office with 12 staff for the site is located at Ywa Ngan town. Four ranger posts have been built. Local and international trainings were given for the staff.

### TOURISM

The site is easily accessible all season to local tourists who can reach it by car 37 km east from Kume on Yangon Mandalay Highway. The main attractions are the two limestone Pyadalin caves located in the Panlaung forest reserve. The smaller contains paintings that are over 11,000 years old, dated between the Mesolithic and Neolithic periods. Both caves contain over 1,600 stone relics and many animal and human bones and red ochre.

### LAND USE AND HUMAN ACTIVITIES

- INSIDE**
- Conservation
  - Recreation
- OUTSIDE**
- Agriculture



PAR SAR

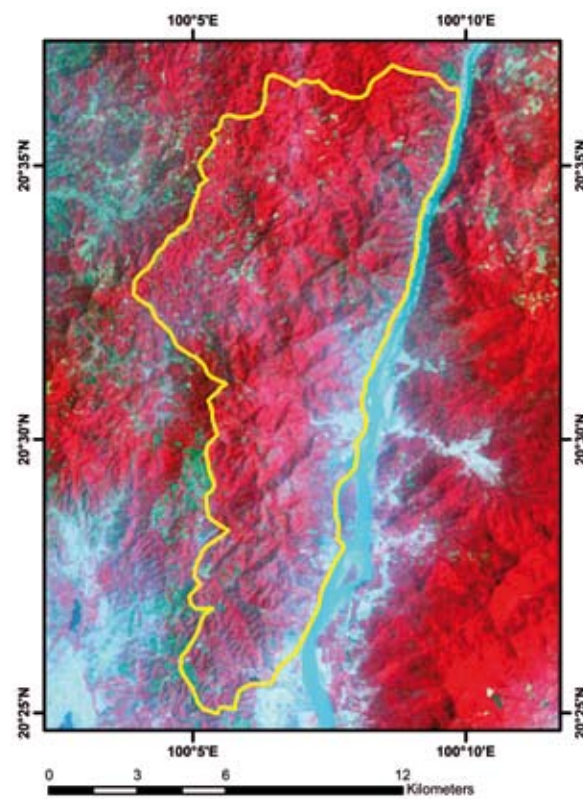
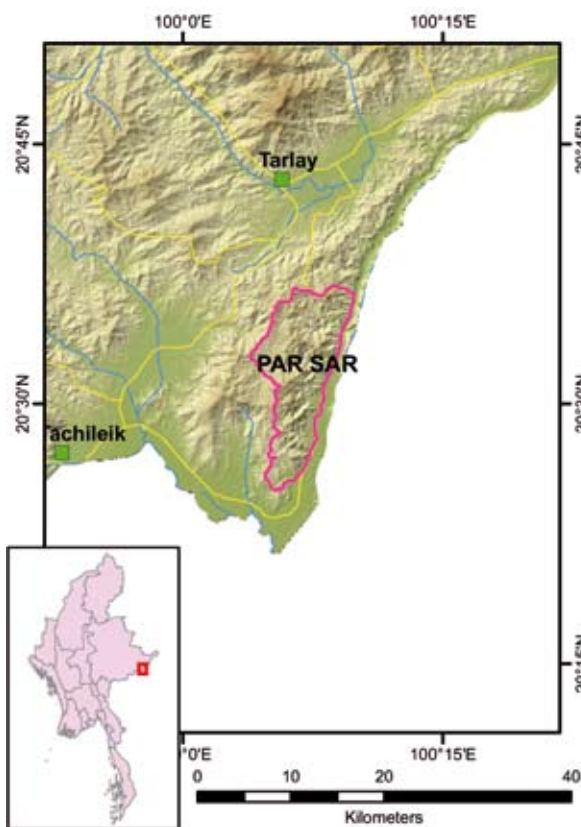
Site ID	31
Locality	Shan State, Tachilek Township
Coordinates	N 20° 31', E 100° 00'
Size (km <sup>2</sup> )	77
Altitude (m. asl)	370 – 1,105
Myanmar category	Protected Area
IUCN category	NA
Site Governance	Forest Department
Boundaries	Demarcated
Year proposed	1996
Protection level	Total
Main purposes	Conservation
Habitat	Mixed Deciduous Forest (Moist Upper), Hill Forest (Dry)
Key resources	Jungle Fowl, Chinese Pangolin

Legend of topographic maps

- Head Quarters
  - Ranger Post
  - Towns
  - Protected Areas
  - State/Region Boundaries
  - Roads
  - Water areas
  - Rivers
- Elevation**
- 5.800 m. asl
  - 0 m. asl

Legend of satellite maps

- |  |   |
|--|---|
| <b>Water Depth</b>                               | <b>Vegetation Density</b>               |
| <span style="color: blue;">■</span> Deep         | <span style="color: red;">■</span> High |
| <span style="color: lightblue;">■</span> Shallow | <span style="color: pink;">■</span> Low |



SITE DESCRIPTION

The site was a Reserved Forest until 1996, and then it was upgraded to the status of protected area thanks to the efforts of Reverend Maing Fone, a famous Shan ethnic Buddhist monk, who has been promoting nature conservation activities around the Pagoda of Lwan Lin town.

NATURAL RESOURCES

Very little information is available. Park staff report the presence of the Sun Bear (*Ursus malayanus*).

MANAGEMENT

The site is managed by the Forest Department of the Keng Tung Township. However, the only activities carried out are scattered tree planting in forest gaps. No management plan is present. Security problems are reported as one of the major management constraints.

STAFF / RESOURCES

No park staff, no infrastructure, no facilities and equipment are present on site.

TOURISM

No information on tourism is available and access is restricted for security reasons. There are local pilgrims visiting the Pagoda. Foreign tourists are allowed in Tachilek town with a special visa which can be obtained at the Thai border or a special permit from Yangon from where they can reach the area only by plane.

THREATS

- Annual & Perennial Non-Timber Crops
- Wood & Pulp Plantations
- Hunting & Collecting Terrestrial Animals

The natural resources of the area are threatened by the increasing pressure of shifting cultivation. Moreover, being villages so close to the PA borders, illegal logging or poaching activities may occur in the forest. Around the area artificial plantations (like Rubber tree and Tea) could cause an encroachment of the natural habitats.

LAND USE AND HUMAN ACTIVITIES

INSIDE

- Shifting cultivation

OUTSIDE

- Management of natural forests
  - Forest Plantations
  - Permanent cropping
- Around the site there are some activities of Community Forestry. However, the main land uses are plantations of Rubber tree and Tea.

RESEARCH

No information available.

# PIDAUNG

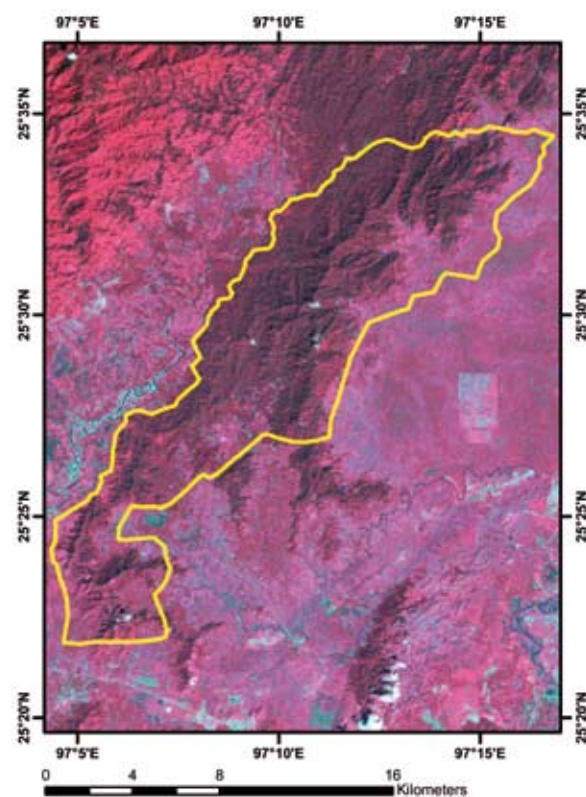
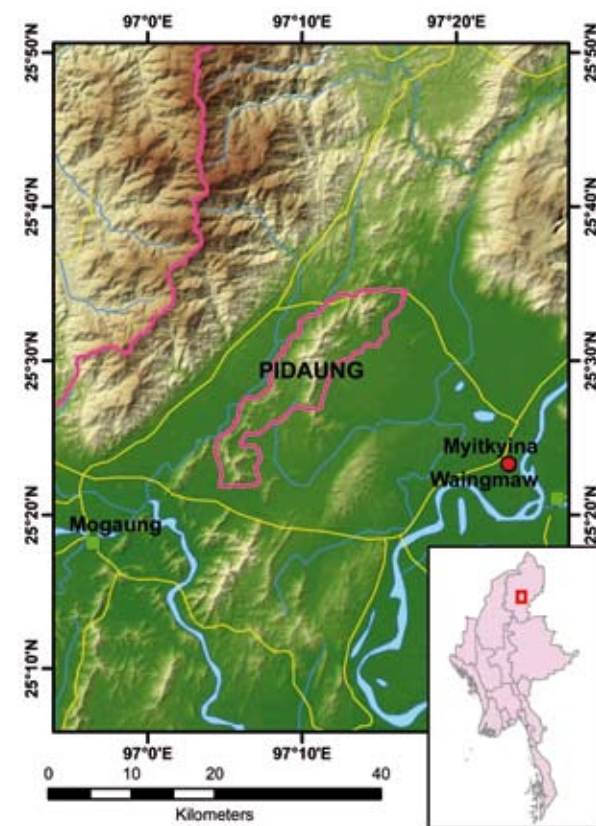
Site ID	32
Locality	Kachin State (Myitkyina Township)
Coordinates	N 25° 29', E 97° 10'
Size (km <sup>2</sup> )	122
Altitude (m. asl)	155 – 665
Myanmar category	Wildlife Sanctuary
IUCN category	IV
Site Governance	Nature and Wildlife Conservation Division
Boundaries	Demarcated
Year gazetted	1918
Protection level	Total
Main purposes	Conservation , Research/Education
Habitat	Evergreen Forest (Typical), Agricultural/Plantation Areas
Key resources	Leopard, Gaur, Sambar Deer, Hog Deer, Wild Boar, Asiatic Black Bear, Rhesus Macaque, Hoolock Gibbon, Wreathed Hornbill, Oriental Pied Hornbill

### Legend of topographic maps

- Head Quarters
  - Ranger Post
  - Towns
  - Protected Areas
  - State/Region Boundaries
  - Roads
  - Water areas
  - Rivers
- Elevation**
- 5.800 m. asl
  - 0 m. asl

### Legend of satellite maps

- |  |   |
|--|---|
| <b>Water Depth</b>                               | <b>Vegetation Density</b>               |
| <span style="color: cyan;">■</span> Deep         | <span style="color: red;">■</span> High |
| <span style="color: lightblue;">■</span> Shallow | <span style="color: pink;">■</span> Low |



### SITE DESCRIPTION

The sanctuary was the first Protected Area to be designated in Myanmar. It is situated in Myitkyina Township of Kachin State in northern Myanmar. The Sanctuary was established in order to conserve biodiversity, to educate local people in environmental conservation, to encourage local people to participate in conservation activities and to develop their socio-economic conditions.

### NATURAL RESOURCES

Evergreen forest covers 80% of the site. The site was established to protect many threatened species, but only leopard and Hoolock Gibbon, among the most threatened species, were observed recently.

### MANAGEMENT

- Annual operation plan  
 Management actions in place:
- Regular patrolling
  - General observation of animal distribution
  - Collection of medicinal plants
  - Educational talks on conservation and protected area at villages
  - Erection of boundary marker boards

### THREATS

- INSIDE and OUTSIDE
- Annual & Perennial Non-Timber Crops
  - Logging & Wood Harvesting
  - Hunting & Collecting Terrestrial animals

- Border line inspection
  - Forest plantation
- Management problems:
- Financial constraint
  - Inadequate manpower
  - Difficult access to the site
- Required actions:
- More patrolling
  - More staff
  - Staff training
  - Budget
  - Computer training
  - Provision of field and communication equipments
  - Staff quarters

### STAFF / RESOURCES

The Warden's office is situated at Myitkyina town and nine permanent forest staff and two daily wages staff are assigned duties for the site. Two ranger posts have been built. Local and international training were provided for the staff.

### TOURISM

No available information

### LAND USE AND HUMAN ACTIVITIES

- INSIDE
- Shifting cultivation
  - Conservation
  - Forest replantation

- OUTSIDE
- Shifting cultivation
  - Temporary buildings

### RESEARCH

No available information.



POPA

Site ID	33
Locality	Mandalay Region, Kyaukpadaung Township
Coordinates	N 20° 53', E 95° 14'
Size (km <sup>2</sup> )	129
Altitude (m. asl)	285 – 1,490
Myanmar category	Mountain Park
IUCN category	IV
Site Governance	Nature and Wildlife Conservation Division
Boundaries	Demarcated
Year gazetted	1989
Protection level	Partial (Tourism and settlements allowed)
Main purposes	Conservation, Natural resources maintenance, Research/Education, Recreation/Ecotourism
Habitat	Deciduous Dipterocarp Forest (Indaing) Forest, Mixed Deciduous Forest (Dry Upper), Dry Forest
Key resources	Dry Zone Ecosystem, Traditional Medicinal Plants

**Legend of topographic maps**

- Head Quarters
- Ranger Post
- Towns
- Protected Areas
- State/Region Boundaries
- Roads
- Water areas
- Rivers

**Elevation**

5.800 m. asl

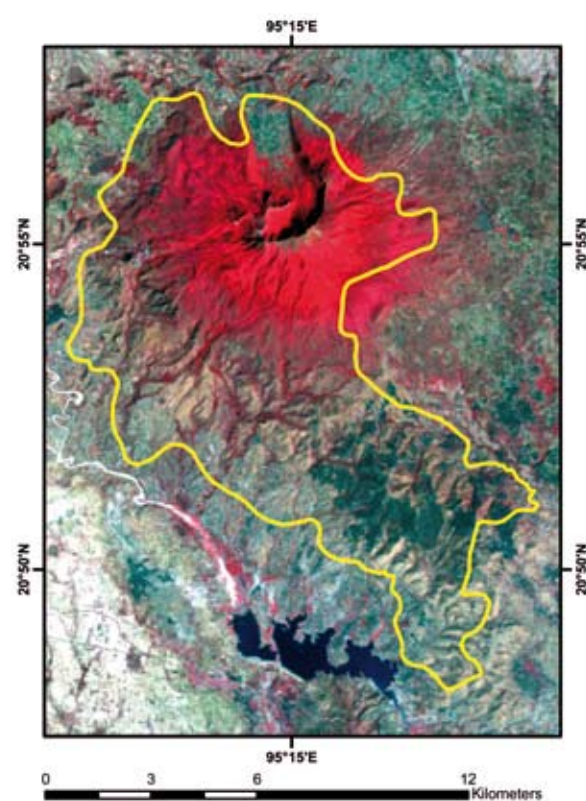
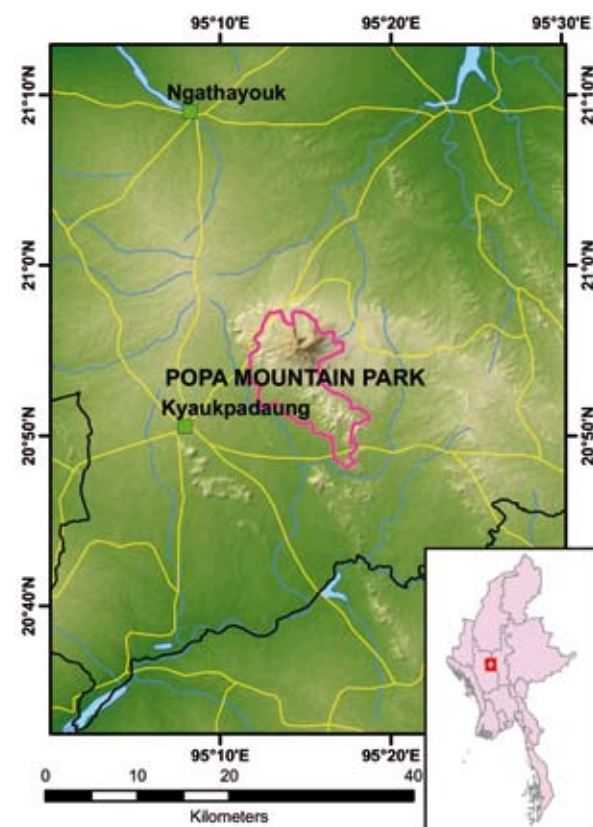
0 m. asl

**Legend of satellite maps**

**Water Depth**    **Vegetation Density**

Deep                  High

Shallow              Low



**SITE DESCRIPTION**

Popa mountain is an extinct volcano in middle Myanmar. Popa Mountain Park was established to protect the dry zone ecosystem, conserve the watershed area of Kyetmauk Taung reservoir, conserve medicinal plant species of Popa mountain, to conduct public education and research, and to promote ecotourism.

**NATURAL RESOURCES**

The deciduous dipterocarp forest (Indaing) and the dry forest (Than-Dahat) are the main forest types of the site. Checklists of trees, mammals, birds and butterflies of the park are compiled at the office. Medicinal plants of Popa Mountain are famous all over Myanmar. Many globally threatened species of mammals are recorded in the area (Eld's Deer, Dusky Langur, Capped Langur, Dhole). Checklists of trees, mammals, birds and insects are available.

**MANAGEMENT**

The site has a 4-year management plan. There is a buffer zone where the Forest Department (and in particular former NWCD directors) has supported the local people to establish cash crops and firewood plantations. Management actions include weekly patrolling and annual biodiversity surveys. Special

**THREATS**

- Tourism & Recreation Areas
- Annual & Perennial Non-Timber Crops plantation
- Logging & Wood Harvesting
- Housing & Urban Areas
- Gathering Terrestrial Plants

There are severe conflicts with neighbouring communities who clear the forest for tourism activities, tea plantations and agricultural expansion (banana and mango). Several villages and extensive banana and mango plantations are located in the buffer zone. Illegal collection of firewood and medicinal plants (especially *Michelia champaca*) is conducted but impact is difficult to estimate.

conservation actions target the dusky leaf monkey population inhabiting the old crater. The establishment of banana and mango plantations have supported the development of the villagers located in the buffer zone, although further assistance is needed.

**STAFF / RESOURCES**

About 120 staff are allocated to the protected area and have been trained over time by Forest Department, the Smithsonian Institute, WCS and Japan Makino Botanical Garden. Existing infrastructure includes 1 park warden office, 4 ranger posts, 1 guest house, 1 environmental education centre, 1 library for medicinal plants, staff quarters. The park is in need of field and communication equipment and tools such as computers, GPS and binoculars.

**TOURISM**

Popa mountain is a famous tour site of Myanmar and many local and foreign tourists visit Popa throughout the year due to its good location on the way to or from famous ancient Bagan pagodas. Most only pay a one-day visit to the Nats temples and have a walk in the mountain trails. Restaurants are available inside the area as well as a government guest house and a private luxury hotel for overnight guests.

**LAND USE AND HUMAN ACTIVITIES**

Permitted land uses inside the area are conservation, research, recreation and extraction of medicinal plants. Neighbouring villages depend on tourism and the cultivation of permanent crops (Bean, Pea, Maize, Sesame, Onion).

**RESEARCH**

Herpetological research was conducted by CAS and a PhD thesis was written on the ecology of the Dusky Leaf Monkey.

**PYIN-O-LWIN**

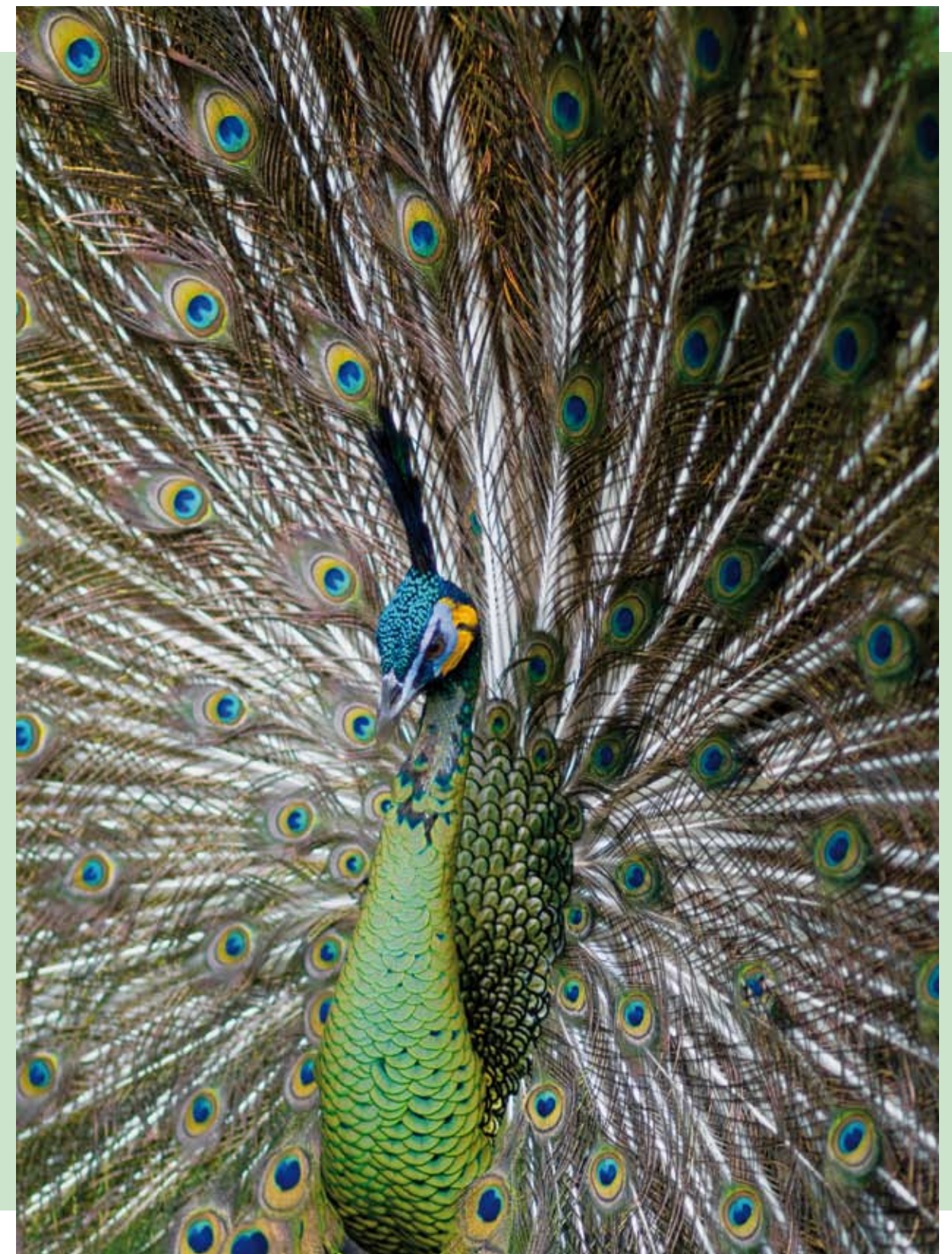
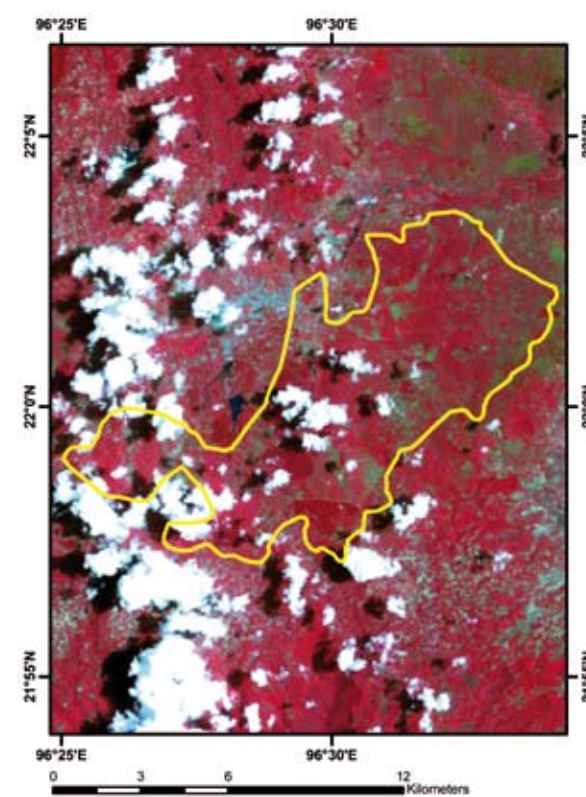
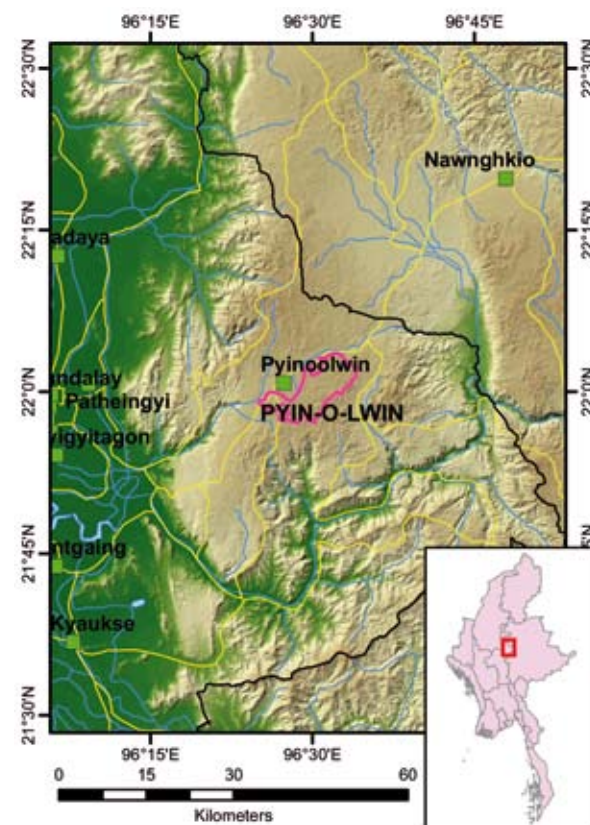
Site ID	34
Locality	Mandalay Region, Pyin-O-Lwin Township
Coordinates	N 22° 00', E 96° 30'
Size (km <sup>2</sup> )	127
Altitude (m. asl)	975 -1,210
Myanmar category	Bird Sanctuary
IUCN category	IV
Site Governance	Forest Department
Boundaries	Demarcated
Year gazetted	1918
Protection level	Total
Main purposes	Conservation, Research/ Education
Habitat	Hill Forest (Evergreen)
Key resources	Green Peafowl, Barking Deer, Grey Peacock Pheasant

**Legend of topographic maps**

- Head Quarters
  - Ranger Post
  - Towns
  - Protected Areas
  - State/Region Boundaries
  - Roads
  - Water areas
  - Rivers
- Elevation**
- 5.800 m. asl
  - 0 m. asl

**Legend of satellite maps**

- | Water Depth                                   |   | Vegetation Density                               |  |
|---|---|--|--|
| <span style="color: lightblue;">■</span> Deep | <span style="color: red;">■</span> High | <span style="color: lightblue;">■</span> Shallow | <span style="color: red;">■</span> Low |



# RAKHINE YOMA ELEPHANT RANGE

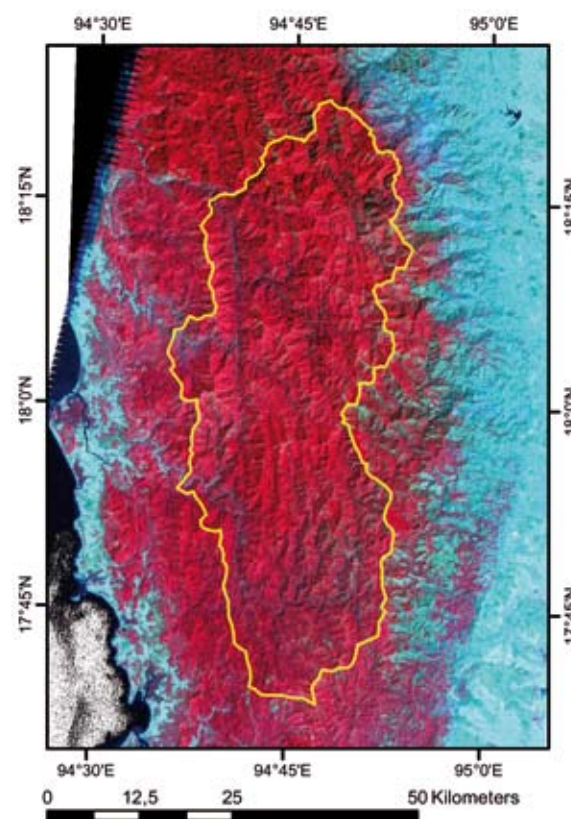
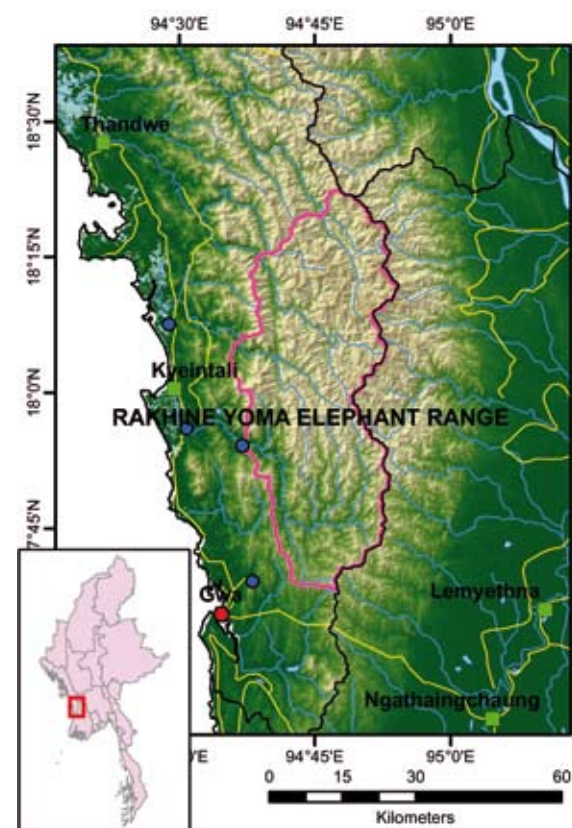
Site ID	35
Locality	Rakhine State , Thandwe and Gwa Townships)
Coordinates	N18° 00', E94°45'
Size (km <sup>2</sup> )	1,756
Altitude (m. asl)	20 – 1,270
Myanmar category	Wildlife Reserve
IUCN category	NA
Site Governance	Nature and Wildlife Conservation Division
Boundaries	Demarcated
Year gazetted	1997
Protection level	Total
Main purposes	Conservation
Habitat	Evergreen Forest, Bamboo Brakes, Mixed Deciduous Forest (Moist Upper)
Key resources	Elephant, Gaur, Leopard, Jackal, Asiatic Black Bear

### Legend of topographic maps

- Head Quarters
  - Ranger Post
  - Towns
  - Protected Areas
  - State/Region Boundaries
  - Roads
  - Water areas
  - Rivers
- Elevation**
- 5.800 m. asl
  - 0 m. asl

### Legend of satellite maps

- | Water Depth |         | Vegetation Density |      |
|-------------|---------|--------------------|------|
|             | Deep    |                    | High |
|             | Shallow |                    | Low  |



### SITE DESCRIPTION

The site is located in the southern part of the Rakhine Yoma mountain range. The topography consists of a series of steep ridges running from north to south, with the main drainage lines cutting them from east to west. The area is famous for luxurious patches of evergreen forest as well as the presence of bamboo brakes (mainly *Melocanna bambusoides*). The key protected resources are 150 Asian Elephants, which constitutes the largest remaining population of wild elephants in Myanmar, and the endemic species of Rakhine Forest Turtle (*Heosemys depressa*).

### NATURAL RESOURCES

Most of the site is covered with evergreen forest, bamboo brakes and mixed deciduous forest (moist upper). Nine mammals are recorded: Asian Elephant, Clouded Leopard, Leopard, Gaur, Common Otter, Hoolock Gibbon, Barking Deer, Sambar Deer, Hog Deer, Malaysian Sun Bear, Himalayan Black Bear. Tigers were present until 30 years ago but are now extinct. Rakhine Forest Turtle (*Heosemys depressa*) is endemic to the range and critically endangered. 123 bird species including Bamboo Woodpecker, Oriental Pied Hornbill, Great Hornbill, Red-headed Trogon, Green-billed Malkoha, Vernal Hanging Parrot and Green Lora have been recorded and a checklist is compiled at the park warden's office.

### THREATS

#### INSIDE

Many poachers enter the sanctuary from the southern point, at the boundary between Ayeyawaddy Division and Rakhine State. Gaur and Barking Deer are mainly hunted for meat; elephant for trade; Malaysian sun bear for selling legs to Thailand; otter for selling parts of the body to Thailand. River poisoning for fishing is also reported.

#### OUTSIDE

Shifting cultivation fields in the buffer zone by poor landless families who are encroaching into the protected area. Tree cutting for charcoal production to be sold to Yangon. Poison fishing is mainly done by outsiders.

### MANAGEMENT

An annual plan is present, as well as indications for a Buffer zone. However, both tools are not implemented. Conflicts between wild elephants and agricultural activities have been reported in the villages around the site.

### STAFF / RESOURCES

A Park Warden is present, along with 15 other staff from the Nature and Wildlife Conservation Division of the Forest Department. More rangers for patrolling activities are needed. The Park Office is located in the town of Gwa, and four Ranger posts are present in the surrounding areas of the PA, outside its border. Equipment such as boats and motorbikes are needed in order to patrol the area and a new ranger post is required in the southern part to control poaching.

### TOURISM

Access to the site is difficult with no transportation except footpath.

The area is restricted to foreign visitors and special permits are needed to access it. Permits can be requested through local travel agencies in Yangon. Nevertheless, the potential for ecotourism is very high due to the proximity to a major tourism destination, Ngapali beach, on the Rakhine coast.

### LAND USE AND HUMAN ACTIVITIES

#### INSIDE

- Shifting cultivation

#### OUTSIDE

- Permanent cultivation
- Fishing (capture)

### RESEARCH ACTIVITIES

Surveys on tortoises and gibbons were implemented respectively by WCS and FFI in collaboration with the community-based organisation Rakhine Coastal Area Conservation Association (RCA).

# SHINPINKYETTHAUK

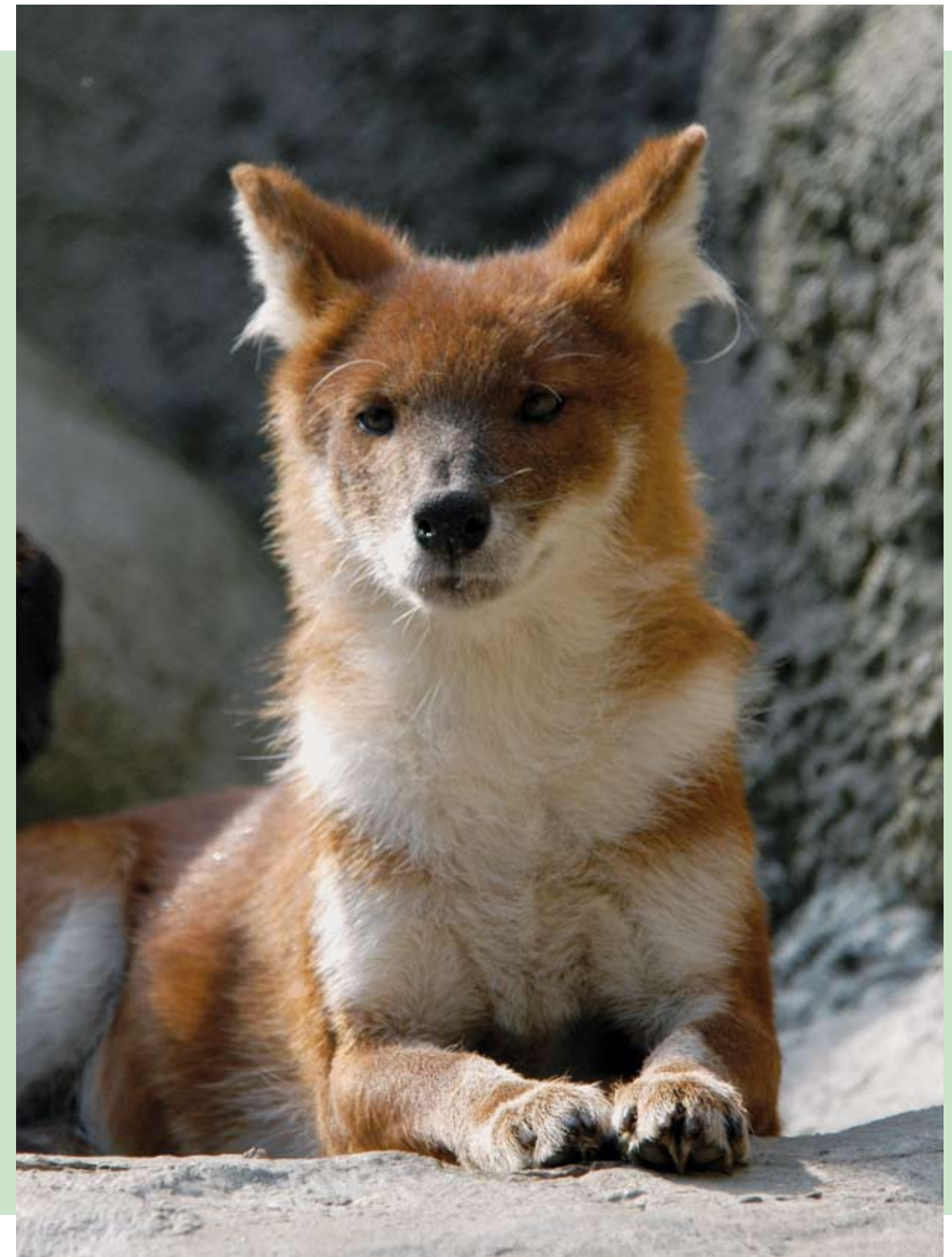
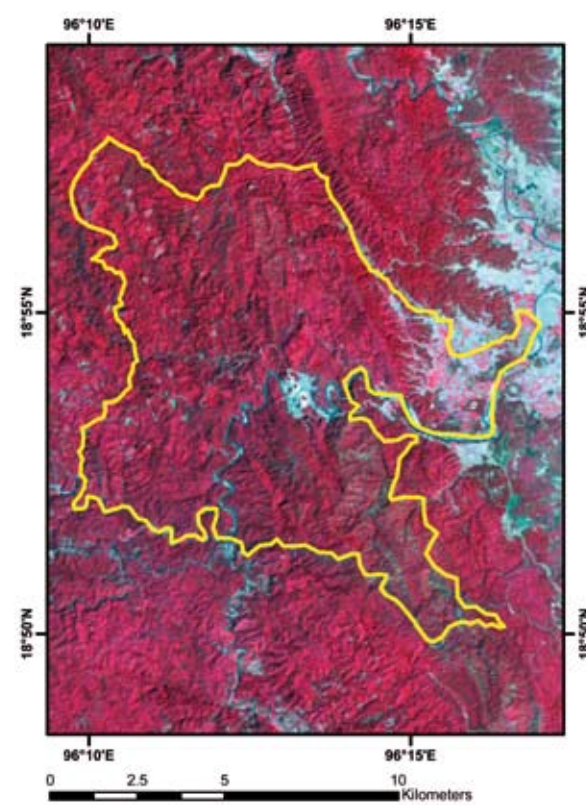
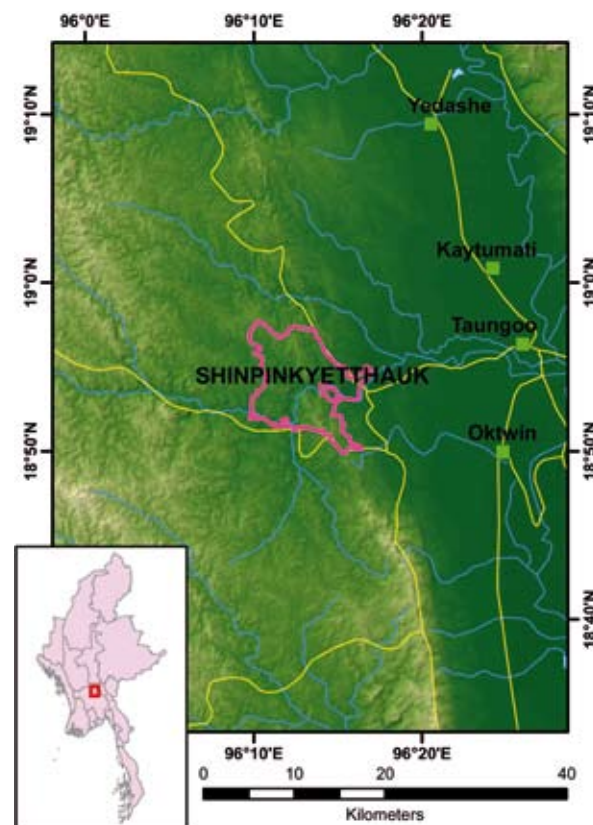
Site ID	36
Locality	Bago Region , Taungoo and Oaktwin Townships
Coordinates	N 18° 54', E 96° 12'
Size (km <sup>2</sup> )	72
Altitude (m. asl)	60 – 320
Myanmar category	Wildlife Sanctuary
IUCN category	IV
Site Governance	Forest Department
Boundaries	Demarcated
Year proposed	2006
Protection level	Total
Main purposes	Conservation, Research/ Education, Recreation/ Ecotourism
Habitat	Evergreen Forest (Typical), Mixed Deciduous Forest (Moist Upper)
Key resources	Asiatic Wild Dog, Sunda Pangolin, Reptile Spp., Wild Boar, Barking Deer, Hog Deer

### Legend of topographic maps

- Head Quarters
  - Ranger Post
  - Towns
  - Protected Areas
  - State/Region Boundaries
  - Roads
  - Water areas
  - Rivers
- Elevation**
- 5.800 m. asl
  - 0 m. asl

### Legend of satellite maps

- |  |   |
|--|---|
| <span style="color: cyan;">—</span> Deep         | <span style="color: red;">—</span> High |
| <span style="color: lightblue;">—</span> Shallow | <span style="color: pink;">—</span> Low |



# SHWESETTAW

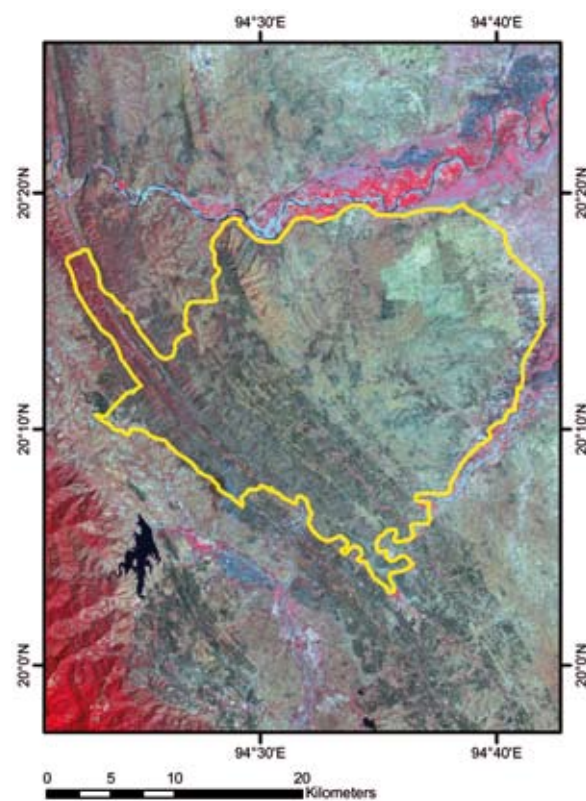
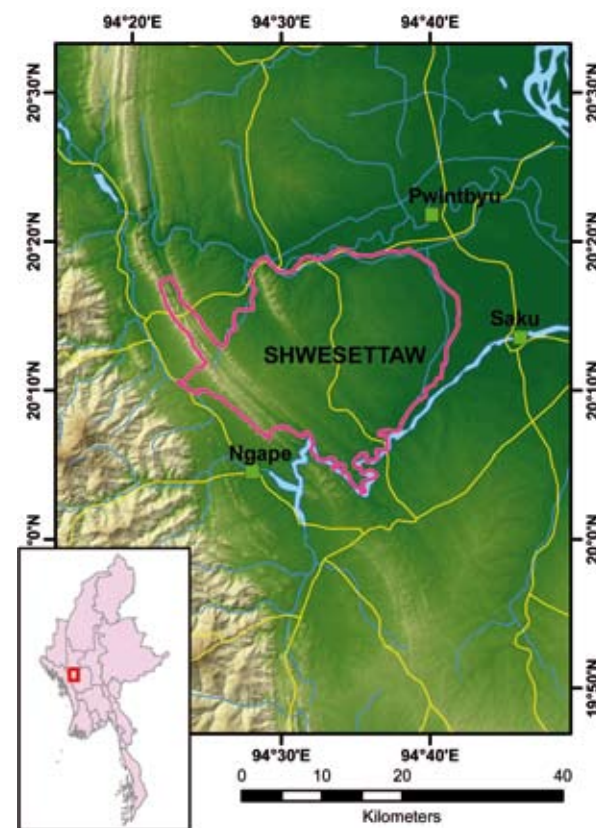
Site ID	37
Locality	Magway Region, Minbu, Pwintphyu, Ngape and Saytotetaya Townships
Coordinates	N 20° 12', E 94° 33'
Size (km <sup>2</sup> )	553
Altitude (m. asl)	55 – 555
Myanmar category	Wildlife Sanctuary
IUCN category	IV
Site Governance	Nature and Wildlife Conservation Division
Boundaries	Demarcated
Year gazetted	1940
Protection level	Total
Main purposes	Conservation
Habitat	Mixed Deciduous Forest (Dry Upper), Mixed Deciduous Forest (Moist Upper)
Key resources	Eld's Deer, Sambar Deer, Barking Deer, Gaur, Burmese Star Tortoise, Dry Zone Ecosystem

### Legend of topographic maps

- Head Quarters
  - Ranger Post
  - Towns
  - Protected Areas
  - State/Region Boundaries
  - Roads
  - Water areas
  - Rivers
- Elevation**
- 5.800 m. asl
  - 0 m. asl

### Legend of satellite maps

- |   |   |  |  |
|---|---|--|--|
| <b>Water Depth</b>  |   | <b>Vegetation Density</b>  |  |
| <span style="background-color: lightblue; width: 10px; height: 10px; display: inline-block;"></span> Deep | <span style="background-color: red; width: 10px; height: 10px; display: inline-block;"></span> High | <span style="background-color: lightblue; width: 10px; height: 10px; display: inline-block;"></span> Shallow | <span style="background-color: red; width: 10px; height: 10px; display: inline-block;"></span> Low |



### SITE DESCRIPTION

The Shwese ttaw Wildlife Sanctuary is situated in Minbu, Pwint Phyu, Ngape and Saytotetaya Townships of Magwe Region in middle Myanmar. The site boundaries are well marked by the Mone and Mann streams. The site was established to conserve the dry zone ecosystem conservation and especially the habitat of Eld's deer *Cervus eldii*.

### NATURAL RESOURCES

Dry upper and moist upper mixed deciduous forests cover respectively 80% and 20% of the Sanctuary. The critically endangered Burmese Star Tortoise *Geochelone platynota* endemic to Myanmar, is present in the site, together with other globally threatened species like the endangered Dhole *Cuon alpinus* and the Sunda Pangolin *Manis javanica*. Checklists of trees, mammals, birds, reptiles, amphibians and butterflies are available.

### MANAGEMENT

Annual operation plan  
 Buffer zone designated (firewood, post and bamboo collection allowed)  
 Management actions in place:

- Recovery centre for Burmese star tortoise (*Geochelone platynota*)
- Regular patrolling
- Erection of warning and notification signboards
- Annual Eld's deer counting
- Annual migratory birds observation

### THREATS

#### INSIDE

The most severe threat is the hydropower dam and power cable line construction. Collection of Burmese star tortoise and poaching of deer, shifting cultivation and forest encroachment occur in the site.

#### OUTSIDE

Increasing human pressure in the buffer zone in terms of human settlement, collection of firewood and house poles, agriculture expansion.

- Public environmental education
- Management problems:
- Budget constraint
  - Human capacity constraint

Required actions:

- More staff
- More patrolling
- Improvement of water ponds
- Building of one watchtower
- Improve the livelihood of people in buffer area

### STAFF / RESOURCES

The site is well conserved with 54 forest staff and adequate infrastructure. The park warden's office is situated in the site. Twelve ranger posts are stationed with 1 range officer and 2 forest guards at each post. Trainings for the forest staff were conducted in collaboration with SI, WCS and CAS. There is neither capacity nor equipment for computer operation. One well furnished guest house, provided by FREDA, for 12 people is built in the administrative office compound. Access to the site is easy due to the presence of motor roads and tracks.

### TOURISM

Shwese ttaw pagoda is situated in the site and it is one of the most famous pagodas of Myanmar. The site is visited every year by about 200,000 local pilgrims and tourists. Private temporary lodges for 800 guests are built along the Man Stream during the pagoda festival.

### LAND USE AND HUMAN ACTIVITIES

#### INSIDE

- Conservation
- Recreation
- Fishing
- Research

#### OUTSIDE

- Agriculture

### RESEARCH ACTIVITIES

A study on the eld's deer was undertaken by FD in collaboration with SI. Star tortoise was studied by FD. The Zoology department of Yangon university has studied endemic and endangered species (2004) and wildlife trade (2008).

# SHWE-U-DAUNG

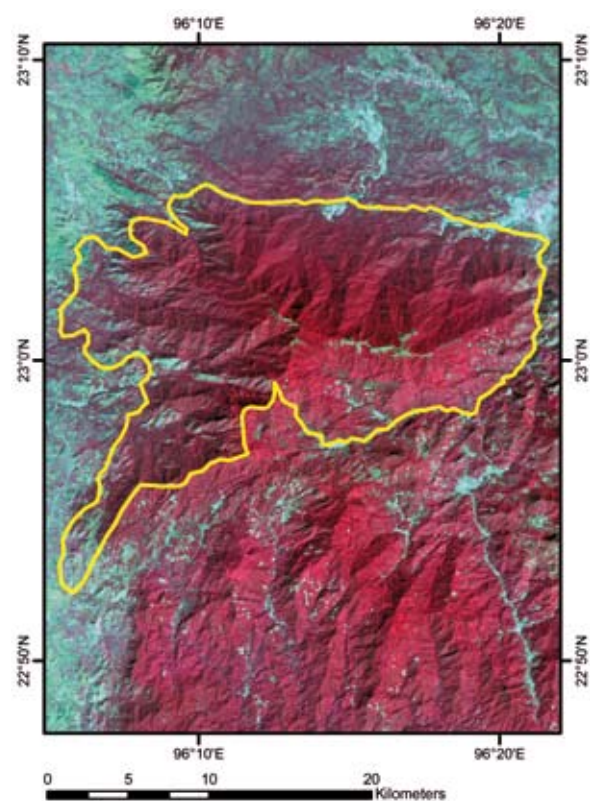
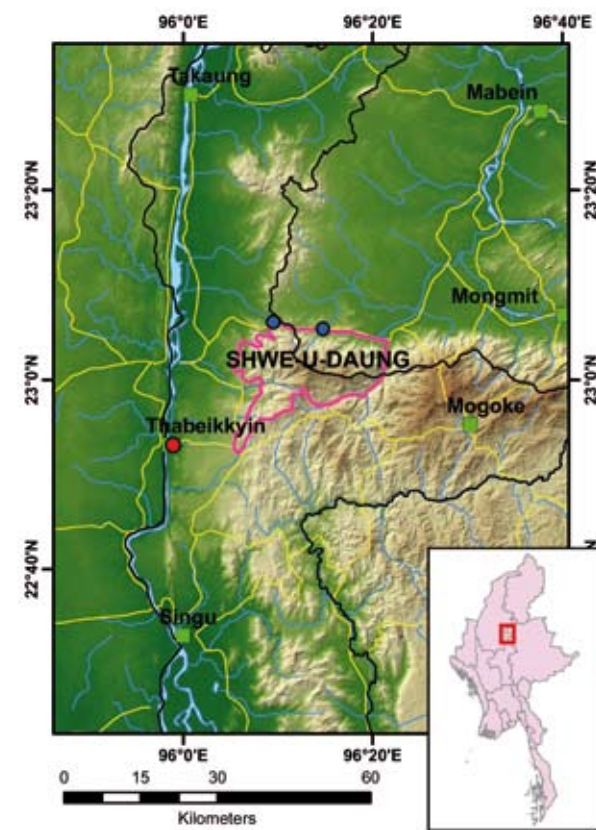
Site ID	38
Locality	Mandalay Region, Thabaikkyin and Mogoke Townships; Shan State, Mong Mit Township
Coordinates	N 23° 01', E96° 13'
Size (km <sup>2</sup> )	326
Altitude (m. asl)	180 -1,845
Myanmar category	Wildlife Sanctuary
IUCN category	IV
Site Governance	Nature and Wildlife Conservation Division
Boundaries	Demarcated
Year gazetted	1918
Protection level	Total
Main purposes	Conservation, Research/Education
Habitat	Evergreen Forest (Typical), Mixed Deciduous Forest (Dry Upper), Indaing Forest
Key resources	Gaur, Elephant, Banteng, Bears, Sambar Deer, Serow Deer

### Legend of topographic maps

- Head Quarters
  - Ranger Post
  - Towns
  - Protected Areas
  - State/Region Boundaries
  - Roads
  - Water areas
  - Rivers
- Elevation**
- 5.800 m. asl
  - 0 m. asl

### Legend of satellite maps

- Water Depth**    **Vegetation Density**
- Deep
  - High
  - Shallow
  - Low



### SITE DESCRIPTION

Shwe-U-Daung Wildlife Sanctuary is situated in Thabaikkyin and Moegoke Townships of Mandalay Region and Moemate Township of Shan State. Objectives of the Sanctuary are: to prevent biodiversity habitat loss and degradation; to support the agriculture and livestock breeding activities of the surrounding villages; to conserve elephants; to prevent poaching and hill-side cultivation and to serve as an ecotourism site.

### NATURAL RESOURCES

Evergreen forest is the main forest type of the site. Mixed deciduous and deciduous dipterocarp (*Indaing*) forests are also present. Checklists of plants, mammals, are available at the park warden office and WCS.

### MANAGEMENT

- Annual operation plan  
 Management actions in place:
- Regular patrolling
  - Environmental education
  - Research

### THREATS

- INSIDE**
- Logging & Wood Harvesting
  - Mining & Quarrying (gold)
  - Hunting & Collecting Terrestrial Animals
  - Gathering Terrestrial Plants
  - Housing & Urban Areas
- OUTSIDE**
- Housing & Urban Areas
  - Wood & Pulp Plantations
  - Roads & Railroads
  - Hunting & Collecting Terrestrial Animals
  - Logging & Wood Harvesting

### Management problems:

- Inadequate manpower
  - Budget
- Required actions:
- Environmental awareness raising
  - Enhance patrolling activities
  - More ranger posts
  - Provision of communication and field equipments
  - Education center building
  - Computer training.

### STAFF / RESOURCES

Headquarters is situated in Thabaikkyin town and a total of 15 permanent and one temporary staff are working at the office. Four ranger posts are built. Local and international training have been provided to the staff. Computer knowledge is at a basic level.

### TOURISM

No information available.

### LAND USE AND HUMAN ACTIVITIES

- INSIDE**
- Conservation
  - Research
  - Forest plantation
- OUTSIDE**
- Forest plantations
  - Gold mining
  - Human settlement

### RESEARCH

The Zoology department of Yangon university studied the habitat utilization and distribution of wild elephant *Elephas maximus*

# TANINTHARYI NATIONAL PARK

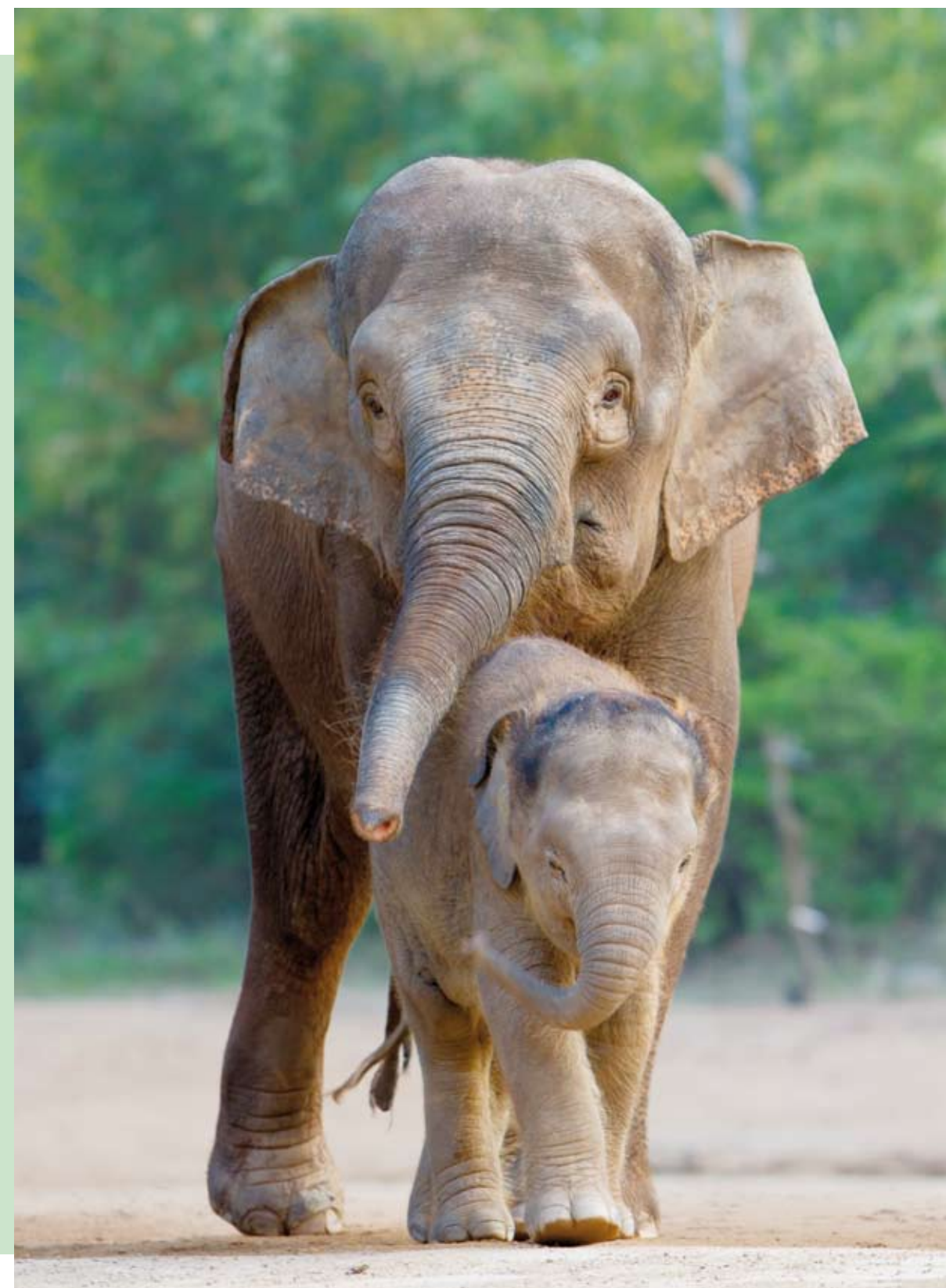
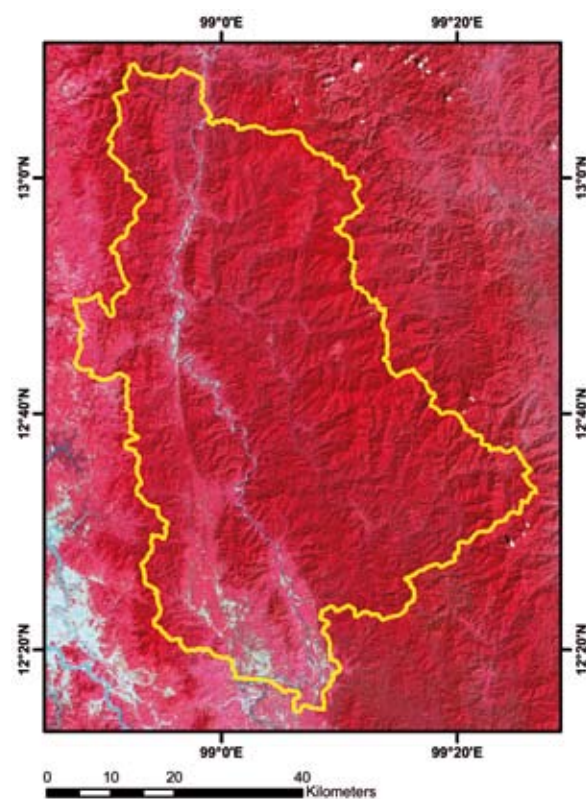
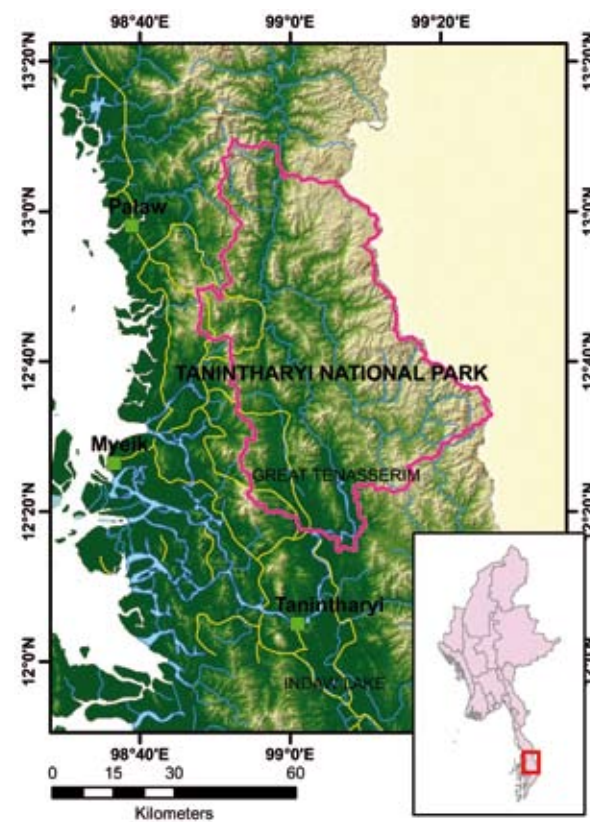
Site ID	39
Locality	Tanintharyi Region, Tanintharyi Township
Coordinates	N 12° 41', E 99° 04'
Size (km <sup>2</sup> )	2072
Altitude (m. asl)	0 - 1,490
Myanmar category	National Park
IUCN category	II
Site Governance	Forest Department
Boundaries	Demarcated
Year proposed	2002
Protection level	Total
Main purposes	Conservation
Habitat	Evergreen Forest (Typical), Hill Forest (Evergreen), Mangrove Forest
Key resources	Sambar Deer, Asian Elephant, Barking Deer, Serow, Red Goral, Leopard, Birds Spp

### Legend of topographic maps

- Head Quarters
  - Ranger Post
  - Towns
  - Protected Areas
  - State/Region Boundaries
  - Roads
  - Water areas
  - Rivers
- Elevation**
- 5.800 m. asl
  - 0 m. asl

### Legend of satellite maps

- |  |   |   |   |
|--|---|---|---|
| <b>Water Depth</b>                               |   | <b>Vegetation Density</b>               |   |
| <span style="color: lightblue;">—</span> Deep    | <span style="color: red;">—</span> High | <span style="color: red;">—</span> High | <span style="color: red;">—</span> High |
| <span style="color: lightblue;">—</span> Shallow | <span style="color: red;">—</span> Low  | <span style="color: red;">—</span> Low  | <span style="color: red;">—</span> Low  |



# TANINTHARYI NATURE RESERVE

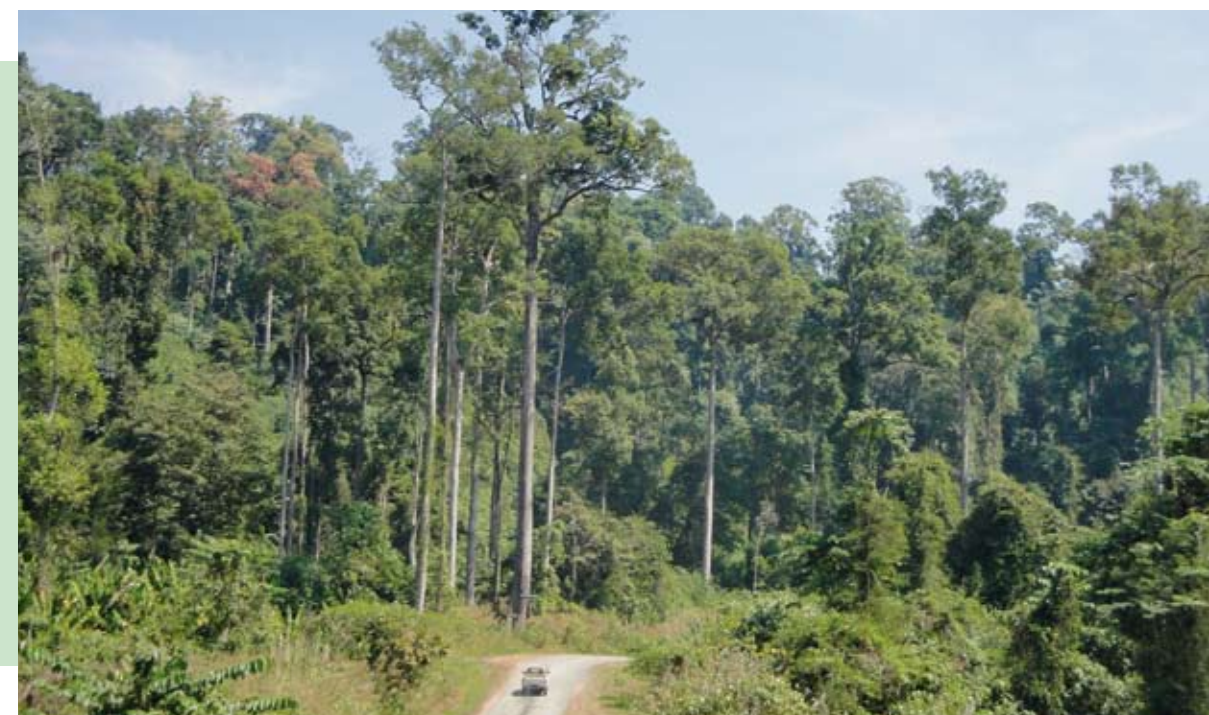
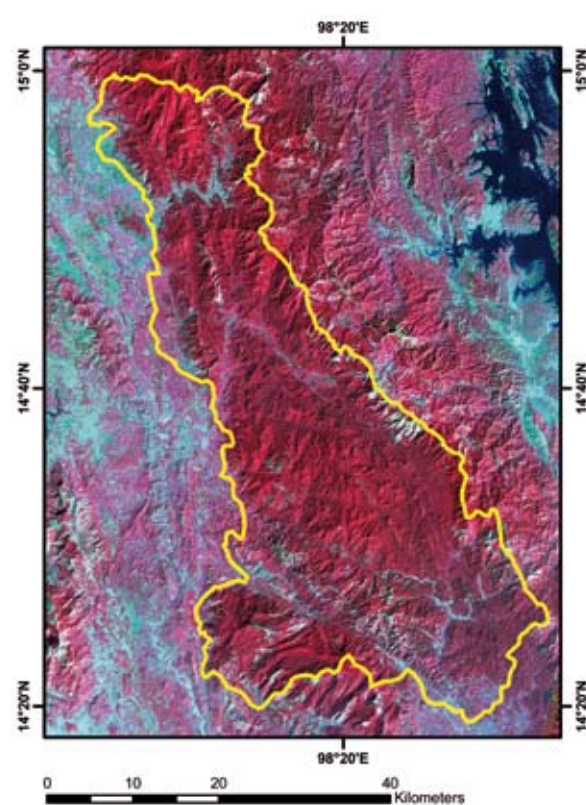
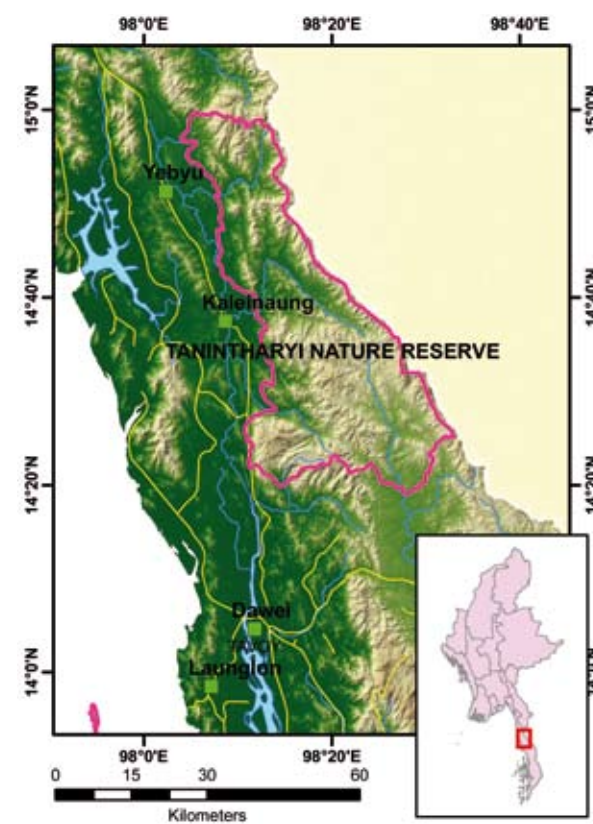
Site ID	40
Locality	Tanintharyi Region (Yebyu and Tavoy Townships)
Coordinates	N 14° 36', E 98° 17'
Size (km <sup>2</sup> )	1,700
Altitude (m. asl)	20 -130
Myanmar category	Nature Reserve
IUCN category	VI
Site Governance	Forest Department
Boundaries	Demarcation in course
Year gazetted	2005
Protection level	Partial (Industry allowed)
Main purposes	Conservation, Scientific research and education, Natural Resources Maintenance
Habitat	Evergreen Forest (Giant and Riverine), Mixed Deciduous Forest (Bamboo), Grassland
Key resources	Gurney's Pitta, Elephant

### Legend of topographic maps

- Head Quarters
  - Ranger Post
  - Towns
  - Protected Areas
  - State/Region Boundaries
  - Roads
  - Water areas
  - Rivers
- Elevation**
- 5.800 m. asl
  - 0 m. asl

### Legend of satellite maps

- | Water Depth                                 |   | Vegetation Density                      |   |
|---|---|---|---|
| <span style="color: blue;">—</span> Deep    | <span style="color: red;">—</span> High | <span style="color: red;">—</span> High | <span style="color: red;">—</span> High |
| <span style="color: cyan;">—</span> Shallow | <span style="color: pink;">—</span> Low | <span style="color: pink;">—</span> Low | <span style="color: pink;">—</span> Low |



### SITE DESCRIPTION

The protected area has been created with the main purpose of conserving the tropical rain forest and constituent biodiversity in the Tanintharyi region. The management plan also says that it aims to contribute to the reduction of climate change and to support the management of natural gas transportation corridor from offshore drilling rigs in an ecologically sound manner.

### NATURAL RESOURCES

Over 75% of the area is covered by evergreen forest which supports a rich biodiversity. Checklists of trees, mammals and birds are available. The site hosts the endangered Gurney's Pitta (*Pitta gurneyi*) endemic to Thailand and Myanmar, and almost 70 species of mammals, many of which are globally threatened. Checklists of trees, mammals and birds are available.

### MANAGEMENT

The Total company has funded a multi-year project to the Forest Department for the conservation and management of the reserve. The project has supported all human resources (staff and consultants) as well as park infrastructure and equipment. The project has prepared a 4-year management plan of the area to last until 2013. The plan extends to the buffer zone where several villages are located whose livelihoods depend on agriculture, fishing, hunting and

### THREATS

Main threats to the conservation of the area are shifting cultivations, illegal hunting and logging, outbreak of frequent forest fires and catastrophic floods associated with massive landslides. Outside the area, forest is rapidly being converted into rubber plantations.

subsistence logging. Park staff is conducting environmental education seminars for the communities in order to try to encourage the establishment of community forestry.

### STAFF / RESOURCES

A total of 32 staff members are allocated to the reserve, 3 of which are based in Yangon (project director and clerks). The park warden, 9 rangers, 7 foresters and labourers are based at Gangaw taung village. Former staff received training from WCS and CAS but at the end of the first phase of the project they were all transferred to other sites. Access to the area is possible thanks to a main road which cuts longitudinally from the coast to the mountains on the top of the gas pipeline. There is 1 head office, 4 ranger posts and 1 forest nursery. The facilities are equipped with necessary tools to perform patrolling and monitoring activities.

### TOURISM

No tourists allowed in the site.

### LAND USE AND HUMAN ACTIVITIES

Allowed land uses are only conservation and infrastructure (gas pipeline). Part of the area is restricted for security reasons, both for the presence of an army quarter and for insurgents. The villagers in the buffer zone rely on the paddy fields associated to shifting cultivation while rubber plantations belong to the businessmen.

### RESEARCH

Research has been carried out by park staff in association with the University of Forestry, Yezin, on socio-economic and flora studies and by NWCD on mammals and birds. CAS has studied reptiles and fish of the site.



# TAUNGGYI

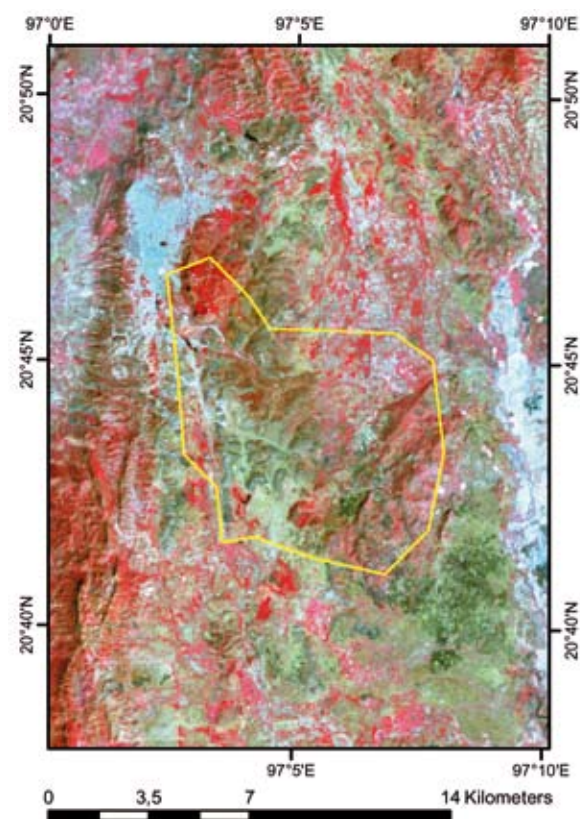
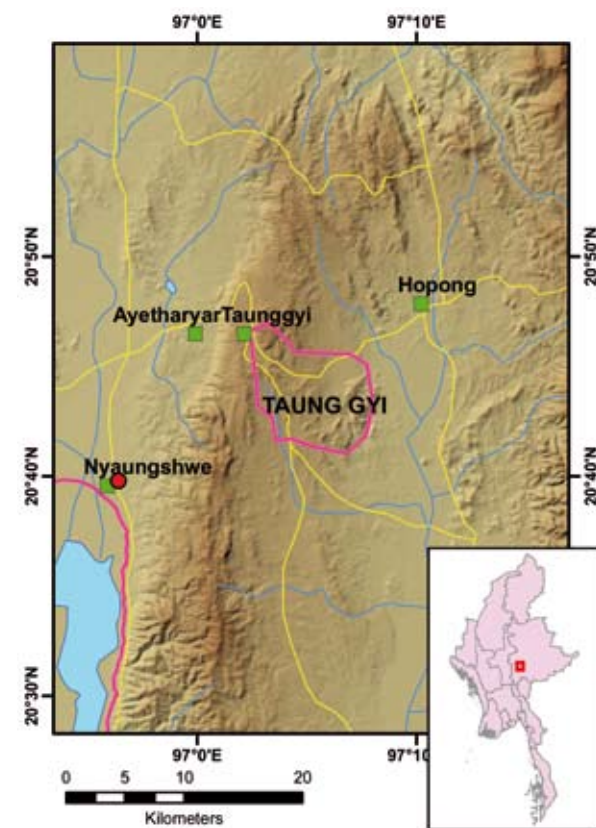
Site ID	41
Locality	Shan State, Taunggyi Township
Coordinates	N 20° 43', E 97° 05'
Size (km <sup>2</sup> )	16
Altitude (m. asl)	1,045 – 1,750
Myanmar category	Bird Sanctuary
IUCN category	IV
Site Governance	Forest Department
Boundaries	Demarcated
Year gazetted	1989
Protection level	Unknown
Main purposes	Conservation
Habitat	Hill Forest (Pine and Dry)
Key resources	Birds spp.

### Legend of topographic maps

- Head Quarters
  - Ranger Post
  - Towns
  - Protected Areas
  - State/Region Boundaries
  - Roads
  - Water areas
  - Rivers
- Elevation**
- 5.800 m. asl
  - 0 m. asl

### Legend of satellite maps

- | Water Depth   |   | Vegetation Density   |  |
|---|---|--|--|
| <span style="background-color: lightblue; width: 10px; height: 10px; display: inline-block;"></span> Deep | <span style="background-color: red; width: 10px; height: 10px; display: inline-block;"></span> High | <span style="background-color: lightblue; width: 10px; height: 10px; display: inline-block;"></span> Shallow | <span style="background-color: red; width: 10px; height: 10px; display: inline-block;"></span> Low |



### SITE DESCRIPTION

Established since August 1906 as the Taunggyi Wildlife Reserve, the area was redesignated as a Bird Sanctuary in 1989. The size reported in the list provided by FD in 2009 (16 km<sup>2</sup>) is not consistent with the size calculated with the GIS boundary (8 km<sup>2</sup>). The purpose of the area is to conserve resident birds and the dry hill forest ecosystem. It is very famous for the beautiful Shwe Pon Pwint pagoda on the top of the hill, which is visited by many pilgrims, especially during the annual Balloon Festival.

### NATURAL RESOURCES

The area is covered by dry hill forest; pine forest and moist forest types. Main species are Pine (*Pinus species*); Wet-thitcha (*Quercus semiserrata*); Cherry (*Betula alnoides*); Laukya (*Schima khasina*); Zi phyu (*Emblca officinalis*). The forest is supposedly habitat for a variety of resident birds, but no checklist is available.

### MANAGEMENT

The area falls under the responsibility of the Shan state Forest Department of Taunggyi town which has demarcated its boundaries with visible signs and performs occasional

patrolling. There is no management plan.

### PARK RESOURCES

There is no park infrastructure and no staff assigned to protect and conserve the area.

### TOURISM

The area offers various opportunities for Study and Recreation: a) Observation of Dry hill forest and Pine forest ecosystem; b) Observation of Resident Bird species; c) Observation and enjoyment of scenic beauty of the Shan Plateau. In spite of that, it is mostly accessed by Myanmar pilgrims visiting the pagoda. Many of the international tourists come from nearby Inlay lake (site 11) and occasionally proceed to visit Pyadalin caves (site 30).

### LAND USE AND HUMAN ACTIVITIES

#### INSIDE

- Recreation (Religious tourism)

#### OUTSIDE

The site is surrounded by Taunggyi town which is the fourth largest city in Myanmar, which used to be a trading centre for agricultural goods. The north-eastern part of the city is occupied by an important army compound.

### THREATS

- Fire & Fire Suppression
- Logging & Wood Harvesting (firewood and turpentine oil)
- Housing & Urban areas (proximity to Taunggyi town)

### RESEARCH

According to the FD, no research survey has been implemented in the site.

# THAMIHILA KYUN

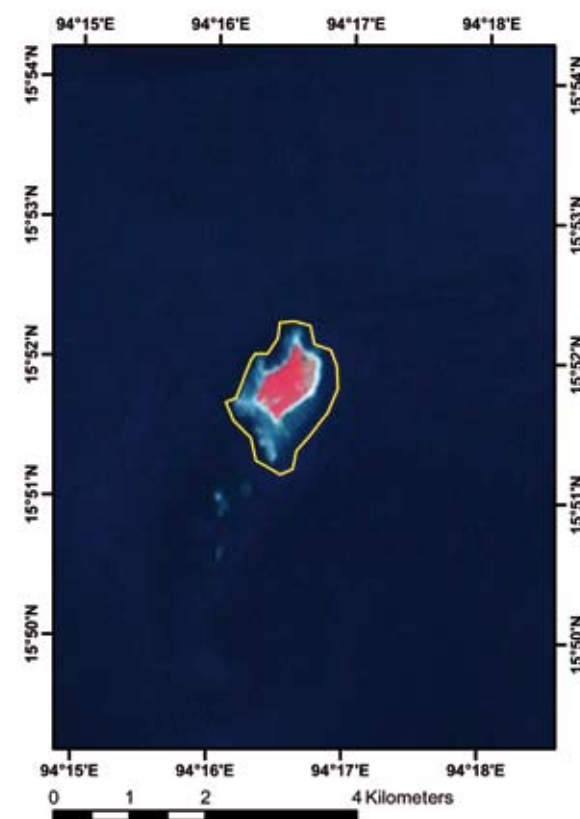
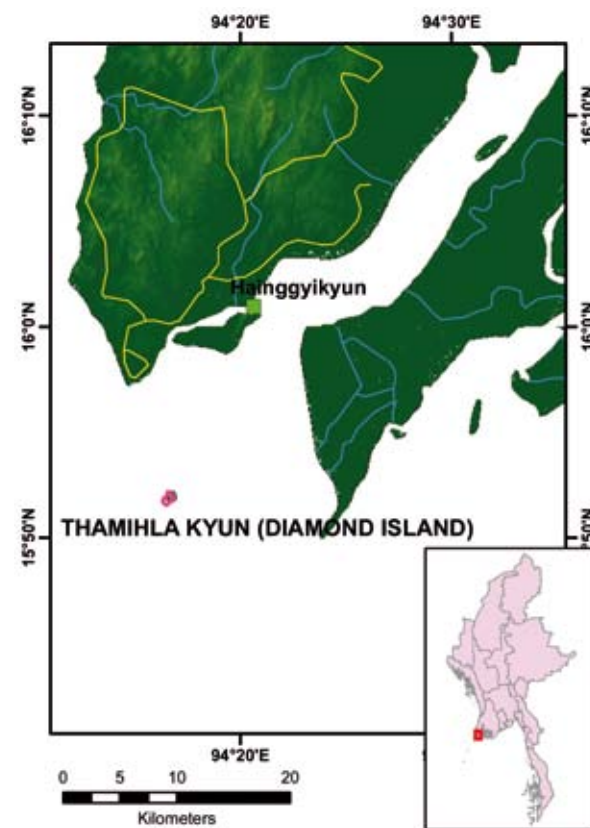
Site ID	42
Locality	Ayeyawaddy Region, Ngaputaw Township
Coordinates	N 15° 51', E 94° 16'
Size (km <sup>2</sup> )	0.88
Altitude (m. asl)	0 – 35
Myanmar category	Wildlife Sanctuary
IUCN category	IV
Site Governance	Forest Department
Boundaries	Demarcated
Year gazetted	1970
Protection level	Total
Main purposes	Conservation
Habitat	Mixed Deciduous Forest (Lower), Evergreen Forest (Typical)
Key resources	Olive Ridley, Green Turtle, Logger Head Turtle, Leatherback, Hawksbill Turtle

### Legend of topographic maps

- Head Quarters
  - Ranger Post
  - Towns
  - Protected Areas
  - State/Region Boundaries
  - Roads
  - Water areas
  - Rivers
- Elevation**
- 5.800 m. asl
  - 0 m. asl

### Legend of satellite maps

- |  |   |  |   |
|--|---|--|---|
| <b>Water Depth</b>                               |   | <b>Vegetation Density</b>                        |   |
| <span style="color: cyan;">■</span> Deep         | <span style="color: red;">■</span> High | <span style="color: cyan;">■</span> Deep         | <span style="color: red;">■</span> High |
| <span style="color: lightblue;">■</span> Shallow | <span style="color: pink;">■</span> Low | <span style="color: lightblue;">■</span> Shallow | <span style="color: pink;">■</span> Low |



# WENTHTIKAN

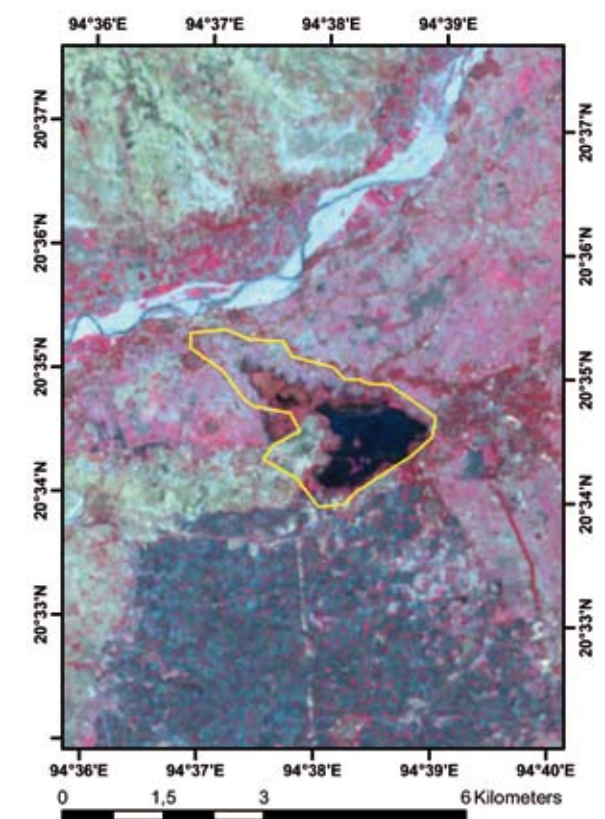
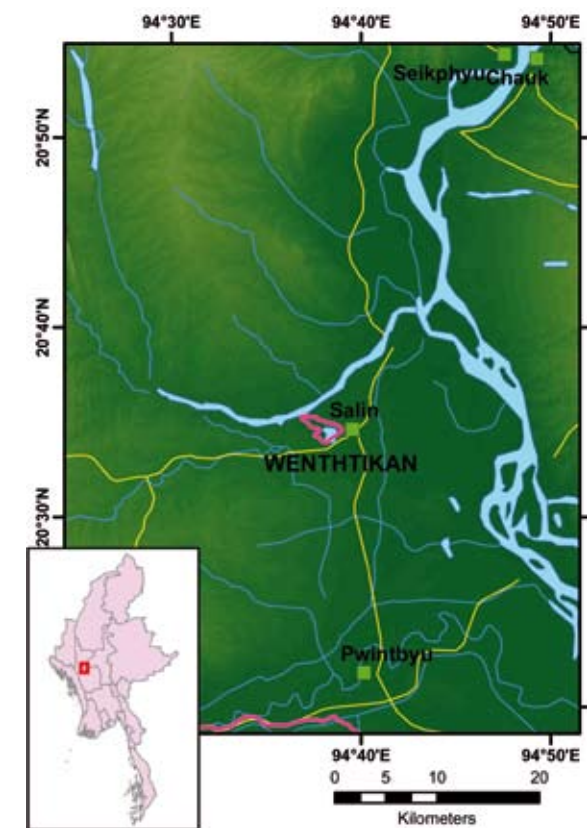
Site ID	43
Locality	Magway Region, Salin Township
Coordinates	N 20° 34', E 94° 38'
Size (km <sup>2</sup> )	4.4
Altitude (m. asl)	60 – 90
Myanmar category	Bird Sanctuary
IUCN category	IV
Site Governance	Forest Department
Boundaries	Demarcated
Year gazetted	1939
Protection level	Total
Main purposes	Conservation
Habitat	Mixed Deciduous Forest (Moist Upper), Dry Forest, Wetland
Key resources	Water Bird species

### Legend of topographic maps

- Head Quarters
  - Ranger Post
  - Towns
  - Protected Areas
  - State/Region Boundaries
  - Roads
  - Water areas
  - Rivers
- Elevation**
- 5.800 m. asl
  - 0 m. asl

### Legend of satellite maps

- |  |   |  |   |
|--|---|--|---|
| <b>Water Depth</b>                               |   | <b>Vegetation Density</b>                        |   |
| <span style="color: cyan;">■</span> Deep         | <span style="color: red;">■</span> High | <span style="color: cyan;">■</span> Deep         | <span style="color: red;">■</span> High |
| <span style="color: lightblue;">■</span> Shallow | <span style="color: pink;">■</span> Low | <span style="color: lightblue;">■</span> Shallow | <span style="color: pink;">■</span> Low |





L. Beffasti

### 3 In-depth Study of Lampi Island Marine National Park



A. Bonetti

#### 3.1 Purpose

The objective of this in-depth study was to verify existing information and to collect new – mainly qualitative – data to fill in some of the gaps in the existing information on the protected area, with the available resources and under the strong limitations of accessibility (permits and climate). Prior to the current surveys, information on the occurrence and status of critical biodiversity in Lampi Island Marine National Park (MNP) were collected from reputable sources: FAO 1983b; FD-UNDP-FAO 1986; Rabinowitz 1995; Fischer 1996 & 1997. Up-to-date, reliable and more comprehensive information are needed to guide future planning and management strategies. To fulfil this objectives, surveys were undertaken of marine and terrestrial flora and fauna, specifically on plant, mammal, bird, reptile, amphibian, fish, crab, mollusc, sea-cucumber, seaweed and plankton species. Interviews to local villagers to assess socio-economic conditions were also conducted. Time and resource constraints allowed the organization of a limited number of surveys of the flora and fauna of Lampi Island MNP. The focus of the surveys was selected based on the analysis of the main gaps concerning biodiversity information and on the consensus agreed between stakeholders, in particular Istituto Oikos, BANCA and FD. Priority was given to qualitative surveys in order to produce information on the type of biodiversity resources present in the protected area. Surveys took place in the period 2006 – 2010 in the framework of the MABR (2006-2009) and MEP (2009-2010) projects. A detailed list of surveys is given under paragraph 7 - Research (current chapter). The description of the Lampi Island MNP contained in this chapter therefore present the preliminary findings of the surveys carried out under the MABR and MEP projects, being fully aware that further investigation is required and desired to bring more significant results, fill the remaining information gaps and continue to update the data.

#### 3.2 Results

##### Geography

The Myeik Archipelago, located in the Tanintharyi Region, the most southern Region of Myanmar, comprises 800 islands distributed along 600 km of coastline in the Andaman sea. The Archipelago was formed by a combination of tectonic movement and volcanic activity. The islands, ranging in size from very small to hundreds of square kilometers, are covered by tropical lowland wet evergreen forests with a high biodiversity and surrounded by an extensive coral reef system. Lampi Island Marine National Park is one of the four marine protected areas in Myanmar and the only protected site in the Myeik Archipelago. It protects a variety of different habitats (evergreen forest, mangrove forest, beach and dune forest, coral reefs, sea grass) and a rich biodiversity. 195 plant species of the evergreen forest and 63 species typical of the mangrove forest, 19 mammal, 228 bird, 19 reptile, 10 amphibian, 42 fish, 42 crab, 50 gastropod, 41 bivalves, 35 sea-cucumber (holothurians), 73 seaweed, 11 seagrass and 333 plankton species have been identified so far and more are likely to be added with further surveys (see paragraph 3.4 checklist). The protected area provides food, water and energy sources to the local population (3,000 people in 5 settlements). Spiritual and cultural values are attributed to the site by Moken sea gypsies who consider Lampi as a “Mother island”. Socio-economic and demographic pressures are the main threats to the natural and cultural values of the park.



(MEP, 2009-2010), belonging to evergreen forest and beach and dune forest and 63 species were identified in the mangrove forest. The evergreen forest is the dominant vegetation type in Lampi Island MNP, characterized by large trees that can reach more than 26 meter in height. Common species are *Bouea burmanica*, *Cinnamomum sp.*, *Dipterocarpus costatus*, *Dipterocarpus obtusifolius*, *Firmicana colorata*, *Homalium griffithianum*, *Lophopetalum filiforme*, *Macaranga gigantean*, *Phoebe tavoyana*, *Pterospermum acerifolium*, *Parashorea stellata*, *Strombosia javanica*, *Shorea farinose*, *Vatica dyeri*, *Xerospermum noronhianum*, *Wendlandia glabrata*.

**Evergreen Forest in Lampi Island MNP** (A. Bonetti)



17 tree species found in Lampi Island MNP are threatened according to IUCN categories:

Scientific name	Status (Red List 2010)
<i>Anisoptera curtisii</i>	CR
<i>Dipterocarpus dyeri</i>	CR
<i>Dipterocarpus grandiflorus</i>	CR
<i>Dipterocarpus turbinatus</i>	CR
<i>Hopea helferi</i>	CR
<i>Hopea sangal</i>	CR
<i>Parashorea stellata</i>	CR
<i>Shorea farinosa</i>	CR
<i>Diospyros crumenata</i>	EN
<i>Dipterocarpus alatus</i>	EN
<i>Dipterocarpus costatus</i>	EN
<i>Shorea gratissima</i>	EN
<i>Syzygium zeylanicum</i>	EN
<i>Ternstroemia penangiana</i>	EN
<i>Abarema bigemina</i>	VU
<i>Hopea odorata</i>	VU
<i>Memecylon grande</i>	VU

**Table 6**  
**Threatened tree species of Lampi Island MNP**

CR = Critically Endangered  
EN = Endangered  
VU = Vulnerable

The beach and dune forest is found along narrow strips on beaches and dunes along the coast in the locality of Baik Aw or Tourist River, Balaik Aw and Bawin Aw. It supports pure stands of *Casuarina equisetifolia* and species of *Dillenia* and *Calophyllum*.

**Beach and dune forest in Lampi Island MNP** (L. Beffasti)



The mangrove forest, although minor in terms of extension, is in almost intact conditions with high ecological value. The pristine areas are located at Labi Chaung, Khe Chaung, Mi Gyaung Aw and Thit Wa Aw on the west coast and in Bulet Aw on the east coast of Lampi Island. The mangrove survey conducted in Lampi Island MNP area in February-April 2010 recorded a total of 63 species belonging to 31 families, comprising both woody species (40 species) and mangrove associates (23 species of shrubs and climbers), which is a reflection of the fact that the Myeik Archipelago is located within the Indo-Malayan biogeographic region which has the highest diversity of mangroves in the world. Two community types of mangrove forests are found in Lampi Island MNP, the *Rhizophora apiculata* community and the *Bruguiera cylindrica* community, well correlated to the level of tidal zone and the sediment types. Dominant species of mangroves are *Rhizophora apiculata* (Byu-che-dauk-apo) and *Rhizophora mucronata* (Byu-che-dauk-ama), species that in the seashore where salinity is very high are the only ones present. One species *Pemphis acidula* recorded during the mangrove study is of particular interest since it is known to occur in East Africa but absent from South India to Sumatra, and it reappears in East Malaysia. Its presence on Lampi and adjacent islands fills a critical gap in the available information about the distribution of this species. On the other hand, some mangrove species such as *Sonneratia apuitala* (Kan-pa-la), *Sonneratia cassiolaris* (La-mu), *Xylocarpus mulocensis* (Kya-na) and *Amoora cucullata* (Pan-tha-ka), present in other mangrove areas of Myanmar, are not found in Lampi area, due to high salinity (3.5% - 3.8%) and soil types (loamy sand and sandy loam soils are common).

Scientific name	Status (Red List 2010)
<i>Sonneratia griffithii</i>	CR
<i>Heritiera fomes</i>	EN
<i>Aegialitis rotundifolia</i>	NT
<i>Brownlowia tersa</i>	NT

**Table 7**  
**Threatened and near threatened mangrove species of Lampi Island MNP**

CR = Critically Endangered  
EN = Endangered  
NT = Near Threatened

### Marine habitat

The marine habitat is more difficult to study, in part due to the fact that the NWCD has no trained staff for marine protected areas, and in part because marine surveys require specific equipment and tools that are not readily available in a remote area. Coral reefs remain largely unexplored despite being one of the main resources of the MNP for notification letter. On the other hand, it was possible to conduct research on plankton, seagrass, seaweeds and some aquatic fauna (echinoderms, molluscs, crustaceans and fishes). Data available on **coral reefs** as from Fischer (1985), Reef Check Europe (2001) and GCRMN (2005), affirm that the Myeik Archipelago contains 1,700 km<sup>2</sup> of coral formations, with the major ones around the smaller islands, especially in the Gregory Group, and relatively poor formations around the main island of Lampi. The coral formations consists of fringing reefs, submerged pinnacles and seamounts, limestone caves, sheer and sloping rock walls, and boulder-strewn sand bottoms. Reef Check Europe in 2001 identified in the Myeik Archipelago 61 species and 31 genera of hermatypic corals, and 4 species and 3 genera of ahermatypic corals. Reef Check Europe estimated that between 60 and 95 species of hard corals are to be found in the Myeik Archipelago. According to the recent research by the Department of Marine Science at Mawlamyine University, a total of 512 species of hard corals (Scleractenian and Hydrozoa corals) were identified from 24 islands of the Myeik Archipelago. The highest species composition was observed at Pa lei Island (Sir J. Malcolm Island) representing 104 species and 42 genera, and followed by Sin Island (High Island), Ka mar Island (Sir E. Owen Island) and Thayawthedangyi Island (Elphinstone Island). Additional coral reef surveys are required, specifically in Lampi Island MNP, to confirm species composition and to verify the conservation status.



Coral reefs of Pony island (A. Bonetti)

In the **seagrass meadows** around Lampi Island MNP, 11 species of seagrass were found, among which *Halophila minor* and *Thalassia hemprichii* (dominant species in Lampi Island) are new records for Myanmar. *Cymodocea serrulata* is the rarest species in the area, as it was recorded at only one site on the east of Lampi Island. There is evidence that seagrass beds in the park provide feeding habitat for dugongs (*Dugong dugon*) and green turtles (*Chelonia mydas*), both of which are threatened and are the object of considerable conservation efforts. *Halophila ovalis* is the dominant species in the seagrass beds

grazed by dugongs. The number, size and species composition of the meadows observed in the Lampi Island MNP suggest that there is enough seagrass in the area to support a small population of dugongs. The **plankton** survey of March 2010 recorded 136 species of phytoplankton belonging to 49 genera and 150 species of zooplankton belonging to 93 genera were observed. Eight species of plankton are identified as new records for Myanmar: one phytoplankton species, the pinnate diatom *Pleurosigma nicobaricum*, and seven zooplankton species, namely: *Pegantha sp.* (Hydromedusa), *Pelagia noctiluca* (Jelly fish), *Pleurobranchia rhodopis* (Ctenophore) *Phtisica marina* (Amphipod), *Thalassomysis sewelli* (Mysid), *Salpa maxima* (Salp), *Iasis zonaria* (Salp). The **seaweed** surveys recorded 73 species belonging to 46 genus, belonging to blue-green algae Cyanophyta (2 species), green algae Chlorophyta (24 species), brown algae Phaeophyta (9 species) and red algae Rhodophyta (38). Some important economically, industrially and medicinally seaweed species were observed. Some green algae, such as *Catenella*, *Caulerpa* and *Ulva* can be used for the production of health foods and sea vegetables. *Catenella* which is known as "Kyauk Pwint" in Myanmar, is a famous seafood item and it is also used as food and medicine to cure or prevent gout. Certain species of brown algae, for example, *Dichthyota*, *Padina*, *Turbinaria* and *Sargassum*, could be utilized for the production of alginates, manitol and iodine. Certain species of red algae, such as *Gracilaria* could be used for the production of agar-agar while species of *Catenella*, *Hypnea* and *Acanthophora* are harvested for the production of carrageenan compounds.

### Fauna

The project identified 32 species of **sea cucumbers**, 17 of these were found in the catches of fishermen of Lampi Island MNP. The diverse sea cucumber fauna supports a small-scale industry that is an important source of income for local fishers. Interviews with local fishers of sea-cucumbers and dry fish revealed that the sea-cucumber market is a very profitable one, both for the local and for the foreign market, with prices ranging from 9 euros/kg for species like *Holothuria atra* up to more than 30 euros/kg for species like the sandfish *Holothuria scabra*, one of the most valuable species. The uncontrolled fishing of sea cucumber inside the park is arguably leading to over-exploitation, as is the case with other sea cucumber fisheries in the region. However, the existence of some apparently healthy stocks in some bays of Lampi Island provides an opportunity to conserve this important fishery through proper management. The survey of **molluscs** fauna revealed in the water surrounding the MNP, both within and outside the two miles of protection, 50 gastropod species belonging to 27 families and 41 bivalve species belonging to 18 families. Among the **Gastropods** found in Lampi Island MNP, many species are of economic importance as food resource and for traditional decoration and shell jewellery: i) *Trochus niloticus* is the most economically important shell, collected for commercial use by local divers; ii) *Strombus canarium* (Strombidae), very common and abundant in mud, muddy sand habitat and algae bottom of south and southeast part of Lampi, is collected for food and traditional decoration, for both local use and export to neighbouring countries; iii) *Cerithidea cingulata* (Potamididae), a shell traditionally used for decoration in other coastal areas of Myanmar but not in Lampi Island MNP, is abundant in muddy sand, muddy rock and mangrove fringe habitats; iv) *Babylonia areolata* (Buccinidae), harvested on sand and mud grounds near Ko Phawt Island, for food and traditional decoration, both for local use and for export to Thailand; v) *Turbo marmoratus* is collected for export to Thailand as a food resource and for shell jewellery. Most of the species of Family Cypraeidae, generally known as "Kywe poke kha yu", are very common and inhabit reef areas and sandy habitats among rock environments, tidal pools, branch corals and seaweed of the intertidal and sublittoral zone. Almost all species are collected for the food and shell market. The most famous is *Cypraea tigris* (tiger cowrie), collected for its shell. Only one individual of this species was found in Lampi Island MNP, suggesting the need for further investigation. Among the **Bivalves** found in Lampi Island MNP, the species of economic importance are: i) pearl oyster *Pinctada margaritifera* found on hard substrate in clear water along the coast of Lampi Island and several nearby islands north of Lampi Island; ii) three species of hammer oyster (Malleidae), *Malleus malleus*, *Malleus albus*, *Malleus regula*, abundant in rocky and coral reef habitats around the Island, are used by Moken people as traditional food; iii) edible *Polymesoda bangalensis* found in brackish water in mangrove swamps area of Crocodile River bank. Giant clams (*Tridacna spp.*), collected for their flesh and shell, have also high commercial value both for the export market and for local trade.



**Hermit crab in Lampi Island MNP** (A. Bonetti)

The **crustaceans** survey concentrated only on crabs, recording 42 crab species belonging to 25 genera and 11 families. Among these, families Grapsidae, Potunidae and Ocypodidae are the most diverse groups represented respectively by 11, 9 and 8 species. The species *Sesarma intermedia* has the highest abundance followed by *Sesarma minutum* and *Sesarma picta*. Highest abundance of crabs were observed in the seagrass habitat type with 15 species (*Charybdis* and *Matuta* species) followed by mangrove, sandy beach and sea habitat types respectively with 10, 8 and 7 species. Many of these crabs are potentially economically important as primary food species such as the mud crab, *Scylla serrata*, and the larger species belonging to the genus *Sesarma*, which is also the most abundant in Lampi Island MNP. A species with commercial potential is the mangrove stone crab of the genus *Potunus*. Many species, in particular the sesarmines and ocypodids, are ecologically important in mangrove energetics, being involved in nutrient cycling. A partial preliminary **ichthyological** (fish) assessment survey at Lampi Island MNP recorded a total of 42 fish species belonging to 22 families, including 7 new records for Myanmar belonging to the family Oryziatidae. A more detailed fish surveys is needed, including a fish stock assessment. The **herpetofauna** surveys was carried out only in the west part of Lampi Island MNP and adjacent to Bo Cho Island for time and logistic constraints; 10 amphibians and 19 reptiles, out of which one species *Leptolalax heteropus* (amphibians, order Anura) is a new record for Myanmar. Two species of Amphibians (*Ichthyophis spp.* order Gymnophiona and *Occidozyga spp.* Order Anura ) could be new to science but still need verification. From local people knowledge, eight more species have been recorded to occur in Lampi Island MNP but need confirmation.

**Table 8 Threatened and near threatened herpetofauna of Lampi Island**

Scientific name	Common name	Status (Red List 2010)
<i>Indotestudo elongata</i>	Yellow Tortoise	EN
<i>Limnonectes blythii</i>	Blyth's Giant Frog	NT

EN= Endangered;  
NT=Near Threatened



**Mangrove Pit-Viper in Lampi Island MNP** (A. Bonetti)

Most of the amphibians and reptiles found in Lampi MNP are restricted to evergreen and mangrove forests in good conditions, proving the importance of the forests for the diversity of amphibians and reptiles. Mountain streams represent another important habitat for many species like *Limnonectes blythii* and *Leptolalax heteropus*. The species of the genus *Ichthyophis* was found in agriculture habitat of muddy area and beside of stream. Species utilizing the mangrove streams consist mainly of arboreal snakes (*Cryptotyrops purpureomaculatus*) and larger species of giant frogs (*Limnonectes blythii*, *Limnonectes doriae*, *Limnonectes hascheanus*, *Limnonectes cf. macrognathus*, *Ingerana tenasserimensis* and *Occidozyga s.*) found on fresh water creek and spring. *Cyrtodactylus oldhami* (Slender toe gecko) is found in evergreen forest, while forest crested Lizard *Draco blanfordii* and flying Dragon *Calotes emma* inhabit the mangrove habitat at Tourist River site. Three species of sea turtles are reported to inhabit Lampi Island MNP and surroundings, out of the five species considered to be living in the waters of Myanmar, although Hawksbill (*Eretmochelys imbricata*) and Leatherback (*Dermochelys coriacea*) are considered extremely rare. Carapaces of Green Turtle and Loggerhead Turtle were found on the beaches of the park, confirming the existence of these species in the area, while for the Olive Ridley Turtle information are coming only from interviews to local people and no direct observations were done by the survey team.

**Table 9 Threatened sea turtles of Lampi Island**

Scientific name	Common name	Status (Red List 2010)	Note
<i>Caretta caretta</i>	Loggerhead Turtle	EN	Carapaces found
<i>Chelonia mydas</i>	Green Turtle	EN	Carapaces found
<i>Lepidochelys olivacea</i>	Olive Ridley Turtle	VU	Information from local people

EN = Endangered ; VU = Vulnerable

Several beaches on the main Lampi Island and on smaller islands of the MNP were indicated by local people as sea turtle breeding sites. Evidences were found only on a beach close to Sitta Galet village, where two nests with open eggshells were found. Local people reported that the turtles hatchlings occurred between 15 and 20 November.

Several **bird** surveys were carried out in different years and periods of the year, first under the MABR project (2006-2009) and then in the framework of the MEP project (2009-2010).



**Beach Thicknee in Lampi Island MNP** (A. Bonetti)

A total of 228 species were observed in Lampi Island Marine National Park and surrounding areas. Out of these, 8 species are new records for Myanmar: Malaysian Plover (*Charadrius peronii*), Bar-tailed Godwit (*Limosa lapponica*), Common Tern (*Sterna hirundo*), Rusty-breasted Cuckoo (*Cacomantis sepulcralis*), Short-tailed Babbler (*Malacocincla malaccensis*), Little Curlew (*Numenius minitus*), Grey-chested Jungle Flycatcher (*Rhinomyias umbratilis*), Golden-bellied Gerygone (*Gerygone sulphurea*). 19 species are listed as threatened and near threatened in the IUCN Red List of Threatened Species.

**Table 10 Threatened and near threatened birds of Lampi Island MNP**

Scientific name	Common name	Status (Red List 2010)
<i>Aceros subruficollis</i>	Plain-pouched Hornbill	VU
<i>Spizaetus nanus</i>	Wallace's Hawk Eagle	VU
<i>Rollulus rouloul</i>	Crested Partridge	NT
<i>Caloperdix ocellata</i>	Ferruginous Partridge	NT
<i>Megalaima mystacophanos</i>	Red-throated Barbet	NT
<i>Buceros bicornis</i>	Great Hornbill	NT
<i>Halcyon amauroptera</i>	Brown-winged Kingfisher	NT
<i>Phaenicophaeus diardi</i>	Black-bellied Malkoha	NT
<i>Treron fulvicollis</i>	Cinnamon-headed Green Pigeon	NT
<i>Numenius arquata</i>	Eurasian Curlew	NT
<i>Esacus neglectus</i>	Beach Thicknee	NT
<i>Ichthyophaga ichthyaetus</i>	Grey-headed Fish Eagle	NT
<i>Pitta megarhyncha</i>	Mangrove Pitta	NT
<i>Pericrocotus igneus</i>	Fiery Minivet	NT
<i>Aegithina viridissima</i>	Green Lora	NT
<i>Rhinomyias umbratilis</i>	Gray-chested Jungle Flycatcher	NT
<i>Anthreptes rhodolaema</i>	Red-throated Sunbird	NT
<i>Charadrius peronii</i>	Malaysian Plover	NT
<i>Platysmurus leucopterus</i>	Black Magpie	NT

VU=Vulnerable; NT=Near Threatened

Additional surveys in different periods of the year are needed as well as specific studies on population densities and dynamics for species of conservation concern like the vulnerable Plain-pouched Hornbill (see Box 1) and Wallace's Hawk Eagle.

The assessment survey on **mammals** recorded 19 species of small, medium and large size mammal. Out of these, 7 species are in danger according to the IUCN Red List of Threatened Species (2010).

**Table 11 Threatened and near threatened mammals of Lampi Island MNP**

Scientific name	Common name	Status (IUCN Red List 2010)
<i>Elephas maximus</i>	Asian Elephant	EN
<i>Sunda pangolin</i>	Sunda Pangolin	EN
<i>Dugong dugon</i>	Dugong	VU
<i>Macaca nemestrina</i>	Southern Pig-tailed Macaque	VU
<i>Aonyx cinerea</i>	Oriental Small-clawed Otter	VU
<i>Ratufa bicolor</i>	Black Giant Squirrel	NT
<i>Trachypithecus obscurus</i>	Dusky Langur	NT

EN=Endangered; VU=Vulnerable; NT=Near Threatened

The Lesser Mouse-deer can be considered abundant on Lampi Island since it is very common to find traces of this animal in the forest, but the high incidence of illegal hunting reported by the villagers and directly observed by the project team, poses serious concern about the long term survival of the population of Lesser Mouse-deer in Lampi. The Lesser Mouse-deer found in Lampi is considered a subspecies (*Tragulus kanchil subsp. lampensis*) although further investigation is required to confirm it.<sup>11</sup> A large colony of island flying foxes *Pteropus hypomelanus*, between 3500-4000 individuals, was recorded (MABR, MEP) on the small island of Than dar Ni Island in the Gregory Group, although in 2010 only few individuals were observed. The Dugong (*Dugong dugon*) occurs in the area since feeding trails were observed several times starting from 2008, on a dense seagrass meadow in the east coast of Lampi Island, where *Halophila ovalis* is the dominant seagrass species (one of the dugong's favourite seagrass species). Occurrence of dugong at some islands of Myeik Archipelago such as Sular Island, La Ngan Island, Bo Lut Island and War Kyunn Island was also reported by local people. The feeding trails found in Lampi constitute the first proof of the occurrence of the dugong in the Myeik Archipelago.

Mammal species mentioned by the FAO report (1983) and in the notification letter for the establishment of Lampi Island MNP, like the Barking Deer (*Muntiacus muntjak*), the capped Langur (*Trachypithecus pileatus*) and the White-handed Gibbon (*Hylobates lar*), were not found during the current surveys and nor had they been observed by local people.

#### Threats

Lampi Island Marine National Park has total protection, but its status until now of paper park, with no staff and infrastructure, has caused an increasing development of illegal human activities and settlements. The main island of Lampi is the only one where also local people have the perception that activities conducted there are in a sort of illegality framework, while on the minor islands, although part of the marine NP, there is an unwritten consensus about the possibility to exercise different types of activity and to establish temporary or even permanent settlements. Therefore the MNP is coming under increasing threat from settlements and human activities even within the park's boundaries. As human population increases in its immediate vicinity, there is a corresponding increase in the use of natural resources also inside the protected area to satisfy human needs. The main threats recorded by the project in the area can be classified as follows, according to the IUCN and the Conservation Measures Partnership (CMP) classification of threats:

<sup>11</sup> For a discussion on mouse-deer systematics, see Miller (1903) and Meijaard & Groves (2004).



Table 12 Threats recorded in Lampi Island MNP

IUCN-CMP THREATS CLASSIFICATION	THREATS IDENTIFIED INSIDE LAMPI ISLAND MNP	THREATS IDENTIFIED OUTSIDE LAMPI ISLAND MNP
<b>1 Residential &amp; Commercial Development</b>		
1.1 Housing & Urban Areas	Illegal and legal human settlements on 4 small islands causing forest destruction	Growing population in Nyaung Wee and increasing number of fishing boats.
<b>2 Agriculture &amp; Aquaculture</b>		
2.1 Annual & Perennial Non-Timber Crops	Agricultural expansion (rubber, beetlenut, mango and other plantations in Makyone Galet village)	Forest clearing for rubber plantation in Kyun Pila.
<b>5 Biological Resource Use</b>		
5.1 Hunting & Collecting Terrestrial Animals	Heavy poaching of forest mammals (mouse-deer, wild pig, monkeys, civet)	Heavy poaching of forest mammals (mouse-deer, wild pig, monkeys, civet)
5.3 Logging & Wood Harvesting	Extraction of akarwood and rattan Logging of mangroves in Crocodile river and Ko Phawt Logging of mature trees of <i>Dipterocarpus</i> and other valuable species	Logging of mature trees of <i>Dipterocarpus</i> and other valuable species in Nyaung Wee.
5.4 Fishing & Harvesting Aquatic Resources	Overfishing, illegal fishing techniques incl. dynamite fishing Overharvesting of marine flora and fauna (including sea cucumbers, sea shells, echinoderms, etc.)	Overfishing, illegal fishing techniques including dynamite fishing Overharvesting of marine flora and fauna (including sea cucumbers, sea shells, echinoderms, etc.)
<b>7 Natural System Modifications</b>		
7.2 Dams & Water Management/Use	Unplanned/illegal water use from springs and rivers, for domestic use and commercial use (fish factory located in War Kyunn)	
7.3 Other Ecosystem Modifications	Sedimentation especially in the East side	Sand digging on Pine Tree Island
<b>9 Pollution</b>		
9.1 Household Sewage & Urban Waste Water	Waste disposal from existing settlements and visiting fishing boats	Waste disposal from fishing boats
<b>11 Climate Change &amp; Severe Weather</b>		
11.1 Climate change	Change in sea currents Sea level rise	Change in sea currents
11.4 Storms & Flooding	Forest destruction due to storm in 1989 in War Kyunn	

### 3. Management

Although Lampi Island Marine National Park was designated in 1996, no management or operational plan was prepared and systematically implemented. As a consequence of weak control over the territory, the human settlements inside and outside the protected area have considerably and rapidly increased. In 2009 the MEP project initiated consultations among the different stakeholders aimed at launching the process for a participatory development of the management plan to ensure the involvement of local communities and the incorporation of their needs and aspirations. It has also supported field surveys to gather scientific data on the naturalistic and cultural features of the area, the results of which are reported in this publication, to enable participatory planning and management of natural resources. Low levels of social cohesion among the heterogeneous population groups and of trust towards the authorities are a major obstacle to the organization of successful meetings where all people feel free to express their opinion. In order to ensure productive discussion during multi-stakeholder workshops, focus group discussions (FGDs) have been conducted to obtain a better insight into local perceptions of the status of the environment, threats, problems and solutions, as they emerge, while a small number of people with the same livelihood strategy interacts. Furthermore, every focus group has elected a representative who would participate at the first general workshop on "Conservation and Sustainable Management of Lampi Island Marine National Park" which took place in the village of Makyone Galet on 8th and 9th December 2010 with representatives from authorities, communities and NGOs. All stakeholders took part in mixed group discussion on the values and threats of the park and the objectives of the management plan. Finally, a zoning exercise was conducted to receive suggestions on how to plan conservation and sustainable use of resources. More workshops need to be conducted during the preparation of the general management plan which aims to be finalized in 2011. Yet the implementation of the GMP hangs on the resource allocation by the FD with the possible support from NGOs.

### 4. Park staff and other resources

At present Lampi Island MNP has no staff assigned on site but only on paper. 25 people were formally assigned as park staff - wardens and rangers, but they are not yet present in the park. In 2010 Istituto Oikos and BANCA supported the construction of a field camp at Makyone Galet village on Bo Cho Island which is very near to the southern coast of Lampi Island. The camp includes a basic office and a rest house and is equipped with 1 motorboat, 3 GPS, 2 binoculars, 1 laptop, 1 printer, field guides. Four ranger posts will be necessary to facilitate patrolling especially in the proximity of human settlements, equipped with a 48 miles radar station. Since the area has no or very basic services, there is the need to have park staff who are well trained in boat handling and maintenance procedures, swimming, diving, first aid and basic life saving techniques. Wardens and rangers should be specifically trained on field surveys and monitoring techniques, especially on marine ecosystem management. Furthermore, park staff organization should include a community outreach program.

Table 13 Park staff assigned to Lampi MNP

Park Warden	Range officer	Rangers	Foresters	Forest guards	Upper clerk	Lower clerk	Typewriter	Permanent Labourer
1	1	3	5	5	1	1	1	7



L. Beffasti

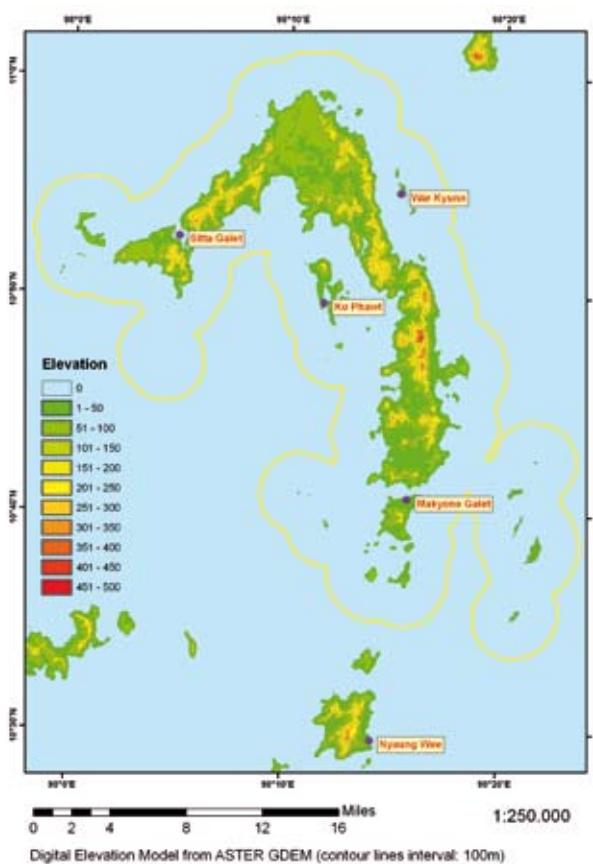
### 5. Tourism

Ecotourism was identified as one of the main vocation of the site by the 1995 joint survey prior to the designation of the Marine National Park. At that time the whole archipelago was closed to tourism due to security concerns. In January 1997 the Ministry of Tourism issued the Tourist Transport Business licence to three companies based in Phuket, Thailand. Nowadays the number of companies allowed to bring tourists to Lampi Island MNP and other selected islands of the archipelago has increased to 34, including both Thai and Myanmar companies. Nonetheless, the development of tourist infrastructures has been slow and limited to three sites:

- Andaman Resort - Kha Yin Gwa (MacLeod) Island
- Andaman club - Thu Htay Island
- Treasure Island Resort - Pakchan river, off Kawthaung

At present there is no accommodation for tourists on Lampi Island or on the other islands closer to Lampi. Opportunities to visit Lampi are limited to sailing cruises including diving opportunities. There are no recreation facilities inside the MNP. Tea shops and restaurants offer very low standard of food options. Local authorities look at ecotourism as a possible tool to boost the local economy, also including community-based tourism opportunities, in form of guided walks or boat trips.

### 6. Land use



**Table 14 Household (HH) trend in Lampi Island MNP**

Survey year	1995	2008	2010
Source	FD	BANCA	Istituto Oikos
1 Makyone Galet	55 <sup>12</sup>	88	191
2 War Kyunn	172	243	255
3 Ko Phawt	Not existing	8	30
4 Sitta Galet	Not existing	9	26
5 Nyaung Wee	Only boats	27	62
TOTAL	227	375	564

During the survey period (2009-10), 4 permanent human settlements (Makyone Galet, War Kyunn, Ko Phawt and Sitta Galet) were identified in Lampi Island MNP core area and 1 in the proposed buffer zone (Nyaung Wee). Only Makyone Galet is an officially recognised village, War Kyunn is a private work camp and Ko Phawt, Sitta Galet and Nyaung Wee were until 2008 only temporary camps. Since the area has been opened to tourism and business in 1996<sup>13</sup>, the population size of the area has dramatically increased through several flows of migration in the last 15 years as illustrated in table 1.

Although human settlements are officially not allowed in the park, this rule has been applied so far only to Lampi main island, for instance the former Moken settlement has been moved from southern Lampi Island to Bo Cho Island (still inside park boundaries). The proposal (field report 1995) to move War Kyunn fish factory to the coast has been disregarded. There are no official rules for land allocation and use in the five human settlements of Lampi area but the informal tenure system is respected by all community members, thus secure in its own context. In the former days a person who was the first to use a parcel of land for dwelling or farming was recognized as having land rights. Land resources were relatively abundant to local population so that every household could easily find suitable lands for settlement and cultivation. Hence, there have, till recently, been very few land disputes and all disputes could be settled personally or locally through mediation by community leaders. The land tenure system of War Kyunn camp is an interesting exception to this rule. According to local informants, War Kyunn land has been almost entirely leased to Annawarsoe company for the last 25 years. The company brought migrant workers from various places of Tanintharyi Region, especially from Palaw Township, to establish a huge fishing industry, raising the number of residents in the War Kyunn who are only tenants.

Rational planning of human settlements is required to avoid future conflicts among villagers and destructive impact on natural resources

#### HUMAN ACTIVITIES

The project livelihood survey (2010) shows that fishery is still the most important economic activity of the area. The number of fishing boats, both in-shore and off-shore, has increased, as well as the type of catches and fishing gear and techniques. This has induced the opening of other smaller economic activities to provide fishers with a wide range of consumer goods and services (from karaoke to mechanical workshops). The living standards and education level of most households surveyed in Lampi area are low. Many are self-employed fishers, yet they contracted large debts to buy the fishing equipment. Access to electricity and safe water is limited. In addition, the health facilities and waste management (and infrastructure) is lacking and people stress that these issues need urgent attention.

**Sea cucumber collector in Lampi Island MNP (L. Beffasti)**



<sup>13</sup> Formerly the area was designated as a restricted or "black" area with security problems, namely insurgents and pirates

<sup>12</sup> In 1995 two Salone villages were situated on the southern tip of Lampi island on the passage ("Galet" in local language) that faces up to Bo Cho island. After designation of Lampi Island MNP in 1996, the villages have been resettled on the northern coast of Bo Cho island, facing the same passage and maintaining the same name.

**Agriculture in Makyone Galet (Lampi Island MNP)** (A.Bonetti)**Fisheries**

Although fishing is prohibited inside the park boundaries, a variety of fishing gears are used by subsistence and commercial fishermen for different catches. Lines, net and set gillnet are used for prawn fishing especially in War Kyunn area; traps, bag and artificial prawn baits are used to catch squid in the area of Makyone Galet, Ko Phawt, Sitta Galet and War Kyunn. A very small minority of fishermen has the necessary collection and carrying license from the Fishery Department. Local fishers use fishing vessels of small-medium dimension and they have frequent disputes with large fishing vessels illegally coming to catch near the shore destroying their traps and nets as well as the fishing ground. The collection of molluscs and sea cucumber is common amongst the Moken-Salone and Karen people respectively. The main market for the Lampi catches is neighboring Thailand. The illegal practice of dynamite fishing (or blast fishing) is common in this area and its destructive effects are visible on the corals around Lampi Island.

**Secondary occupations**

Grocery, general stores and tea shops are common in the five human settlements. Shopkeepers buy food supply directly from Kawthoung (border town in Myanmar) and/or Ranong (border town in Thailand) and resell to the local inhabitants and fishers from passing fishing boats. Hunting, especially by Karen migrants, is an illegal yet very lucrative livelihood. A single hunter can kill daily 10 to 20 animals such as mouse-deer, pangolin, giant lizard and wild-pigs, which he sells to the local fishermen or keeps conserved in cool box and then sends to Makyone Galet market. Although on small scale and with basic equipment, hunting in Lampi area could have severe consequences on the biodiversity of the site.

Horticultural farming is only present in Makyone Galet village and War Kyunn work camp. Cashew, betel and rubber are the main crops of Makyone Galet and cashew betel and mango are primary cash crops in War Kyunn. The vegetables consumed in the area are mainly imported from Kawthoung.

Very recently, due to the State policy encouraging rubber plantations under an agricultural commercialization scheme, local people of Makyone Galet have started to convert the natural forest of Bo Cho Island into private rubber plantations. Logging is illegal but common in the site, especially in Bo Cho Island during rainy season when the transport of logs from the forest to the boats is made easier by water streams. The most common trees felled in the forest are *Shorea* sp., *Dipterocarpus* sp., *Firmiana* sp., *Syzygium* sp., *Cinnamomum* sp., *Shorea farinosa* Fischer Mitra, *Heritiera javanica* (Blume), *Artocarpus calophyllus* Kurz, *Hopea sangol* Korth, *Hopea odorata* Roxb., *Strombosia javanica* Blume.

**7. Research**

The isolation of the Myeik Archipelago precluded for many years the possibility to conduct scientific expeditions in the area. Only recently Istituto Oikos and the local partner BANCA, in collaboration with other organizations like Ecoswiss, and with the support of Forest Department, had the opportunities to jointly organize some basic resource assessments in Lampi Island Marine National Park.

**List of technical reports on Lampi Island MNP produced in the framework of the MABR and MEP projects.**

Surveys implemented in the period 2006-2008 were part of the Mergui Archipelago Biodiversity Research (MABR) project managed by Ecoswiss in partnership with Istituto Oikos and BANCA, funded by Stiftung Drittes Millennium. Surveys implemented in the period 2009-2010 were part of the Myanmar Environmental Project (MEP) and Conservation and Sustainable Management of Lampi MNP (COSMO) project, both managed by Istituto Oikos in partnership with BANCA, co-funded by European Union, Regione Lombardia and Stiftung Dritt Millennium. Survey reports are reported in chronological order in Table 15. They are available under request (coverage for contacts).

**Table 15 Survey reports about Lampi Island MNP**

Survey title	Conducted by	Timeframe
Birds of the Mergui Archipelago: preliminary observations	Andrea Bonetti	2006-2007
Sea Cucumber Report	Barry Bendel	May 2008
Socio-economic survey report	Tint Tun and Aung Myint Oo	May 2008
Lampi fish report	Tint Swe, San Tha Tun and Tint Tun	September 2008
Seagrass report	Barry Bendel and Tint Tun	December 2008
Mangrove of Myeik Archipelago rapid survey assessment	Win Maung	January 2009
Hornbills of Myanmar (poster presented at the fifth International Hornbill conference in Singapore 22-25 March 2009)	Lara Beffasti and Tint Tun	March 2009
Birds survey report	San San Nwe and Nila Pwin	April 2010
Flora survey report	Ei Ei Phyo and Myint Sein	April 2010
Livelihoods survey report	Lara Beffasti and Saw Mon Theint	April 2010
Mammals survey report	Khin Maung Soe, Thaw Sin, Pyi Phyo Swe	April 2010
Mangroves survey report	Moe Min Win	April 2010
Marine resources survey report	Saw Han Shein (plankton), Tint Tun, Tint Wai and Thuang Htut (seagrass and seaweeds)	April 2010
Birds survey report	Sein Myo Aung, Saw Moises, San San Nwe and Nila Pwint	December 2010
Crabs survey report	Tat Su Mar	December 2010
Dugongs status survey report	Tint Tun	December 2010
Focus Group Discussion Report	Saw Mon Theint and Than Than Aye	December 2010
Molluscs survey report	Tint Tun, Tint Wai and Thuang Htut	December 2010
Reptiles and amphibians survey report	Kyo Soe Lwin and Khin Mar Tin	December 2010
Salone cultural ecology study	Mya Thidar Aung and Moe Thidar Twe	December 2010
Sea turtles survey report	Aung Hlaing Win and Htet Myint Aung	December 2010

### 3.3 Conclusions and recommendations

Lampi Island Marine National Park preserves important natural and cultural resources. It is the only protected area of the Myeik Archipelago and the only marine national park of Myanmar. The diversity of marine and terrestrial biodiversity is of significant value at national, international and regional level (IBA, ASEAN heritage site). A total of fifty globally protected species have been identified so far but it is likely that further and more detailed surveys inside and outside Lampi Island MNP will lead to more discoveries. Lampi mangrove forests are the best conserved of Myanmar and, possibly, of the region. Seagrass beds provide a feeding habitat for endangered species such as dugongs and sea turtles. Both habitats are under threat of degradation. Some 3,000 people depend on the natural resources of Lampi Island Marine National Park. The current conflicts between resource protection and use by people need to be addressed in time. Destruction and overexploitation must be prevented by promoting the participation of all stakeholders in conservation and wise management of resources and encouraging sustainable revenue-generating activities. If it is set in such a way as successful, the participatory approach initiated in Lampi Island MNP will be the cornerstone of how Myanmar can work to protect its precious resources and natural environment. The following recommendations are made for the conservation and sustainable development of the Lampi Island MNP. The conservation and management goals of the protected area should be realistically achievable in the present situation, considering that, although not allowed on paper, there are already not only permanent villages and settlements, but many commercial activities. At present, only Lampi Island is to some extent protected while smaller islands and the marine side have been left totally unprotected ever since the park designation. A **4-year management plan**, where different uses and limits of use are defined according to different zones, should be prepared and enacted in time. The creation of a management/advisory committee including representatives of Forest Department, Navy and Fisheries Department (as recommended by Rabinowitz 1995), as well as civil society is envisaged to support the park staff in accomplishing the conservation and development goals.

**Zoning:** total protection should be granted to the main Lampi Island and to priority habitats inside the park boundaries, for instance mangrove forests, seagrass beds and coral reefs. Sustainable management of resources in the other minor islands of Lampi Island MNP should be encouraged, starting with the legalization of existing villages and definition of a land plan. In particular, further expansion of human settlements should be contained and support to the livelihoods of current settlers should be given to promote wise resource use and participation in controlling illegal activities, like logging, poaching, fishing with illegal techniques. **Park staff** should be permanently allocated to the newly constructed park office in Makyone Galet for the implementation of the activities according to the management plan, monitoring key resources and patrolling illegal activities, in particular logging and dynamite fishing. More **research** should be conducted to monitor the status of key resources and to fill information gaps, in particular on coral reefs, sea turtles nesting sites, dugongs, plain-pouched hornbill. Information about the park should be divulged to the villages and boats, signs should be installed around the perimeter.

**Stakeholder consultations** should continue to be organised on a regular basis with attention to gender and ethnic balance. Collaboration between the park staff and organised groups of villagers should be encouraged, especially to **control illegal logging and fishing**, and to regulate the access and use of water resources. **Environmental education** should be included in the school programmes and seminars regularly organised for the communities. Sound waste management should be initiated starting with cleaning campaigns on the beach and around water springs. Water, energy and health programmes are needed to address current problems. As recommended by Rabinowitz (1995) and Fischer (1996), **ecotourism** should be developed only after park management is in place and in a manner that favours community-based initiatives. As the only protected area of Myeik Archipelago in the Myanmar side, the site ought to be connected to Surin and Similan MPAs in Thailand within a large **transboundary reserve** to apply the Convention on Biological Diversity (CBD) ecosystem approach and accommodate different land uses and planning needs.

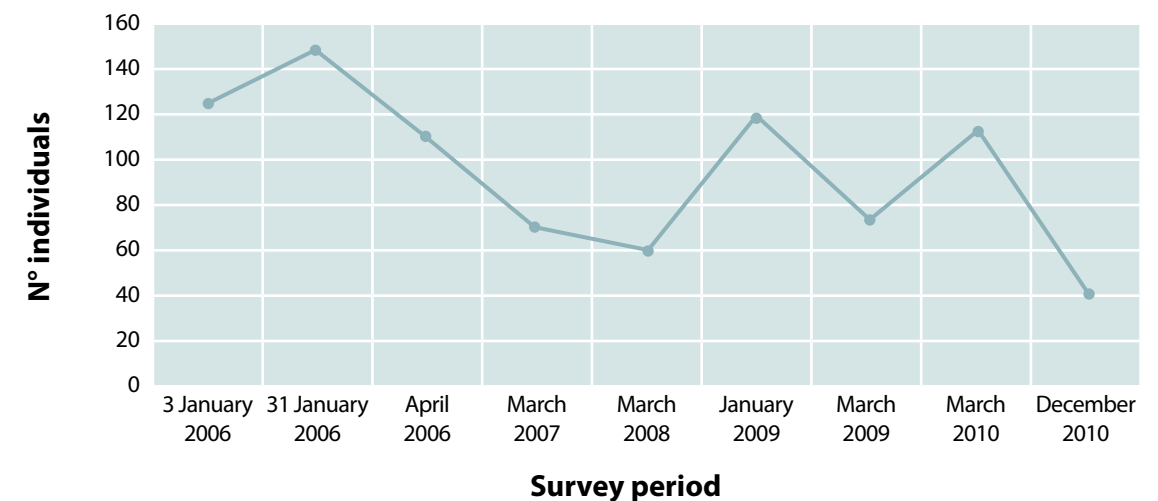
## Plain-pouched Hornbill



Plain-pouched Hornbill in Lampi Island MNP (A. Bonetti)

The Plain-pouched hornbill *Aceros subruficollis* is an endangered species listed as vulnerable in the IUCN Red List (2010) due to its small and declining population. The main threats are hunting and shrinking of the preferred habitat, the lowland wet evergreen forest. The species is confined to Southern Myanmar and adjacent Thailand, and to northern Malaysia. Historically described (Anderson, 1889) as common in Myanmar and occurring in great numbers in the Myeik Archipelago, being the commonest hornbill in the area, it was not recorded in Myanmar since as far back as 1941 (Smith 1942) and in the Myeik Archipelago since 1920 (unknown source in BLI 2005). It appears to have undergone a rapid and huge decline in the last century (Rasmussen in litt. 1999). During the MABR and MEP project surveys in Myeik Archipelago and Lampi Island MNP (2006-2010), two roosting sites were localized, a major one with up to 150 individuals in Hornbill Island, and a minor one, comprising 20-25 individuals, on an islet immediately south of Bo Cho Island. At least one count per year was done at the Hornbill Island roost from 2006 and 2010, in the period between December and April, recording a maximum of 149 (end of January 2006) and a minimum of 43 (beginning of December 2010) individuals. More counts at fixed period should be carried out to understand if the variation in numbers is related to the breeding season or to a population decline. Furthermore, to assess the conservation status of the species, more surveys in the whole Myeik Archipelago are needed.

Plain-pouched Hornbill trend in Lampi Island MNP (Source: MABR 2006-2008; MEP 2009-2010)



## Moken Sea Gypsies

An indigenous population arisen from aboriginal Malay stock, the Moken (as they call themselves or "Salone" as they are called in Myanmar) have lived in the Myeik Archipelago since the last century, roaming the sea from island to island, collecting and trading sea products. During the rainy season the sea gypsies used to settle in some islands that offered good shelter and whose forests provided food when the sea was too rough for navigation. They built their huts on stilts very close to the shore, in order to be able to constantly check the sea and their boats. Most live also during the dry season in the huts, except when they have to embark in longer fishing trips. It is estimated that a total population of 4,000 Moken still inhabit the archipelago both on the Myanmar and Thai side. However, in the surroundings of Lampi Island Marine National Park the project (2009-2010) recorded less than 100 Moken households (about 400 individuals) based, at the villages of Makyone Galet, Nyaung Wee and Ko Phawt. A reason for their sedentarisation, is the decrease in number of the traditional Moken big boats *kabang* in the archipelago. In Lampi area, there are only a few *kabangs* left and they are either owned by non-Moken fishermen or they are stranded on the shore out of use. Moken nowadays own smaller dug-out canoes and row close to the coastline in search of sea products or have one big boat pull many canoes to the fishing ground and back. There are still a few men in the Nyaung Wee village able to build boats in the traditional way. They carve

a type of wood which is not hard but very floatable such as Taung-pain-hne (*Artocarpus chaplasha*), Katut (*Aporosa wallichii*), Kan-soe (*Heritiera javanica*), Zi (*Zizyphus sp.*) and Tha-pyay (*Sizygium sp.*). The raw boat is then heated using Tha-naigther (*Hopea odorata*) wood over bamboo slats or dry coconut shells to brighten the original colour and kill moths, and eventually it is smeared with oil dregs. Finally, the boat is heated again to become light on the surface of the water. The boat can be used continuously for six years if some basic maintenance work, such as clearing away the moss and occasional heating, is



Moken village in Nyaung Wee (A. Bonetti)

regularly done. For their housing they mostly use a kind of wood called La-nga-dote which lasts long without being eaten by moths or worm-holed. The roofing is made of thatch which they cut from the plants themselves. The Moken of Makyone Galet now build their houses with timber and corrugated iron like the other migrants. But they usually choose as building site the sand beach along the coastal line. Moken do not traditionally conserve any specific area or resource. They have never perceived resources as limited because under such a limited population pressure and low impact activities, resources would regenerate during their movements from island to island or during the rainy season. Yet they believe that one shouldn't be greedy but take from the sea and the forest only what is necessary for subsistence.

### Livelihoods

In former days the Mokens' livelihood depended on the collection of a variety of molluscs and other marine creatures together with subsistence spear fishing and hunting. A good income generating activity was the collection of sea cucumbers at low tide or even up to 10-12 m deep grounds. Moken are famous for being good divers<sup>14</sup>. Nevertheless, recently the resources in and around the park have become scarcer and Moken can not compete with the better equipped divers from Dawei and Ayeyawaddy region in search

of valuable sea cucumbers for the Chinese market. Since 1998-99 the main economic activity of Moken living in and around Lampi has become squid fishing (*Loligo sp.*). However, as opposite to Myanmar fishers who use kerosene lamps to attract and catch a variety of squid known as Kin-mon yet fout, they only catch the small squids Kin-mon gandu with a very basic technique of putting a fake fish as bait into the water. In the former days the bait was carved out of wood but now it has been replaced by a Thai made plastic toy. A good catch is said to be about 5-7 kg whereas on unlucky days it is just about 1-2 kg or none. During moon waxing days, when best catches are expected, several canoes tied together with a long rope go out fishing pulled by a motorboat. The trip may last for a few days, during which Moken, mainly women, will have to sleep in the small canoe and eventually sell all the catch to the motorboat owner at a very low price<sup>15</sup>, in exchange for the diesel and food rations consumed during the trip. For their subsistence the Moken collect mainly sea worms, sea urchins and different kinds of molluscs. These activities are exclusively performed by women, while men try to catch several kinds of crabs among the rocks at ebb tide or fish by spearing in the open sea. Though sea people, they use forest products for a number of purposes apart from boat and house construction, mainly for food, firewood and traditional medicine. Especially during the rainy season, Moken hunt in the forests with their dogs for wildboars, mouse-deer

and bats, and they gather wild vegetables and fruits. They especially look for a big tuber kywe-ou, small fruits called Ma-yan, purgative crotons and cockscomb flowers which they call Taw-kyet-mauk. They use a variety of medicinal herbs to treat the most common diseases. A mixture of honey and the gum of a creeper Lar-lat is prepared as a remedy for high temperature. Boiled leaves and branches of Ba-ine are taken by women that have recently given birth. The same medicinal herb is also used as a medication when their babies suffer from stomach ache by grinding the branch and smearing it over the



Moken kabang and dug-out canoes in Lampi Island MNP (A. Bonetti)

belly. The scale of a pangolin is believed to be useful in preventing infantile ailments that can result in nervous disorders and muscular dysfunctions.

### What future for the sea gypsies?

The quickening and broadening processes of economic, political, social and technological development in the archipelago are leading to the marginalisation and impoverishment of the Moken. The reliance on a single catch (squid) is eroding their ecological knowledge of the archipelago and its resources. In addition, without motorboats they have no choice but to work as underpaid temporary labourers for traders from the mainland coming to settle in the park. Without ID cards Moken can not access the, albeit poor, public education and health services and they can't own land or fishing license. With these premises, integration into Myanmar society is difficult and almost limited to women choosing to marry a Myanmar man, learn his language and adopt Buddhist religion. Pure Moken households live in the smaller huts without water and electricity, separated from the other migrants. The rate of alcoholism and drug abuse is alarming and, summed up with low hygienic standards and an increasingly polluted environment, is leading towards shorter life-spans especially among men. As the competition over resources in Lampi steadily increases, a few Moken groups have chosen to move to more distant islands, resuming the nomadic lifestyle from which they derived their identity and freedom.

<sup>14</sup> A study demonstrates that Moken children have a 50% better underwater vision than European children (Gislen et al., 2003).

<sup>15</sup> 1 kg of squid is sold for 1,5-2 USD (2010).

### 3.4 Checklist of Lampi Island MNP resources

Species that are new records for Myanmar or possible new species, are indicated in red.

#### PHYTOPLANKTON

(in alphabetical order)

	Scientific Name		Scientific Name
1	<i>Bacillaria paradoxa</i>	51	<i>Coscinodiscus lineatus</i>
2	<i>Bacteriastrium comosum</i>	52	<i>Coscinodiscus nodulifer</i>
3	<i>Bacteriastrium elongatum</i>	53	<i>Coscinodiscus oculus-iridis</i>
4	<i>Bacteriastrium hyalinum</i>	54	<i>Coscinodiscus radiatus</i>
5	<i>Bacteriastrium varians</i>	55	<i>Coscinodiscus subtilis</i>
6	<i>Bellerophia malleus</i>	56	<i>Cyclotella comta</i>
7	<i>Biddulphia sinensis</i>	57	<i>Dictyocha fibula</i>
8	<i>Campylodiscus undulatus</i>	58	<i>Dinophysis homunculus</i>
9	<i>Cerataulina bergoni</i>	59	<i>Dinophysis miles</i>
10	<i>Ceratium candelabrum</i>	60	<i>Diplosalis lenticulata</i>
11	<i>Ceratium deflexum</i>	61	<i>Ditylum brightwelli</i>
12	<i>Ceratium dens</i>	62	<i>Ditylum sol</i>
13	<i>Ceratium extensum</i>	63	<i>Eucampia cornuta</i>
14	<i>Ceratium fusus</i>	64	<i>Eucampia zoodiacus</i>
15	<i>Ceratium macroceros</i>	65	<i>Frgilaria oceanica</i>
16	<i>Ceratium pennatum</i>	66	<i>Gonyaulax polygramma</i>
17	<i>Ceratium ponectum</i>	67	<i>Gonyaulax sp.</i>
18	<i>Ceratium pulchellum</i>	68	<i>Guinardia flaccida</i>
19	<i>Ceratium sumatranum</i>	69	<i>Gymnodinium sp.</i>
20	<i>Ceratium tenue</i>	70	<i>Gyrosigma sp.</i>
21	<i>Ceratium trichoceros</i>	71	<i>Hemiaulus indica</i>
22	<i>Ceratium tripos</i>	72	<i>Hemiaulus sinensis</i>
23	<i>Ceratium turca</i>	73	<i>Hemidiscus cuneiformis</i>
24	<i>Ceratium vulture</i>	74	<i>Hyalodiscus stelliger</i>
25	<i>Chaetoceros affinis</i>	75	<i>Lauderia borealis(annulata)</i>
26	<i>Chaetoceros coarctatus</i>	76	<i>Leptocylindrus danicus</i>
27	<i>Chaetoceros compressus</i>	77	<i>Melosira borneri</i>
28	<i>Chaetoceros curvisetus</i>	78	<i>Navicula cuspidata</i>
29	<i>Chaetoceros decipiens</i>	79	<i>Navicula sp.1</i>
30	<i>Chaetoceros denticulatum</i>	80	<i>Navicula sp.2</i>
31	<i>Chaetoceros lauderi</i>	81	<i>Nitzschia closterium</i>
32	<i>Chaetoceros lorenzianus</i>	82	<i>Nitzschia seriata</i>
33	<i>Chaetoceros paradoxum</i>	83	<i>Nitzschia sigma</i>
34	<i>Chaetoceros peruvianus</i>	84	<i>Nitzschia sp.</i>
35	<i>Chaetoceros pseudicrinatus</i>	85	<i>Noctiluca scintillans</i>
36	<i>Chaetoceros pseudicurvisetus</i>	86	<i>Ornithocercus magnificus</i>
37	<i>Chaetoceros rostratus</i>	87	<i>Ornithocercus steini</i>
38	<i>Chaetoceros siamensis</i>	88	<i>Peridinium (Protoperidinium) catenatum</i>
39	<i>Chaetoceros subtilis</i>	89	<i>Peridinium (Protoperidinium) cerasus</i>
40	<i>Chaetoceros tortissimus</i>	90	<i>Peridinium (Protoperidinium) conicum</i>
41	<i>Chaetoceros weisfoggii</i>	91	<i>Peridinium (Protoperidinium) depressum</i>
42	<i>Climacodium biconcavum</i>	92	<i>Peridinium (Protoperidinium) divergens</i>
43	<i>Climacodium frauenfeldianum</i>	93	<i>Peridinium (Protoperidinium) oceanicum</i>
44	<i>Cocconeid pediculus</i>	94	<i>Peridinium (Protoperidinium) steini</i>
45	<i>Coscinodiscus astromphalus</i>	95	<i>Pinnularia sp.</i>
46	<i>Coscinodiscus cintrales</i>	96	<i>Pleurosigma aesturii</i>
47	<i>Coscinodiscus concinnus</i>	97	<i>Pleurosigma intermedia</i>
48	<i>Coscinodiscus excentricus</i>	98	<i>Pleurosigma nicobaricum</i>
49	<i>Coscinodiscus gigas</i>	99	<i>Pleurosigma normani</i>
50	<i>Coscinodiscus janesianus</i>	100	<i>Pleurosigma sp.1</i>
		101	<i>Pleurosigma sp.2</i>
102	<i>Podolampas biped</i>		
103	<i>Pyrocystis fusiformis</i>		
104	<i>Pyrocystis lunula</i>		
105	<i>Pyrocystis noctiluca</i>		
106	<i>Pyrophacus horologicum</i>		
107	<i>Rhizosolenia (Proboscia)alata</i>		
108	<i>Rhizosolenia (Pseudosolenia) calcaravis</i>		
109	<i>Rhizosolenia alata f. innermis</i>		
110	<i>Rhizosolenia alata f. indica</i>		
111	<i>Rhizosolenia bergoni</i>		
112	<i>Rhizosolenia castracenei</i>		
113	<i>Rhizosolenia clevei</i>		
114	<i>Rhizosolenia imbricata</i>		
115	<i>Rhizosolenia rhombus</i>		
116	<i>Rhizosolenia robusta</i>		
117	<i>Rhizosolenia setigera</i>		
118	<i>Rhizosolenia stolterfothii</i>		
119	<i>Rhizosolenia styliformis</i>		
120	<i>Schrodirella delicatula</i>		
121	<i>Skeletonema costatum</i>		
122	<i>Stephanopyxis palmeriana</i>		
123	<i>Streptothecha thamensis</i>		
124	<i>Thalassiosira sp.1</i>		
125	<i>Thalassiosira gravida</i>		
126	<i>Thalassionema nitzschioides</i>		
127	<i>Thalassiosira rotula</i>		
128	<i>Thalassiosira subtilis</i>		
129	<i>Thalassiothrix frauenfeldii</i>		
130	<i>Thalassiothrix longissima</i>		
131	<i>Thalassiothrix mediterranea</i>		
132	<i>Triceratium favus</i>		
133	<i>Triceratium reticulatum</i>		
134	<i>Triceratium revale</i>		
135	<i>Trichodesmium theibauti</i>		
136	<i>Trichodesmium (Oscillatoria) erythraeum</i>		

#### ZOOPLANKTON

(in alphabetical order)

	Scientific Name
1	<i>Abyla hakaeli</i>
2	<i>Abylopsis eschscholtzi</i>
3	<i>Acartia centula</i>
4	<i>Acartia erythraea</i>
5	<i>Acartia spinicauda</i>
6	<i>Acetes indicus</i>
7	<i>Acrocalanus gibbe</i>
8	<i>Acrocalanus gracilis</i>
9	<i>Aequorea macrodactyla</i>
10	<i>Aequorea sp.</i>
11	<i>Alciopa sp.</i>
12	<i>Aulophaera sp.</i>

13	<i>Aurelia sp.</i>	69	<i>Krohnitta subtilis</i>	125	<i>Sagitta hexaptera</i>
14	<i>Beroe cucumis</i>	70	<i>Labidocera acuta</i>	126	<i>Sagitta neglecta</i>
15	<i>Beroe forskali</i>	71	<i>Labidocera bengaliensis</i>	127	<i>Sagitta pulchra</i>
16	<i>Bolivina sp.</i>	72	<i>Labidocera euchaeta</i>	128	<i>Sagitta terox</i>
17	<i>Bougainvillea pyramidata</i>	73	<i>Labidocera minuta</i>	129	<i>Salpa fusiformis</i> (solitary and aggregate forms)
18	<i>Brachycelus sp.</i>	74	<i>Labidocera pectinata</i>	130	<i>Salpa maxima</i> (solitary form)
19	<i>Calanopia elliptica</i>	75	<i>Laophonte sp.</i>	131	<i>Saphirella sp.</i>
20	<i>Calanus sp.</i>	76	<i>Lensia conoidea</i>	132	<i>Sapphirina nigromaculata</i>
21	<i>Callizona sp.</i>	77	<i>Lensia sp.</i>	133	<i>Stegosoma magnum</i>
22	<i>Candacia bradyi</i>	78	<i>Leptotinnus nordqvisti</i>	134	<i>Stomolophus sp.</i>
23	<i>Canthocalanus pouper</i>	79	<i>Leucosolenia(spicules) sp.</i>	135	<i>Sulculeoria biloba</i>
24	<i>Cavolinia longirostris</i>	80	<i>Liriope tetraphylla</i>	136	<i>Temora discaudata</i>
25	<i>Centropages furcatus</i>	81	<i>Lopadorhynchus sp.</i>	137	<i>Temora turbinata</i>
26	<i>Clytemnestra rostrata</i>	82	<i>Lucicutia flavicornis</i>	138	<i>Thalassomysis sewelli</i>
27	<i>Clytemnestra scutellata</i>	83	<i>Lucifer penicillifer</i>	139	<i>Thalia democratica</i> (solitary form)
28	<i>Codonellopsis morchella</i>	84	<i>Macrosetella gracilis</i>	140	<i>Tintinnopsis aperta</i>
29	<i>Codonellopsis ostenfeldi</i>	85	<i>Mastigias papua</i>	141	<i>Tintinnopsis beroidea</i>
30	<i>Codonellopsis parva</i>	86	<i>Metacalanus sp.</i>	142	<i>Tintinnopsis butschlii</i>
31	<i>Conchoecia elegans</i>	87	<i>Microsetella morvigeca</i>	143	<i>Tintinnopsis cylindrical</i>
32	<i>Conchoecia sp.</i>	88	<i>Microsetella rosea</i>	144	<i>Tintinnopsis gracilis</i>
33	<i>Corycaeus andrewsi</i>	89	<i>Notholca sp. (Loricis)</i>	145	<i>Tintinnopsis mortenseni</i>
34	<i>Corycaeus catus</i>	90	<i>Obelia sp.</i>	146	<i>Tintinnopsis nana</i>
35	<i>Corycaeus latus</i>	91	<i>Oikopleura cophocerca</i>	147	<i>Tintinnopsis radix</i>
36	<i>Corycaeus sp.1</i>	92	<i>Oikopleura dioica</i>	148	<i>Tortanus forcipatus</i>
37	<i>Corycaeus sp.2</i>	93	<i>Oikopleura longicauda</i>	149	<i>Undinula vulgaris</i>
38	<i>Corycaeus speciosus</i>	94	<i>Oithona brevicornis</i>	150	<i>Vorticella oceanica</i>
39	<i>Creseis acicula</i>	95	<i>Oithona linearis</i>		
40	<i>Cypridina noctiluca</i>	96	<i>Oithona nana</i>		
41	<i>Dactyloseta pacifica</i>	97	<i>Oithona plumifera</i>		
42	<i>Diphyes appendiculata</i>	98	<i>Oithona rigesa</i>		
43	<i>Diphyes chamisonis</i>	99	<i>Oithona similis</i>		
44	<i>Diphyes dispar</i>	100	<i>Oncaea conifer</i>		
45	<i>Disoma sp.</i>	101	<i>Oncaea venusta</i>		
46	<i>Doliolum denticulatum</i>	102	<i>Paracalanus aculetus</i>		
47	<i>Doliolum nationalis</i>	103	<i>Paracalanus crassirostris</i>		
48	<i>Dromosphaera sp.</i>	104	<i>Paracalanus parvus</i>		
49	<i>Eirene sp.</i>	105	<i>Pegantha sp.</i>		
50	<i>Eucalanus crassus</i>	106	<i>Pegea confoederata</i>		
51	<i>Eucalanus minachus</i>	107	<i>Pelagia noctiluca</i>		
52	<i>Eucalanus subcrassus</i>	108	<i>Pelagobia longicirrata</i>		
53	<i>Euchaeta concinna</i>	109	<i>Penilia avirostris</i>		
54	<i>Euphysa bigelowi</i>	110	<i>Phialidium discoid</i>		
55	<i>Euterpona acutifrons</i>	111	<i>Phtisica marina</i>		
56	<i>Eutintinnus lusus-undae</i>	112	<i>Pleurobranchia pileus</i>		
57	<i>Evadne teroestina</i>	113	<i>Pleurobranchia rhodopsis</i>		
58	<i>Fritillaria formica</i>	114	<i>Pontella andersoni</i>		
59	<i>Fritillaria haplostoma</i>	115	<i>Pontella danae</i>		
60	<i>Fritillaria pellucid</i>	116	<i>Pontellopsis scotti</i>		
61	<i>Fritillaria venusta</i>	117	<i>Pseudodiaptomus aurivilli</i>		
62	<i>Gammaris sp.</i>	118	<i>Pterosagitta draco</i>		
63	<i>Gastrosaccus sp.</i>	119	<i>Pyrocypis sp.</i>		
64	<i>Globigerina bulloides</i>	120	<i>Rhopilema asamushi</i>		
65	<i>Globoquadrina sp.</i>	121	<i>Rhopilema esculenta</i>		
66	<i>Heliocladus sp.</i>	122	<i>Sagitta bedoti</i>		
67	<i>Hyperia sp.</i>	123	<i>Sagitta crassa</i>		
68	<i>Iasis zonaria</i> (solitary forms)	124	<i>Sagitta enflata</i>		

#### MEROPLANKTON

(in alphabetical order)

	Scientific Name
1	<i>Actinotrocha of Phoronids</i>
2	<i>Alim of Stomatopods (various)</i>
3	<i>Archnactis larva of anthozoa</i>
4	<i>Auricularia of Holothuroids</i>
5	<i>Bipinnaria of Starfish</i>
6	<i>Copepodite of various taxa of Copepods</i> (various development states 1-4)
7	<i>Cydidippid larva of ctenophore</i>
8	<i>Cypris of Acorn barnacle</i>
9	<i>Echinopluteus of Echinoids</i>
10	<i>Juvenile of Acetes</i>
11	<i>Juvenile of Cryptoniscidis</i>
12	<i>Juvenile of Leptocheila</i>
13	<i>Lanice larva</i>
14	<i>Larvae of Alciopids</i>
15	<i>Larvae of alpeid caridean (various)</i>
16	<i>Larvae of Anomuran (Pagurid)</i>
17	<i>Larvae of Megalonids</i>
18	<i>Larvae of Nereid (various)</i>
19	<i>Larvae of Palae monid caridean</i> (various)
20	<i>Larvae of Processid caridean (various)</i>
21	<i>Larvae of Savellarids</i>
22	<i>Larvae of Spionids</i>
23	<i>Larvae of Tubereilids</i>

24	<i>Megalopa of brachyuran</i> (various)	9	<i>Caulerpa verticillata</i>
25	<i>Metanectochaete (late) larvae</i> (various)	10	<i>Chaetomorpha gracilis</i>
26	<i>Mitraria larvae</i>	11	<i>Chaetomorpha sp1.</i>
27	<i>Mysis of Penaeids</i> (various)	12	<i>Chaetomorpha sp2.</i>
28	<i>Nauplius of Acorn barnacle</i>	13	<i>Cladophora sp1.</i>
29	<i>Nauplius of Calanoids</i> (various)	14	<i>Cladophora sp2.</i>
30	<i>Nauplius of Cyclopoids</i> (various)	15	<i>Codium arabicum</i>
31	<i>Nauplius of Goose barnacle</i>	16	<i>Codium edule</i>
32	<i>Nauplius of Pontillids</i> (various)	17	<i>Codium geppei</i>
33	<i>Nectochaete larvae</i> (various)	18	<i>Halimeda discoidea</i>
34	<i>Ophioluteus of Brittle Star</i>	19	<i>Halimeda macroloba</i>
35	<i>Pilidium larvae</i>	20	<i>Halimeda opuntia</i>
36	<i>Planktonic fish eggs</i>	21	<i>Rhizoclonium sp.</i>
37	<i>Planktonic fish larvae</i>	22	<i>Ulva intestinalis</i>
38	<i>Planula larva of hydrozoa</i>	23	<i>Ulva reticulata</i>
39	<i>Polydora larva</i>	24	<i>Ulva sp.</i>
40	<i>Trochophora larvae</i> (various)		<b>Brown algae (Phylum: Phaeophyta)</b>
41	<i>Veligers of gastropods</i> (various)	1	<i>Dictyota bartayresiana</i>
42	<i>Viligers of bivalves</i> (various)	2	<i>Dictyota divaricata</i>
43	<i>Young nematodes</i> (unidentified)	3	<i>Lobophora variegata</i>
44	<i>Zoea and juveniles of Lucifer</i>	4	<i>Padina minor</i>
45	<i>Zoea of brachyuran</i> (various)	5	<i>Padina australis</i>
46	<i>Zoea of Penaeids</i> (various)	6	<i>Padina sp.</i>
47	<i>Zoea of Porcellanids</i> (various)	7	<i>Sargassum stolonifolium</i>

## SEAGRASS

	Scientific Name		Scientific Name
		8	<i>Sargassum polycystum</i>
		9	<i>Turbinaria ornata</i>
			<b>Red algae (Phylum: Rhodophyta)</b>
		1	<i>Acanthophora spicifera</i>
1	<i>Cymodocea rotundata</i>	2	<i>Actinotrichia fragilis</i>
2	<i>Cymodocea serrulata</i>	3	<i>Amphiroa fragilissima</i>
3	<i>Syringodium isoetifolium</i>	4	<i>Asterocystes ornate</i>
4	<i>Enhalus accoroides</i>	5	<i>Bostrychia binderii</i>
5	<i>Halodule pinifolia</i>	6	<i>Catenella nipae</i>
6	<i>Halodule uninervis</i>	7	<i>Centroceras clavulatum</i>
7	<i>Halophila baccarii</i>	8	<i>Ceramium sp1.</i>
8	<i>Halophila minor</i>	9	<i>Ceramium sp2.</i>
9	<i>Halophila ovalis</i>	10	<i>Dichotomaria marginata</i>
10	<i>Halophila decipiens</i>	11	<i>Dichotomaria obtusata</i>
11	<i>Thalassia hemprichii</i>	12	<i>Endosiphonia clavigera</i>
		13	<i>Galaxaura filamentosa</i>
		14	<i>Galaxaura rugosa</i>
		15	<i>Gelidiella acerosa</i>
		16	<i>Gelidium arenarium</i>
		17	<i>Gracilaria</i>
		18	<i>Gracilaria canaliculata</i>
		19	<i>Grateloupia durvillaei</i>
		20	<i>Grateloupia filicina</i>
		21	<i>Hydropuntia euclideanoides</i>
		22	<i>Hypnea pannosa</i>
		23	<i>Hypnea charoides</i>
		24	<i>Hypnea musciformis var. Hippuriodes</i>
		25	<i>Hypnea saidana</i>
		26	<i>Jania sp.</i>
		27	<i>Martensia fragilis</i>
		28	<i>Phyllophora sp.</i>
		29	<i>Plocamium cartilagineum</i>

## SEAWEEDS

	Scientific Name		Scientific Name
			<b>Blue green algae (Phylum: Cyanophyta)</b>
		1	<i>Lyngbya sp.</i>
		2	<i>Oscillatoria sp.</i>
			<b>Green algae (Phylum: Chlorophyta)</b>
1	<i>Anadyomene stellata</i>		
2	<i>Avrainvillea erecta</i>		
3	<i>Boergesenia forbesii</i>		
4	<i>Boodlea composita</i>		
5	<i>Caulerpa racemosa</i>		
6	<i>Caulerpa serrulata</i>		
7	<i>Caulerpa sertularioides</i>		
8	<i>Caulerpa taxifolia</i>		

30	<i>Polysiphonia sp1.</i>
31	<i>Polysiphonia subtilissima</i>
32	<i>Portieria hornemanii</i>
33	<i>Rhodymenia sp.</i>
34	<i>Spondylothamnion sp.</i>
35	<i>Tolypocladia calodictyon</i>
36	<i>Tolypocladia glomerulata</i>
37	<i>Vanvoorstia spectabilis</i>
38	<i>Wrangelia hainanensis</i>



A. Bonetti

## SPECIES OF THE EVERGREEN FOREST &amp; DUNE AND BEACH FOREST (in alphabetical order)

N°	Scientific Name	Myanmar Name
1	<i>Abarema bigemina</i> (L.) Kosterm.	Hin-cho-gyi
2	<i>Actinodaphne sesquipetalis</i>	Me-daung
3	<i>Adenanthera pavonina</i> L.	Ywe-gyi
4	<i>Albizia odoratissima</i> (L.f.) Benth.	Taung-ma-gyi
5	<i>Albizia sp.</i>	Sit_myaw
6	<i>Alstonia scholaris</i> (L.) R. Br.	Taung-mayo
7	<i>Anacardium occidentale</i> L.	Thiho-thayet
8	<i>Anisoptera curtisii</i> Dyer	Kaung-hmu
9	<i>Anthocephalus chinensis</i> Rich	Ma-U
10	<i>Antiaris toxicaria</i> (Pers.) Lesch.	Hmya-seik
11	<i>Aporusa frutescens</i> Blume	Liyo
12	<i>Aporusa villosula</i> Kurz.	Thit-khauk
13	<i>Aporusa wallichii</i> Hook.f.	Ka-dauk
14	<i>Aquilania agallocha</i> Roxb.	Akyaw
15	<i>Archidendron jiringa</i> Jack	Da-nyin
16	<i>Ardisia polycephala</i> Wall.	Kyet-ma-oke
17	<i>Artocarpus calophyllus</i> Kurz	Taung-bein
18	<i>Artocarpus chaplasha</i> Roxb.	Taung-peinne
19	<i>Baccaurea parviflora</i> Muell. Arg.	Kana-so
20	<i>Baccaurea sapida</i> Muell. Arg.	Sha-yu-tar
21	<i>Barringtonia racemosa</i> (L.) Spreng	Ye-kyi
22	<i>Bischofia javanica</i> Blume	Ye-pa-don
23	<i>Bombax insignis</i> Wall	Taung-let-pan
24	<i>Bouea burmanica</i> Griff.	Ma-yan
25	<i>Bridelia sp.</i>	Not known
26	<i>Bruguiera conjugata</i> (L.) Merr.	Byu-u-talon
27	<i>Bruguiera gymnorhiza</i> (L.) Lamk.	Byu-oak-song
28	<i>Calophyllum amoenum</i> Wall.	Tha-ra-phi
29	<i>Calophyllum inophyllum</i> L.	Pon-nyet
30	<i>Carallia brachiata</i> (Lour.) Merr.	Yap-pin
31	<i>Cerallia sp.</i>	Ma-ni-awl-za
32	<i>Castanopsis argyrophylla</i> King	Thit-tat
33	<i>Casuarina equisetifolia</i> Forst.	Lae-tha-pin
34	<i>Celtis sp.</i>	Thit-pok-taing
35	<i>Cerbera manghas</i> L.	Ye-za-lat
36	<i>Cinnamomum iners</i>	Hman-thin
37	<i>Cinnamomum sp. (1)</i>	Taung-pa-yon
38	<i>Cinnamomum sp. (2)</i>	Kara-way-yaing
39	<i>Cinnamomum sp. (3)</i>	Kyam-bo
40	<i>Cinnamomum verum</i> Pres	Thit-ky-bo
41	<i>Citrus hystrix</i> DC.	Bya-thi
42	<i>Coccoceras plicatum</i> Muell. Arg.	Yaung-ban
43	<i>Croton sp.</i>	Not known
44	<i>Croton robustus</i> Kurz.	Tha-yin-phyu
45	<i>Crptocarya griffithina</i> Wight	Ka-lak-thiang
46	<i>Crypteronia sp.</i>	Yon-bin
47	<i>Cynometra ramiflora</i> L.	Myin-ga
48	<i>Dalbergia rimosa</i> Roxb.	Not known
49	<i>Derris indica</i> Burrel	Than-that
50	<i>Dialium indum</i> L.	Taung-ka-ye
51	<i>Dillenia parviflora</i> Griff.	Zin-byun
52	<i>Dillenia sp.</i>	Thaung-thami-laung

53	<i>Diospyros peregrina</i> (Gaertn) Gurte	Bot-the
54	<i>Diospyros crumentata</i> Thwaites	Taung-bok
55	<i>Diospyros ehretioides</i> Wall.	Auk-chin-sa
56	<i>Dipterocarpus alatus</i> Roxb.	Ka-nyin-phyu
57	<i>Dipterocarpus costatus</i> Gaertm.f.	Ka-nyin-ni
58	<i>Dipterocarpus dyeri</i> Pierre	Ka-nyin
59	<i>Dipterocarpus grandiflorus</i> Blanco	Kanyin
60	<i>Dipterocarpus obtusifolius</i> Teysm	Ka-nyin
61	<i>Dipterocarpus tuberculatus</i> Roxb.	In
62	<i>Dipterocarpus turbinatus</i> Gaertn.f.	Ka-nyin
63	<i>Dolichandrone serrulata</i> L.f.	Tha-kut
64	<i>Dolichandrone sp.</i>	Ye-tha-kut
65	<i>Dracontomelon sp.</i>	Payar-koe-su-pin
66	<i>Duabanga grandiflora</i> Walp.	Myauk-ngo
67	<i>Elaeocarpus sp.</i>	Moo-ti-ya
68	<i>Engelhardtia spicata</i> Blume	Taung-min-sok
69	<i>Eriolaena sp.</i>	Taung-tha-yaw
70	<i>Erythrina stricta</i> Roxb.	Taung-kathit
71	<i>Exoecaria agallocha</i> L.	Ta-yaw
72	<i>Ficus glomerata</i> Roxb.	Taung-tha-phan
73	<i>Ficus hispida</i> L.	Kha-aung
74	<i>Ficus pisocarpa</i>	Nyaung
75	<i>Ficus sp.(1)</i>	Pa-aung
76	<i>Ficus sp.(2)</i>	Ye-tha-phan
77	<i>Ficus sp.(3)</i>	Ka-dut-pho
78	<i>Firmiana colorata</i> (Roxb.) R. Br.	Gant-phyu
79	<i>Firmiana sp.</i>	Gan-ni
80	<i>Garcinia cowa</i> Roxb.	Taung-tha-le
81	<i>Garcinia heterandra</i> Wall.	Taung-min-gut
82	<i>Glycosmis cyanocarpa</i> Spreng.	Mat-paw
83	<i>Gmelina arborea</i> Roxb.	Ye-ma-nae
84	<i>Heritiera fomes</i> Buch._ham.	Ye-ka-na-zo
85	<i>Heritiera javanica</i> (Blume) Kosterm.	Kant-so
86	<i>Heritiera sp.(1)</i>	Taung-ka-naso-phyu
87	<i>Heritiera sp.(2)</i>	Taung-ka-naso-ani
88	<i>Hibiscus tiliaceus</i> L.	Pin-le-shaw
89	<i>Holigarna kurzii</i> King	Che-po
90	<i>Homalium griffithianum</i> Kurz.	Taung-ka-byaw
91	<i>Homalium tomentosum</i> Benth.	Myauk-chaw
92	<i>Hopea helferi</i> (Dyer) Brandis	Thingan-kyauk
93	<i>Hopea odorata</i> Roxb.	Thin-gan
94	<i>Hopea sangal</i> Korth.	Thingan-magale
95	<i>Hopea sp.</i>	Thinganwar
96	<i>Hypobathrum racemosum</i> Kurz	Pinle-kyetyo
97	<i>Lagerstroemia floribunda</i> Jack	Pyinma
98	<i>Lagerstroemia sp.</i>	Tha-beik-kyan
99	<i>Lagerstroemia speciosa</i> (L.) Pers.	Pyin-ma
100	<i>Lagerstroemia tomentosa</i> Presl.	Le-sa
101	<i>Lannea coromandelica</i> (Houtt.) Merr.	Ye-kyauung-sha
102	<i>Lepisanthes tetraphylla</i> (Vahl) Radlk	Myauk-nyo
103	<i>Limonia acidissima</i> L.	Thee-pin
104	<i>Linociera terniflora</i> Wall.	San-sae-pin
105	<i>Litsea grandis</i> (Nees) Hook. F.	Tha-ku-mae-nal
106	<i>Litsea lancifolia</i>	On-don
107	<i>Litsea sp.</i>	Taung-ta-gu
108	<i>Lophopetalum filiforme</i> Laws.	Yemane-ani

109	<i>Lophopetalum fimbriatum</i> Wight	Yemane-aphyu
110	<i>Lophopetalum</i> sp.	Yae-ma-nae-chauk
111	<i>Macaranga denticulata</i> Muell. Arg.	Not known
112	<i>Macaranga gigantea</i>	Phet-wun
113	<i>Maesa ramentacea</i> A.DC.	Nga-nwa
114	<i>Mallotus floribundus</i> Muell. Arg.	Taung-ka-do
115	<i>Mallotus oblongifolius</i> Mull.Arg.	Not known
116	<i>Mallotus</i> sp.	Not known
117	<i>Manglietia insignis</i> (Wall.) Blume	Taung-saga-wa
118	<i>Melanorrhoea glabra</i> Wall.	Thit-sae
119	<i>Memecylon grande</i> Retz.	Taung-phyu
120	<i>Mesua nervosa</i> Planch.&Triana	Gan-gaw
121	<i>Mesua</i> sp.	Gant-gwe-paung
122	<i>Michelia champaca</i> L.	Sa-ga-pin
123	<i>Millettia atropurpurea</i> Dunn.	Kywe-da-nyin
124	<i>Mitragyna rotundifolia</i> Kuntze	Bin-ga
125	<i>Morinda angustifolia</i> Roxb.	Nibase
126	<i>Myristica angustifolia</i> Roxb.	Kywe-thwe
127	<i>Myrsine</i> sp.	Min-ka-zaw
128	<i>Opuntia dillenii</i> (Ker Gawl.) Haw.	Ka-la-zaung
129	<i>Ormosia watsonii</i> Fisch	Le-zin
130	<i>Palaquium obovatum</i> (Griff.) Engl.	Pinle-byin
131	<i>Parashorea stellata</i> Kurz	Lay-tha-yet
132	<i>Payena paralleloleura</i> Kurz	Zin-zwel
133	<i>Pemphis acidula</i> Forst.	Not-known
134	<i>Phoebe tavoyana</i> Hook. F.	Kye-se
135	<i>Podocarpus neriifolius</i> D.Don	Thit-min
136	<i>Prismatomeris albidiflora</i> Thwaites	Kyet-yon
137	<i>Pterocarpus</i> sp.	Pa-dauk-pho
138	<i>Pterospermum acerifolium</i> Willd.	Taung-phet-wun
139	<i>Pterospermum jackiamun</i>	Nwa-ba-byin
140	<i>Pterygota alata</i> (Roxb.) R.Br.	Khok-thin-nya
141	<i>Quercus</i> sp.	Not known
142	<i>Rhizophora candelaria</i> DC.	Byu-chidauk-apo
143	<i>Rhizophora mucronata</i> Lam.	Byu-chidauk-ama
144	<i>Samadera lucida</i> Wall	Ka-the
145	<i>Sandoricum koetjape</i> (Burm.f) Merr.	Thit-to
146	<i>Sapium baccatum</i> Roxb.	Aw-le
147	<i>Sapium insigne</i> (Muell.Arg.) Trimen	Taung-kala
148	<i>Scaevola taccada</i> (Gaertn.) Roxb.	Not known
149	<i>Semecarpus heterophyllus</i> Blume	Kyae-pin
150	<i>Senna timoriensis</i> DC.	Taw-me-za-li
151	<i>Shorea cinerea</i> Fisher	Ka-dut-ni
152	<i>Shorea farinosa</i> Fischer	U-ban
153	<i>Shorea gratissima</i> Dyner	U-ban-hput
154	<i>Shorea</i> sp.(1)	Not known
155	<i>Shorea</i> sp.(2)	Hput-ma-tet
156	<i>Shorea</i> sp.(3)	Ka-dut-phyu
157	<i>Spondias</i> sp.(1)	Taw-gwe
158	<i>Spondias</i> sp.(2)	Not known
159	<i>Sterculia foetida</i> Linn.	Let-khok
160	<i>Sterculia</i> sp.	Not known
161	<i>Sterculia urens</i> Roxb.	Shaw
162	<i>Strombosia javanica</i> Blume	Ban-na-tha
163	<i>Swintonia floribunda</i> Griff.	Taung-tha-yet
164	<i>Syzygium cymosum</i> DC.	Thabye-kyetter

165	<i>Syzygium formosum</i> (Wall) Masam.	Tha-bye-phyu
166	<i>Syzygium fruticosum</i>	Kyet-yoe_tha-bye
167	<i>Syzygium grande</i> (ight) Walp.	Thabye-ywet-gyi
168	<i>Syzygium gratum</i> (Wight) SN. Mitra	Thebye-pauk-pauk
169	<i>Syzygium inophyllum</i> DC.	Thabye-satche
170	<i>Syzygium polyanthum</i> (Wight) Walp.	Mat-la-ga
171	<i>Syzygium</i> sp.(1)	Tha-bye
172	<i>Syzygium</i> sp.(2)	Thabyae-khun-bya
173	<i>Syzygium zeylanicum</i> (L.) DC.	Thabye-ni
174	<i>Tamarindus indica</i> L.	Ma-gyi
175	<i>Tarennoidea wallichii</i> (Hook.f.) D.	Khat-mya
176	<i>Terminalia catappa</i> L.	Ban-da
177	<i>Terminalia penangiana</i> Choisy	Let-put-thi-pin
178	<i>Tetrameles nudiflora</i> R. Br.	Thit-pok
179	<i>Trema orientalis</i> (L.) Blume	Kywe-sa
180	<i>Tristania merguensis</i> Griff.	Mya-kamaung
181	Unknown	Not-known
182	Unknown	Not-known
183	Unknown 1	Pin-sein
184	Unknown 2	Man-bar
185	Unknown 3	Pan-da-nyin
186	Unknown 4	Sanwin-pok
187	<i>Vatica dyeri</i> King	Kanyin-Kyaung-che
188	<i>Vitex pubescens</i> Vahl.	Kyet-yo
189	<i>Wendlandia tinctoria</i> DC.	Thit-me
190	<i>Wendlandia glabrata</i> DC.	Thit-phyu
191	<i>Wendlandia</i> sp.(1)	Kywe-nan
192	<i>Wendlandia</i> sp.(2)	Sa-kit-pin
193	<i>Xerospermum noronhianum</i> Blume	Taung-kyetmauk
194	<i>Xylocarpus gangeticus</i> C.E.Park.	Pinle-on
195	<i>Ziziphus</i> sp.	Not known

## SPECIES OF THE MANGROVE FOREST

(in alphabetical order)

N°	Scientific Name	Myanmar Name
1	<i>Acanthus illicifolius</i>	Kha-ya
2	<i>Acrostichum aureum</i>	Nyet-kyi-taung-gyi
3	<i>Acrostichum speciosum</i>	Nyet-kyi-taung-thay
4	<i>Aegialitis rotundifolia</i>	Sar-pin
5	<i>Aegialitis annulata</i>	
6	<i>Aegiceras corniculatum</i>	Yae-kha-ya
7	<i>Aegiceras iripa</i>	-
8	<i>Avicennia alba</i>	Tha-me-kyet-tet
9	<i>Avicennia marina</i>	Tha-me-phyu
10	<i>Avicennia officinalis</i>	Tha-me-gyi
11	<i>Barringtonia asiatica</i>	-
12	<i>Brownlowia tersa</i>	Yae-tha-man
13	<i>Bruguiera cylindrica</i>	Bue-khar-kyeik-leim
14	<i>Bruguiera gymnorhiza</i>	Byu-oak-sung
15	<i>Bruguiera parviflora</i>	Hni-phyu
16	<i>Bruguiera sexangula</i>	Byu-shwe-war
17	<i>Caesalpinia crista</i>	Alo-lay-new
18	<i>Calamus arborescens</i>	Da-non
19	<i>Calophyllum inophyllum</i>	Pon-nyet
20	<i>Calycopterus floribunda</i>	Kywet-new

21	<i>Cerbera manghas</i>	-
22	<i>Cerbera odollam</i>	-
23	<i>Ceriops decandra</i>	Ma-da-ma
24	<i>Ceriops targal</i>	Ma-da-ma-myaw
25	<i>Clerodendrum inerme</i>	Taw-kyauing-pan
26	<i>Cynometra iripa</i>	-
27	<i>Derris indica</i>	Thin-win-phyu
28	<i>Derris trifoliata</i>	New-net
29	<i>Diospyros embryopteris</i>	Tae
30	<i>Dolichandrone spathacea</i>	Yae-tha-kut
31	<i>Ecoecaria agallocha</i>	Tha-yaw
32	<i>Erythrina indica</i>	Pin-le-ka-thit
33	<i>Finlaysonia maritima</i>	Byauk-new
34	<i>Flagellaria indica</i>	Myauk-kyein
35	<i>Heritiera fomes</i>	Ye-ka-na-so
36	<i>Heritiera littoralis</i>	Kon-ka-na-so
37	<i>Hibiscus tiliaceus</i>	Tha-man-shaw
38	<i>Intsia bijuge</i>	Sa-gar-lun
39	<i>Ipomoea pes-caprae</i>	Pin-le-kazun
40	<i>Lumnitzera littorea</i>	Eik-ma-thwe-ni
41	<i>Lumnitzera racemosa</i>	Eik-ma-thwe-phyu
42	<i>Merope angulata</i>	Taw-shauk
43	<i>Nypa fruticans</i>	Da-ni
44	<i>Oncoperma tigillarum</i>	Ka-zaung
45	<i>Pandanus foetidus</i>	Tha-baw
46	<i>Pandanus tectorius</i>	-
47	<i>Pemphis acidula</i>	-
48	<i>Phoemix paludosa</i>	-
49	<i>Premna obtusifolia</i>	Taw-taung-tan-gyi
50	<i>Rhizophora apiculata</i>	Byu-cha-e-dauk-pho
51	<i>Rhizophora mucronata</i>	Byu-cha-e-dauk-ma
52	<i>Sarcobolus carinatus</i>	Sut-kha-mon-new
53	<i>Scaevola taccada</i>	-
54	<i>Scyphiphora hydrophyllaceae</i>	-
55	<i>Sesuvium portulacastrum</i>	-
56	<i>Sonneratia alba</i>	La-mu-ka-thet
57	<i>Sonneratia griffithii</i>	La-ba
58	<i>Terminalia catappa</i>	Ban-da
59	<i>Thespesia populnea</i>	-
60	<i>Xylocarpus moluccensis</i>	
61	<i>Xylocarpus granatum</i>	Pin-le-ohn
62	<i>Xylocarpus rumphii</i>	-
63	<i>Morinda citrifolia</i>	-

## ECHINODERMS-HOLOTHUROIDEA (SEA CUCUMBERS)

N°	Species Name	Scientific Name
1	Stonefish	<i>Actinopyga lecanora</i>
2		<i>Actinopyga</i> sp. **
3		<i>Bohadschia atra</i>
4		<i>Bohadschia marmorata</i>
5	Chalkfish	<i>Morph tenuissima</i>
6		<i>Morph vitiensis</i>

7		<i>Morph cousteau</i>
8	Lollyfish	<i>Holothuria atra</i>
9	Pinkfish	<i>Holothuria edulis</i>
10		<i>Holothuria fuscocinerea</i>
11		<i>Holothuria hilla</i>
12		<i>Holothuria impatiens</i>
13		<i>Holothuria leucospilota</i>
14		<i>Holothuria moebii</i>
15	Sandfish	<i>Holothuria scabra</i>
16		<i>Holothuria verrucosa</i>
17		<i>Holothuria pardalis</i>
18		<i>Holothuria</i> sp. **
19		<i>Holothuria</i> sp. **
20		<i>Holothuria</i> sp. **
21		<i>Holothuria</i> sp.
22	Flowerfish	<i>Pearsonothuria graeffei</i>
23	Greenfish	<i>Stichopus chloronotus</i> **
24	Curryfish	<i>Stichopus hermanni</i>
25	Dragonfish	<i>Stichopus</i> c.f. <i>horrens</i> sp. 1
26		<i>Stichopus</i> c.f. <i>horrens</i> sp. 2
27		<i>Stichopus</i> c.f. <i>naso</i>
28		<i>Stichopus vastus</i>
29		<i>Opheodesma</i> sp. 1
30		<i>Opheodesma</i> sp. 2
31		<i>Opheodesma</i> sp. 3
32		<i>Protankyra</i> sp.
33		<i>Synaptula</i> sp. 1
34		<i>Synaptula</i> sp. 2
35		<i>Ohshimella ehrenbergii</i>

## GASTROPODS (MOLLUSCS)

N°	Scientific Name	Common Name
1	<i>Architectonica maxima</i> (Philippi, 1849)	Giant Sundial
2	<i>Babylonia areolata</i> (Link, 1807)	Maculated Ivory Whelk
3	<i>Casis cornuta</i> (Linnaeus, 1758)	Horned Helmet
4	<i>Rhinoclavis vertagus</i> (Linnaeus, 1758)	Common Vertagus
5	<i>Conus suratensis</i> Hwass, 1792	Suratan Cone
6	<i>Conus litteratus</i> Linnaeus, 1758	Lettered Cone
7	<i>Cypraea tigris</i> Linnaeus, 1758	Tiger Cowrie
8	<i>Cypraea vitellus</i> Linnaeus, 1758	Pacific Deer Cowrie
9	<i>Cypraea talpa</i> Linnaeus, 1758	Mole Cowrie
10	<i>Cypraea eglantine</i> Duclou, 1833	Eglantine Cowrie
11	<i>Cypraea mauritiana</i> Linnaeus, 1758	Humpback Cowrie
12	<i>Pleuroplaea trapezium</i> (Linnaeus, 1758)	Rapizium Horse Conch
13	<i>Fusinus colus</i> (Linnaeus, 1758)	Distaff Spindle



14	<i>Ficus subintermedia</i> (Orbigny,1852)	Underlined Fig Shell
15	<i>Marginella ventricosa</i>	
16	<i>Ellobium aurismidae</i> (Linnaeus, 1758)	
17	<i>Pugilina cochlidium</i> (Linnaeus,1758)	Spiral Melongena
18	<i>Chicireus torrefactus</i> (Sowerby, 1841)	Firebrand Murex
19	<i>Chicoreus ramosus</i> (Linnaeus,1758)	Ramose Murex
20	<i>Murex ternispina</i> Lamaeck, 1822	Black Spined Murex
21	<i>Thais alouina</i> (Roding, 1798)	Alou Rock Shell
22	<i>Nassarius dorsatus</i> (Roding, 1798)	Channeled Nassa
23	<i>Polinices mammilla</i> (Linnaeus,1758)	Pear Shaped Moon Snail
24	<i>Natica lineate</i> (Roding, 1798)	Lined Moon Anail
25	<i>Natica vitellus</i> (Linnaeus,1758)	Calf Moon Snail
26	<i>Nerita costata</i> Gmelin, 1791	Costate Nerite
27	<i>Nerita polita</i> Linnaeus, 1758	Polished Nerite
28	<i>Nerita albicilla</i> Linnaeus, 1758	Oxpalate Nerite
29	<i>Nerita chameleon</i> Linnaeus, 1758	Chamelon Nerite
30	<i>Oliva miniacea</i> (Roding, 1798)	Redmouth Oliver
31	<i>Cellana rota</i> (Gmelin, 1791)	Rayed Limpet
32	<i>Cerithidea cingulata</i> (Gmelin, 1791)	Girdled Horn Shell
33	<i>Cymatium sp.</i>	Triton Shell
34	<i>Strombus canarium</i> Linnaeus, 1758	Dog Conch
35	<i>Strombus luhuanus</i> Linnaeus, 1758	Strawberry Conch
36	<i>Strombus variabilis</i> Swainson, 1820	Variable Conch
37	<i>Strombus urceus</i> Linnaeus, 1758	Little Pitcher Conch
38	<i>Lambis lambis</i> (Linnaeus,1758)	Common Spider Conch
39	<i>Lambis chiragra chiragra</i> (Linnaeus,1758)	Chiragra Spider Conch
40	<i>Terebra areolata</i> (Link, 1807)	Fly Spotted Auger
41	<i>Tonna dolium</i> (Linnaeus, 1758)	Spotted Tun
42	<i>Tonna olearium</i> (Linnaeus, 1758)	Oily Tun
43	<i>Trochus niloticus</i> Linnaeus, 1767	Commercial Top
44	<i>Tectus pyramis</i> (Born, 1778)	Pyramid Top
45	<i>Turbo argyrostomus</i> Linnaeus, 1758	Silvermouth Turban
46	<i>Turbo marmoratus</i> Linnaeus, 1758	Green Turban
47	<i>Turritella duplicate</i> (Linnaeus, 1758)	Duplicate Turret
48	<i>Turritella terebra</i> (Linnaeus,1758)	Screw Turret
49	<i>Melo melo</i> (Lightfoot, 1786)	Indian Volute
50	<i>Xenophora solaris</i> (Linnaeus, 1764)	Sunburust Carrier Shell

## BIVALVES (MOLLUSCS)

N°	Scientific Name	Common Name
1	<i>Scapharca inaequivalvis</i> (Bruguiere,1789)	Inequivalve Ark
2	<i>Arca ventricosa</i> Lamarck,1819	Ventricose Ark
3	<i>Barbatia foliate</i> (Firsskal,1775)	Decussate Ark
4	<i>Scapharca indica</i> (Gmelin,1791)	Rudder Ark

5	<i>Fragum unedo</i> (Linnaeus,1758)	Pacific Strawberry Cockle
6	<i>Fragum fragum</i> (Linnaeus,1758)	White Strawberry Cockle
7	<i>Trachycardium rugosum</i> (Lamarck,1819)	Pacific Yellow Cockle
8	<i>Fulvia papyraea</i> (Bruguiere,1789)	Paper Cockle
9	<i>Polymesoda bangalensis</i> (Lamarck,1818)	Bengali Geloina
10	<i>Donax socortum</i> (Linnaeus, 1758)	Leather Donax
11	<i>Donax faba</i> Gmelin, 1791	Pacific Bean Donax
12	<i>Hyothisa hyotis</i> (Linnaeus, 1758)	Honeycomb Oyster
13	<i>Isognomon isognomum</i> (Linnaeus, 1758)	Wader Tree Oyster
14	<i>Anodontia edentula</i> (Linnaeus, 1758)	Toothless Lucine
15	<i>Mactra sp.</i>	Trough Shell
16	<i>Malleus malleus</i> (Linnaeus, 1758)	Black Hummer Oyster
17	<i>Malleus regula</i> (Fosskal, 1775)	Straight Hummer Oyster
18	<i>Malleus albus</i> (Lamarck,1819)	White Hammer Oyster
19	<i>Septifer bilocularis</i> (Linnaeus, 1758)	Box Mussel
20	<i>Modiolus aratus</i> (Dunker,1857)	Furrowed Horse Mussel
21	<i>Modiolus metcafei</i> (Hanley,1843)	Yellow Banded Horse Mussel
22	<i>Minnivola pyxidata</i> (Born, 1778)	Box Scallop
23	<i>Gloripallium pallium</i> (Linnaeus, 1758)	Royal Cloak Scallop
24	<i>Atrina vexillum</i> (Born,1778)	Flag Pen Shell
25	<i>Placuna ehippium</i> (Philipsson,1788)	Saddle Oyster
26	<i>Pinctada margaritifera</i> (Linnaeus,1758)	Blacklip Pearl Oyster
27	<i>Pinctada maculate</i> (Gould, 1850)	Spotted Pearl Oyster
28	<i>Solen grandis</i> Dunker, 1861	Grand Razer Shell
29	<i>Solen roseomaculatus</i> Pilsbry, 1901	Spotted Razer Shell
30	<i>Siliqua radiate</i>	Radar Clam
31	<i>Spondylus barbatus</i> Reeve, 1856	Bearded Thorny Oyster
32	<i>Spondylus sp.1</i>	Thorny Oyster
33	<i>Spondylus sp.2</i>	Thorny Oyster
34	<i>Tridacna crocea</i> Lamarck, 1819	Crocus Giant Clam
35	<i>Paphia textile</i> (Gmelin,1791)	Textile Venus
36	<i>Placamen tiara</i> (Dillwyn, 1817)	Tiar Venus
37	<i>Katelysia hiantina</i> (Lamarck, 1818)	Hiant Venus
38	<i>Paphia sp.1</i>	Venus
39	<i>Periglypta puerpera</i> (Linnaeus, 1771)	Youthful Venus
40	<i>Cyclina sinensis</i> (Gmelin, 1791)	Oriental Cyclina
41	<i>Sunetta menstrualis</i> (Menke, 1843)	Mauve Sunetta

## CRAB (CRUSTACEAN)

N°	Scientific Name	Common Name
1	<i>Dorippe astuta</i>	
2	<i>Philyra pisum</i>	
3	<i>Matuta lunaris</i>	

4	<i>Matuta planipes</i>	
5	<i>Matuta cuetispina</i>	
6	<i>Calappi japonica</i>	
7	<i>Calappi lophos</i>	
8	<i>Doclea andersoni</i>	
9	<i>Dromia dehaani</i>	
10	<i>Scylla serrata</i>	
11	<i>Potunus pelagicus</i>	
12	<i>Potunus sanguinolentus</i>	
13	<i>Charybids cruciata</i>	
14	<i>Charybids annulata</i>	
15	<i>Charybids merguensis</i>	Mangrove crab
16	<i>Charybids rivers-andersoni</i>	
17	<i>Charybids callianassa</i>	
18	<i>Thalamita prymna</i>	
19	<i>Leptodictus exaratus</i>	
20	<i>Etirus laevimanus</i>	
21	<i>Etirus rhynchophorus</i>	
22	<i>Pilumnus vespertilio</i>	
23	<i>Geocarcinus logostoma</i>	
24	<i>Ocypoda routandus</i>	
25	<i>Ocypoda stimpsons</i>	
26	<i>Gelasimus annulipes</i>	Venigar crab
27	<i>Gelasimus tetragonun</i>	Venigar crab
28	<i>Macrophthalmus depressus</i>	Venigar crab
29	<i>Scopimera globosa</i>	Mangrove crab
30	<i>Dottila myctiroides</i>	
31	<i>Grapsus strigosus</i>	Mangrove crab
32	<i>Pseudograpsus intermedius</i>	Mangrove crab
33	<i>Clistocoeloma</i>	Mangrove crab
34	<i>Varuna littreta</i>	Hairy crab
35	<i>Sesarma quadratum</i>	Paddler crab
36	<i>Sesarma biden</i>	-
37	<i>Sesarma singaporensis</i>	
38	<i>Sesarma andersoni</i>	
39	<i>Sesarma picta</i>	
40	<i>Sesarma intermedia</i>	
41	<i>Sesarma minutum</i>	
42	<i>Raninia ranina</i>	

## FISH (in alphabetical order)

N°	Scientific Name
1	<i>Albula neoguinaica</i>
2	<i>Alepes djeddaba</i>

3	<i>Ambassis interruptus</i>
4	<i>Ambassis vachelli</i>
5	<i>Atherinomorus endrachtensis</i>
6	<i>Atherinomorus ogilbyi</i>
7	<i>Blenny</i>
8	<i>Carangoides chrysophrys</i>
9	<i>Carangoides ferdau</i>
10	<i>Epinephelus areolatus</i>
11	<i>Epinephelus sp.</i>
12	<i>Gerres abbreviatus</i>
13	<i>Gerres oyena</i>
14	<i>Gerres filamentosus</i>
15	<i>Half beak larvae (Hemirhamphus sp.)</i>
16	<i>Hemirhamphus far</i>
17	<i>Hyporhamphus offinis</i>
18	<i>Ilisha melastoma</i>
19	<i>Leiognathus equulus</i>
20	<i>Liza tade</i>
21	<i>Liza vaigiensis</i>
22	<i>Megalaspis cordyla</i>
23	<i>Megalops cyprinoids</i>
24	<i>Opisthopterus tardoore</i>
25	<i>Opisthopterus valenciennesi</i>
26	<i>Oryzias sp.</i>
27	<i>Pentapriion longimanus</i>
28	<i>Periophthalmus koelreuteri</i>
29	<i>Platybelone platyura</i>
30	<i>Pomadasys olivaceun</i>
31	<i>Rastrelliger karnagurta</i>
32	<i>Rhoniscus sp.</i>
33	<i>Saurida micropectoralis</i>
34	<i>Scomberoides tol</i>
35	<i>Selar crumenophthalmus</i>
36	<i>Selaroides leptolepis</i>
37	<i>Siganus canaliculatus</i>
38	<i>Siganus lineatus</i>
39	<i>Sillago sihama</i>
40	<i>Tetraodon sp.</i>
41	<i>Therapon jarbua</i>
42	<i>Tylosurus gavaloides</i>

## AMPHIBIAN

N°	Scientific Name	Common Name	Note
1	<i>Bufo melanostictus</i>	Common Toad	
2	<i>Leptolalax heteropus</i>	Variable Slender Frog	
3	<i>Ingerana tenasserimensis</i>	Tanintharyi Frog	
4	<i>Limnonectes blythii</i>	Blyth's Giant Frog	
5	<i>Limnonectes doriae</i>	Frog	
6	<i>Limnonectes hascheanus</i>	Frog	
7	<i>Limnonectes macrognathus</i>	Big-headed Frog	
8	<i>Occidozyga spp.</i>	Floating Frog	Possible new species

9	<i>Polypedates leucomystax</i>	Common Tree Frog	
10	<i>Ichthyophis spp.</i>	Caecilians	Possible new species

## REPTILE

N°	Scientific Name	Common Name
1	<i>Caretta caretta</i>	Loggerhead Turtle
2	<i>Chelonia mydas</i>	Green Turtle
3	<i>Lepidochelys olivacea</i>	Olive Ridley Turtle
4	<i>Indotestudo elongata</i>	Yellow Tortoise
5	<i>Calotes emma</i>	Forest Crested Lizard
6	<i>Draco blanfordii</i>	Flying Dragon
7	<i>Cyrtodactylus oldhami</i>	Slender Toe Gecko
8	<i>Gekko gekko</i>	Tocky
9	<i>Hemidactylus spp.</i>	House Gecko
10	<i>Dasia olivacea</i>	Olive Tree Skink
11	<i>Eutropis multifasciata</i>	Common Sun Skink
12	<i>Sphenomorphus maculatus</i>	Streamside Skink
13	<i>Tropidophorus spp.</i>	Water Skink
14	<i>Varanus salvator</i>	Water Monitor Lizard
15	<i>Python reticulatus</i>	Reticulated Python
16	<i>Ahaetulla prasina</i>	Oriental Whip Snake
17	<i>Boiga cyanea</i>	Green Cat Snake
18	<i>Dendrelaphis spp.</i>	Bronzebacks Snake
19	<i>Trimeresurus purpureomaculatus</i>	Mangrove Pit-viper

## BIRD

N°	Scientific Name	Common Name
1	<i>Rollulus rouloul</i>	Crested Partridge
2	<i>Caloperdix oculea</i>	Ferruginous Partridge
3	<i>Dinopium javanense</i>	Common Flameback
4	<i>Chrysocolaptes lucidus</i>	Greater Flameback
5	<i>Hemicircus canente</i>	Heart-spotted Woodpecker
6	<i>Mulleripicus pulverulentus</i>	Great Slaty Woodpecker
7	<i>Megalaima haemacephala</i>	Coppersmith Barbet
8	<i>Megalaima australis</i>	Blue-eared Barbet
9	<i>Megalaima asiatica</i>	Blue-throated Barbet
10	<i>Megalaima mystacophanos</i>	Red-throated Barbet
11	<i>Buceros bicornis</i>	Great Hornbill
12	<i>Anthraceros albirostris</i>	Oriental Pied Hornbill
13	<i>Anorrhinus galeritus</i>	Bushy-crested Hornbill
14	<i>Aceros subruficollis</i>	Plain-pouched Hornbill
15	<i>Harpactes oreskios</i>	Orange-breasted Trogon
16	<i>Eurystomus orientalis</i>	Dollarbird
17	<i>Alcedo atthis</i>	Common Kingfisher
18	<i>Ceyx rufidorsa</i>	Rufous-backed Kingfisher
19	<i>Halcyon amauroptera</i>	Brown-winged Kingfisher

20	<i>Halcyon capensis</i>	Stork-billed Kingfisher
21	<i>Halcyon smyrnensis</i>	White-throated Kingfisher
22	<i>Halcyon pileata</i>	Black-capped Kingfisher
23	<i>Halcyon coromanda</i>	Ruddy Kingfisher
24	<i>Todiramphus chloris</i>	Collared Kingfisher
25	<i>Merops leschenaulti</i>	Chestnut-eared Bee-eater
26	<i>Cacomantis sepulcralis</i>	Rusty-breasted Cuckoo
27	<i>Hieroccyx fugax</i>	Malaysian Hawk Cuckoo
28	<i>Eudynamis scolopacea</i>	Asian Koel
29	<i>Phaenicophaeus diardi</i>	Black-bellied Malkoha
30	<i>Phaenicophaeus tristis</i>	Green-billed Malkoha
31	<i>Phaenicophaeus sumatranus</i>	Chestnut-bellied Malkoha
32	<i>Centropus sinensis</i>	Greater Coucal
33	<i>Loriculus vernalis</i>	Vernal Hanging Parrot
34	<i>Loriculus galgulus</i>	Blue-crowned Hanging Parrot
35	<i>Collocalia esculenta</i>	Glossy Swiftlet
36	<i>Collocalia maxima</i>	Black-nest Swiftlet
37	<i>Collocalia fuciphaga</i>	Edible Nest Swiftlet
38	<i>Collocalia germane</i>	Germain Swiftlet
39	<i>Hirundapus giganteus</i>	Brown-backed Needletail
40	<i>Rhaphidura leucopygialis</i>	Silver-rumped Needletail
41	<i>Apus affinis</i>	House Swift
42	<i>Hemiprocne longipennis</i>	Grey-rumped Treeswift
43	<i>Hemiprocne comate</i>	Whiskered Treeswift
44	<i>Otus sunia</i>	Oriental Scops Owl
45	<i>Otus bakkamoena</i>	Collared Scops Owl
46	<i>Bubo sumatranus</i>	Barred Eagle Owl
47	<i>Glaucidium cuculoides</i>	Asian Barred Owlet
48	<i>Glaucidium brodiei</i>	Collared Owlet
49	<i>Ninox scutulata</i>	Brown Hawk Owl
50	<i>Tyto alba</i>	Barn Owl
51	<i>Strix leptogrammica</i>	Brown Wood Owl
52	<i>Caprimulgus macrurus</i>	Large-tailed Nightjar
53	<i>Eurostopodus macrotis</i>	Great Eared Nightjar
54	<i>Columba livia</i>	Rock Pigeon
55	<i>Streptopelia chinensis</i>	Spotted Dove
56	<i>Chalcophaps indica</i>	Emerald Dove
57	<i>Caloenas nicobarica</i>	Nicobar Pigeon
58	<i>Treron vernans</i>	Pink-necked Green Pigeon
59	<i>Treron bicincta</i>	Orange-breasted Green Pigeon
60	<i>Treron pompadora</i>	Pompador Green Pigeon
61	<i>Treron curvirostra</i>	Thick-billed Green Pigeon
62	<i>Treron fulvicollis</i>	Cinnamon-Headed Green Pigeon
63	<i>Ducula bicolar</i>	Pied Imperial Pigeon

64	<i>Ducula aenea</i>	Green Imperial Pigeon
65	<i>Ducula badia</i>	Mountain Imperial Pigeon
66	<i>Rallina spp</i>	Crake
67	<i>Lymnocyptes minimus</i>	Jack Snipe
68	<i>Limosa limosa</i>	Black-tailed Godwit
69	<i>Limosa lapponica</i>	Bar-tailed Godwit
70	<i>Numenius minutus</i>	Little Curlew
71	<i>Numenius phaeopus</i>	Whimbrel
72	<i>Numenius arquata</i>	Eurasian Curlew
73	<i>Tringa totanus</i>	Common Redshank
74	<i>Tringa nebularia</i>	Common Greenshank
75	<i>Tringa ochropus</i>	Green Sandpiper
76	<i>Actitis hypoleucos</i>	Common Sandpiper
77	<i>Arenaria interpres</i>	Ruddy Turnstone
78	<i>Esacus recurvirostris</i>	Great Thick-knee
79	<i>Esacus neglectus</i>	Beach Thick-knee
80	<i>Charadrius peronii</i>	Malaysian Plover
81	<i>Pluvialis squatarola</i>	Grey Plover
82	<i>Charadrius leschenaultii</i>	Greater Sand Plover
83	<i>Gelocbelidon nilotica</i>	Gull-billed Tern
84	<i>Sterna anaethetus</i>	Bridled Tern
85	<i>Sterna aurantia</i>	River Tern
86	<i>Sterna bengalensis</i>	Lesser Crested Tern
87	<i>Sterna bergii</i>	Great Crested Tern
88	<i>Sterna hirundo</i>	Common Tern
89	<i>Sterna albifrons</i>	Little Tern
90	<i>Sterna dougallii</i>	Roseate Tern
91	<i>Sterna sumatrana</i>	Black-naped Tern
92	<i>Chlidonias hybridus</i>	Whiskered Tern
93	<i>Chlidonias leucopterus</i>	White-winged Tern
94	<i>Pandion haliaetus</i>	Osprey
95	<i>Pernis ptilorhynchus</i>	Oriental Honey Buzzard
96	<i>Milvus migrans</i>	Black Kite
97	<i>Aviceda jerdoni</i>	Jerdon's Baza
98	<i>Haliaastur indus</i>	Brahminy Kite
99	<i>Haliaeetus leucogaster</i>	White-bellied Sea Eagle
100	<i>Ichthyophaga ichthyaetus</i>	Grey-headed Fish Eagle
101	<i>Accipiter trivirgatus</i>	Crested Goshawk
102	<i>Accipiter badius</i>	Shikra
103	<i>Accipiter Soloensis</i>	Chinese Sparrowhawk
104	<i>Accipiter gularis</i>	Japanese Sparrowhawk
105	<i>Accipiter virgatus</i>	Besra
106	<i>Butastur teesa</i>	White-eyed Buzzard
107	<i>Butastur indicus</i>	Grey-faced Buzzard
108	<i>Buteo buteo</i>	Common Buzzard
109	<i>Spizaetus cirrhatus</i>	Changeable Hawk Eagle
110	<i>Spizaetus nanus</i>	Wallace's Hawk Eagle
111	<i>Spilornis cheela</i>	Crested Serpent Eagle
112	<i>Hieraetus pennatus</i>	Booted Eagle
113	<i>Falco tinnunculus</i>	Common Kestrel

114	<i>Falco Peregrinus</i>	Peregrine Falcon
115	<i>Egretta sacra</i>	Pacific Reef Egret
116	<i>Ardea sumatrana</i>	Great-billed Heron
117	<i>Ardea cinerea</i>	Grey Heron
118	<i>Casmerodius albus</i>	Great Egret
119	<i>Mesophox intermedia</i>	Intermediate Egret
120	<i>Bubulcus ibis</i>	Cattle Egret
121	<i>Ardeola spp</i>	Pond Heron
122	<i>Butorides striatus</i>	Little Heron
123	<i>Gorsa chius melano lophus</i>	Malayan Night Haron
124	<i>Nycticorax nycticorax</i>	Black-crowned Night Heron
125	<i>Ixobrychus cinnamomeus</i>	Cinnamon Bittern
126	<i>Calyptomena viridis</i>	Green Broadbill
127	<i>Pitta cyanea</i>	Blue Pitta
128	<i>Pitta sordid</i>	Hooded Pitta
129	<i>Pitta megarhyncha</i>	Mangrove Pitta
130	<i>Irena puella</i>	Asian Fairy Bluebird
131	<i>Chloropsis sonnerati</i>	Greater Green Leafbird
132	<i>Chloropsis cyanopogon</i>	Lesser Green Leafbird
133	<i>Lanius cristatus superciliosus</i>	Brown Shrike
134	<i>Lanius cristatus</i>	Brown Shrike
135	<i>Corvus macrorhynchos</i>	Large-Billed Crow
136	<i>Platysmus leucopterus</i>	Black Magpie
137	<i>Cissa chinensis</i>	Common Green Magpie
138	<i>Oriolus chinensis</i>	Black-naped Oriole
139	<i>Pericrocotus cantonensis</i>	Swinhoe's Minivet
140	<i>Pericrocotus divaricatus</i>	Ashy Minivet
141	<i>Pericrocotus igneus</i>	Fiery Minivet
142	<i>Pericrocotus flammeus</i>	Scarlet Minivet
143	<i>Rhipidura albicollis</i>	White-throated Fantail
144	<i>Rhipidura javanica</i>	Pied Fantail
145	<i>Dicrurus macrocercus</i>	Black Drongo
146	<i>Dicrurus leucophaeus</i>	Ashy Drongo
147	<i>Dicrurus remifer</i>	Lesser Racket-tailed Drongo
148	<i>Dicrurus paradiseus</i>	Greater Racket-tailed Drongo
149	<i>Pachycephala grisola</i>	Mangrove Whistler
150	<i>Hypothymis azurea</i>	Black-naped Monarch
151	<i>Terpsiphone paradisi</i>	Asian Paradise Flycatcher
152	<i>Philentoma pyrhopterum</i>	Rufous-winged Philentoma
153	<i>Aegithina tiphia</i>	Common lora
154	<i>Aegithina viridissima</i>	Green lora
155	<i>Tephrodornis gularis</i>	Large Woodshrike
156	<i>Monticola solitarius</i>	Blue Rock Thrush
157	<i>Zoothera citrina</i>	Orange-headed Thrush
158	<i>Rhinomyias umbratilis</i>	Grey-chested Jungle Flycatcher
159	<i>Muscicapa sibirica</i>	Dark-sided Flycatcher
160	<i>Muscicapa dauurica</i>	Asian Brown Flycatcher

## 4 In-depth Study of Rakhine Yoma Elephant Range Wildlife Reserve



161	<i>Ficedula parva</i>	Red-throated Flycatcher
162	<i>Copsychus saularis</i>	Oriental Magpie Robin
163	<i>Copsychus malabaricus</i>	White-rumped Shama
164	<i>Acridotheres tristis</i>	Common Myna
165	<i>Gracula religiosa</i>	Hill Myna
166	<i>Acridotheres fuscus</i>	Jungle Myna
167	<i>Riparia paludicola</i>	Plain Martin
168	<i>Riparia riparia</i>	Sand Martin
169	<i>Hirundo rustica</i>	Barn Swallow
170	<i>Hirundo daurica</i>	Red-rumped Swallow
171	<i>Delichon dasypus</i>	Asian House Martin
172	<i>Hirundo tahitica</i>	Pacific Swallow
173	<i>Pycnonotus atriceps</i>	Black-headed Bulbul
174	<i>Pycnonotus finlaysoni</i>	Stripe-throated Bulbul
175	<i>Pycnonotus goiavier</i>	Yellow-vented Bulbul
176	<i>Pycnonotus brunneus</i>	Red-eyed Bulbul
177	<i>Pycnonotus plumosus</i>	Olive-winged Bulbul
178	<i>Alophoixus pallidus</i>	Puff-throated Bulbul
179	<i>Alophoixus ochraceus</i>	Ochraceous Bulbul
180	<i>Alophoixus bres</i>	Grey-cheeked Bulbul
181	<i>Iole virescens</i>	Olive Bulbul
182	<i>Iole propinqua</i>	Grey-Eyed Bulbul
183	<i>Prinia hodgsonii</i>	Grey-breasted Prinia
184	<i>Zosterops palpebrosus</i>	Oriental White-eye
185	<i>Zosterops everetti</i>	Everett's White-eye
186	<i>Gerygone sulphurea</i>	Golden-bellied Gerygone
187	<i>Acrocephalus aedon</i>	Thick-billed Warbler
188	<i>Orthotomus sutorius</i>	Common Tailorbird
189	<i>Orthotomus atrogularis</i>	Dark-necked Tailorbird
190	<i>Orthotomus sericeus</i>	Rufous-tailed Tailorbird
191	<i>Phylloscopus fuscatus</i>	Dusky Warbler
192	<i>Phylloscopus inornatus</i>	Yellow-browed Warbler
193	<i>Phylloscopus borealis</i>	Arctic Warbler
194	<i>Phylloscopus trochiloides</i>	Greenish Warbler
195	<i>Phylloscopus magnirostris</i>	Large-billed Leaf Warbler
196	<i>Phylloscopus tenellipes</i>	Pale-legged Warbler
197	<i>Phylloscopus coronatus</i>	Eastern Crowned Warbler
198	<i>Garrulax pectoralis</i>	Greater Necklaced Laughingthrush
199	<i>Malacocincla abbotti</i>	Abbott's Babbler
200	<i>Pellorneum tickelli</i>	Buff-breasted Babbler
201	<i>Pellorneum ruficeps</i>	Puff-throated Babbler
202	<i>Macronous gularis</i>	Striped Tit Babbler
203	<i>Alcippe poioicephala</i>	Brown-cheeked Fulvetta
204	<i>Malacocincla malaccensis</i>	Short-tailed Babbler
205	<i>Pellorneum capistratum</i>	Black-capped Babbler
206	<i>Trichastoma bicolor</i>	Ferruginous Babbler
207	<i>Malacopteron magnirostre</i>	Moustached Babbler

208	<i>Malacopteron magnum</i>	Rufous-crowned Babbler
209	<i>Stachyris erythroptera</i>	Chest-nut Winged Babbler
210	<i>Erpornis zantholeuca</i>	White-bellied Erpornis
211	<i>Dicaeum agile</i>	Thick-billed Flowerpecker
212	<i>Dicaeum trigonostigma</i>	Orange-bellied Flowerpecker
213	<i>Dicaeum concolor</i>	Plain Flowerpecker
214	<i>Dicaeum cruentatum</i>	Scarlet-backed Flowerpecker
215	<i>Anthreptes simplex</i>	Plain Sunbird
216	<i>Anthreptes malacensis</i>	Brown-throated Sunbird
217	<i>Anthreptes rhodolaema</i>	Red-throated Sunbird
218	<i>Nectarinia sperata</i>	Purple-throated Sunbird
219	<i>Nectarinia calcostetha</i>	Copper-throated Sunbird
220	<i>Nectarinia asiatica</i>	Purple Sunbird
221	<i>Nectarinia jugularis</i>	Olive-backed Sunbird
222	<i>Aethopyga saturata</i>	Black-throated Sunbird
223	<i>Aethopyga siparaja</i>	Crimson Sunbird
224	<i>Arachnothera longirostra</i>	Little Spiderhunter
225	<i>Dendronanthus indicus</i>	Forest Wagtail
226	<i>Motacilla citreola</i>	Citrine Wagtail
227	<i>Motacilla flava</i>	Yellow Wagtail
228	<i>Motacilla cinerea</i>	Grey Wagtail

### MAMMAL

Nº	Scientific Name	Common Name
1	<i>Elephas maximus</i>	Asian Elephant
2	<i>Dugong dugon</i>	Dugong
3	<i>Ratufa bicolor</i>	Black Giant Squirrel
4	<i>Callosciurus erythraeus</i>	Pallas's Squirrel
5	<i>Galeopterus variegatus</i>	Sunda Colugo
6	<i>Macaca fascicularis</i>	Long-Tailed Macaque (Crab Eating Monkey)
7	<i>Macaca nemestrina</i>	Southern Pig-Tailed Macaque
8	<i>Trachypitecus obscurus</i>	Dusky Langur
9	<i>Tragulus kanchil</i>	Lesser Mouse-Deer
10	<i>Sus scrofa</i>	Eurasian Wild Pig
11	<i>Tursiops aduncus</i>	Indo-Pacific Bottlenose Dolphin
12	<i>Aonyx cinerea</i>	Oriental Small Clawed-Otter
13	<i>Paradoxurus hermaphroditus</i>	Common Palm Civet
14	<i>Arctogalidia trivirgata</i>	Small-Toothed Palm Civet (Three Stripe Palm Civet)
15	<i>Pteropus hypomelanus</i>	Island Flying Fox
16	<i>Cynopterus sphinx</i>	Greater Short-Nosed Fruit Bat
17	<i>Megaderma lyra</i>	Greater False Vampire
18	<i>Taphozous longimanus</i>	Long-Winged Tomb Bat
19	<i>Manis javanica</i>	Sunda Pangolin

### Introduction

The Rakhine Yoma Elephant Range Wildlife Reserve has been selected for in-depth study because of its vulnerability to the loss of biodiversity due to human pressure in the area. The threats are several: logging for timber, fuel wood or poles; forest encroachment for cultivation (both permanent and shifting); trade-driven hunting of endangered species. BANCA has already worked in the area alongside the Rakhine Coastal Conservation Association (RCCA), among the most important and diffused CBOs operating in southern Rakhine State, in projects about environmental awareness, community forestry and biodiversity assessment. RCCA itself has expressed its interest in the result of a research involving the Rakhine Yoma region; therefore, after a joint consultation, the following objectives for this in-depth study have been decided:

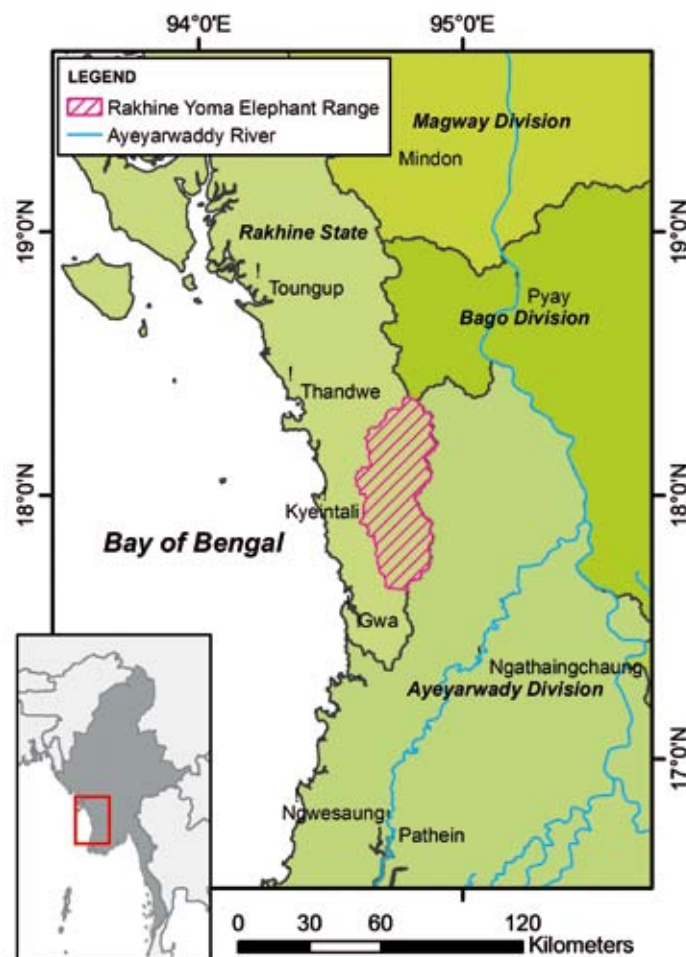
- 1) to prepare a land cover map of the Rakhine Yoma Elephant Range Wildlife Reserve and of the surrounding areas;
- 2) to conduct a study of the vegetation changes which have occurred in the last decades;
- 3) to draw up management-relevant recommendations

Land Cover maps usually represent the different vegetation types covering a portion of the Earth's surface. Due to the lack of existing reliable maps of the study area, it has been decided to use the knowledge of both BANCA and RCCA experts, alongside the photointerpretation of remotely sensed data, such as from Landsat Satellite. BANCA and RCCA experts successfully contributed to the field survey and actively participated to the map legend formulation. Images acquired from the space are a powerful tool to discriminate the different vegetation types present on the Earth's surface, and, given the possibility to analyse data coming from different years, to study the vegetation change dynamics. The outputs of this project will provide RCCA with a valuable tool for planning future conservation activities and addressing current threats, identifying the most vulnerable areas in the Rakhine Yoma. Although some land cover maps derived from satellite imageries exist for this area, none of these maps has a fine spatial resolution and an appropriate legend derived from a field survey. The study has also been extended to the surroundings of the PA to better understand the situation in the more inhabited regions, and because it is not possible to separate the environment of the Rakhine Yoma from the close coastal and valley regions situated around it. The Department of Environmental Sciences, Remote Sensing Lab., University of Milano – Bicocca (Italy), has been directly involved in the process.

## Geography

The Rakhine Yoma Elephant Range Wildlife Reserve (WR) is located in the southern portion of the Rakhine State, in the Thandwe District, inside the homonymous mountain range. The central area of the Yoma consists of a series of ridges running more or less from north to south, although the main drainage lines cut across them from east to west. The streams are in steep valleys with many waterfalls. The geology is dominated by Cretaceous Flysch-type sediments and limestones. The main lithologies found are sandstone, shales and limestone, where the soils are principally of the red brown forest type. The steep slopes and the friable soils result in frequent landslides. The area experiences a monsoonal climate typical of that found throughout Southern Myanmar. Rainfall occurs only between May and September, with an annual rainfall on the coast of more than 4000 mm (source: World Meteorological Organization and FAOCLIM database), decreasing towards the mainland to the east. The humidity is highly intercepted by the mountains, and in the valley of the Ayeyawaddy annual rainfall drops to around 1000 mm. Temperatures are usually between 20° C in January and less than 30° C during April/May. The leafless season for the deciduous species starts in December and ends at the beginning of the rainy season in May. The protected area was established in 2002 and is more than 1,700 Km<sup>2</sup>. large. The main key protected resources are wildlife species, among the most important is a population of wild Asian Elephant (*Elephas maximus*): according to the Park staff, currently there are around 150 living in the

area. The topography of the protected area is mountainous, ranging from 80 meters asl. in the valleys of the southern region, to more than 1,200 meters asl in the northern heights. Several streams and rivers dissect the area and are all part of the western catchment (e.g. Kyeintali river), flowing westwards to the sea which is located only around 15 km from the border of the PA. Moving towards the east side, outside the protected area, the elevation decreases as well, eventually reaching the large alluvial valley of the Ayeyawaddy river. The main vegetation types occurring inside the mountain range and in the protected area are the evergreen forest and the bamboo brakes. Going towards the sea there are many deciduous species mixing with the evergreen, and occasional mangrove forests or agricultural areas on the coast and in the narrow valleys. The pattern of vegetation types is determined by rainfall, altitude and exposure, therefore an interesting natural mosaic of different habitats was observed also in previous surveys (FAO 1983a). On the east side dry deciduous species became quickly dominant, and eventually the agricultural areas prevail close the Ayeyawaddy River: the pattern of the vegetation seems to be more homogenous.



Location of Rakhine Yoma Elephant Range WR

## 4.1 Data and methods

The study was conducted following subsequent steps. In this context, a simple overview of the methodology used is given; for more information it is possible to contact the authors.

### Step 1. Data harmonisation and collection

The first step was to carry out consultation meetings with Forestry experts from BANCA and Environmental experts from RCCA to review the baseline knowledge about the vegetation of the study area. At the same time, a GIS database was set up using, as a basis, topographic maps, Landsat satellite images and Digital Elevation Models, alongside many shapefiles coming from the Myanmar Information Management Unit (MIMU), the mapping facility of United Nations operating in Yangon. Combining all the information, a preliminary land cover classification of years 2000-2003 was carried out. The most evident land cover classes were drawn in a map, such as mangrove forests, bamboo brakes, evergreen forests, mixed deciduous forest and agricultural areas. With the same approach, a satellite image dating from 1974 was analyzed using as a primary source of information the knowledge of the past situation of the RCCA expert, eventually producing another draft vegetation map.

Vegetation maps from international organizations, such as the JRC GLC2000 Project, UNEP 2001 Land Use/Land Cover, and ESA Ionia GlobCover, have been retrieved and their accuracy analysed. Unfortunately their spatial accuracy is very low compared to the needs of the present project, and some errors were found in such maps mainly due to the lack of a ground survey. For example, the UNEP 2001 land cover map erroneously classified some areas as covered by coniferous forest that are in fact absent in the study area. Therefore it has been chosen not to use them. Data used in this study are summarised in Table 1.

Table 16 GIS data used

LIST OF GIS DATA USED:
<b>Digital Elevation Models:</b>
Aster GDEM (a product of METI and NASA), 30 m of resolution
<b>Landsat Satellite Images (USGS – NASA):</b>
1) Landsat 7 ETM+, p133r048, Date: 03.03.2000
2) Landsat 7 ETM+, p133r047, Date: 24.02.2000
3) Landsat 7 ETM+, p134r047, Date: 03.03.2003
4) Landsat 1 TM, p143r048, Date: 11.02.1974
<b>Topographic Maps:</b>
Indian Grid IVB, Sheets 85J-85K-85L, Half-Inch to One Mile
<b>Climate:</b>
FAOCLIM database
<b>Shapefiles:</b>
Administrative boundaries, Road network, Hydrology (all from Myanmar Information Management Unit)

### Step 2. Ground truth campaign

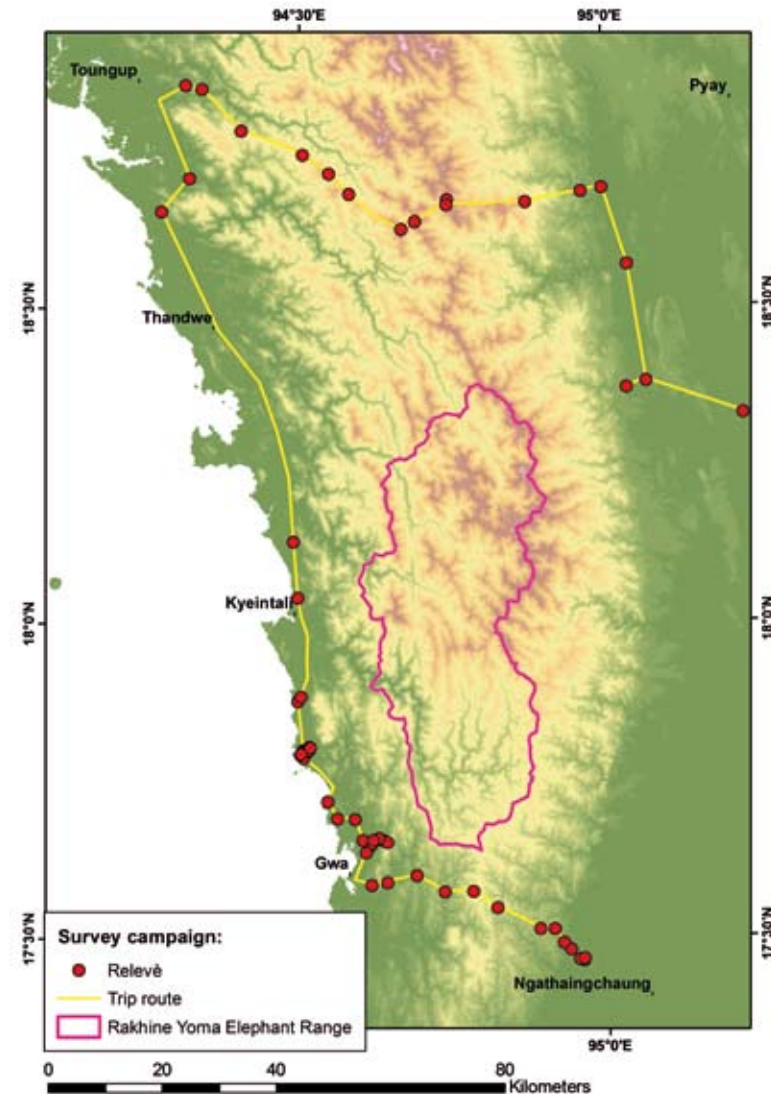
Subsequently, a field trip of five days (from 22nd to 26th March 2010) was organized to collect ground truth data, in order to refine the preliminary classification and define a complete legend of the vegetation types occurring in the area. The map below indicates the route followed by the field team, comprising: a remote Sensing researcher from the University of Milano - Bicocca, a GIS expert from the Istituto Oikos, a forestry expert from BANCA, an environmental expert from RCCA.

During all the stops the following data was collected:

- vegetation type;
- dominant tree species;
- qualitative assessment of the vegetation status;
- observations on morphology, soil and lithology;
- panoramic views of the inaccessible areas;
- observation of the possible vegetation changes in place.

For the last item the local knowledge of the RCCA expert and of all the local inhabitants interviewed was crucial.

**Topography of the Rakhine Yoma and Ground Survey trip route (March 2010)**



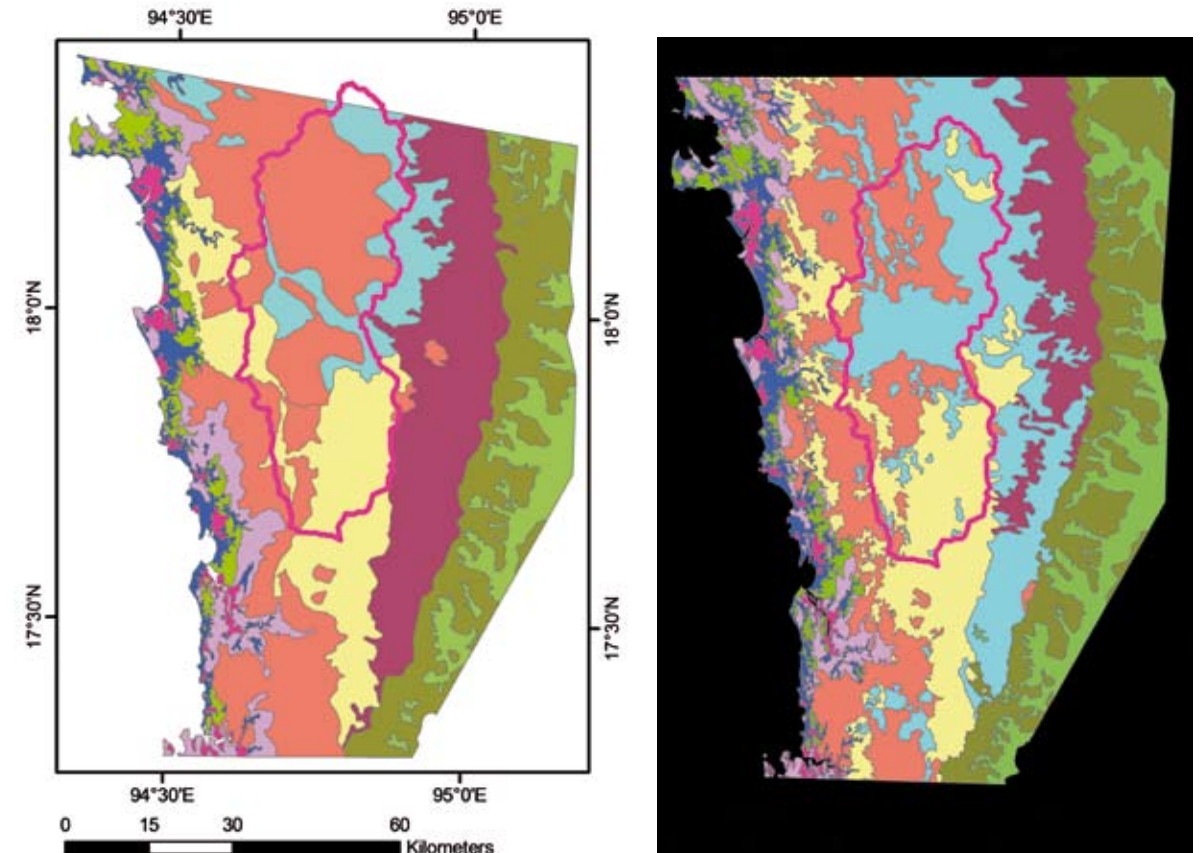
The main constraint of the trip was the lack of roads accessible by vehicles: the team could not enter inside the protected area itself. Paths permitted walking access only to the park border and, in future, it will be useful to plan a walking tour of a few days within the Park, identifying some strategic environmental points/areas. However, all the different regions have been crossed and four main transects have been carried out to cover all the possible situations: one East-West transect in the southern mountain range; one South-North in the coastal area; another one West-East in the northern range; and finally one in the inland valley region. Although the ground-truth of the land cover were collected far away from the PA, satellite multispectral data allowed to derive transfer keys based on multispectral signatures, colour and spatial patterns typical of each land cover and hence to extrapolate the information at regional level.

**Step 3. Land cover maps**

After organizing all the data collected, 10 land cover classes were defined as indicated in the legend below. It was possible to identify the same land cover classes in all the satellite maps utilised for the analysis, with the exception for the 1974 map which do not include category 9 "Plantation and degraded dry deciduous land", that was not yet present in the past.

By means of visual interpretation of satellite images and using the previously described legend the Land Cover map of years 2000-2003 and the Land Cover map of 1974 were drawn up.

**Land cover map of Rakhine area 1974 (left) and 2000-2003 (right)**



**Legend**

- |   |   |
|---|---|
| Bamboo brakes                           | Mangroves forest                              |
| Closed semi-evergreen forest            | Plantation and degraded dry deciduous land    |
| Eastern agricultural areas              | Sparse semi-evergreen forest                  |
| Eastern dry deciduous forest and shrubs | Western Coastal and valley agricultural areas |
| Evergreen forest                        | Western mixed deciduous forest                |

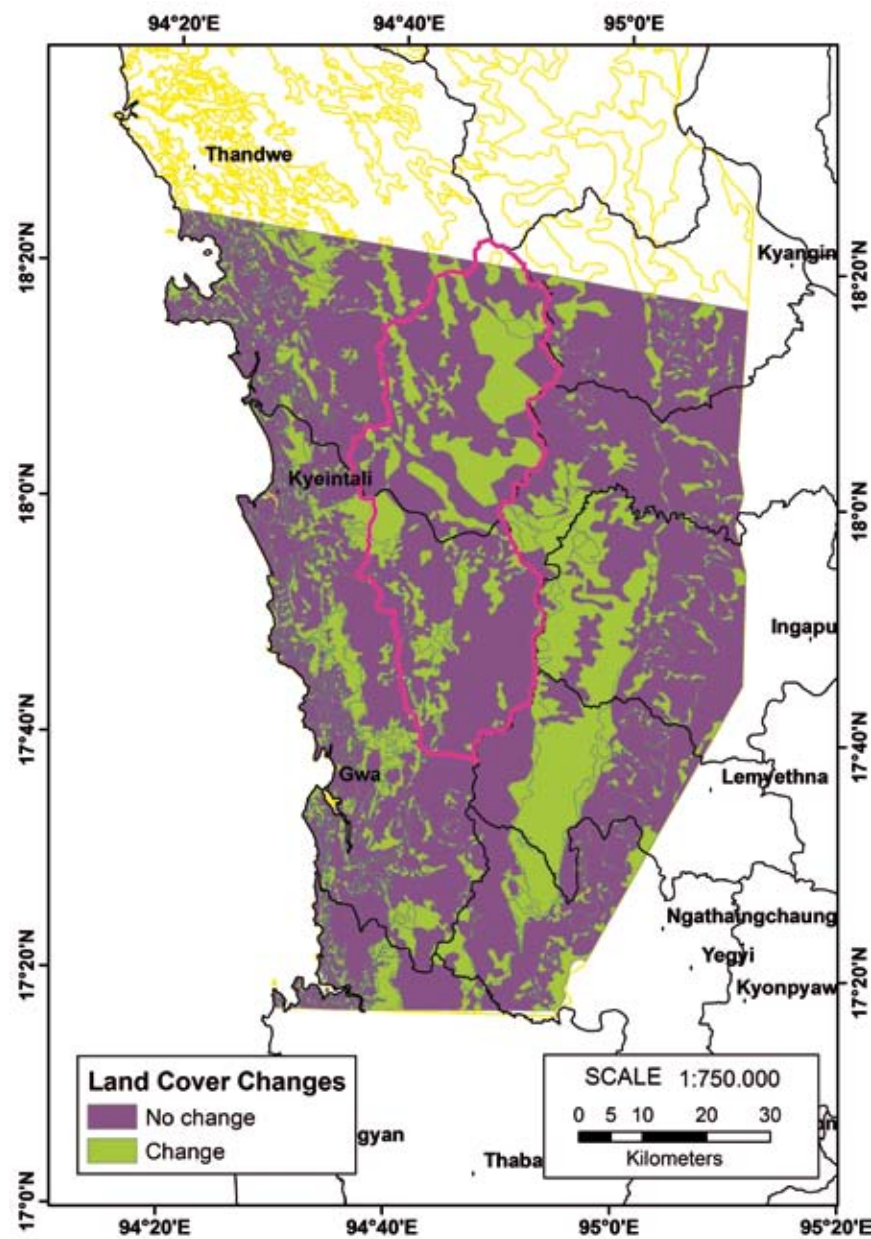
In spite of the technical differences in the maps of different years that make difficult an accurate comparison, the land cover maps from 1974 and 2000-2003 have been overlapped and a spatial analysis has been carried out to underline the areas where changes have occurred. Small changes, less than 1 hectare, have been excluded because are caused probably only by an imperfect overlapping of the maps caused by the technical differences of the dataset of satellite images used.



#### Step 4. Change detection analysis

In order to detect and to evaluate the land cover changes (decreasing and recovering process over time) the multi-temporal Landsat MSS and ETM+ images, acquired respectively on 23 November 1978 and 17 November 2001 at full vegetation cover in the cool season, were initially pre-processed and adopted for a NDVI (Normalised Difference Vegetation Index) Image Differencing algorithm for change detection. Changes were classified into 5 categories such as “increase”, “moderate increase”, “no-change”, “moderate decrease” and “decrease” of NDVI change. A final map illustrating the types of change found in the study area was produced.

Land cover change in Rakhine Yoma Elephant Range WR



## 4.2 Results

### Description of land cover classes

A brief description of each land cover classes is presented, including mention of the causes of degradation.

#### Mangrove Forest

This class can be commonly encountered around the coastal area, principally along the estuaries. Main species are trees such as *Avicennia officinalis* and *Rhizophora spp.* Largely diffused by human activities is the palm *Nipa fruticans*, used for its fibres. Even if their extension is limited as total surface (only 2% of the study area), mangrove forests cover a big portion of the seaside. The importance of this ecosystem for the coastal region is very high in terms of biodiversity, coastal stabilisation, primary production and provision of nursery habitat for marine fish. The main threats to this habitat are the permanent conversion to agriculture or fish nurseries, and the degradation due to over-collection of fuel wood and poles.

#### Western Coastal and Valley Agricultural Areas

This class comprises three different kinds of vegetation: the large agricultural fields situated on the coastal region; the small farms in the narrow valleys of the eastern side of the Rakhine Yoma; the semi-natural dune and beach forests, often substituted with artificial plantation of palm species (such as coconut). The main crops are: dry paddy rice; different kinds of nuts and beans; chilli; tobacco. The surface of this class is around the 4% of the total.

#### Western Mixed Deciduous Forest

This forest type is encountered in the lowest western slopes of the Rakhine Yoma, where the evergreen species are reduced in abundance and mostly only deciduous trees are present: *Xylia dolabriformis* (Pyinkado or Iron Wood), *Lannea grandis* (Nabe), and *Lagerstromea speciosa* (Pynma). Due to their close location to the most inhabited areas of the coastal region, this class is highly threatened by human pressure for timber, fuelwood and housing material. Moreover, as a result of traditional practices of weed and vermin control in the bordering agricultural areas, these forests are usually disturbed by fires. As a result, generally the fertility of this class seems to be severely degraded. Some artificial plantations have been found of *Hevea brasiliensis* (Rubber tree), *Tectona grandis* (Kyun or Teak), and *Xylia dolabriformis*, established mostly more than 10 years ago. The surface of this class is limited, covering only around the 3% of the study area.

#### Closed Semi-Evergreen Forest

An intermediate step between the lowland mixed deciduous woodland and the evergreen forest present at the higher altitude, in this class deciduous and evergreen species are intimately mixed together. The most common species are *Xylia dolabriformis* and *Dipterocarpus spp.* (Kanyin), which are particularly characteristic of this ecosystem and can both form almost pure patches. Other trees occurring are *Lannea grandis*, *Lagerstromea speciosa*, as well as other evergreen species. Bamboos, like *Bambusa polymorpha* (Kyathang Wa), and rattans (*Calamus sp*) are also found. The overall status of these forests seems to be better than the previous Western Mixed Deciduous Forest, although they cover only 4% and are increasingly threatened by human activities such as wood collection and fire disturbances.

### Evergreen Forest

Typical vegetation of the central Rakhine Yoma, these forests are located mainly in the mountainous regions of the study area, covering around 19% of the total. The dominant trees are *Dipterocarpus* spp., but also examples of *Swintonia floribunda* (Taung Theyet), *Michelia champaca* (Sagawa) and *Mesua ferrea* (Gangaw) have been found. Some scattered deciduous trees are present, like *Xylia dolabriformis*, *Lannea grandis* and *Lagerstromea speciosa*. The lower storey is rich in many species, mainly evergreen and bamboos like *Melocanna bambusoides* (Kayin-Wa). The main threats are timber exploitation and shifting cultivation that are causing a dangerous fragmentation and encroachment of this habitat. The overall status of the remaining patches of forests seems to be still good.

### Sparse Semi-evergreen Forest

The identification of this class turned out to be the most difficult due to the high habitat fragmentation. This situation comprises a deeply intermixed mosaic of evergreen trees and deciduous trees, as scattered big examples or small plots, and pure patches of *Melocanna bambusoides*, with different percentages of composition. The process that has led to the creation of this vegetation seems generally the introduction of *Melocanna bambusoides* in the evergreen and semi-evergreen forests, and then the establishment of this aggressive species as pure patches. Totally this class comprises about 22% of the surface.

### Bamboo Brakes

Other typical vegetation of the area, this class covers around 15% of the study area and is dominated by *Melocanna bambusoides*, accompanied by scattered deciduous or evergreen individual trees. This intrusive species has been signaled since 1956 (Chein Hoe 1956) and has the potential to spread to and substitute many other forest types. As the dense growth of this bamboo precludes natural regeneration of most species, the tendency is to produce pure plots of *Melocanna bambusoides*. The flowering of this species occurs in mass after 30-40 years, and then they all wither and die. Other bamboo species present in the region are *Dendrocalamus longispatus* (Talagu Wa), *Gigantochloa macrostachya* (Wa Pyu Gyi) and *Bambusa polymorpha*.

### Eastern dry deciduous forest and shrubs

Due to the low rainfall occurring on the eastern slopes, the vegetation is here formed entirely by deciduous species. Generally the dominant layer is close but not dense, and there is a thick understory of bamboo (*Dendrocalamus strictus* or Hmyin Wa). The main trees found are *Lannea grandis* and *Albizzia procera* (Sit). The area covered by this class is around 12% of the entire study area. Close to the road many evidences of wood collection and over-exploitation have been observed, and the overall status seems to decrease heading more and more to the lowest eastern slopes where the population density is higher.

### Plantation and degraded dry deciduous land

Moving towards the lowest slopes on the east side, the natural dry vegetation becomes highly degraded by over-logging and forest fires. Remaining scattered patches of the so called Indaing forest can be found: the main species present are *Dipterocarpus obtusifolius* (Inbo) and *Dendrocalamus strictus*. Common in the area are large plantations of *Tectona grandis*, established in the last 2 to 3 years, or other tree crops like cashew nuts. This class is covering around 13% of the total. Serious evidences of soil erosion, in forms of both rills and gullies, are widely present. The habitat degradation due to human over-exploitation of natural resources and modification on the natural vegetation cover is high.

### Eastern Agricultural Areas

Differences from its western counterparts come from the diverse topographic location: the valley of the Ayeyawaddy River. Due to the presence of extensive terraces of both alluvial and colluvial material, the size of the farms is usually bigger, with a more homogenous distribution. Main crops are paddy rice, both dry and irrigated, fruit trees, cotton, nuts, palms. The surface of this class is around 6% of the total. Between the fields, some remaining patches of degraded dry deciduous forest are present.

## DESCRIPTION OF VEGETATION COVER CHANGE AND IDENTIFICATION OF MAIN CAUSES OF CHANGE

The overlapping of the land cover maps from 1974 and 2000/2003 has allowed to identify main changes in the vegetation cover of the area.

The conversion from any type of natural vegetation to agriculture areas has been estimated at around 173 km<sup>2</sup> on the Ayeyawaddy valley and 92 Km<sup>2</sup> on the coastal side. This is consistent with the higher rate of agricultural development possible in the lowlands close to the Ayeyawaddy River. An inverse process, still to be analysed, has been the conversion of agricultural or degraded forest areas in mixed deciduous forest: the surface involved has been estimated at 92 km<sup>2</sup>. Also the conversion from Eastern Dry Deciduous Forest to Plantation & Dry Degraded Forest is an indication of the high negative human impact on the eastern slopes. This change has been noted in about 99 km<sup>2</sup>. The lower rainfalls and worst soil conditions could be enhancing the degradation process, giving to the vegetation fewer chances to regenerate properly. The largest change has been identified however in the transformation from any class to the Sparse Semi-Evergreen Forest or Bamboo Brakes (Table 17), evidence of the invasion of *Melocanna bambusoides* in the area. More than 1,455 km<sup>2</sup> has been identified as being subject to this trend. Although the *Melocanna bambusoides* is found naturally in the Rakhine Yoma Elephant Range WR, it has been confirmed from this study that human practices in the area, like shifting cultivation and forest fires, are a cause of first spreading of bamboo in new areas, where later it established itself as pure patches.

1974			2000		
Vegetation class	AREA (Km2)	PERCENTAGE of COVER	Vegetation class	AREA (Km2)	PERCENTAGE of COVER
Bamboo brakes	455	27%	Bamboo brakes	492	29%
Evergreen forest	913	54%	Evergreen forest	508	30%
Sparse semi-evergreen forest	320	19%	Sparse semi-evergreen forest	710	42%

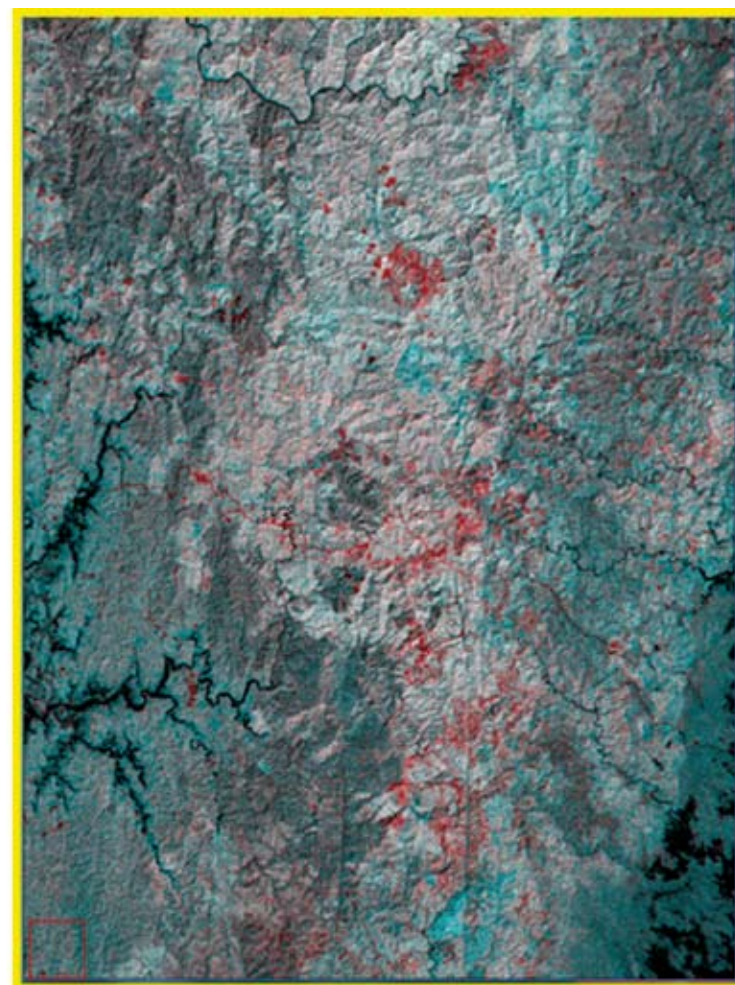
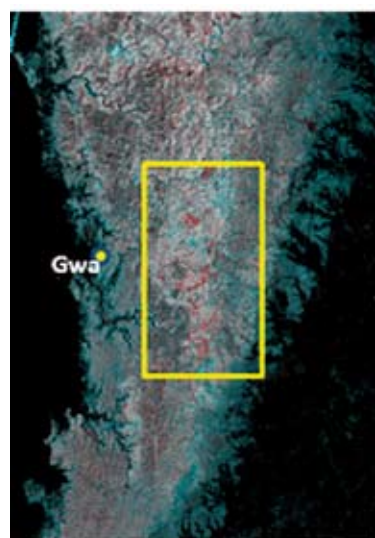
**Table 17** Main changes occurred in the vegetation cover classes from 1974 to 2000 in Rakhine Yoma Elephant Range WR

The main drivers identified during field survey as causes of the vegetation cover changes are: woodlands clearing to establish agricultural fields; conversion of natural vegetation to artificial plantation; fires and shifting cultivation followed by bamboo invasion. In general in the field a general degradation has been observed due to wood over-exploitation and forest fires, higher in the forests close to the lowland inhabited areas than in the highest mountains. This process seems to be severe in both sides, even if it is generally higher on the eastern valley, maybe for differences in climate regimes.

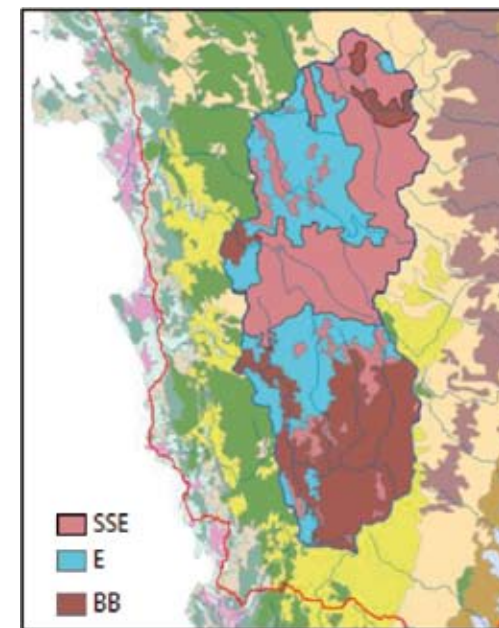
**IDENTIFICATION OF TYPES OF CHANGE**

Figure 5 shows the final map, and a more detailed subset, to illustrate the types of change found in the study area. In Figure 5 the magnitude of increase and decrease of vegetation NDVI is expressed in tones of cyan and red, respectively. Recent road networks, quarries and dams constitute large decrease of vegetation and are easily detected from their spatial pattern. There are also clearly visible negative and positive changes due to clear cutting and regeneration which represent the traditional slash and burn cultivations in hilly and mountainous forest.

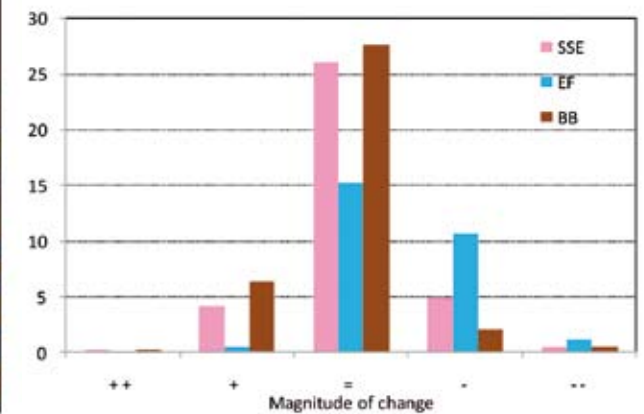
**Vegetation change in Rakhine Yoma Elephant Range WR**



Overall, within the protected area about 70% of surface remain stable in time and this area cannot be considered to be a hot spot of degradation. On the contrary the western and eastern mixed deciduous forest are more affected by damage (prevalently human-induced) with variable intensity and recovering in relation to distance from the coast line and hence to the spatial pattern of rainfall (data not shown). Within the park a net decrease of NDVI of about 10% was however observed from 1974 to 2001. The main land cover found in the area consists of Bamboo Brakes, Evergreen and Sparse Semi-Evergreen forest. Overall, it appears that evergreen forests are subjected to subtle degradation associated to an increase of vigour in bamboo formations.



**NDVI changes for land cover (2000) within the Rakhine Yoma Elephant Range WR**





### 4.3 Conclusions and recommendations

The study has achieved the objectives agreed among stakeholders.

A land cover map representing the different vegetation types covering the Rakhine Yoma Elephant Range Wildlife Reserve and the surrounding areas is now available. Local stakeholders have the possibility to use the maps and data produced during the present activity to conduct future activities and raise awareness on the problems threatening ecosystem and biodiversity in relation to the generation of a protected area.

Overall, it seems that from the 1974 this remote protected area has not undergone major changes in terms of vegetation reduction and cannot be considered as a hot spot of degradation. Generally, human activities are reduced inside the Wildlife Sanctuary compared with the surrounding areas and the vegetation status seems to be better, even if it is subject to fragmentation mainly due to shifting cultivation. Moreover, due to the high impact of the human activities all around the border, also the protected area may be at risk for future encroachment due to agricultural expansion or commercial plantation.

In this context it should be useful to quantify the human-pressure and potential future market which may determine uncontrolled change in the protected area.

As well as the danger of encroachment, also the degradation of the remaining patches of forest owing to over-exploitation of timber, fires started by people and soil erosion seem to be a major concern. Many small landslides have been also detected on satellite images and during field survey, but they have not been quantified. Creation of a buffer zone, accessibility tracks, elephant inventory, spring and water points, should be evaluated in the future in order to generate a strategic and sustainable plan for the development of the PA.

An interesting scientific point would be to evaluate the ecological/biological effect of the expansion of *Melocanna bambusoides*, and to understand how much human activity is enhancing this process. Also the impacts of this process on the wildlife could not be assessed in the present study, but they are nevertheless of critical importance and should be investigated in the future. For example, the population of wild elephants widely feeds on bamboos. At the same time, a population of Hoolock Gibbons (*Bunopithecus hoolock*) seems to be present in the southern fringes of the Rakhine Yoma, and for this monkey large patches of bamboo brakes are a barrier (Pers. comm., Gibbon Project from BANCA). Overall a reduction of greenness was found using the satellite images and, although some trends can be outlined, evergreen forests appear subject to degradation while bamboo formations increase in vigour.

## 5 Conclusion



L. Beffasti

## 5.1 Progress and priorities for Myanmar PAs

The Myanmar protected area system currently includes 35 designated and 8 proposed PAs that were established in the period 1918-2010. The 43 PAs cover 49,500 km<sup>2</sup> which is equivalent to 7.3% of total country area.

PAs fall under five of the seven categories foreseen by the Protection of Wildlife and Wild Plants and Conservation of Natural Areas Law (1994). In particular, 29 PAs are Wildlife Sanctuaries comparable to IUCN category IV (Habitat/Species management area). However, the category description is often inconsistent with the current protection level and restrictions on site.

In spite of Myanmar's long coastline, only 4 out of 43 sites are MPAs. The capacity and resources for marine resources management by park authorities need to be enhanced also by increasing coordination with DOF and universities.

In terms of governance, 22 sites fall under FD and 21 under NWCD. Two experiences of joint governance with private companies in Hlawga Wildlife Park and Hukaung Valley Wildlife Sanctuary present incompatibilities between conservation and economic goals, highlighting the need for coordinated land use planning and a clear and transparent regulatory system. No other forms of joint governance (including transboundary PAs) exist in Myanmar.

The number and the size of Myanmar PAs have increased over the years in a positive trend aimed at the protection of entire ecosystems instead of single species. Nonetheless, some habitats are still underrepresented, in particular beach and dune, mangrove and swamp forests.

The conservation status of most PAs is generally judged good by park staff, i.e. within acceptable range of variation but requires some intervention. Biological resource use, agriculture and human settlements occur respectively in 87%, 47% and 43% of surveyed PAs. Less common threats, such as infrastructure and invasive species, are considered of higher impact on biodiversity conservation.

About half of PAs have partial biodiversity inventories and management or operational plans. In these sites which, interestingly, fall under NWCD governance, monitoring, patrolling and environmental education are implemented regularly despite the inadequate human, technical and financial resources. Absence of infrastructure and staff is reported in 17 sites<sup>16</sup> where no conservation and management actions are systematically implemented.

Twelve out of 43 PAs are listed among Myanmar ecotourism sites but access to 8 of them is difficult and in most cases special permits for foreign visitors are required. Religious tourism occurs in many areas related to the presence of famous Buddhist pagodas. Nevertheless, the presence of tourists is reported more as a threat than as a resource due to the fact that tourist revenues do not directly contribute to support PA management.

Research surveys have been implemented in 65% of sites by national and international organisations and universities as well as by FD staff, without coordinated research programmes. Consequently, information was not always made available to park wardens and data are difficult to compare.

## 5.2 Recommendations

### 1. Review and strengthen the protected area system

- The legal framework of PAs should be rationalised and updated. Existing PAs should be re-categorised according to updated information with emphasis given to the purpose of management. More importantly, objectives need to be realistically achievable in respective sites.
- The protected area system should be strategically expanded to reach the target of 10% of total country area (NFMP 2001) by addressing gaps in coverage of globally threatened species and Key Biodiversity Areas (BLI 2005) as well as wildlife corridors, in full compliance with the rights of indigenous peoples mobile peoples and local communities (Durban Action Plan 2003). Underrepresented habitats, in particular mangroves and swamp forests, should be protected. The constitution of more MPAs is also to be considered a priority.

- PA governance should be enhanced to ensure effectiveness. The coordination of FD/NWCD with other stakeholders is crucial to achieve the management objectives, share costs and benefits, and create long-term support to conservation. Other forms of governance should be piloted, in particular co-managed protected areas (including transboundary PAs) and community conserved areas, to build a flexible and responsive PA system (Borrini-Feyerabend et al. 2004) as recommended by CBD convention ratified by Myanmar in 1994.

### 2. Raise awareness and build capacity for conservation

- Communication and education on the role and benefits of protected areas need to be increased through awareness raising campaign targeting from decision makers to grassroots levels, also using the media.
- Intensified capacity-building of FD staff at local and national level, with special attention to the young generations, is needed to address timely the complex issues related to PA management and secure effective implementation of conservation actions.
- The creation of a platform on conservation and protected areas among policy-makers, practitioners and communities is essential to achieve comprehensive stakeholder participation
- The knowledge at national and international level of natural, cultural and social values of Myanmar PAs should be improved, also through the international designation of PAs (e.g. World Heritage Sites, Biosphere Reserves, Ramsar sites, etc.), to enhance technical, technological, scientific and financial cooperation.

### 3. Improve protected area management

- All PAs should have at least an annual management plan that needs to be site-specific and include a land use plan agreed with local authorities and other relevant stakeholders. In those sites containing cultural heritage premises, human settlements or permanent economic activities, the plan should be sensitive to the spiritual values and contain different management zones. However, the majority of the area should be managed for the primary purpose of the site according to the legal category.
- PAs should be provided with adequate human, technical and financial resources to implement effectively the conservation and management activities foreseen by the management plan. Priority should be given to the 17 under-resourced PAs. The management effectiveness of PAs should be periodically assessed using IUCN procedures.
- An inventory of biodiversity should be compiled in all PAs through the collaboration with academic institutions and NGOs. Procedures for monitoring should be standardised and based on globally-agreed criteria. Checklists should be organized in a database at the central office of NWCD to facilitate information sharing on priority species at national and international level. Information should be periodically sent to the WCPA website and ASEAN Centre for Biodiversity (ACP).
- The human impacts of PAs should be measured in order to identify and implement innovative poverty reduction strategies that can contribute to meet the conservation and development goals. Such mechanisms may include: community forestry, payments for environmental services, fish spillover, ecotourism and protected area jobs.

### 4. Support collaboration and sustainable financing

- Collaboration of PAs with NGOs and universities is essential and needs to be enhanced. In particular, there is a need for coordinated research programmes related to conservation actions. Every site should establish research priorities and researchers should give a copy of their findings to the park warden who communicates to central office.
- A combination of financing mechanisms should be identified to ensure stable revenue sources for PAs, to support the management of the area and the sustainable development of its surroundings. Donor-funded projects in collaboration with INGOs can support the preparation of management plans and/or biodiversity inventories can train the park staff and provide infrastructure and tools. However, a sustainable strategy should create a stable cash flow for management operations through the involvement of all stakeholders benefitting from the ecosystem services provided by the site. Besides grants and donations, PAs could benefit from the development of local businesses (e.g. community-based initiatives, marketing ecosystem services, ecotourism) that are also more flexible to amend based on impacts and needs.

<sup>16</sup> Bumhpabum, Hponkarazi, Kahilu, Kelatha, Kyauk-Pan-Taung, Lenya, Lenya (ext.), Loimwe, Maharmyaing, Mulayit, Par Sar, Pyin-O-Lwin, Shinpinkyetthauk, Tanintharyi National Park, Taunggy, Thamilia Kyun, Wenthtikan.

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## Appendices

### Appendix 1 Major Myanmar Environmental Laws and Policies

Laws and policies are given in chronological order according to the date of approval.

#	Legislation	Year	Purposes/objectives
1	Forest Rules	1856	To regulate teak harvesting (All India, including the then Province of Burma)
2	Elephant Preservation Act	1879	To regulate the capturing of wild elephants
3	Burma Forest Act	1881	To impose law enforcement in forests throughout the country (not applicable to private land)
4	Indian Forest Policy	1894	To ensure maintenance of adequate forest cover for the general well-being of the country, meeting needs of local people and maximum revenue collection.
5	Burma Forest Act & Rules	1902	To impose sustainable management of forests
6	Wild Birds & Animals Protection Act	1912	To protect the fauna (birds and mammals) (applied to all of British India)
7	Burma Village Act	1921	To encourage forest conservation and teak plantation through the establishment of forest <i>taungya</i> villages
8	Burma Game Rules	1927	To establish seasons and bag limits on game birds and mammals (under Burma Forest Act)
9	Wild Birds and Animals Protection Act Amendment	1929	To increase the number of protected species
10	Wild Birds and Animals Protection Act Amendment	1934	To increase the number of protected species
11	The Wildlife Protection Act	1936	To establish wildlife sanctuaries, to designate hunting seasons, and to accord complete and partial protection to mammals, birds and reptiles (except snakes)
12	The Wildlife Protection Act Amendment	1956	To accord protected status to additional wildlife species
13	Burma Forest Act Amendment	1956	To regulate timber harvesting
14	Forest Law	1992	To conserve and manage the forest systematically, and to control timber extraction
15	National Environmental Policy	1994	To enhance the quality of the life of all Myanmar citizens through the integration of environmental considerations into the development process
16	Protection of Wildlife and Wild Plants and Conservation of Natural Areas Law	1994	To protect wild animals and plants, conserve natural areas, and fulfil Myanmar's obligations under international agreements
17	Myanmar Forest Policy	1995	To conserve the environment and biodiversity; to promote sustainable management of natural forests, and to establish forest plantations
18	Forest Rules and Community Forestry Instructions	1995	To regulate sustainable forest management and forest plantations, and promote community participation
19	Myanmar Agenda 21	1997	To promote biodiversity conservation through the involvement of local communities in designing and planning protected area management, gathering data, consultation and decision-making.
20	National Forest Master Plan	2001	To maintain the forest and biodiversity of Myanmar.
21	Rules on Protection of Wildlife, and Protected Area Conservation Law	2003	To establish a procedural framework for the 1994 Protection of Flora and Fauna, and Protected Area Conservation Law
22	National Sustainable Development Strategy	2009	Sustainable management of natural resources, integrated economic development, sustainable social development.

### Appendix 2 Major International Conventions related to protected areas and forest lands signed by Myanmar

Conventions are given in chronological order according to the date of accession (Ac), acceptance (At) or ratification (R) by Myanmar.

International Convention	Place	Year	Date of deposit by Myanmar
Convention for the Protection of the Ozone Layer (Vienna Convention)	Vienna	1988	1993 (Ac)
Protocol on Substances that Deplete the Ozone Layer (Montreal Protocol)	Montreal	1989	1993 (Ac)
London Amendment to the Montreal Protocol	London	1992	1993 (Ac)
Convention for the Protection of the World Cultural and Natural Heritage	Paris	1972	1994 (At)
Convention on Biological Diversity	Rio de Janeiro	1992	1994 (R)
United Nations Convention to Combat Desertification in those Countries Experiencing Serious Drought and/or Desertification, Particularly in Africa	Paris	1994	1997(Ac)
Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)	Bonn	1979	1997(Ac)
United Nations Framework Convention on Climate Change	New York	1992	2003 (Ac)
Convention on Wetlands (Ramsar Convention)	Ramsar	1971	2005 (R)
Copenhagen Amendment to the Montreal Protocol	Copenhagen	1994	2009 (Ac)

### Appendix 3 Key resources supported by PAs as for notification letter

LC=Least Concern, NT=Near Threatened, VU=Vulnerable, EN=Endangered, CR=Critically Endangered

Common name	Scientific name	STATUS Red List	PAs supporting threatened species	Endemic to Myanmar
<b>Reptiles</b>				
Loggerhead Turtle	<i>Caretta caretta</i>	EN	42	
Green Turtle	<i>Chelonia mydas</i>	EN	42	
Salt-Water Crocodile	<i>Crocodylus porosus</i>	LR/LC	23	
Leatherback	<i>Dermochelys coriacea</i>	CR	42	
Hawksbill Turtle	<i>Eretmochelys imbricata</i>	CR	42	
Burmese Star Tortoise	<i>Geochelone platynota</i>	CR	18,24,37	Endemic
Olive Ridley	<i>Lepidochelys olivacea</i>	VU	42	
<b>Birds</b>				
Wreathed Hornbill	<i>Aceros undulatus</i>	LC	32	
Plain-Pouched Hornbill	<i>Aceros subruficollis</i>	VU	17	
Oriental Pied Hornbill	<i>Anthracoceros albirostris</i>	LC	32	
White Bellied Heron	<i>Ardea insignis</i>	CR	8, 9	
Great Hornbill	<i>Buceros bicornis</i>	NT	10	
White-Winged Duck	<i>Cairina scutulata</i>	EN	7,8,9	
Edible Nest Swiftlet	<i>Collocalia fuciphaga</i>	LC	26	
Hooded Treepie	<i>Crypsirina cucullata</i>	NT	10	Endemic
Red Junglefowl	<i>Gallus gallus</i>	LC	31	
White-Rumped Vulture	<i>Gyps bengalensis</i>	CR	10	
Himalayan Vulture	<i>Gyps himalayensis</i>	LC	10	
Slender-Billed Vulture	<i>Gyps tenuirostris</i>	CR	10	
Masked Finfoot	<i>Heliopais personatus</i>	EN	7,8,9	
Burmese Bushlark	<i>Mirafra microptera</i>	LC	10	endemic
Green Peafowl	<i>Pavo muticus</i>	EN	8,9,34	
Gurney's Pitta	<i>Pitta gurneyi</i>	EN	19,20,40	
Grey Peacock Pheasant	<i>Polyplectron bicalcaratum</i>	LC	34	
White-Browed Nuthatch	<i>Sitta victoriae</i>	EN	29	endemic

<b>Mammals</b>				
Red Panda	<i>Ailurus fulgens</i>	VU	14	
Hog Deer	<i>Axis porcinus</i>	EN	5,12,25	
Gaur	<i>Bos gaurus</i>	VU	3, 29, 32,35,37,38	
Banteng	<i>Bos javanicus</i>	EN	22,38	
Takin	<i>Budorcas taxicolor</i>	VU	14	
Golden Jackal	<i>Canis aureus</i>	LC	3	
Serow	<i>Capricornis milneedwardsii</i>	NT	1,3,12,15,16,29,38,39	
Eld's Deer	<i>Cervus eldi thamin</i>	EN	4,5,37	endemic
Wild Boar	<i>Sus scrofa</i>	not threatened	32,36	
Sambar Deer	<i>Cervus unicolor</i>	VU	1,5,16,19,22,26,32,37,38,39	
Dhole (Asiatic Wild Dog)	<i>Cuon alpinus</i>	EN	6,22,36	
Asian Elephant	<i>Elephas maximus</i>	EN	1,3,7,8,9,19,22,35,38, 39,40	
Jungle Cat	<i>Felis chaus</i>	LC	16,22	
Small Asian Mongoose	<i>Herpestes javanicus</i>	LC	6,22	
Western Hoolock Gibbon	<i>Hoolock hoolock (Bunopithecus hoolock)</i>	EN	7,8,9,10,19,32	
Eastern Hoolock Gibbon	<i>Hoolock leuconedys</i>	VU	6,22	
Rhesus Monkey	<i>Macaca mulatta</i>	LC	32	
Sunda Pangolin	<i>Manis javanica</i>	EN	13,19,21,36	
Chinese Pangolin	<i>Manis pentadactyla</i>	EN	31	
Black Musk Deer	<i>Moschus fuscus</i>	EN	14	
Barking Deer	<i>Muntiacus muntjak</i>	LC	5,6,13,16,19,25,26,28, 34,36,37,39	
Red Goral	<i>Naemorhedus baileyi</i>	VU	3,6,14,15,16,29,39	
Clouded Leopard	<i>Neofelis nebulosa</i>	VU	3,16	
Leopard	<i>Panthera pardus</i>	NT	1,3,15,16,28,32,35, 39	
Tiger	<i>Panthera tigris</i>	EN	1,7,8,9,15,28	
Asiatic Golden Cat	<i>Pardofelis temminckii</i>	NT	3	endemic
Wild Boar	<i>Sus scrofa</i>	LC	16,19,22,28,32,36	
Asian Tapir	<i>Tapirus indicus</i>	EN	19	
Lesser Mouse-deer	<i>Tragulus kanchil (javanicus)</i> <i>Tragulus javanicus subsp. Lampensis</i>	LC Unknownn	12,19 17	
Sun Bear	<i>Ursus malayanus</i>	unknown	8,9	
Asiatic Black Bear	<i>Ursus thibetanus</i>	VU	1,8,9,19,21,32,35,38	

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