Philippine Biodiversity Conservation Priorities

A second iteration of the **National Biodiversity Strategy and Action Plan**

FINAL REPORT

DENR-PAWB

CONSERVATION INTERNATIONAL PHILIPPINES

CI PHILIPPINES

BCP-UPCIDS

FINAL REPORT

THE PHILIPPINE BIODIVERSITY CONSERVATION PRIORITIES

A second iteration of the National Biodiversity Strategy and Action Plan

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COVER PHOTOGRAPH:
Kayangan Lake, Coron Island
© Haroldo Castro/CI

ISBN 971-8986-48-0

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SUGGESTED CITATION:
Ong, P.S., L.E. Afuang, and R.G. Rosell-Ambal (eds.) 2002.
Philippine Biodiversity Conservation Priorities: A Second Iteration of the National Biodiversity Strategy and Action Plan. Department of Environment and Natural Resources-Protected Areas and Wildlife Bureau, Conservation International Philippines, Biodiversity Conservation Program-University of the Philippines Center for Integrative and Development Studies, and Foundation for the Philippine Environment, Quezon City, Philippines.

UNIVERSITY OF THE PHILIPPINES
Quezon City

OFFICE OF THE PRESIDENT

MESSAGE

The University of the Philippines is honored to be a part of the Philippine Biodiversity Conservation Priority-setting Program (PBCPP), a pioneering collaborative effort with the Department of Environment and Natural Resources (DENR) and Conservation International (CI).

The PBCPP's value lies not just in having identified the country's priority areas for conservation and the corresponding strategic actions, but also in facilitating the interaction of more than 300 social and natural scientists from more than 100 local and international institutions. The consensus achieved on the 206 priority conservation areas and the five (5) strategic actions is a testament to the capacity of people and institutions to work together and pursue a common objective: the conservation of the country's highly threatened biodiversity.

The results of the PBCPP provide a framework from which research and development and an extension program for biodiversity conservation can be designed. The rich materials that were produced in the process of the PBCPP form the content from which books and other teaching materials will be developed. We therefore commit to make the PBCPP results an integral part of the university's commitment to excellence in teaching, research and extension. We will also take the lead in promoting the results of the PBCPP within the academic community, beginning within the UP System, and extend this to other strategic partners in the different branches of government and the business community as well. Likewise, we will pursue the relationships forged during the PBCPP, particularly in the formation of a mechanism, the Network for Nature (N4N), which will coordinate the national and global efforts to save Philippine Biodiversity.

The causes of biodiversity loss are complex in nature and often interrelated, particularly in the socioeconomic and political context of the Philippines. Hence, there are no simple solutions, but the PBCPP is a starting point. Together with DENR and CI, we look forward to the implementation of the PBCPP results and struggle for the conservation of our biodiversity.

FRANCISCO NEMENZO
President

TO THE READER

This report presents the consensus of more than 300 expert scientists and decision-makers from more than 100 local and international institutions, on the most biologically important areas in the Philippines. The intent of the report is to present the results of the Philippine Biodiversity Conservation Priority-setting Program (PBCPP) in order to influence conservation and development planning throughout the Philippines.

The PBCPP is a second iteration of the National Biodiversity Strategy and Action Plan (NBSAP) prepared by the Department of Environment and Natural Resources (DENR) in 1997. The results contained herein are intended for policy and decision-makers within the government and the private sector, as well as for activists, scientists, and research institutions.

This report provides the biological justification and recommendations for geographic areas in need of conservation. Preservation of these areas is a prerequisite if the wholesale extinction of Philippine biodiversity is to be averted. The information in this document is based on decades of combined field experience, expert opinion, and two years of data accumulation, processing, analysis and consensus-building.

The PBCPP is a rich source of material for the planning and enhancement of research and development programs, information, education and communication campaign materials and training materials, among others. The supporting species and geographic information gathered during the process and documented for each of the priority areas, as well as supplemental information on the process and its participants, are available on CD-ROM from any of the program convenors' offices.

In using the maps, please take note that the numbering of the maps reflects all the integrated conservation priority areas (number 1 - 170 for terrestrial and inland waters and number 171- 206 for the marine areas) and all the thematic priority areas (number 207 - 283 for terrestrial and inland waters and number 284 - 412 for the marine areas). Thus, two numbers may refer to similar named areas because these refer to integrated conservation priority areas and thematic priority areas (e.g., number 14 refer to the Northern Sierra Madre Natural Park while 211 refer to the Northern Sierra Madre). Hence, the shapes and sizes of the areas referred to varies as this reflects the areas that each working group has identified for their taxa or ecosystem.

The report is organized into five main sections. Chapter One provides background information on Philippines' biodiversity and conservation initiatives in the country; Chapter Two explains the methodology employed throughout the priority-setting process; Chapter Three presents the results and maps; and Chapter Four provides a discussion and analysis of the results, and Chapter Five discusses the recommendations for their implementation.

ACKNOWLEDGEMENTS

The Philippine Biodiversity Conservation Priority-setting Program (PBCPP) was convened by the Department of Environment and Natural Resources- Protected Areas and Wildlife Bureau (DENR- PAWB), the Biodiversity Conservation Program of the University of the Philippines' Center for Integrative and Development Studies (BCP-UPCIDS), and Conservation International Philippines (CI Phil).

The PBCPP was the product of collaborative work among more than 300 people from more than 100 local and international institutions. A complete list is available in the accompanying CD-ROM. Nevertheless, we acknowledge the following partner institutions for their unstinting commitment in making the PBCPP a success: Center For Applied Biodiversity Science at CI (CABS-CI), Wildlife Conservation Society of the Philippines (WCSP); Environmental Science for Social Change (ESSC); HARIBON Foundation; the Philippine National Museum (PNM); Philippine Council for Agriculture, Forestry, Natural Resources, Research and Development (PCARRD) and the Philippine Council for Aquatic and Marine Resources, Research and Development (PCAMRD) of the Department of Science and Technology (DOST); Cebu Biodiversity Conservation Foundation (CBCF); Philippine Eagle Foundation (PEF); World Wide Fund for Nature - Philippines (WWF-Phils); International Council for Living Aquatic Resources (ICLARM); various units of the University of the Philippines System (Diliman, Los Baños, Baguio, Visayas, and Mindanao), especially the Institute of Biology and Marine Science Institute in U.P Diliman and the Institute of Biological Sciences and Environmental Remote Sensing and Geo-Information Laboratory in UP Los Baños (ERSG-UPLB); Leyte State University (LSU); Central Mindanao University (CMU); De La Salle University-Dasmariñas; Environment Management Bureau (EMB) and the Laguna Lake Development Authority (LLDA) of the DENR; South East Asian Fisheries Development Authority (SEAFDEC); Resources, Environment and Economics Center for Studies, Inc. (REECS); Shell Philippines Exploration (SPEx); Pilipinas Shell Foundation, Inc. (PSFI) and Bookmark.

A core team of tireless members worked through the 30-month process to ensure that our collaborative efforts resulted in quality products. The team consisted of the following people:

Working Group Leaders: Daniel Lagunzad (Plants), Victor Gapud (Arthropods), Arvin Diesmos (Amphibians and Reptiles), Neil Aldrin Mallari (Birds), Blas Tabaranza, Jr. (Mammals), Adelina Santos-Borja (Inland Waters), Porfirio Aliño (Marine), and Rowena Reyes-Boquiren (Socio-economics).

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CI Philippines Program: Perry Ong, Leticia Afuang, Oliver Coroza, Ruth Grace Rosell-Ambal, Liza Valenzuela, Nancy Ibuna, Joy Navarro, Connie Morales, Rhea Ledesma, Rosemarie Tandang, Rosheila Rodriguez, Michael de Guia and Angelito Arjona.

Scientific Advisers: Prescillano M. Zamora, Lawrence R. Heaney, and John MacKinnon.

Conservation International (CI) Support Group: Silvio Olivieri, Carly Vynne and Paul Burgess (Global Strategic Planning Department of the Center for Applied Biodiversity Science at CI); Kirk Talbott, Peter Kristensen, Wendy Tan, Irene Mugizi, Lela Gibbs, Michelle Han, and Rick Slade (CI Asia-Pacific Program); Iwan Wijayanto and Ermayanti (CI Indonesia Program).

The PBCPP benefited from the generous support of the United States Agency for International Development (USAID) project #0348-0039, the Asian Development Bank (ADB), Critical Ecosystems Partnership Fund (CEPF), the United Nations Development Program (UNDP), Foundation for the Philippine Environment (FPE), HARIBON Foundation for the Conservation of Natural Resources (HARIBON), ASEAN Regional Center for Biodiversity Conservation (ARCBC), First Philippine Conservation Inc. (FPCI), SIEMENS, INTEL Corporation, and First Philippine Holdings Corporation (FPHC).

Photo Credits

The PBCPP convenors would like to thank the following individuals and organizations for permission to use their photographs in this publication. Page numbers are listed after every description of the photograph.

Tamaraw Falls, Puerto Galera, Oriental Mindoro: xii - **Leticia E. Afuang**; Philippine ironwood (*Xanthosthemon* sp.): 80, Boat in Bicobian Bay, Divilacan, Isabela: 11, Tagbanua, Coron Island: 55, Calamian deer (*Axis calamianensis)*: 1 & 67, and Pitcher plant (*Nepenthes* sp.): 57 - **Haroldo Castro**; Tree frog (*Rhacophorus pardalis*): 48, Polillo false gecko (*Pseudogecko smaragdinus)*: 2, and Pit viper (*Trimeresurus* sp.): 8 - **Arvin Diesmos**; Green sea turtle (*Chelonia mydas*): 69 - **Andrew Drake**; Dumagat woman weaving: 21 and White-bellied woodpecker (*Dryocopus javensis)*: 44 - **Mariano Roy Duya**; Rufous paradise flycatcher (*Terpsiphone cinnamomea*): 71 - **Kate Hampson**; Cloud rat (*Phloeomys pallidus)*: 46 - **William Oliver**; massive *Lobophylla sp.* coral, Calamianes Islands: 51, Reef fish (*Chromis sp.*), Calamianes Islands: 52 - **Tim Werner**; Walking stick (*Sungaya inexpectata*): 26 and (*Stenobrimus tagalog*): 68 - **Oliver Zompro**; Philippine eagle (*Pithecophaga jefferyi*): 24 - **F.R.E.E. Limited.**

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LIST OF ACRONYMS

ADB	Asian Development Bank
ARCBC	ASEAN Regional Center for Biodiversity Conservation
BMS	Biodiversity Monitoring System
BFAR	Bureau of Fisheries and Aquatic Resources
CBD	Convention on Biological Diversity
CI	Conservation International
CITES	Convention on the International Trade in Endangered Species of Flora and Fauna
CMU	Central Mindanao University
CPA	Conservation Priority Area
CPP	Conservation Priority-setting Process
CPPAP	Conservation of Priority Protected Areas Project
CRMP	Coastal Resource Management Program
DA	Department of Agriculture
DAO	Department Administrative Order
DENR	Department of Environment and Natural Resources
DOST	Department of Science and Technology
DOT	Department of Tourism
EBA	Endemic Bird Area
ERDB	Ecosystems Research and Development Bureau
ERDS	Ecosystems Research and Development Service
ESSC	Environmental Science for Social Change
EU	European Union
GIS	Geographic Information System
IBA	Important Bird Area
ICLARM	International Center for Living Aquatic Resources Management
IEC	Information, Education and Communication
IUCN	International Union for the Conservation of Nature and Natural Resources
LGU	Local Government Unit
LRC	Legal Rights and Natural Resources Center, Inc.
MSI	Marine Science Institute
MSU	Mindanao State University
M & E	Monitoring and Evaluation
NAST	National Academy of Science and Technology
NBSAP	National Biodiversity Strategy and Action Plan
NEDA	National Economic and Development Authority
NGO	Non-Governmental Organization
NIPAP	National Integrated Protected Areas Programme
NIPAS	National Integrated Protected Areas System
NORDECO	Nordic Agency for Development and Ecology
NSMNP	Northern Sierra Madre Natural Park
N4N	Network for Nature
PA	Protected Area
PAMB	Protected Area Management Board
PAWB	Protected Areas and Wildlife Bureau
PAWD	Protected Areas and Wildlife Division
PBCPP	Philippine Biodiversity Conservation Priority-setting Process
PCARRD	Philippine Council for Agriculture, Forestry, and Natural Resources Research and Development
PCAMRD	Philippine Council for Aquatic and Marine Resources Research and Development
PCSD	Philippine Council for Sustainable Development
PO	People's Organization
PPDO	Provincial Planning and Development Office
RA	Republic Act
RDC	Regional Development Council
R & D	Research and Development
SAGUDA	Sagipin ang Gubat at Dagat
UNDP	United Nations Development Programme
UP	University of the Philippines
USAID	United States Agency for International Development
WGL	Working Group Leader
WCSP	Wildlife Conservation Society of the Philippines
WWF	World Wide Fund for Nature

Note: This list includes acronyms only mentioned in the text of this Report. A complete list of acronyms used throughout the PBCPP is available in the accompanying CD-ROM

FOREWORD

The Philippines is one of the 17 biologically richest countries in the world. More than half of the biodiversity in the Philippines is found nowhere else on earth. Yet few people, including most Filipinos, are aware of the vast richness of biological treasures found in the Philippine Archipelago. Unfortunately, without immediate action, this biological wealth is threatened with destruction. Hence, the country finds itself in the midst of a biodiversity crisis with unimaginable consequences – the loss of its rich biological heritage.

The Philippines lost more forest in the last 50 years of the 20th century than in the preceding 450 years. As a people, we have sometimes regarded environmental issues as a luxury that we as a society cannot afford because the need to alleviate poverty takes precedence. More than ever, the effects of the biodiversity crisis are now intertwined with the well being of our people. As floods and landslides wreak havoc on our daily lives, whether it is in Mindanao, the Visayas or Luzon, we are reminded of the connectivity between a healthy environment and a healthy society. The costs attributable to the biodiversity crisis range from the billions of pesos lost in the destruction of crops and homes, roads and bridges, and the loss of human lives. The impact of the destruction does not discriminate between rich and poor but further exacerbates the pervasive poverty amongst the Filipino people. When these human-caused catastrophes occur, people start asking how these can be prevented in the future. An often-cited reason is the lack of information and scientific data to guide policy makers in making informed decisions to confront the biodiversity crisis and its devastating impacts. The recently concluded Philippine Biodiversity Conservation Priority-setting Program (PBCPP) was a critical first step toward finding solutions to the biodiversity crisis. The PBCPP clearly identified actions to take and areas on which to focus our efforts.

One of the major lessons from the PBCPP is that strategic stakeholders, from the scientific community, the government, the non-governmental organizations, the private sector and the donor community, can work together and arrive at a consensus on the country's priorities to conserve biodiversity. The process was not easy, but its outputs now effectively demonstrate that it can be done. In the end, when species lists are completed, maps of priority areas are drawn and conservation priorities are established and finalized, the responsibility of making these priorities a reality lies with the Filipino people.

The partnerships, alliances, and relationships built and developed in the past two years are the cornerstones from which the implementation of the PBCPP results will be based. Transforming these partnerships and alliances into a functional mechanism, known as the Network for Nature (N4N), will help to ensure the implementation of the PBCPP results and will be another milestone in our continued struggle to conserve Philippine Biodiversity.

The urgency of the biodiversity crisis cannot be over emphasized. We simply are running out of time and must take action now. We also should bear in mind that our actions in the past have not been commensurate to the scale of the crisis at hand. "Business as usual" will not save us from the consequences of an environmental collapse or a species extinction crisis from which the Philippines cannot recover.

It is our fervent hope, given the socio-economic-political context in which the cause of biodiversity conservation finds itself, that we as a people and as a species must be moved into action before the point of no return is reached. Given the urgent need to address poverty issues, we firmly believe that poverty alleviation will not be possible if it does not include a sound biodiversity conservation framework. The development paradigm of the 20th century clearly was not effective and has led to the destruction of the environment and the loss of biodiversity. This paradigm must be recast in a new light - we simply cannot afford otherwise, as we are running out of options. The results of the PBCPP present an option that we cannot ignore. The decision is in your hands.

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Republic of the Philippines
DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES

MESSAGE

The Philippines is recognized as one of the 17-megadiversity countries that collectively claim within their boundaries two-thirds of the earth's biological diversity. However, the country is also known as one of the "hotspot areas" where biodiversity is under constant threat from over-harvesting, pollution, over-population, and poverty. The commercial and social demand for the terrestrial and coastal resources of the Philippines has resulted in high rates of biodiversity loss.

In 1992, the government of the Philippines became one of the contracting parties to the Convention on Biological Diversity at the UN Conference on Environment and Development in Rio de Janeiro. In fulfillment of the government's subsequent obligation to the Convention, a comprehensive assessment of the Philippines' biological diversity was undertaken and problems, pressures, issues, and gaps in the knowledge relating to the Philippines' biodiversity were identified. Using this information, a National Biodiversity Strategy and Action Plan (NBSAP) was formulated in 1997. This action plan sets forth the concrete policy and management measures for developing programs and projects that would address pressing issues and concerns in biodiversity conservation and management.

In the last decade, the number of programs and projects devoted to biodiversity conservation in the Philippines has increased. Protected areas are being established throughout the country. In spite of these tireless efforts, very little improvement on the status of Philippine Biodiversity is apparent. This does not necessarily imply, however, that efforts are going to waste. Rather, this could be interpreted, as a failure to direct efforts to where they are needed most. Hence, there is a need to identify a mechanism that allows determination of conservation priorities.

The results of the Philippine Biodiversity Conservation Priority-setting Program set forth the much-needed direction for the Philippine conservation community as a whole. It also makes available geographical and biological information on areas that need urgent attention. This information can be used by policy makers in preparing a rational action plan and investment in biodiversity conservation in the Philippines.

I congratulate the convenors of this activity. This effort not only demonstrates a timely response to the country's conservation needs but also exemplifies success through true partnership and cooperation. The participation of government agencies, academics, the private sector, international and local non-governmental organizations, people's organizations, and donors has given this priority-setting process a unique breadth of perspectives, expertise and acceptability.

Again, congratulations and let us continue to work together to save the endangered Philippine Biodiversity.

HEHERSON T. ALVAREZ
Secretary

CONSERVATION INTERNATIONAL

MESSAGE

The island nation of the Philippines is a very special place in terms of global biodiversity. It is one of the world's top 17 megadiversity countries, and is actually the second smallest country on this important list (after Ecuador), harboring an enormous concentration of life forms per unit area. Indeed, it is eighth on the world list of endemic plants, fifth in endemic birds, fifth in endemic mammals, eighth in endemic reptiles, and ninth in overall non-fish vertebrate endemism. Percent endemism is even more impressive, with nearly half of all vertebrate species and three-quarters of all plants being found nowhere else, which is almost unheard of for a country of only 300,780 km^2; it ranks as a global priority on these criteria alone.

The Philippines is also one of the most heavily impacted of the biodiversity hotspots, with more than 93% of its original natural vegetation already gone. The situation is especially severe in several smaller islands like Cebu, Negros, Bohol, and Camiguin to name a few, where only the tiniest of fragments of forest remain, many of them of great global value for biodiversity conservation. Not surprisingly, the Philippines contains one of the highest concentrations of Critically Endangered and Endangered species on Earth. The country ranks second on the world's bird list, with a terrifying 25 species in these two threatened categories, while for mammals it is fifth on the world list. This combination of very high endemism, presence of a large number of threatened species, and high overall degree of threat makes the Philippines one of the "hottest of the hot" and, in the opinion of many, the highest priority hotspot on Earth.

In terms of protection, the Philippines already have a number of protected areas, estimated to cover about 25,995 km^2, or 8.7% of the country's area. Although each protected area in existence is very important, much more needs to be done. For example, a study carried out by BirdLife International and Haribon Foundation indicated that existing protected areas under the National Integrated Protected Areas System (NIPAS) covered only about 62% of the 117 important bird areas (IBAs) in the country. Clearly, a series of immediate actions are required. Existing areas need to be more effectively protected, new areas need to be created while the opportunity still exists, and those species most at risk of extinction need very special attention. If this does not happen in the very near future, there is a great risk that the Philippines will be the site of one of the first major extinction spasms of the 21st century.

In light of all this, Conservation International (CI) is very pleased to have been one of the convenors of this important activity, the Philippine Biodiversity Conservation Priority-setting Program (PBCPP). CI is committed to maintaining the full diversity of life on Earth, and believes that no species and no critical habitat should be allowed to disappear. CI has adopted a strategic approach that focuses on the hotspots, and works with stakeholders at all levels within these very special places to identify the species, the areas, and the conservation corridors most critical to this process. The PBCPP is such an approach that sought to lay the strongest possible scientific underpinning for all future conservation actions. The PBCPP national workshop, held from Dec. 4 to 8, 2000, was one of the most successful and most comprehensive to date, which involved 200 specialists from more than 70 national and international institutions. The results are geographically explicit, scientifically sound, and supported by the strongest possible documentation. They are presented in a way that will be of maximum utility to the government as it implements its National Biodiversity Strategy and Action Plan.

Conservation International is committed to the Philippines and has been present in the country since 1990. We believe that it is possible to change the course of conservation history in this critically important hotspot, and want to do everything possible to facilitate the process of protecting more key habitats and strengthening the capacity of the Philippines to carry out this process in the future. We very much hope that the very successful mobilization of the conservation community that took place through the PBCPP will make a major contribution to the maintenance of biodiversity in the Philippines. And we remain committed to help in the implementation of the program's recommendations to the maximum extent possible.

Russell A Mittermeier

RUSSELL A. MITTERMEIER
President

PHILIPPINE BIODIVERSITY CONSERVATION PRIORITIES

A second iteration of the National Biodiversity Strategy and Action Plan

EXECUTIVE SUMMARY

THE GLOBAL SIGNIFICANCE OF PHILIPPINE BIODIVERSITY AND ITS IMPORTANCE TO PHILIPPINE SOCIETY

Biodiversity is the foundation of healthy and functioning ecosystems, the fountains of opportunity for all people. Rich soils, clean air and water, abundant forests - the complexity of nature and the myriad of species it supports - are essential for stable and thriving societies.

The Philippines is one of the most important countries in the world for conserving diversity of life on Earth. It is one of 17 megadiversity countries, with more than 52,177 described species, of which more than half are found nowhere else in the world. As such, Philippine biodiversity forms part of our global heritage. However, less than six percent of the country's original forest cover remains while 418 species are listed in the 2000 IUCN Red List of Threatened Species making it one of 25 global biodiversity hotspots.

The Philippines is one of the few countries in the world that is both a megadiversity country and a biodiversity hotspot. Per hectare, the Philippines probably harbors more diversity of life than any other country on Earth. This biodiversity also is under tremendous threat of total destruction. Therefore, every parcel of land that is converted, cultivated, or developed translates into the loss of unique life forms. The destruction of our original forests, freshwater, and marine ecosystems have led to an unmatched biodiversity crisis in this globally important country.

The impact of the biodiversity crisis in the Philippines now is felt more than ever. The costs attributed to the biodiversity crisis range from the billions of pesos lost in the destruction of crops and fisheries, homes, roads and bridges, to the actual loss of human lives. The effects of the destruction do not discriminate between rich and poor but further exacerbates the pervasive poverty amongst the Filipino people. Only when environmental concerns, particularly biodiversity conservation, are included in the development equation will poverty eradication programs have long lasting impacts and be sustainable. The Philippine Biodiversity Conservation Priority-setting Program (PBCPP) results provide a decision framework on which development programs should be anchored. The foundation of sustainable development is the conservation of biodiversity.

With responsible stewardship for the remaining natural systems and the associated species assemblages, Filipinos will be able to continue to enjoy the great diversity of natural resources and their benefits and services. There is a small window of opportunity in which it is still possible to save this global hotspot from complete devastation and the unique life forms found within from extinction. The PBCPP represents a critical first step into taking advantage of this opportunity.

CONSERVATION PLANNING, THE NBSAP AND THE PBCPP

The nature of the Philippine Archipelago has allowed for the evolution of many unique and restricted range life forms. Preservation of these life forms requires a comprehensive plan to ensure representation of all species across the nation. Because each forest remnant may harbor species found nowhere else on Earth, the Philippines cannot afford a "triage approach": conserving an area in one place at the expense of losing precious tracts of land elsewhere. A comprehensive conservation plan for the Philippines must include a protected area (in the general sense) in every center of biodiversity within the archipelago - indeed skipping an island in one location may be equivalent to losing an entire country's biodiversity elsewhere.

Previously, national-level biodiversity plans were based on limited supporting scientific information or knowledge. An effective and implementable biodiversity action plan must be based on the best available scientific information. In 1997, the Philippines, through the DENR, developed and adopted its National Biodiversity Strategy and Action and Plan (NBSAP) in an attempt to address the country's biodiversity crisis. However, new information, approaches and analysis from various initiatives such as the Terrestrial Ecoregions of the Indo-Pacific Project by World Wildlife Fund - US Conservation Science Program, the Key

Conservation Sites in the Philippines by the Haribon Foundation and BirdLife International, Conservation International's Megadiversity and Biodiversity Hotspots analysis, indicated that there was a need to revisit the NBSAP. Thus, the PBCPP was designed and implemented with the intention of becoming the second iteration of the NBSAP. At the same time, it was recognized that if such a plan was going to be effective, then a new culture of collaboration among conservation practitioners from a wide spectrum of stakeholders was essential. To address these concerns, the Department of Environment and Natural Resources-Protected Areas and Wildlife Bureau (DENR-PAWB), University of the Philippines (UP), and Conservation International Philippines (CI Phil) convened the PBCPP.

The PBCPP sought to put in place a centralized database of knowledge drawn from experts' knowledge and experience as well as from available published information. This was then used to delineate geographically explicit priority areas for conservation. Planning for avoidance of species extinctions in the Philippines requires putting together a series of land use plans, from the national to the local level. The information generated by the PBCPP is the best available to-date and will be a useful tool to guide these plans.

More than 300 natural and social scientists from more than 100 local and international institutions representing the government, the NGO community, academia, people's organizations, donor communities, and the private sector were mobilized. Collectively, these specialists represented the best available knowledge on Philippine biodiversity. The results and recommendations of this report are supported by the broad-based consensus achieved during the priority-setting process.

RESULTS OF THE PBCPP

The results of the Philippine Biodiversity Conservation Priority-setting Program (PBCPP) represent the national consensus of the country's foremost experts in the biological and social sciences on the priorities and strategies for conserving Philippine biodiversity. The PBCPP key outputs include: (1) re-assessment and updating of the terrestrial and marine biogeographic regions, (2) identification of 206 biodiversity conservation priority areas, (3) identification of five strategic actions needed to be implemented in the conservation priority areas, (4) identification of marine and terrestrial biodiversity corridors, and (5) state of the art assessments for each thematic group.

Sixteen terrestrial biogeographic regions were delineated, which effectively updated the Philippine biogeographic regions first published by the DENR in the National Biodiversity Strategy and Action Plan. These regions were defined based on the distribution patterns of vascular plants, arthropods, amphibians, reptiles, birds, and mammals. Similarly, the Marine Working Group also delineated six marine biogeographic regions, which were based on the connectivity and the dispersal features of ocean circulation with broad transition zones based on the evolutionary geology of the archipelago and observed associated reef fish assemblages. The biogeographic regions were used as one of the bases for identifying conservation priority areas to ensure representativeness.

Analyses of data from five taxon-based thematic groups (plants, arthropods, amphibians and reptiles, birds, and mammals); two ecosystem-based groups (inland and marine waters); and one socio-economic group resulted in the identification of 206 biodiversity conservation priority areas of which 170 are terrestrial and 36 are marine areas. The taxon- and ecosystem-based thematic groups identified biologically important areas by using a set of agreed-upon criteria. These were integrated with the outputs of the socio-economic group to identify the conservation priority areas. Priority levels were also assigned for each area which includes for the terrestrial priority areas: Extremely High Urgent (EHu) and Extremely High Critical (EHc), Very High (VH), High (H), and Insufficient Data (ID); and, for the marine areas: Extremely High (EH), Very High (VH), and High (H). ID priority level for terrestrial areas are biologically important areas with absent or insufficient data on socio-economic pressures.

Five strategic actions were also identified and enumerated below to ensure that the Philippine biodiversity crisis is addressed. These strategic actions fine-tuned five of the six strategic actions prescribed in the National Biodiversity Strategies and Action Plan published by DENR in 1997. The following actions should be pursued to ensure that conservation in the 206 PBCPP priority areas is successfully implemented and should be taken in concert, rather than independently.

Harmonize Research with Conservation Needs

Information on Philippine biodiversity is limited, incomplete, and scattered among various institutions and individuals. Another major gap in conserving the country's biological diversity is a lack of baseline

information. Existing information is outdated and the status of previously recorded species needs updating in terms of their biology, distribution, and abundance. Only by continuing inventory work will the "empty forest syndrome" be monitored. If species begin to disappear from existing forests, appropriate and immediate actions can be undertaken.

Harmonization of research with conservation needs can be undertaken by addressing gaps in existing knowledge. This includes conducting basic research and linking formal sciences and indigenous knowledge systems. The role of academe in establishing data generation infrastructure, capacity building, and institutionalization of biodiversity conservation should be highlighted. Because it is a good measure of the quality of conservation work, and is a means to develop further research capacity, the importance of scientific publication also should be emphasized.

The 418 threatened species listed on the 2000 IUCN Red List and the 206 priority areas provide a rich source of materials for biological studies that are immediately relevant to conservation. These threatened species and priority areas should form the framework of future research and development projects in biodiversity conservation as well as conservation goals agreed upon by relevant stakeholders.

Enhance and Strengthen the Protected Area System

The most effective way of conserving biodiversity is through the protection of habitats. The National Integrated Protected Areas System Act or NIPAS (R.A. 7586) is a measure that can help ensure protection and should be strengthened. However, in Philippine society, there are local communities and indigenous people living in and around protected areas. Concerns of local communities and indigenous peoples over security of land tenure and access to resources should be addressed with compassion and in such a way that is consistent with conservation goals.

The existing protected areas system needs to be expanded to include new areas identified during the PBCPP. At the end of 2001, the DENR recognized 244 protected areas under NIPAS, of which 132 protected areas overlapped with identified priority areas. Fifty-two of these areas that overlapped were established through presidential proclamations and legislative actions as protected areas while for the remaining 80, the necessary processes needed for inclusion as part of the NIPAS framework are being completed. The boundaries of the 132 priority and protected areas that overlapped should also be re-assessed to include the appropriate areas in need of protection, since in its current form, some portions of the recognized protected areas do not include areas of high biological significance.

An assessment of the remaining 112 NIPAS components not overlapping with the conservation priority areas is necessary to determine if their value as protected areas is warranted. If needed, these areas can be replaced by the 108 biologically important areas identified by the PBCPP that are currently outside the system. It is highly recommended that PBCPP priority areas be included in the NIPAS or as critical wildlife habitats under the Wildlife Resources Conservation and Protection Act (RA 9147) or, alternatively, be protected under any other existing legal framework that can ensure their protection and proper management.

The improvement of the protected area management system should focus on the strengthening and building capacity of protected area managers. Management programs should be participatory in nature, with local communities involved and informed of all activities to be undertaken. The Protected Area Management Board (PAMB) also should be strengthened and the participation of its members maximized. The limited effectiveness and inadequacy of the NIPAS also is partly attributable to limited institutional support and allocation of resources.

Institutionalize Innovative and Appropriate Biodiversity Conservation Approaches: The Biodiversity Corridors

Biodiversity corridors are large, interconnected networks of protected areas and the surrounding landscape and are established to protect and conserve biodiversity within a given landscape. Corridors are efficient strategies for conservation of biodiversity, one reason being that they allow tenurial land holders to allocate part of their holdings for conservation without giving up their land use rights. Corridors usually comprise a network of parks, reserves and other areas of less intensive use whose management is integrated into biodiversity conservation. This ensures the survival and protection of the widest possible range of species unique to a particular region.

The use of landscape-level corridors as planning units can accomplish what planning at the scale of individual parks and buffer zones cannot: the optimum allocation of resources to conserve biodiversity at the least cost to society. This is fundamentally different from minimalist, "least area" solutions advocated in the past, since these solutions did not adequately address the problems of fragmentation and isolation, nor did they consider how more efficient economic policy instruments can be employed to maintain large portions of the landscape friendly to biodiversity. Planning for biodiversity at the landscape scale is our best hope if we are to significantly improve long-term survival of biodiversity.

A total of 19 terrestrial and inland water corridors and nine marine corridors were identified. These encompass 92 and 17 of the priority areas, respectively. Using the corridor approach, the conservation needs of 80% of the priority areas would be addressed. Currently, several corridor initiatives are underway by different institutions: the Sierra Madre Biodiversity Corridor led by Conservation International Philippines and their local, provincial and regional partners; the Samar Island Biodiversity Project led by the DENR-PAWB and their local government and non-government partners; and the Sulu-Sulawesi Large Marine Ecosystems led by World Wildlife Fund Philippines and their local and international partners.

Institutionalize Monitoring and Evaluation Systems of Projects and of Biodiversity

Many research and conservation projects in the Philippines do not include monitoring and evaluation (M & E) systems. On the other hand, some existing M & E systems can only be used for specific taxa or require expensive equipment. A simple but robust Biodiversity Monitoring System (BMS) for protected areas was developed by the NORDECO for implementation of the DENR-PAWB and was pilot-tested in eight Protected Areas. The BMS can provide up-to-date and comparable information on biodiversity as a basis for the management of protected areas. The adoption of the BMS in all biodiversity conservation work should be a priority. This, however, does not preclude the continuing need for more systematic approaches and longer time frames in the direct monitoring of biodiversity.

Develop a National Constituency for Biodiversity Conservation in the Philippines

Philippine society needs to share in conservation efforts, and should not view conservation as the responsibility only of a handful of government agencies, environmental groups and concerned individuals. Philippine society must advance its conservation efforts, overhauling its attitude towards the environment and conservation, through the creation of a national constituency for biodiversity conservation.

People's participation is a critical element in biodiversity conservation if it is to succeed. Availability of and access to information play critical roles in the empowerment of local communities and other stakeholders. Informed decisions can only be made if local communities have access to the best available information. The promotion and dissemination of the results of the PBCPP through an integrated information, education and communications (IEC) campaign will lead to heightened awareness among the general population concerning biodiversity and the identified conservation priority areas. We anticipate that this will lead to a shift in societal behavior leading to the conservation of the priority areas and the threatened species found within.

The targets for IEC will focus on national and local government institutions and agencies, donor agencies, NGOs/POs, private sector, academe, religious and local communities and the media. The importance of the media in promoting the national biodiversity priorities cannot be overemphasized. These sectors play key roles in biodiversity conservation and linking them through mechanisms such as the Network for Nature (N4N) will ensure the maintenance, dissemination, and promotion of information about the biodiversity conservation needs of the country.

The fifth key output of the PBCCP, the state-of-the-art assessments for each thematic group provide an update on the current state of knowledge concerning each taxonomic or thematic foci. The summary of each assessment is available in the main report and in its complete form on the CD-ROM that accompanies this report.

RECOMMENDATIONS

The PBCPP results are not meant to prevent socio-economic development. Rather priority areas and species identified help to provide a decision framework on which non-traditional stakeholders,

such as the business community, *e.g.* the construction industry, can base their current and future infrastructure development programs. This can be achieved either through redesigning current projects or incorporating information from the PBCPP to guide decisions for future development plans. In this way, negative impacts on the biodiversity in the CPAs and on threatened species can be reduced, if not totally eliminated, when development projects are implemented. The PBCPP results provide a means through which conservation practitioners can engage other strategic stakeholders in a constructive and productive dialogue.

The results also provide a decision framework for various stakeholders and policy-makers to base their conservation and development planning. With reference to the 206 priority areas and the 418 Threatened Species in the 2000 IUCN Red List, overarching recommendations were:

- Extremely High priority areas should be given immediate priority in terms of designing effective conservation plans and implementing conservation plans and actions through the allocation of higher levels of resources while policy reforms or initiatives that will provide additional protection to these areas should be incorporated into the respective work plans of various sectors of society;
- Biologically important areas that have insufficient socio-economic data should be given immediate attention so that their conservation status can be determined;
- The 108 conservation priority areas not currently under NIPAS should be declared as Critical Habitats under the Wildlife Act (RA 9147) as an initial step to confer some sort of protection while awaiting further processing to meet the requirements of NIPAS, if need be; and
- Disseminate the information on the 418 Threatened Species listed under the 2000 IUCN Red List and validate their status in the country and gather additional information about species that should be listed or de-listed. Develop integrated species conservation programs alongside ecosystem-based conservation programs.
- Successful implementation of five strategies: (1) harmonizing research with conservation needs, (2) enhancing and strengthening the protected area system, (3) institutionalizing innovative but appropriate biodiversity conservation approaches: the biodiversity corridors, (4) institutionalizing monitoring and evaluation systems of projects and of biodiversity, and (5) developing a national constituency for biodiversity conservation in the Philippines.

If we are to sustain a diverse future for succeeding generations of Filipinos, then we must seek to transform social, political and economic realities in conjunction with our conservation actions. These recommendations for immediate action will help ensure that the PBCPP results are successfully implemented:

- A multi-sectoral, multi-institutional mechanism should be created, called the "Network for Nature" (N4N), which will proactively disseminate, monitor, and coordinate the implementation of the PBCPP results.
- A "road show" that promotes the PBCPP results and helps to ensure that these results are included in decision-making process of critical stakeholders (national and local government, private sector, academe, donor community, civil society and local communities) shold be undertaken.
- The DENR should adopt the PBCPP results as a framework for its Conservation Program by ensuring that the development side of the DENR is consistent with Department's conservation goals. A Department Administrative Order (DAO) reflecting these changes should be issued after the PBCPP results are adopted and the recommended review is carried out.
- The DENR should recommend to the President the issuance of an Executive Order instructing government agencies to incorporate the PBCPP results into their programs of work.
- Other government agencies to incorporate the PBCPP results in their workplans, in particular for projects that are being planned in or near the identified priority areas.
- The DENR should use the PBCPP results as the basis for securing donor commitments and investments for the DENR's conservation programs.
- Local Government Units (LGUs) should integrate the PBCPP results into their Comprehensive Land Use Plan, Physical

Framework Development Plans and other municipal or regional development plans, or in their revisions if plans are already in place.

- The DENR should promote the PBCPP results to all branches of government to ensure that they act consistently on all issues of environmental protection and biodiversity conservation.
- The NGO community should use the PBCPP results as the basis of unity in their conservation work in the country.
- The academic and scientific community should use the PBCPP results as a rich source of raw materials for their teaching, research and extension work.
- The donor community should use the PBCPP results as a basis for their future investments.
- The private sector should use the PBCPP results to guide their commitment to corporate social responsibility and as the basis for their investments.
- The PBCPP results and the N4N should be used as the springboard to develop a national and international constituency for the conservation of Philippine biodiversity.

No single organization or individual can make the campaign to save the Philippine hotspot successful. Only by building a critical mass of ardent biodiversity advocates will the biodiversity crisis become part of the national consciousness and part of the political debate. Otherwise, it will continue to receive little attention, not only from government but also from Philippine society.

I

INTRODUCTION

Biodiversity is the foundation of healthy and functioning ecosystems - the fountains of opportunity for all people. Rich soils, clean air and water, abundant forests - the complexity of nature and the myriad species they support - are essential for stable and thriving societies. Biodiversity is estimated to have contributed US$ 33 trillion to the global economy (Constanza, *et al.*, 1997). Yet few people realize its value. In the Philippines, the extent of biodiversity loss has reached alarming proportions–so much so that some international experts have proposed to write it off as a global biodiversity disaster area (Terborgh, 1999; Linden, 1998). To respond to these concerns, as well as to demonstrate to the global community that the Philippines will work to reverse these trends, this initiative, to set priorities for Philippines' biodiversity conservation, was undertaken.

THE GLOBAL SIGNIFICANCE OF PHILIPPINE BIODIVERSITY AND ITS IMPORTANCE TO PHILIPPINE SOCIETY

Extraordinary Biodiversity

The Philippines is an archipelago of more than 7,100 islands covering an estimated land area of 30 million ha.

Its archipelagic waters cover an estimated 220 million hectares or approximately 88% of the Philippine territory. The country's complex geological history and long periods of isolation from the rest of the world have produced varied landforms, water bodies, and climatic conditions. These, in turn, have contributed to the wide array of soil, temperature, moisture, and weather regimes and combined with its former extensive areas of rainforest and its tropical location, have given rise to high species diversity and endemism. The Philippines has several centers of diversity and endemism and its biological richness described as "Galapagos times ten" (Heaney and Regalado, 1998). The country has more than 52,177 described species (Department of Environment and Natural Resources, 1997; these numbers are further updated in this study), of which more than half are found nowhere else on Earth. There are many more species that remain unknown to science (Heaney and Regalado 1998; Heaney *et al.*, 1997; Brown *et al.*, 1999). The Philippines is considered one of the 17 megadiversity countries, which together contain 70 to 80% of global biodiversity

BOX 1. Biological Diversity in the Philippines: An Introduction to Megadiversity in a Nation of Islands

Lawrence R. Heaney

ONE OF THE MOST STRIKING aspects of the Philippines is the enormous number of islands (more than 7100) within its boundaries. These islands range from tiny to huge, low-lying to sharply mountainous, and densely clustered to widely spaced and isolated.The archipelagic nature of the Philippines had a great impact on its history and culture, including its biological diversity.

The term megadiversity was coined to describe the set of 17 countries (Mittermeier *et al.*, 1997, 1999; Myers *et al.*, 2000) that hold the greatest numbers of species of living organisms, especially among the best-known groups - plants, birds, mammals, reptiles, and amphibians.

In the Philippines, the best recent estimates (Table i) indicate the presence of 174 species of indigenous, land-living mammals (excluding sea-dwelling creatures such as dolphins and exotic species deliberately or accidentally imported by humans). Of these, 111 are "endemic" that is, they are unique to the Philippines, and live in no other country in the world. Together with the breeding land birds (excluding sea birds, migrants, and strays), reptiles (excluding the sea-living species of turtles), and amphibians (principally frogs), the total number is about 928 species. Of these, more than 500 species are unique to the Philippines - a stunning 57% of the total.

Compared to other countries, the Philippines vaults to the top of the charts for biodiversity (Table ii). Spain is one of the most biologically diverse countries in Europe, and is about 50% larger than the Philippines. It has only 435 species of land-

(Mittermeier *et al.*, 1997). As such, Philippine biodiversity is an integral part of our global heritage and is one of the most important countries in the world for conserving diversity of life on earth.

In addition to their remarkable diversity, Philippine species face one of the highest level of endangerment. More than 93% of the Philippines' original forest cover has been lost in the last 500 years (Figure 1) and 418 threatened species already are listed in the 2000 IUCN Red List (Hilton-Taylor, 2002). It is one of 25 global biodiversity hotspots (Myers *et al.*, 2000; Heaney *et al.*, 2000). The variety of life found only in the Philippines is threatened with extinction and the country faces a biodiversity crisis of unparalleled magnitude.

Figure 1. Forest cover of the Philippines in 1900 and 1999 (projected). (Source: Environmental Science for Social Change, 1998; Department of Environment and Natural Resources, 1998)

Of the more than 1,130 terrestrial wildlife species recorded for the Philippines, almost half are found nowhere else in the world (Table 1). The floral diversity is just as extraordinary, with between 10,000 and 14,000 species of vascular and non-vascular plants (including fungi), with more than half endemic to the Philippines (Merrill, 1923-26).

The Philippines' marine biodiversity is equally exceptional. With a coastline of 22,450 kilometers and an estimated 27,000 square kilometers of coral reefs, it contains nearly 500 of the more than 800 known coral species worldwide (Nañola *et al.*, 2000; Gomez *et al.*, 1994; Werner and Allen, 2000). It also contains more than 2,000 species of fish (Herre, 1953; Dela Paz and Gomez, 1995) and more than 40 species of mangrove plants (Zamora, 1996), making it one of the world's richest countries in terms of concentration of marine life. Unfortunately, mangroves and seagrass beds have been reduced to 120,000 hectares from the original cover of 500,000

Table i. Terrestrial vertebrate fauna of the Philippines

	Total Species	Endemic Species	% Endemic
Land Mammals	174	111	64%
Breeding Land Birds	395	172	44%
Reptiles	258	168	65%
Amphibians	101	78	77%
TOTAL	**928**	**529**	**57%**

(Editors note: the numbers and percentages differ from Table 1 of the main report, since the author restricted the total number of species included in the analysis as described).

living vertebrates, and only 25 of these (about 6%) are unique to Spain. Brazil contains most of the Amazon River basin, and often is referred to as one of the nature's great "storehouses" of biological diversity; it has about 3,100 species of land-living vertebrates, of which about 790 are endemic. But Brazil is 28 times larger than the Philippines. Similar comparisons between the Philippines and other mega-diverse countries such as Indonesia, China, Mexico, and Madagascar, also show that the Philippines not only hosts a remarkably large number of species, but also probably supports the greatest concentration of unique biological diversity currently known on the planet.

hectares while only 5% of the country's coral reefs remain in excellent condition (Calumpong, 1994; Aliño and the Marine Working Group, 2000). Recent study has confiremd that the Philippines is indeed also the top marine biodiversity hot spot in the world (Roberts *et al.*, 2002)

Table 1. Diversity, endemism, and conservation status of Philippine wildlife (Alcala and Brown, 1998; Brown *et al.*, 2001; Diesmos and the Amphibian and Reptile Working Group, 2000; Collar *et al.*, 1994; 1999; Dickinson *et al.*, 1991; Heaney *et al.*, 1998; Mallari and the Bird Working Group, 2000; Ong, 1998; Wildlife Conservation Society of the Philippines, 1997; Tan, 1995).

	No. of Species	No. of Endemic Species	% Endemics	No. of Threatened Species	No. of Threatened Endemic Species
Amphibians	101+	79+	78%	24	24
Reptiles	258+	170+	66%	8	4
Birds	576+*	195+*	34%	74	59
Mammals	204+*#	111+	54%	51	41
TOTAL	**1139+**	**555+***	**49%**	**157**	**128**

Legend: + includes new species (20 amphibians, 18 reptiles, 3 birds, and 16 mammals)
* includes rediscovered species
\# includes 25 species of marine mammals

Pressures on Philippine Biodiversity

The Philippines is one of two countries in the world, Madagascar being the other, which are both a megadiversity country and a biodiversity hotspot. Per hectare, the Philippines probably harbors more diversity of life than any other country on Earth (Heaney, Box 1 this report). Hence, every parcel of land that is converted, cultivated, or developed likely will result in the loss of unique life forms found nowhere else on the planet. The destruction of our original forests, freshwater, and marine ecosystems has led to an extinction crisis that threatens our very own survival as a people and as a species.

The remaining biodiversity and the ecosystems that support it are under tremendous threat. Extractive industries such as logging and mining have destroyed most of the forests (Mallari *et al.*, 2001). High human population density and growth rates have further aggravated the situation as rainforests were converted to agricultural areas and plantations to meet the demands of a growing population (Cincotta *et al.*, 2000). In addition,

Table ii. Comparison of Philippine Biological Diversity with other countries.

Country	Total Species	Endemic Species	% Endemic	Land Area
PHILIPPINES	928	529	57%	300,780 km2
SPAIN	435	25	6%	451,171 km2
BRAZIL	3131	788	25%	8,511,965 km2

Source: Mittermeier, *et al.*, 1997

Patterns in the distribution of biological diversity

The Ice-Age history of the Philippines had a great impact on the distributions of animals in the country. Among the mammals, such distinctive species as tarsiers (*Tarsius spp.*), pygmy squirrels (*Exilisciurus concinnus*), flying lemurs (*Cynocepahlus volans*), certain tree shrews (*Tupaia* spp.), and many others live only on the islands that once made up the Ice-Age island of Greater Mindanao (Figure i). The distributions of non-flying land mammals are illustrative that each island that existed in the Philippines during the Ice Ages is a unique center of biological diversity.

Luzon has 22 species of unique mammals (71% of the total of 31) while the medium-sized islands that remained isolated, such as Mindoro and Greater Negros-Panay, have 45% to 50% unique mammal assemblage. Smaller islands that remained isolated, although small, are also considered unique centers of biodiversity. Some of these are Sibuyan Island (463 sq km), which hosts four species of endemic non-flying mammals (plus one bat), a total that exceeds that of any country in Europe. Even the tiny Camiguin Island (265 sq km), which lies just north of Mindanao, has two unique species of mammals, as well as a

cyanide and dynamite fishing, along with rapid development in coastal areas, have contributed to the destruction of coral reefs and reduction of mangroves areas. Conservative land- and resource-use trend projections indicate that profound degradation of the country's biogeographic regions will occur in approximately 10 to 15 years. Because of the dire conditions of Philippine biodiversity, several authors have written the country off as being damaged beyond repair (Linden, 1998; Terborgh, 1999).

Impact of Biodiversity Loss in the Philippines

The effects of the biodiversity crisis in the Philippines are now felt more than ever— whenever floods and landslides wreak havoc on our daily lives. The costs attributed to the biodiversity crisis range from the billions of pesos lost in the destruction of crops and fisheries, homes, roads and bridges, to the actual loss of human lives. The impact of the reckless pursuit of economic development at the expense of the environment and biodiversity and a rapidly expanding population that requires more and more natural resources to meet its needs and demands further exacerbates the pervasive poverty amongst the Filipino people.

The development paradigm of the last 20th century has been destructive to the environment yet it never alleviated or eradicated poverty. Only when the environment, particularly biodiversity conservation, is included in the development equation, will poverty eradication programs have long lasting impacts and be sustainable.

Responsible stewardship for the remaining natural systems and their associated species assemblages will enable Filipinos continues to enjoy this great diversity of natural resources and their derivative benefits and services. There is a small window of opportunity in which it is still possible to save this global hotspot from complete devastation and its unique life forms from extinction. The Philippine Biodiversity Conservation Priority-setting Program (PBCPP) represents a critical first step to take advantage of this opportunity. The PBCPP results provide a framework on which development decisions and programs should be anchored. The foundation of sustainable development is the conservation of biodiversity.

INITIATIVES AIMED AT CONSERVING PHILIPPINE BIODIVERSITY

The Philippine government's efforts to seriously address the conservation of biological resources began in 1987, when the Protected Areas and Wildlife Bureau (PAWB) was created under the Department of Environment and Natural Resources (DENR) through Executive Order (EO) 192. The PAWB was tasked with handling the establishment and management of the country's protected areas and the conservation of biological diversity. Furthermore, the DENR was

unique frog and about a dozen unique plants. The proper image of biological diversity in the Philippine archipelago is that of the Galapagos Islands — times ten!

Another major factor that influences the pattern of biodiversity is the varied habitat in the country, such as lowland forest, montane forest, and mossy forest, which occurs along the lavational gradient of every large mountain (Figure ii). Species that live in lowland forest tend to be widely distributed on any given island, but species that live only in mossy forest high in the mountains often have naturally fragmented distributions on the tops of mountains and mountain ranges. Because movement between patches of mossy forest is rare, even before humans destroyed the intervening lowland forest, distinctive localized species often developed in specific mountain areas. Because the climatic (and historical) conditions influenced many species, localized sub-centers of endemism associated with mountain ranges developed: the mountains of southern Luzon support mammal species (and frogs, orchids, etc.) that are similar but noticeably different (and recognized as different species) from those in the mountains of northern Luzon. Similarly, some of the islands that once made up Greater Mindanao have distinctive species (or subspecies) of animals and plants, because gene flow was interrupted during periods of high sea level. Thus, in addition to the major

Figure i. Distribution of endemic Philippine mammalian species

also assigned the formulation of the Philippine Strategy for Sustainable Development (PSSD), which was completed in 1989.

Biodiversity conservation in the Philippines began to receive even more attention after the country signed the 1992 Convention on Biological Diversity (CBD) in Rio de Janeiro, which was ratified by the Philippine Senate in 1993. Shortly after the Rio Summit, the Philippine Council for Sustainable Development (PCSD) was created through EO No.15 to help fulfill the Philippines' commitments to CBD. The Director of the PAWB is the *ex-officio* chair of the Sub-committee on Biological Diversity under the PCSD. In 1992, Republic Act No. 7586, otherwise known as the National Integrated Protected Areas System Act (NIPAS), was also passed and became the basis for the establishment and management of protected areas in the country.

In 1994, the Philippine Strategy for Biological Diversity Conservation was formulated to consolidate the legal and institutional foundations needed to create a concrete plan of action to conserve and develop biodiversity in a sustainable manner. This was followed by the *Philippine Biodiversity: an Assessment and Action Plan* (1997), which identified concrete policies and management measures that address pressing issues and concerns in biodiversity conservation and management. The publication was based mainly on the outputs of the Philippine Biodiversity Country Study, a joint undertaking of the DENR and the United Nations Environment Programme (UNDP), which was initiated in 1995 and was approved by PCSD and eventually endorsed by then President Fidel V. Ramos. It had two parts: the first detailing the then current status of biodiversity in the Philippines and the second describing the National Biodiversity Strategy and Action Plan (NBSAP).

Alongside government efforts, parallel initiatives were undertaken by other sectors of society to address the loss of biodiversity. These initiatives were led by conservation NGOs such the Haribon Foundation for the Conservation of Natural Resources, the Kabang Kalikasan ng Pilipinas (also known as World Wide Fund for Nature - Philippines), Conservation International; the academic community, such as the University of the Philippines, Silliman University, Mindanao State University, Leyte State University, and Miriam College; the donor community such as the United States Agency for International Development, Asian Development Bank, World Bank, United Nations Development Programme, the Netherlands Government, Foundation for Philippine Environment, Foundation for Sustainable Development; and the private sector such as the First Philippine Holdings Corporation, Siemens, Intel and Shell Exploration Company.

centers of biodiversity that are discussed above, there are many sub centers of biodiversity that deserve recognition.

Biodiversity Distribution and Conservation Planning

All of the above information makes several key points clear. First, the reason that the Philippines possess such astoundingly high biodiversity is that the country is fundamentally archipelagic in nature. It is a nation of islands, each with diverse (but specific) geological origins and histories. Each of the geo-historically distinct sets of islands is home to a unique set of species of mammals, birds, frogs, plants, and insects. Each of the larger Ice Age islands holds more unique species than most countries; and even some small islands (such as Sibuyan) hold more unique biodiversity than the most biodiverse countries of Europe.

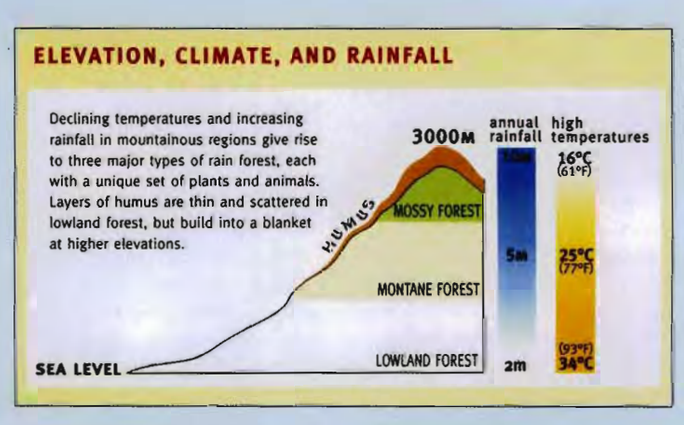


FIGURE ii. Forest types along elevational gradient

Second, it is clear that the reasons for the high biodiversity, and especially the dramatically high levels of endemism in the Philippines, are very different from those behind the high biodiversity of most other megadiverse countries. Brazil, for

The National Biodiversity Strategy and Action Plan

The National Biodiversity Strategy and Action Plan (NBSAP) sets forth the strategies and actions that the country will pursue to conserve its biodiversity. Under a Memorandum Order from then-President Fidel V. Ramos, relevant government agencies were directed to incorporate the NBSAP into their respective work plans. The intentions of NBSAP were translated into the following six objectives, which combined economic, governance, and budget concerns, with biodiversity protection and conservation:

1. Better management and collaborative decision making for biodiversity conservation.
2. Improved policies for conservation, sustainable use, and fair sharing of bio-resources.
3. Proper integration of biodiversity conservation strategies in development planning.
4. Promotion of a conservation culture and ethics supportive of biodiversity conservation.
5. Widening participation in biodiversity conservation.
6. Fulfillment of the country's commitments to the CBD and other environmental agreements.

The six strategies identified to address the aforementioned objectives, under which specific projects were also identified:

1. Expanding and improving knowledge on the characteristics, uses and values of biological diversity.
2. Enhancing and integrating existing and planned biodiversity conservation efforts with emphasis on *in situ* activities.
3. Formulating an integrated policy and legislative framework for the conservation, sustainable use, and equitable sharing of the benefits of biological diversity.
4. Strengthening capacities for integrating and institutionalizing biodiversity conservation and management
5. Mobilizing an integrated information, education, and communication (IEC) system for biodiversity conservation.
6. Advocating stronger international cooperation on biodiversity conservation and management.

Relevant government agencies were directed to incorporate the NBSAP into their respective work plans. There have been some significant

example, has high biodiversity because it is tropical (similarly to the Philippines) and very large. It contains a large number of different habitats, but it is continental, with the habitats entirely contiguous with one another.

If parts of Brazil that are the size of the Philippines were examined, each would probably have higher total diversity (because it is continental and most species are widely distributed); but a much lower number of unique species (again, because it is continental and most species are widely distributed). The Philippines is very unusual in that it is comprised of a large number of isolated areas, each is only moderately high in biodiversity, but with a large number of unique species. It is the aggregation of many small biogeographic units that makes the Philippines so biologically unique.

Third, to protect this uniquely Filipino biological diversity, we must embrace the archipelagic nature of the country and design a system of protected areas that includes each unique center of biodiversity. Skipping any one of them would be the equivalent to skipping an entire country — an unthinkable and disastrous proposition. Instead, in planning for conservation programs, we should deliberately incorporate the Philippines' distinctive feature —its archipelagic nature— at every step.

This last point becomes especially pertinent when considering the country's remaining old-growth rainforest (Figure iii). The remaining patches of forest are scattered widely over the country, but the largest patches tend to lie on the largest islands (Heaney and Regalado, 1998). The smaller islands have only small bits of forest, and some, such as Cebu, have no remaining old-growth rainforest at all. On this basis, one might decide to focus all conservation effort in the Philippines on the remaining large patches of forest and perhaps without even fully recognizing the consequence of the decision, focus on just some portions of the largest islands. However, while this might be a good strategy for some continental countries, it would be disastrous for the Philippines, because the dozens of smaller centers of biodiversity would be left out entirely.

accomplishments in the implementation of the NBSAP in the last 3 years. For instance, the NBSAP has been included in the Philippine Medium Term Development Plan for 1999 to 2004 and in the National Land Use Policy at the Regional Level. Also, in response to the NBSAP, an economic instrument for biodiversity conservation was also developed through the Environmental and Natural Resources Accounting Project of DENR. A Biodiversity Monitoring System (BMS) in protected areas was also developed by NORDECO on behalf of the DENR-PAWB as part of a technical assistance program by the Danish government under the World Bank-Conservation of Priority Protected Areas Project (CPPAP). Other NBSAP initiatives include the biodiversity valuation in Samar Island through the Samar Biodiversity Program (SamBIO), which led to the development of a UNDP Global Environment Facility (GEF) project for the establishment of the Samar Island Natural Park. Various biodiversity databases (i.e. ICLARM's fish and reef data bases, and PAWB's web site, among others) were also established during this period.

In fulfillment of its international commitments and as part of Strategy 6 of the NBSAP, the DENR also led the efforts to establish the ASEAN Regional Center for Biodiversity Conservation (ARCBC) which became operational in 1999 and is housed near the Ecosystems Research and Development Bureau (ERDB) in Los Baños, Laguna. The ARCBC is the central body focused on networking and institutional linkages among ASEAN member countries in order to enhance capacity in promoting biodiversity conservation in the region.

Despite these efforts and accomplishments, various impediments slowed the implementation of the NBSAP. These included the limited financial resources of the DENR, the difficulty of integrating the NBSAP into planning exercises at all levels, and the need to institutionalize and localize the NBSAP. While the NBSAP attempted to present a general overview and background of biodiversity in the Philippines, it provided neither geographically specific recommendations nor priorities for the investment of limited conservation resources.

THE NEED TO IDENTIFY

A far better strategy would be to begin with the premise that there must be at least one adequate protected area in each center of biodiversity, and then to choose the best possible sites within each center of biodiversity (Heaney, 1993; Heaney and Mallari, 2001). Protected areas would be a high priority for the Sierra Madres as the largest remaining block of forest on Luzon, wherein protected areas on such smaller islands as Mindoro, Sibuyan, and Cebu will not be left out.

In the final analysis, such a system of selecting sites would virtually guarantee that at least some effort would be made to provide a permanent rainforest home for every species unique to the Philippines.

FIGURE iii. Remaining old-growth forest in the Philippines

CONSERVATION PRIORITIES

Amidst a biodiversity crisis, the Philippines must determine how to proceed in solving the crisis. Understanding that a healthy ecological state is critical to the health of the country's people and economy, a challenge to take steps to curtail environmental destruction lies before the Filipino people. Setting biological priorities is important not only for conservation but also for development. Decisions have to be made that balance the need to protect the environment with the needs of rural development and poverty alleviation. To address both these issues, a carefully planned integration, addressing both biodiversity and development needs, and approached in a consensual manner is critical.

The archipelagic nature that has allowed for the evolution of so many unique and restricted range life forms in the Philippines requires a comprehensive plan to ensure representation of all species across the nation. Because each remnant of forest may harbor species found nowhere else on earth, the Philippines cannot afford a "triage approach," to conserve one area at the expense of losing precious tracts of land elsewhere. A comprehensive conservation plan for the Philippines must include a protected area (in a general sense) in every center of biodiversity within the archipelago - indeed skipping an island in one place may be equivalent to losing an entire country's biodiversity elsewhere (Heaney, Box 1 of this report).

Previously, national biodiversity plans were based on limited scientific information or knowledge. The best available scientific information is a requisite for developing a comprehensive plan. In light of new information that has come available since the NBSAP was developed in 1997, as well as new approaches and analysis from various initiatives such as the Terrestrial Ecoregions of the Indo-Pacific Project by World Wildlife Fund - US Conservation Science program (Wikramanayake, *et al.,* 2002), the Key Conservation Sites in the Philippines by the Haribon Foundation and BirdLife International (Mallari, *et al.,* 2001), Conservation International's Megadiversity and Biodiversity Hotspots analysis (Mittermeier, *et al.*, 1997 and Myers, *et al.,* 2000), there was a need to revisit the NBSAP. Thus, the Philippine Biodiversity Conservation Priority-setting Program (PBCPP) was designed and implemented as a second iteration of the NBSAP. Another objective was to develop a culture of collaboration among conservation practitioners and other stakeholders. The PBCPP was convened by the Department of Environment and Natural Resources - Protected Areas and Wildlife Bureau (DENR-PAWB), Biodiversity Conservation Program, University of the Philippines - Center for Integrative and Development Studies (BCP UP-CIDS), and Conservation International Philippines (CI Phil).

The Philippine Biodiversity Conservation Priority-setting Program: Reassessing and Reiterating the NBSAP

Five years after the NBSAP was formulated, the need for a re-assessment and a second iteration of the plan became apparent. To address this need, the PBCPP was developed and implemented with the following objectives:

a. to identify, assess, and prioritize specific geographic areas and actions for biodiversity conservation in the Philippines through an established process that supplements published information with a consensus of the latest experts' knowledge;

b. to develop and make available an information base to assist policymakers, planners, and donors to incorporate biodiversity conservation objectives into their implementation plans;

c. to strengthen local capacity for conservation planning and management by developing both an integrated conservation information system and a related skills training program, drawing on the most current expert knowledge; and

d. to propose the development of a program to train regional planning agencies on how to integrate the PBCPP results into their planning and implementation processes.

Setting priorities not only is important for conservation but also for development. Government officials at all levels must make decisions on how to balance the need to conserve biodiversity and protect the environment with the need for national development and poverty alleviation. Consensus on specific conservation priorities will allow decision makers to calculate accurately the trade-offs of development and to place development activities where they will minimize harmful impacts on biodiversity.

The PBCPP sought to put in place a centralized

The PBCPP was undertaken based on the principle that no single individual or organization can save Philippine biodiversity alone. Alliance and partnership building became an integral part of the process, from data collection and compilation to the analysis that culminated in the consensus-building workshop. In the end, more than 300 scientists from more than 100 local and international institutions shared their expertise and resources in order to reach consensus on the priority areas and strategic directions needed to protect the Philippine biodiversity.

II

THE PRIORITY-SETTING PROCESS

CI'S APPROACH TO SETTING PRIORITIES: STATE-OF-KNOWLEDGE ASSESSMENTS AND EXPERTS' CONSENSUS

Conservation International pioneered an approach called the Conservation Priority-setting Process (CPP). This approach utilizes a combination of state-of-the-art knowledge assessment and experts' opinion to develop consensus on areas of high importance for the conservation of biodiversity. Given the slow process of scientific publications, experts' opinion provides the fastest and most credible baseline by which immediate conservation action and research needs can be designed and developed.

The CPP is a method for identifying the most important areas for conservation in a given region. It provides local partners and international conservation groups and governments with a regional tool for designing conservation strategies and actions. One hallmark of the approach is that it relies upon the consensus of experts from the biological and social sciences to set conservation priorities. Achieving consensus among experts proves to be the best approach in areas with scarce information and an urgent need for biodiversity protection.

The process also includes a survey of the level of scientific understanding in an area, referred to as a 'state of knowledge' assessment. This survey of ecological, social and political processes involves an effort to gather the best available scientific data and to organize it into a comprehensive information system. All non-proprietary data collected and information generated becomes public. The database is also freely accessible and can be used as the baseline from which others can build on to improve national, regional or local biodiversity knowledge.

The rest of this chapter explains the various steps, activities, and methodology employed by the various groups involved with the process.

PREPARING FOR THE NATIONAL WORKSHOP

Planning

In January 2000, a small group of scientists and representatives from both NGOs and government institutions were convened to plan for the implementation of the program. The group defined the objectives of the process, made a rough assessment of the knowledge of biodiversity in the Philippines, selected taxonomic group leaders, nominated workshop participants, and laid out the process to be followed (Figure 2).

The experts agreed to share data and data sources that would be helpful in the planning process. It was also agreed that three regional consultations, one each in Luzon, Visayas, and Mindanao, would be undertaken to facilitate data validation and collection, identify regional and local biologically important areas, and develop criteria for identifying national conservation priorities (see section below, Regional Consultations).

Group coordinators were identified in order to set the pace and direction of the process. Regional Coordinators (RCs) were appointed for Luzon, Visayas, and Mindanao and were tasked with coordinating and initiating the regional consultations and facilitating thematic meetings by region. To provide focus and direction in the collection of information and the eventual setting of priorities, eight working groups were identified. Five taxon-based groups for the terrestrial ecosystem (plants, arthropods, amphibians and reptiles, birds and mammals), two broad ecosystem-based groups (inland and marine waters) and one socio-economic group were formed to evaluate the current status of the different taxa and associated ecosystems based on existing literature and experts' knowledge. The Marine Working Group further subdivided themselves into 11 sub-themes (mangroves, seagrasses, seaweeds, molluscs, corals, reef fishes, elasmobranchs, whale sharks, marine turtles, cetaceans, and dugongs), which formed the basis for setting priorities in their ecosystem.

Working Group Leaders (WGLs) were chosen for each thematic group based on their expertise and their willingness to commit time and effort to the process. The WGLs were instrumental in leading the working groups, forming alliances and partnerships with institutions and individuals, and facilitating data collection, compilation, processing and analysis.

Gathering Data

Existing data were collected and synthesized for use by the experts. Data collection focused on the compilation of published and unpublished literature on biodiversity from various experts, repositories, and institutions. The working group leaders provided the initial listing of materials that the program research staff collected. Institutions with existing databases, which included but were not limited to Haribon-BirdLife, World Wildlife Fund-Philippines, University of the Philippines' Marine Science Institute, International Center for Living Aquatic Resource Management (ICLARM), and Asean Regional Center for Biodiversity Conservation (ARCBC) were requested to share their information. Various special projects under the DENR, which included the NORDECO, NIPAP, and CPPAP, also provided invaluable information. A species database including more than 40,000 entries was established as part of this process. The assembled database will be turned over to DENR-PAWB as the key repository of this database. Geographic Information System (GIS) data on soil type, elevation, climate, forest cover, and vegetation were also compiled.

Regional Consultations

An average of 65 local experts participated in each regional consultation. The working group leaders, as well as the respective regional coordinators, were also present at all three consultations, providing direction and leadership in the data gathering, validation of information, networking and alliance building. The consultations were held in Cebu (July 18-20, 2000), Davao (August 30-September 1, 2000), and Batangas (September 27-29, 2000) for the Visayas, Mindanao, and Luzon workshops, respectively.

The objectives of the consultations were to:

a. convene a small group of scientists, representatives from NGOs and from the government in order to make a preliminary assessment of the status of biodiversity and conservation work in the region;

b. agree on a work plan and responsibilities in preparation for the National Workshop; and,

c. nominate the region's representatives to the National Workshop.

During the consultations, participants validated available data and baseline maps produced for the region. They also provided additional data sources as well as first-hand information deemed critical in identifying priorities for the region. The working maps were then overlaid to update information and assess availability of data and current efforts on biodiversity conservation.

The regional consultations provided opportunities to promote the PBCPP. The consultations also provided a venue for a broader spectrum of stakeholders throughout the country to participate in the PBCPP. Access to extensive data sources and meeting with local and regional experts and stakeholders were also made possible by the regional consultations.

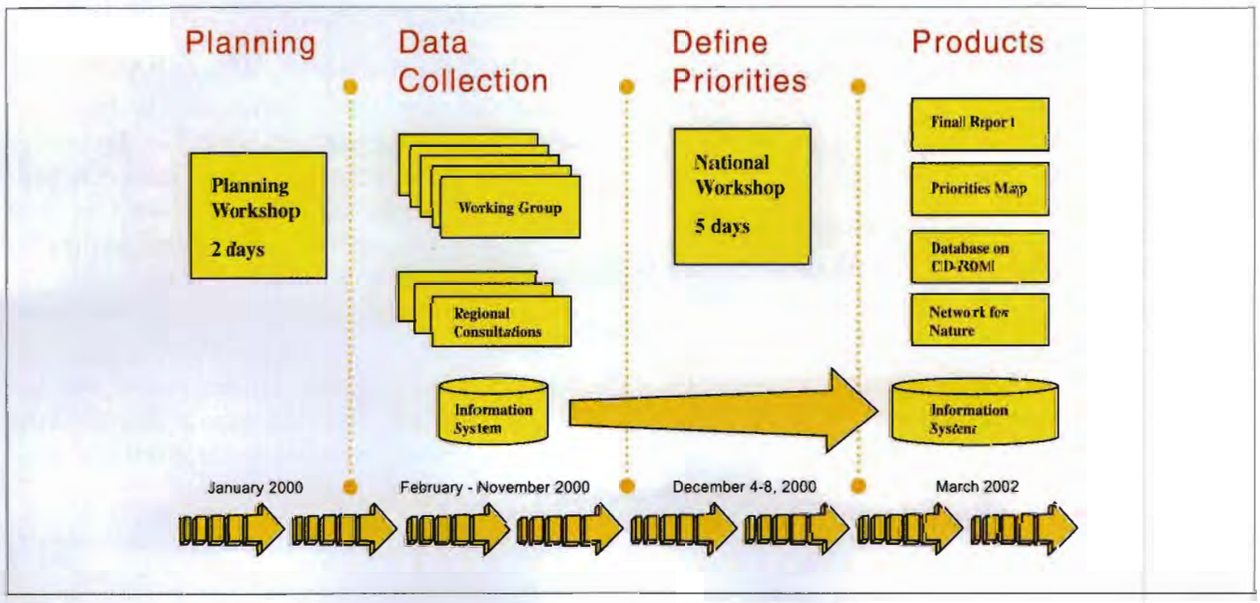


Figure 2. Priority-setting Process and Follow-up Activities

Establishing Preliminary Criteria for Priority-setting

Prior to the National Workshop, a list of criteria for assessing and identifying priorities was agreed upon. Because knowledge varies greatly among taxonomic groups and because each taxonomic group had unique criteria, each was given leeway to determine which criteria they would use for prioritization. The groups used the list as a minimum set of criteria to consider in the final evaluation and determination of the integrated biological priority areas. However, as data were often insufficient, not all of the criteria were used, hence minor adjustments were made by the working groups to adapt to these limitations. The decisions were based largely on experts' opinion. The methodology employed by each of the taxonomic groups followed these criteria and parameters to guide the biological scoring process. The criteria used in identifying important areas were:

1. Biogeographic Representativeness
2. Biological Importance
   a. Habitat Importance
      i. Ecosystem Diversity- total number of habitat types within the area
      ii. Ecosystem Rarity or Uniqueness - presence of non-biological values such as sacredness of the area, geological significance, and other cultural values.
      iii. Ecosystem Processes - the integrity of the area to support life systems by performing functions such as being a critical watershed area, a nursery ground, a migratory route, a spawning ground, and the likes.
   b. Species Status or Threat Status (based on IUCN Red List criteria guidelines)
   c. Species Richness - number of species per unit area
   d. Species Endemism - limited site distribution of species
3. Need for Research - based on the current level of scientific knowledge or the lack thereof

The following supplemental information was also considered:

1. Ecosystem/Habitat Quality
   a. Forest Cover - vegetative cover relative to the area as defined by the terrestrial ecosystems. Gives consideration to the ecological history of the area.
   b. Unexploredness - extent by which the area has been explored or studied.
   c. Water quality - extent by which pollution has affected an area.
   d. Naturalness - degree by which an area has been touched by human activities.

NATIONAL WORKSHOP

The regional consultations and data collection and compilation culminated in a National Workshop, which was held from 4-8 December, 2000 at the White Rock Resort, Subic, Zambales, Philippines. More than 200 specialists participated in the workshop representing more than 70 local and international institutions including the government, the NGO community, the academic community, people's organizations, donor communities, and the private sector.

On Day 1 of the workshop, the different thematic groups refined the criteria to be used in selecting the priorities for the taxonomic groups and then used these criteria to identify priority areas. All thematic groups used baseline maps containing information about topography, administrative units, river systems, and road systems to draw biological priority areas in the form of polygons. Information on forest cover, habitat types, ancestral domains, vegetation, and protected areas was then overlaid on the thematic priority sites.

On Day 2, experts in each working group used these overlays to validate and modify the priority areas. These areas were then scored, based on the pre-defined criteria to determine the level of priority. The WGLs presented these results in plenary on the morning of the third day.

On Day 3, the participants were assigned to three regional groups (Luzon, Visayas, and Mindanao) and asked to refine the consensus, based on the overlay of priority sites for conservation and research in their respective regions. Each group was given copies of the maps produced by the taxonomic groups for consideration. The objective of this session was to produce an integrated map to illustrate the most important conservation priority sites in the region based on data on all taxa. During this process, the Socio-Economic working group identified the existing pressures within these selected biological priority areas.

On Day 4, the outputs of the regional working groups were presented in plenary. This gave other participants time to validate and, if necessary, make

corrections to the identified regional priority areas. An updated map of the Philippine Biogeographic Regions was also presented during plenary by a group of taxonomists, systematists and biogeographers that worked on them. Each biogeographic region contains one or more centers of endemism. This formed the basis for another criterion used to select the integrated biologically important areas, ensuring that there was at least one priority area in each biogeographic region. The regional working groups used this information in finalizing their respective priority areas.

In the afternoon of Day 4, a session was convened to develope strategies for biodiversity conservation in the Philippines. The objective was to establish an agenda to help move the results forward. This was accomplished by asking participants to identify key research gaps, opportunities, and problems for the following topics:

1. Development and implementation of a research agenda
2. Conservation and implementation of protected areas management systems
3. Use of biodiversity corridors as an innovative approach to effective conservation
4. Development of a monitoring and evaluation system for project implementation and biodiversity status
5. Development of an integrated information, education, and communication campaign

The outputs of each group were used to draw up the national strategic actions for biodiversity conservation.

On Day 5, the results of the previous four days of work were presented as the Philippines' integrated priorities for biodiversity conservation. The draft map of the final priority areas, with polygons drawn for each map, was shown. It was agreed that the working group leaders, plus selected advisers, would be consulted to review and refine the results which would include the cross-checking of the names of the priority areas and strengthening the scientific basis for the selection of the priority sites (see section on Reviewing and Refining Workshop Outcomes).

ESTABLISHING SCORING METHODS FOR EACH THEMATIC GROUP

Plants Group

Because of the enormity of the plant assemblage, which includes an estimated 14,000 species, the plant-working group agreed to focus on major taxa by family. Plant families were chosen based on distribution, "representativeness", systematic consistency, ecological importance, economic importance, and threat status. Focus was given to major families and plant groups whose distribution and systematic stability could serve as good sampling representatives for the other plant taxa. These included the following families: Dipterocarpaceae, Meliaceae, Mimosaceae, Caesalpiniaceae, Fagaceae, and Sapindaceae.

Relevant map overlays were used to determine candidate areas. Supporting data, which assisted in the assessment of candidate priority areas, consisted of initial data gathering gleaned from regional consultations and the latest consolidated data from the participating experts. The areas were initially chosen based on the verification of habitat importance and ecosystem characteristics of each candidate area. Areas that were not part of the initial consensus, but that nonetheless represented individual biogeographical units, were also included.

The group made modifications to the pre-defined criteria in order to make a better assessment of the candidate priority sites given the available data and knowledge for each area. For species parameters, factors included endemism and species richness. Habitat/ecological parameters included ecosystem diversity, rarity and function, unexploredness, and naturalness. Because of the limited availability of accurate and recent information at the time of the scoring, species status as defined by IUCN Red List category was not included as a criterion. However, the group agreed that such information, whenever available, could serve as an additional information for assessing the overall biological importance of an area.

Based on the criteria agreed upon by the group, each area was scored, ranging from 1 to 5, for each of the seven parameters. These seven scores were then

averaged to arrive at a single, final biological score, ranging from 1 to 5, for each area. These scores were later on used to rank the priority level of each area. Areas with scores of 3 below were designated as Very High priorities while those with scores of four and five were ranked as Extremely High priorities.

Arthropods Group

Members of the arthropod working group were highly specialized. Each member held extensive field knowledge and were themselves databank of information. Each member of the team, therefore, was able to contribute information on a well-studied segment of the Arthropods group such that the caddisflies (Trichoptera), damselflies and dragonflies (Odonata), butterflies (Rhopalocera), beetles (Coleoptera), mites and ticks (Acarina), and spiders (Araneae), were well represented.

Since the group had such a large taxon to address (more than 20,000 identified species of insects alone), they agreed to choose families that generally represented the whole taxon when applying the criteria for scoring. Preliminary databases compiled by the specialists were consulted during scoring, but final evaluations were made by consensus among group members. The group completed the criteria forms by assigning the specialists to describe areas most important to their particular specialization. The group agreed that data were insufficient for a comprehensive score - hence no ranking took place and these areas were classified as research and/or conservation priorities.

Amphibians and Reptiles Group

The amphibians and reptiles working group began their work by assessing candidate priority areas identified prior to the national workshop. Using the pre-defined criteria on biological importance, each area was scored, ranging from 1 to 5, for each criterion used. Areas known to be nurseries or breeding grounds and sanctuaries of reptile and amphibian species were given higher habitat importance scores. The group also assigned higher scores to areas with higher percentages of intact vegetation cover, based on the extent of forest cover maps provided. Assessment of species status and species richness in each priority area was based mostly on expert opinion.

Additional priority areas were added later as information accumulated from the regional consultations and pre-national workshop meetings

were analyzed. The group also agreed that the final priority level of each area would be based on the research priority scores of 5 to 3 for Extremely High and 2 to 1 for Very High. Refinements made to the final list of priority areas and ranking of the additional areas were based mainly on expert opinion.

Birds Group

The Birds Working Group relied heavily on the book *Key Conservation Site in the Philippines* published by Haribon Foundation and BirdLife International (Mallari *et al.*, 2001) in identifying the priority areas for birds. One hundred seventeen (117) important bird areas (IBAs) were identified in the book using the following criteria: 1) number of globally threatened species, 2) number of restricted range species, and 3) number of congregatory species. The group eventually agreed to adapt the 117 IBAs, which were further assessed using another set of criteria to determine their level of priority. The following four major criteria: 1) habitat diversity, 2) species richness, 3) threat status, and 4) endemicity, were used and areas were assigned scores of 1-5 for each criterion.

Final overall scores were assigned for each area. Scores of 5 and 4 were given Extremely High Bird Priority Areas, 3 indicated Very High Bird Priority Areas, and scores of 2 and 1 were High Bird Priority Areas.

Mammals Group

Priority areas for mammals primarily were chosen based on the forest cover overlays, with the assumption that the remaining intact forests deserve primary attention for conservation. The pre-defined criteria described above and identified centers of endemism were also used in identifying additional priority areas. Numerical scores of 1 to 5 were assigned for each

criterion and were used to assign the priority levels of Extremely High and Very High for each area. However, post-national workshop evaluation of the priority areas by the group resulted in the refinement of the priority levels of the mammal priority areas and was based mainly on experts' opinion.

Inland Waters Group

The group used the list of candidate sites and identified additional areas of importance in their initial assessment of inland water priority areas. The pre-defined criteria were used and revised to suit conditions appropriate for the inland water ecosystems, which focused on assessment of ecosystems rather than species. Each criterion was assigned scores to evaluate the level of conservation priority for each area, which also resulted in the identification of research priority areas. However, the final ranking of the identified conservation and research priority areas mainly was based on experts' opinion. Additional conservation and research priority areas were identified by the experts during the post-national workshop working group meetings which also led to the refinement of the priority levels for each area.

Marine Group

Because of the high level of expertise in the marine working group at the national workshop, the group divided themselves into 11 sub-thematic groups and evaluated priorities for each of the following themes: mangrove, seaweeds, seagrasses, corals, molluscs, reef fishes, turtles, elasmobranchs, whale sharks, cetaceans, and dugong. The pre-defined criteria were used in evaluating areas of biological importance for each of the sub-themes.

The sub-thematic priority areas were then overlaid to develop the initial list of integrated marine priority areas. Areas identified as a priority by six or more sub-themes were included in the list. The group also agreed that the top three priority areas identified by all the sub-thematic groups should be included in the final priority area listing.

The integrated marine priority areas were then assessed according to the averaged habitat criteria values of all the sub-thematic groups that identified it as a priority. The resulting average values of 3, 4 and 5 were then transformed into priority ranks of High, Very High, and Extremely High Biodiversity Areas, respectively.

The group also assessed the socio-economic pressures operating within the integrated marine priority areas. The group used as criteria identified human induced factors that affect the health of the marine ecosystems. The results of the threat assessment were used as a basis for upgrading or downgrading the final level of priority of some areas.

Socio-economic Group

The socio-economic working group worked in parallel with the terrestrial thematic groups for the first few days of the workshop. While the biological scientists agreed on the integrated biologically important terrestrial areas and inland waters, the socio-economic experts used indicators with corresponding weights to score the pressures and conservation opportunities within each area. Threat indicators were defined as factors that adversely affect the priority area. On the other hand, conservation opportunities were defined as initiatives and actions geared towards sustainability of the area. Identified threat indicators were:

a. population pressure - relative density and migration trends

b. local economy - income and poverty status

c. tenurial security - tenurial issues

d. resource utilization – forest-based, logging, mining, agriculture, land conversion, introduction of invasive species, unregulated collection, biopiracy, and presence of damaging projects.

The following conservation opportunity indices were used:

a. sustainability and community management

b. cultural diversity - Indigenous Knowledge System

c. persistence of indigenous resource control measures

d. political stability - resource control or land rights

The indicators for pressures and conservation opportunities were scored using a scale of 1 (low) to 5 (extremely high) for each area. The corresponding weights for pressures were: population pressure (20%), poverty status (20%), tenurial issues (20%), and resource utilization issues (40%). The indices under conservation opportunities were assigned the following weights: sustainability of efforts (30%), community management (30%), persistence of sound indigenous knowledge systems

(10%), persistence of indigenous resource control structures (10%), and political stability (20%). The objective of the exercise was to facilitate the assessment rather than to arrive at a very precise scoring. Experts also included a preliminary analysis of the role of institutions that could influence the sustainability of conservation initiatives.

The weighted scores for pressures then transformed to the following ranks: Moderate, High, Very High, and Extremely High. Conservation initiatives, meanwhile (following the same procedure as in threat scoring), were ranked as Low, Moderate, High, and Very High. Because political and economic environments offer weak prospects for sustained protection, no area was given a conservation initiative score of "Extremely High". Areas for which there was no sufficient information (Insufficient Data) were not included in the final scoring, but remained on the priority list.

MAPPING THE PRIORITY AREAS

Associating Data

Overlays of thematic map sheets and analysis took place simultaneously, i.e., participants were analyzing and integrating available data as they superimposed map sheets (printed on an A0-size, 841 mm x 1189 mm, semi-transparent paper) and drew boundaries defining the priority areas. Experts' opinion was sought to supplement and fill in gaps in data. Figure 3 illustrates the flow of the overlay and analysis stage of the mapping process.

The descriptive databases for species and socio-economic data available during the workshop were associated with their geographic positions on baseline maps. These associated data provided the workshop participants a picture of the geographic distribution of species and socio-economic variables.

Deriving Thematic Maps of Priority Areas

Baseline maps were used to guide the thematic priority area selection. All thematic groups relied heavily on forest cover data to delineate most of the candidate priority areas. Using the pre-defined criteria, thematic priority areas were finalized and their boundaries delineated on the map. This geographic information was digitized and maps by theme were made ready for the next day's discussions.

Deriving Integrated, Regional Maps of Priority Areas

Regional (Luzon, Visayas, and Mindanao) presentation of the thematic priority areas was initiated to identify integrated priority areas per region. Overlays of the thematic maps by region were produced to guide each regional group in identifying integrated priority areas by the same major island groupings. The maps produced were then used to guide the identification of priority areas in the national level.

Deriving Final, Comprehensive Maps of Priority Areas

The national integrated biodiversity conservation priority areas were identified using the overlays of the thematic (terrestrial) and sub-thematic (marine) priority areas. Further refinements were made using the regional outputs map and the integration of the socio-economic pressures or pressures in the biological priorities ranking. The resulting color-coded map combined the results of the terrestrial and marine groups to derive the final Philippine biodiversity conservation priorities map.

Reviewing and Refining Workshop Outcomes

Because the workshop outputs represent the broadest expertise and were consensually developed, these results were intended to be final. However, after the workshop, it was determined that the co-convenors needed to convene the scientific advisors, working group leaders, and regional coordinators in order to review and refine the identification of national priorities based on the overlays of the thematic groups and forest cover. Additionally, the review process resulted in undertaking the following priority activities:

a. Scoring of additional areas;

b. Reconciling nomenclature;

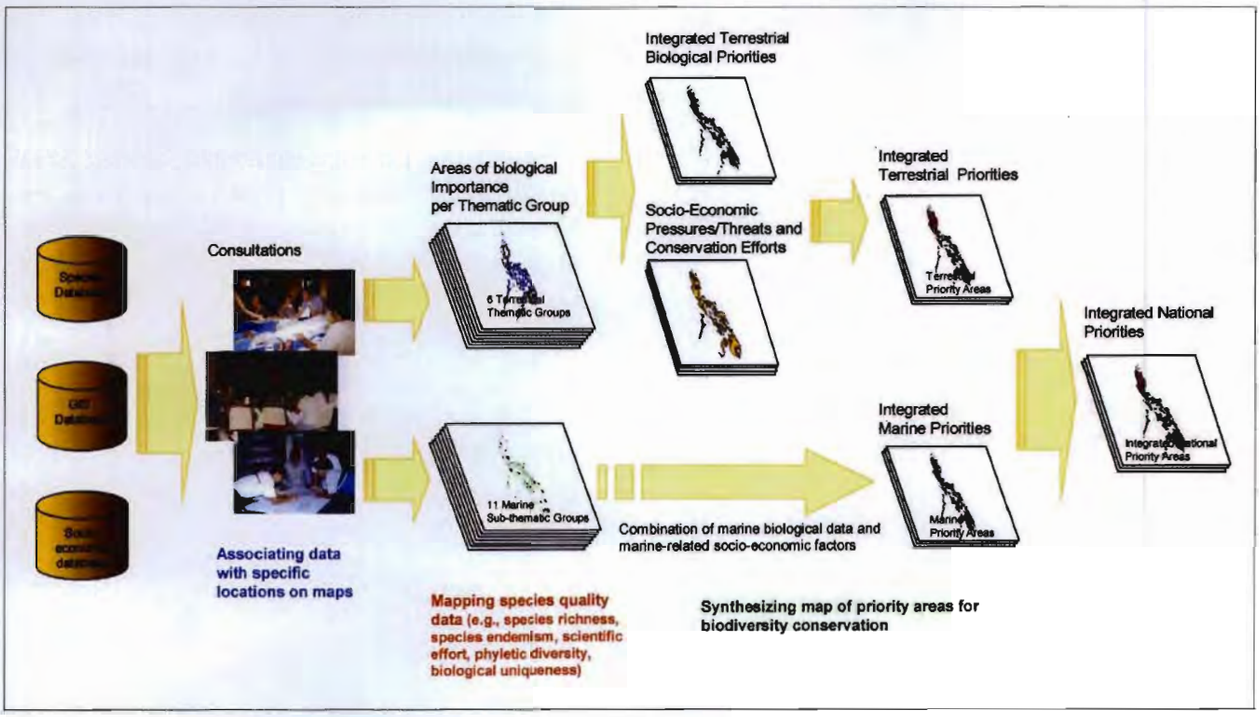


Figure 3. Workshop Process (Reviewing and refining workshop outcomes)

c. Assigning common value of High to Extremely High to areas given numerical scores; and

d. Integrating socio-economic and biological scores for the final integrated priorities score.

Refinement of the integrated terrestrial biodiversity conservation priority areas was deemed necessary based on the pre-defined criteria that all biogeographic regions should be represented by at least one priority area. Further, all remaining primary forest areas were automatically determined to be priority areas for conservation. These were drawn from the overlays of the thematic priorities and forest cover maps during post-workshop meetings. It was also agreed that all inland bodies of water found within the identified terrestrial priority areas should be included in the integrated list.

A subsequent review of the areas identified by each thematic group demonstrated that there was a need to define a common area nomenclature because the various thematic groups had used different names to refer to the same area.

As new areas were added through the iterations following the national workshop, thematic and socio-economic scorings of proposed priority terrestrial areas were carried out using available literature and extensive consultation with experts.

For ease of analysis, the terrestrial thematic groups, together with the socio-economic group developed a combination matrix with the aim of integrating the map of socio-economic pressure with the map of biological priorities. The biologically important areas were divided into Extremely High Biological (**EHB**) and Very High Biological (**VHB**) areas. For socio-economic pressures, the priority areas were divided into Extremely High Pressure (**EHP**), Very High Pressure (**VHP**), High Pressure (**HP**), Moderate Pressure (**MP**), and Insufficient Data (**ID**). The results of the combination of the biological and socio-economic information were classified using the following conservation priority rankings for each of the Biological Important Areas: Extremely High-Urgent (**EHu**), Extremely High-Critical (**EHc**), Very High (**VH**), High (**H**) and areas for which there were Insufficient Data (**ID**). The matrix below shows how these final priority level rankings were derived after combining the biological and socio-economic information for each area:

		Socio-Economic Pressure				
		EHP	VHP	HP	MP	ID
Biological	EHB	**EHu**	**EHc**	**VH**	**VH**	**ID**
Priority	VHB	**EHc**	**VH**	**VH**	**H**	**ID**

EHu areas are areas that require the most urgent attention because they are at immediate risk of losing a high percentage of biological diversity. Failure to initiate appropriate conservation interventions as

soon as possible would lead to a significant loss of biodiversity in these areas.

The EHc areas fit one of two types: either they have extremely high biodiversity importance (EHB) with very high socio-economic pressure (VHP), or they have very high biodiversity importance (VHB) but with extremely high socio-economic pressure (EHP).

VH priority areas either have extremely high biological importance (EHB) but with a lesser degree of socio-economic pressures (HP/MP); or they are very high biological importance (VHB) but with very high or high socio-economic pressures (VHP/HP).

H sites are areas with very high biological diversity and with relatively low socio-economic pressures operating in the area.

Biologically important areas that lacked data on the socio-economic pressure were classified as 'insufficient data' (ID). However, an ID classification does not mean that the areas have a lower conservation priority than other areas. Areas classified as ID should be treated with caution, and before any development is proposed or implemented, a thorough study should be undertaken because these areas are of extremely high or very high biological importance.

The integrated marine biodiversity conservation areas identified during the national workshop required minor refinements and together with the terrestrial priorities comprised the final list of the Philippine biodiversity conservation priorities.

III

RESULTS

MAJOR ACCOMPLISHMENTS

The Philippine Biodiversity Conservation Priority-setting Program (PBCPP) is a major breakthrough in the country's conservation efforts because it represents the first time that experts in the three major ecosystems (terrestrial, inland waters, and marine) and other strategic stakeholders worked together and discussed priorities and strategies for conserving Philippine biodiversity. The results of this process represent a national consensus of the country's foremost experts in the biological and social sciences.

The workshop validated two important facts:

1. Because of its complex geological history and archipelagic nature, the Philippines is indeed a megadiversity country with several centers and sub-centers of endemism and biological diversity in the terrestrial, inland water, and marine realms.
2. The Philippines is the hottest of the global biodiversity hotspots because of its richness and the enormous threats to its biodiversity. The urgency to conserve and protect the Philippines' biodiversity cannot be overemphasized.

The PBCPP accomplished five key outputs. These were:

1. The re-assessment and subsequent updating of the terrestrial and marine biogeographic regions (Figure 4). These should lead to a significant change in the perspective and emphasis both at national and regional planning levels, since each biogeographic region represents unique faunal and floral assemblages that cannot be found elsewhere.
2. A map of the Philippine biodiversity conservation priorities that represents the broadest consensus of scientists and strategic stakeholders (Figure 5). This map depicts areas that must be conserved to prevent extinction of unique species and those that are in most need of protection.
3) Five strategic actions needed to be implemented in the identified priority areas to ensure that the Philippine biodiversity crisis is surmounted.
4) Biodiversity corridors were identified for both marine and terrestrial ecosystems as focal areas for broader scale conservation actions (Figure 6).
5) A state of the art assessment of each thematic group.

In addition to this publication, the results of the priority-setting process are available, in a CD-ROM containing the species and GIS database, photos, white papers, and project reports. These results are summarized in a two-sided map showing the Philippine biodiversity conservation priorities and a set of 12 thematic maps. Each output is designed to be stand-alone, however, using the three together provide the user a better understanding of PBCPP process and results.

UPDATED BIOGEOGRAPHIC REGIONS

The Philippines' terrestrial biogeographic regions were reviewed and updated using the geographic distribution patterns of plants, arthropods, amphibians, reptiles, birds and mammals. During the last Ice Age (the Pleistocene Epoch 15 to 20 thousand years ago), the major Philippine islands were connected to nearby smaller islands as the coastlines became exposed. Each reconfigured island, such as Greater Mindanao (Bohol, Samar, Leyte and Mindanao and other nearby smaller islands), then became a unique center of biodiversity. This re-assessment updates the 15 biogeographic region recognized by the DENR, as published in the National Biodiversity Strategy and Action Plan in 1997. The current analysis identified 16 terrestrial biogeographic regions, including subregions and sub-subregions, that were used to identify priority areas that will ensure biogeographic representation (Figure 4; Appendix 5).

Similarly, the Marine Working Group delineated six marine biogeographic regions: the Sulu Sea, South China Sea, Visayan Sea, Celebes Sea, Northern Philippine Sea, and Southern Philippine Sea. While the Philippine Archipelago formed the important physical boundaries for the terrestrial biogeographic regions, the marine working group used the connectivity and the dispersal features of ocean circulation to identify the marine biogeographic regions. In this context, the group identified six marine biogeographic regions with broad transition

zones based on the evolutionary geology of the archipelago and observed associated reef fish assemblages.

PRIORITY AREAS FOR BIODIVERSITY CONSERVATION

Two hundred six integrated priority areas for biodiversity conservation in the country were identified. The conservartion priority areas were identified based on the analyses of data from: five taxon-based thematic groups (plants, arthropods, amphibians and reptiles, birds, and mammals); two ecosystem-based groups (inland and marine waters); and one socio-economic group. These areas represent the national consensus on the biologically important areas in the Philippines based on the latest scientific information and on experts' knowledge.

The taxon and ecosystem-based thematic groups identified biologically important areas which were integrated with the output of the socio-economic group to produce the final conservation priority areas. The following shows the number of conservation priority areas identified by the terrestrial taxon-based groups and the inland waters group are as follows:

Thematic Group	Conservation Priority Areas
Plants	43
Arthropods	73
Herpetofauna	69
Birds	117
Mammals	60
Inland Waters	34

The overlay of these thematic areas resulted in the identification of 170 terrestrial biologically important areas (Figure 7). The socio-economic working group then assessed the socio-economic pressures affecting the integrity of biodiversity in the 170 priority areas. Combining the 170 biological important areas with the socio-economic pressures resulted in the following terrestrial conservation priorities: 92 Extremely High, 60 Very High, 3 High, and 15 Insufficient Data. Priority areas designated as having "Insufficient Data" generally are biologically important areas that lacked sufficient information on the socio-economic pressures impinging on it.

The marine group divided into 11 sub-thematic groups and identified priorities for each sub-theme. Each group then assessed socio-economic factors operating in the sub-thematic priority areas, and these sub-thematic priority areas were then overlaid, resulting in the mapping of the final 36 integrated marine conservation priority areas. The results for marine conservation priorities were: 14 Extremely High, 12 Very High, and 10 High. The number of priority areas identified by each marine sub-thematic group is listed below:

Marine Sub-Thematic Group	Priority Areas
Mangroves	22
Seaweeds	3
Seagrasses	12
Corals	38
Molluscs	31
Elasmobranchs	15
Reef Fishes	60
Whalesharks	16
Turtles	12
Cetaceans	23
Dugongs	23

STRATEGIC ACTIONS

Besides arriving at a consensus on the 206 priority areas for conservation, five actions were also identified as critical in ensuring that the biodiversity crisis in the Philippines is addressed.

1. Harmonize Research with Conservation Needs
2. Enhance and Strengthen the Protected Area System
3. Institutionalize Innovative but Appropriate Biodiversity Conservation Approaches: The Biodiversity Corridors
4. Institutionalize Monitoring and Evaluation Systems of Projects and of Biodiversity
5. Develop a National Constituency for Biodiversity Conservation in the Philippines

More detailed discussions on the five strategic actions are discussed in Chapter IV.

BIODIVERSITY CORRIDORS

Biodiversity corridors are large, interconnected networks of protected areas and the surrounding land, which are established to protect and conserve biodiversity within a given landscape. Corridors are efficient strategies for conservation of biodiversity, one reason being that they allow tenurial instrument holders to allocate part of their land holdings for conservation without giving up their land use rights.

Corridors are designed to maintain ecosystem and evolutionary processes that dynamically and stochastically occur in tropical systems. This assists in ensuring the survival and protection of the widest possible range of species unique to a particular region. Corridors provide a means to reconnect natural habitats and other landscapes for recolonizing flora and fauna and to provide means of genetic exchange. Corridors are based on the concept of biodiversity assemblages and the need to institutionalize appropriate management approaches in a given area. They usually comprise a network of parks, reserves and other areas of less intensive use whose management is integrated into biodiversity conservation. This ensures the survival and protection of the widest possible range of species unique to a particular region.

To protect wider areas of biological importance, the marine working group adapted the concept of marine biodiversity corridors, based on which areas have high flux exchange of biodiversity mediating propagules. This was the first time that the concept of biodiversity corridors, developed primarily for terrestrial landscapes, has been applied to the marine ecosystem.

A total of 19 terrestrial and inland water corridors and nine marine corridors were identified encompassing 92 and 17 priority areas respectively or 80% of the combined total area covered by the 206 conservation priority areas (Figure 6; Appendix 3).

STATE-OF-KNOWLEDGE ASSESSMENTS OF EACH THEMATIC GROUP

Based on the outputs of the thematic prioritization, Working Group Leaders, in consultation with members of their groups, prepared white papers summarizing the current state of knowledge concerning their respective taxonomic or thematic focuses. The following section includes synopses of these white papers; these papers are available in their complete form on the CD-ROM that accompanies this report.

Terrestrial Groups

PLANTS

Daniel A. Lagunzad, Leonardo L. Co, and Joy M. Navarro

The Philippines is part of the plant geographical unit known as Malesia. Together with the Malay Peninsula, Sumatra, and Borneo, it constitutes the sub floristic province called West Malesia (van Steenis, 1950;

Jacobs, 1974). However, Eastern Malesian (floristic elements are also well represented in the Philippines, indicating the country might have been the corridor through which elements from both sub provinces were exchanged (Tan and Rojo, 1988).

Reports on the estimated number of Philippine plant species vary depending on the revisions done for various plant groups. Madulid (1985) estimates that some 14,000 species of plants occur in the Philippines. In the absence of a complete and comprehensive revision, the total vascular flora of the Philippines is estimated to be at 9,000 species (Ashton, 1997).

Plant endemism in the Philippines ranges from 45% to 60% (DENR, 1997; Amoroso, 2000; and Mittermeier *et al.*, 1999). However, species endemism may be as high as 100% in families represented by a single or few genera, as in *Rafflesiaceae* (2 species - Meijer, 1997) and *Daphniphyllaceae* (3 species - Huang, 1997). In flowering plants, certain families and genera reach 70% to 80% endemism, especially those confined to primary forests (Merrill, 1923-26).

The 2000 IUCN Red List of Threatened Species (Hilton-Taylor, 2000) includes 227 species of Philippine plants. The most threatened families are Dipterocarpaceae, Myristicaceae, Euphorbiaceae, Meliaceae, Leguminosae, Sapindaceae, Annonaceae, Apocynaceae, Sapotaceae, Lauraceae, Palmae, and Elaeocarpaceae.

The present state of knowledge on Philippine flora is still insufficient to conduct a comprehensive analysis of which species still exist. Mapping of habitat types, including limestone, ultramafic, peat swamps, freshwater, and swamps must also be undertaken, since these areas contain unique vegetation assemblages and may be very useful in predicting and validating plant distribution.

Forty-three conservation priority areas and 88 priority sub-areas were identified in the PBCPP (Figure 8a and 8b). Some of these priority areas form larger complexes, highlighting their biogeographical representativeness and ecological importance. Most of the 18 Centers of Plant Diversity identified by the Threatened Plants Unit at the Kew Botanical Gardens in the United Kingdom (as cited in DENR, 1997), were also incorporated in the list of priority areas. The updated information and identification of research gaps in other significant areas prompted the inclusion of additional priority areas. This list of priority areas, divided into "very high" (VH) and "extremely high" (EH) priority levels, provides a generally reliable basis for future floristic work and conservation initiatives.

Relevant map overlays (forest cover, topographic, etc.) were used to determine candidate areas for scoring. Supporting data used to assess candidate priority areas were comprised of initial data gathered during Regional Consultations as well as the most recent consolidated data from the participating experts. The choice of areas was initially based on agreement and on verifications of habitat importance and ecosystem characteristics of each candidate area. Areas that were not included in the consensus, but that represented individual biogeographical units, were also included.

As the process of identifying and scoring conservation priorities unfolded, the group modified the pre-defined criteria based on the availability of data and extent of knowledge on each area, in order to facilitate the scoring process. Criteria used for scoring conservation priorities were classified either as species or habitat/ecological parameters. Species parameters included endemism and taxon richness and habitat/ecological parameters included ecosystem diversity, rarity and function, unexploredness, and naturalness. Species status or the IUCN Red List classification was not included as a parameter because most of the specialists did not agree with the listing. However, the group agreed that such information, whenever applicable, could serve as an additional parameter in considering the overall biological importance of the area.

Based on the criteria discussed above, the group gave each area a score that ranged from 1 to 5 for each of the seven parameters. These scores were then added to come up with a final biological score for each site, ranging from 1 to 5. The number of priority areas initially identified was 43, with 13 designated as Extremely High and 30 Very High. Because some of these areas are relatively large, the group agreed to identify sub-areas in order to accommodate the specific needs and interests of researchers and other data holders.

ARTHROPODS

Victor P. Gapud

The information on Philippine arthropods is quite limited and generally is focused on specific taxonomic groups. The insects, which constitute the single biggest group, have a current species count of 20,940 species with an overall endemicity of 69.8%, in 6,185 genera and 499 families. The levels of endemicity among the orders vary, depending on their mode of and capacity for dispersal, habitat specificity, available niches and guilds, climatic requirements, elevation, reproductive capacity, life cycles, developmental type (metamorphosis), reproductive capacity, generation time, and seasonal cycles. On the whole, however, the majority of orders exhibit a level of endemism higher than 50%.

New species are being discovered and described every year. It is estimated that the total number of Philippine arthropod species will eventually reach between 50,000 and 100,000. Arthropod sampling on forest canopy, however, has not been undertaken in the country. Thus, if the number of species to be discovered in the Philippine forest canopy, which according to some entomologists is the "heart of biotic diversity," is estimated based on the results of the insect inventories in tropical forests elsewhere, the actual species number may even exceed 100,000.

In the absence of extensive studies on arthropods, it was extremely difficult to prioritize based on their status of threat. For many parts of the Philippines, little is known of the arthropod fauna. As a result, except for butterflies, the arthropod working group had little or no idea of which species were threatened. The rating of areas as Extremely High, Very High, High, or Low, is therefore subject to individual perceptions. The group therefore agreed that the priority areas for research were more pressing than the areas for conservation simply because little or no information was available to defend designation of a conservation area. In assigning conservation priority status to an area, the group could only assume that if good forest cover remains, the site should be a conservation priority. Some members of the group also advocated that areas be designated with their

level of conservation priorities even if nothing was known about them, i.e., the absence of information of a suspected high arthropod diversity area is information in itself and this should be enough to warrant such a designation.

Numerous experts who have studied Philippine butterflies presumed that species considered very rare are likely to be Endangered, while those that are rare are likely to be Vulnerable. The list of such threatened species can be extracted from Treadaway (1995). Therefore, areas with very rare endemic butterfly species rank extremely high as priority areas, while areas with rare endemic species rank very high as priority areas.

Since the group handled a large taxon for analysis, they agreed to choose significant families that generally represented the whole taxon for scoring in terms of the criteria set for the workshop. Preliminary database compilations by the experts were used as the basis for scoring, however, scoring was done partially on consensus and mostly by expertise. The group diligently used the criteria sheet forms, each specialist making the score for his or her field of specialization. The specialists submitted 190 score sheets at the end of their scoring session. Analysis of the score sheets resulted in a total of 81 research priorities and 70 conservation priority areas for the group (Figure 9).

There were, however, cases where available data were not sufficient to comprehensively score the areas based on the set criteria. Hence, the group relied on consensus and on expert opinion in order to classify the choice priority areas either as conservation areas or research areas. In these particular cases, the specialists did not use scores to rank the areas.

AMPHIBIANS AND REPTILES

Arvin C. Diesmos, Rafe M. Brown, Angel C. Alcala, Rogelio V. Sison, Leticia E. Afuang, and Genevieve V. A. Gee

The Philippine Archipelago is home to a spectacular and diverse assemblage of amphibians and reptiles. Situated at the interface between the Oriental and Australian faunal zones, this largely oceanic island archipelago and its amphibians and reptiles species have captured the attention and imagination of systematists and biogeographers for nearly 200 years. Previously thought of as having an insignificant herpetofauna, the Philippine archipelago now is recognized as one of the most important centers of amphibian and reptile diversity in Southeast Asia.

The exact number of species of Philippine amphibian and reptiles is still uncertain. The gaps in knowledge on the systematics of amphibians and reptiles need to be addressed first before a satisfactory estimate of the diversity is reached. However, an estimated total of 359 species of amphibians (101 species) and reptiles (258 species) is now known in the country. Of the 359 species, 246 (68%) are endemic—currently the highest known percentage endemism among vertebrates. The rate of discovery of new species is likewise the highest: a total of 36 new species (20 frogs, eight lizards, and eight snakes), roughly 10% of the total herpetofauna, has been discovered in the last ten years.

The Philippine amphibian fauna consists of caecilians (Gymnophiona) and frogs (Anura). The caecilians are represented by two genera and the anurans are represented by at least 23 genera. At present, a total of 101 species comprised of three species of caecilians and 98 species of frogs are recognized. There are no known endemic genera. However, endemicity at the species level is exceptionally high: 79 of the 101 species (78%) are found only in the Philippines.

The reptilian fauna is composed of terrestrial turtles (six species), marine turtles (five species), lizards (124 species), terrestrial snakes (106 species), marine snakes (15 species), and crocodiles (two species). This diverse and complex group is divided into 17 families and is represented by at least 83 genera. Approximately 258 species occur, of which 170 species (66%) are endemic to the Philippines.

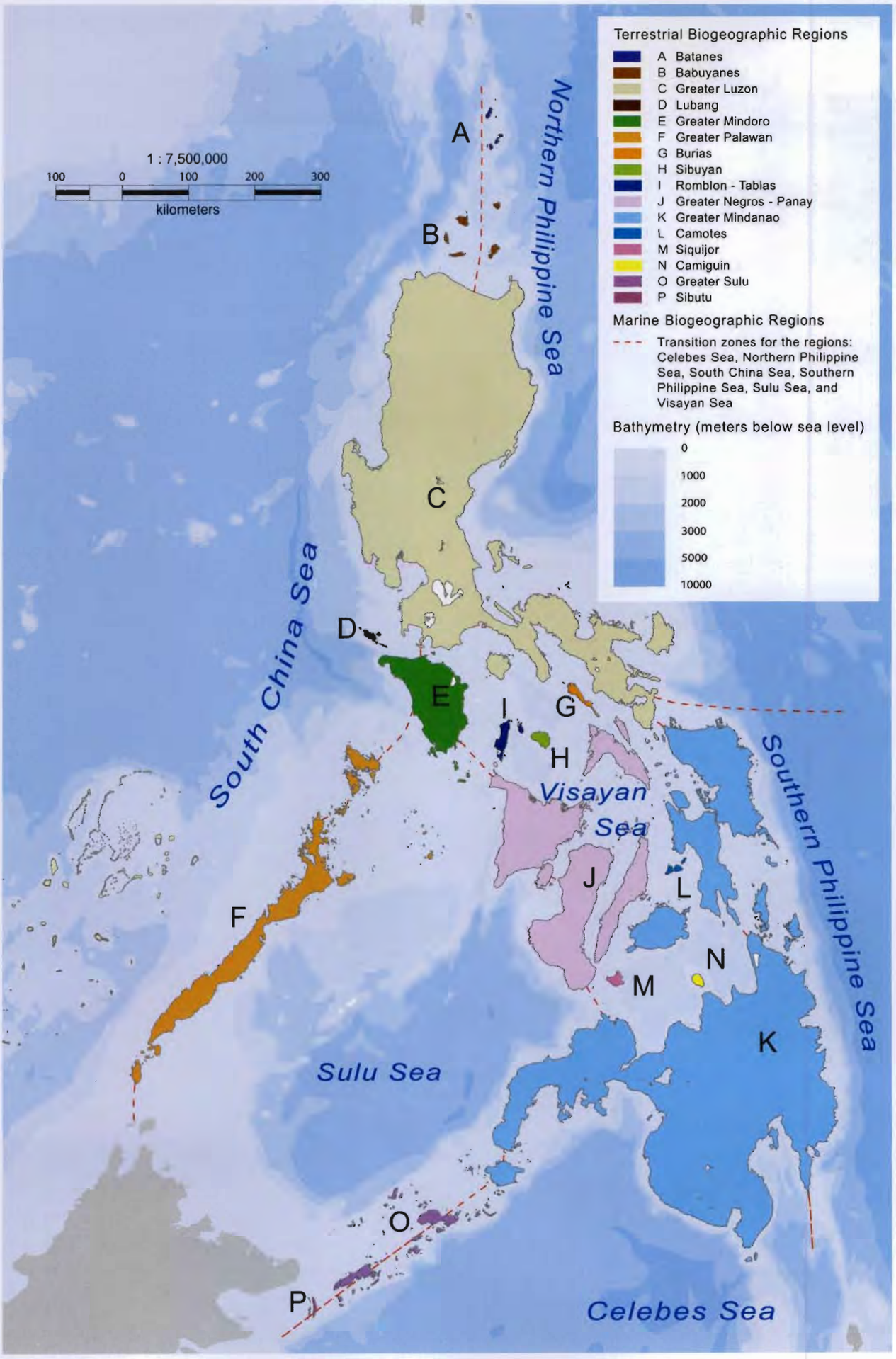


Figure 4. Terrestrial and marine biogeographic regions

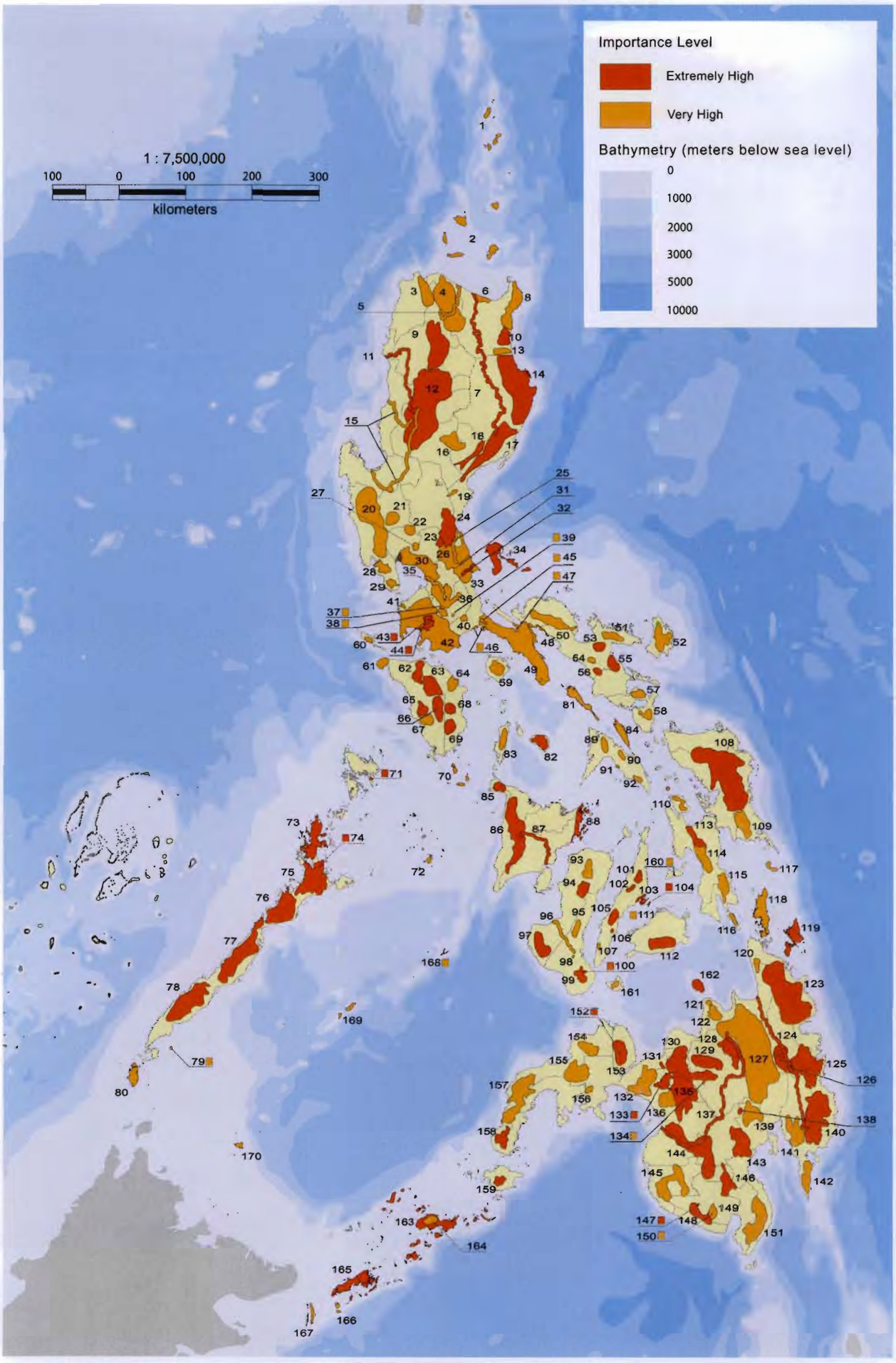


Figure 5. Terrestrial and inland water areas of biological importance

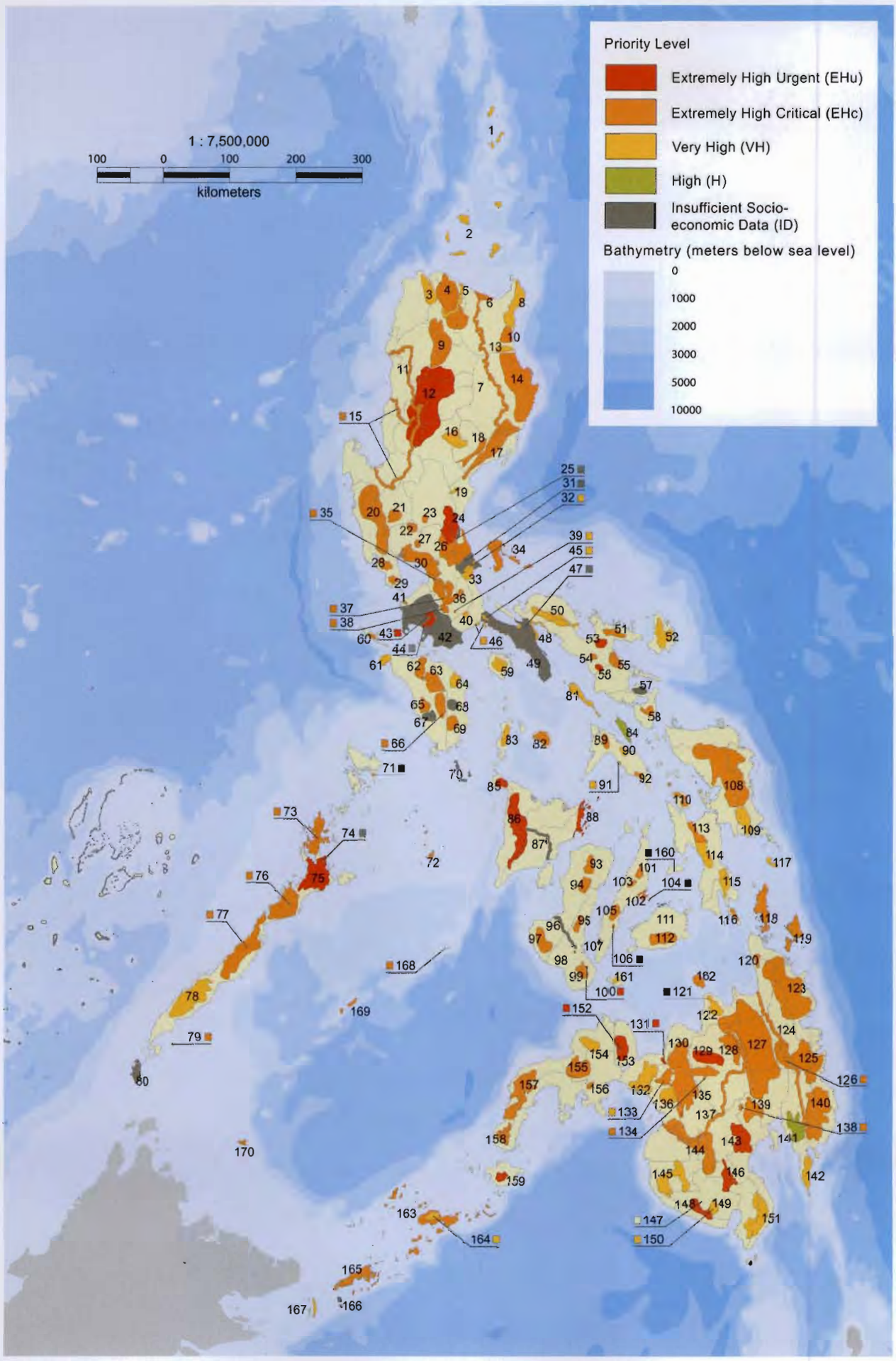


Figure 6. Terrestrial and inland waters conservation priority areas

Figure 7. Terrestrial and marine biodiversity corridors.

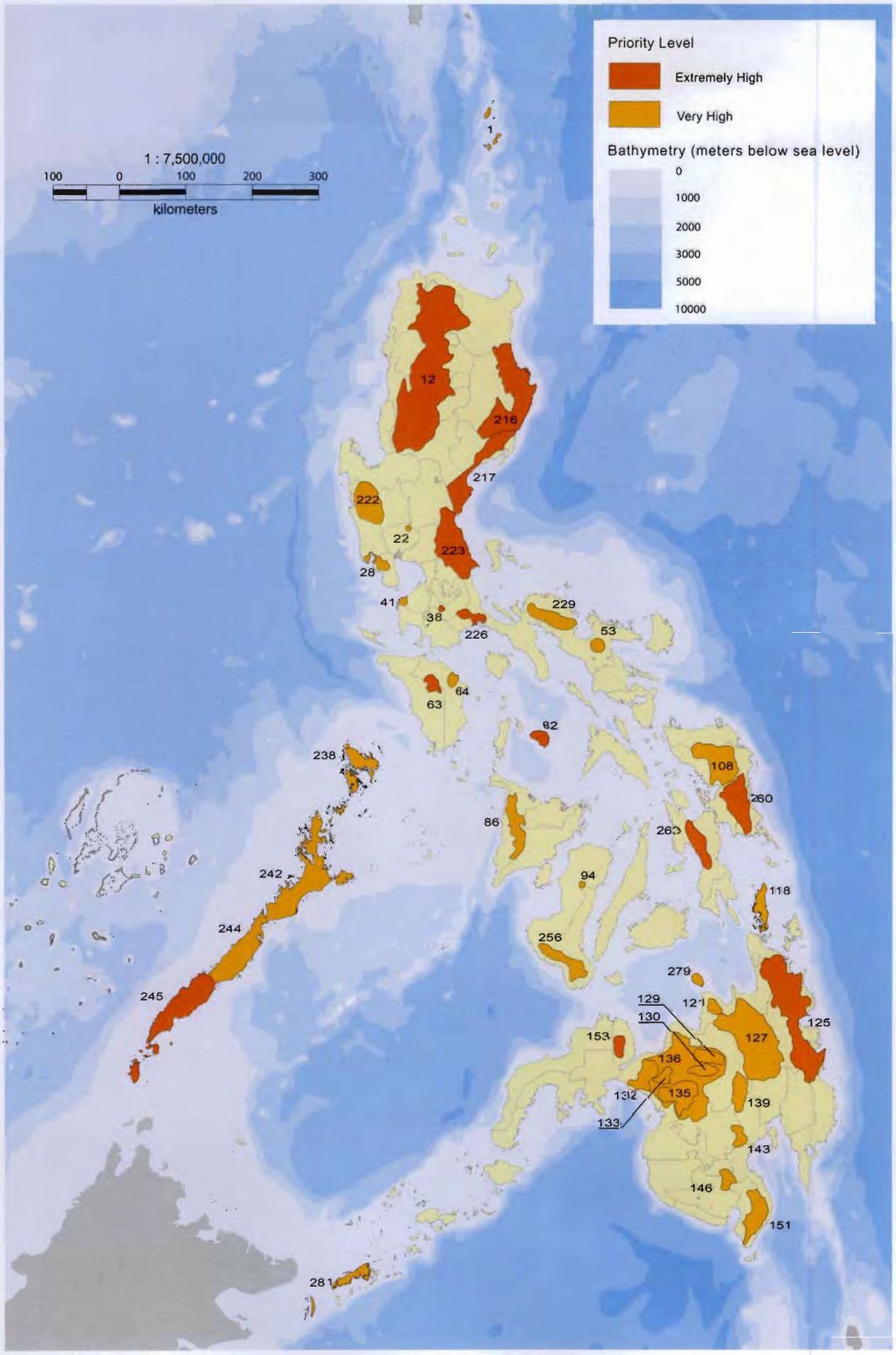


Figure 8a. Conservation priority areas for plants

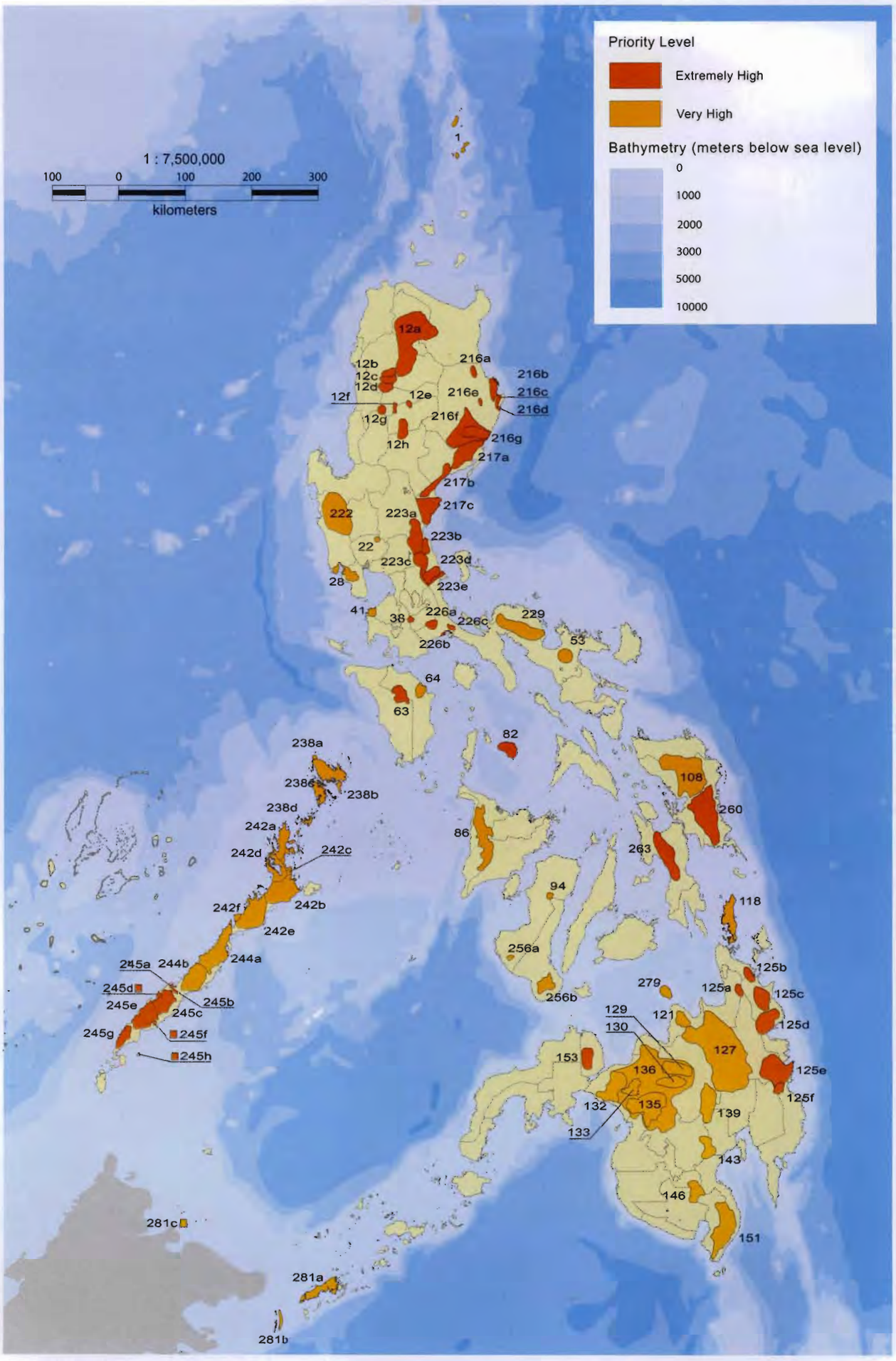


Figure 8b. Conservation priority sub-areas for plants

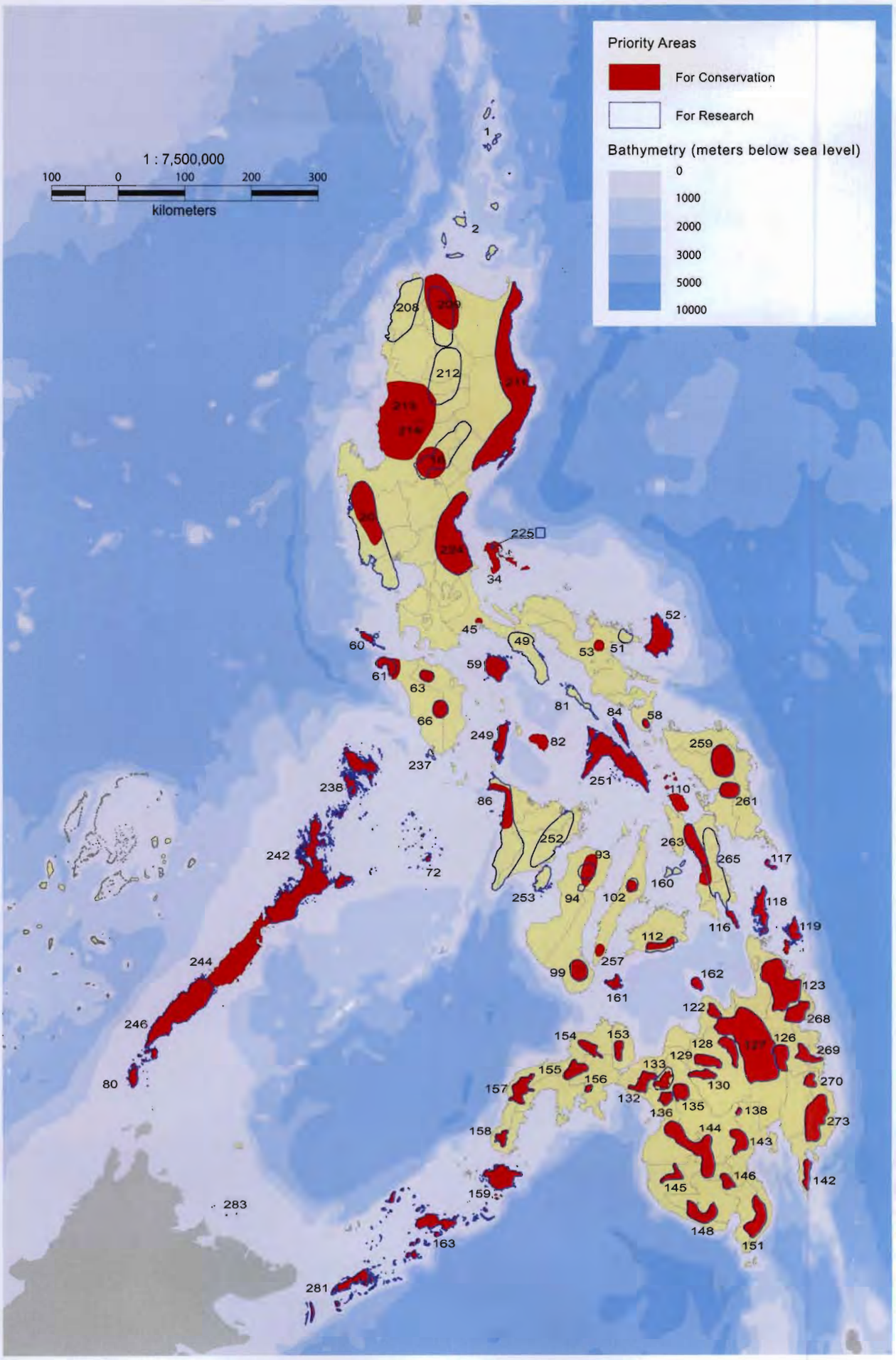


Figure 9. Conservation and research priority areas for arthropods

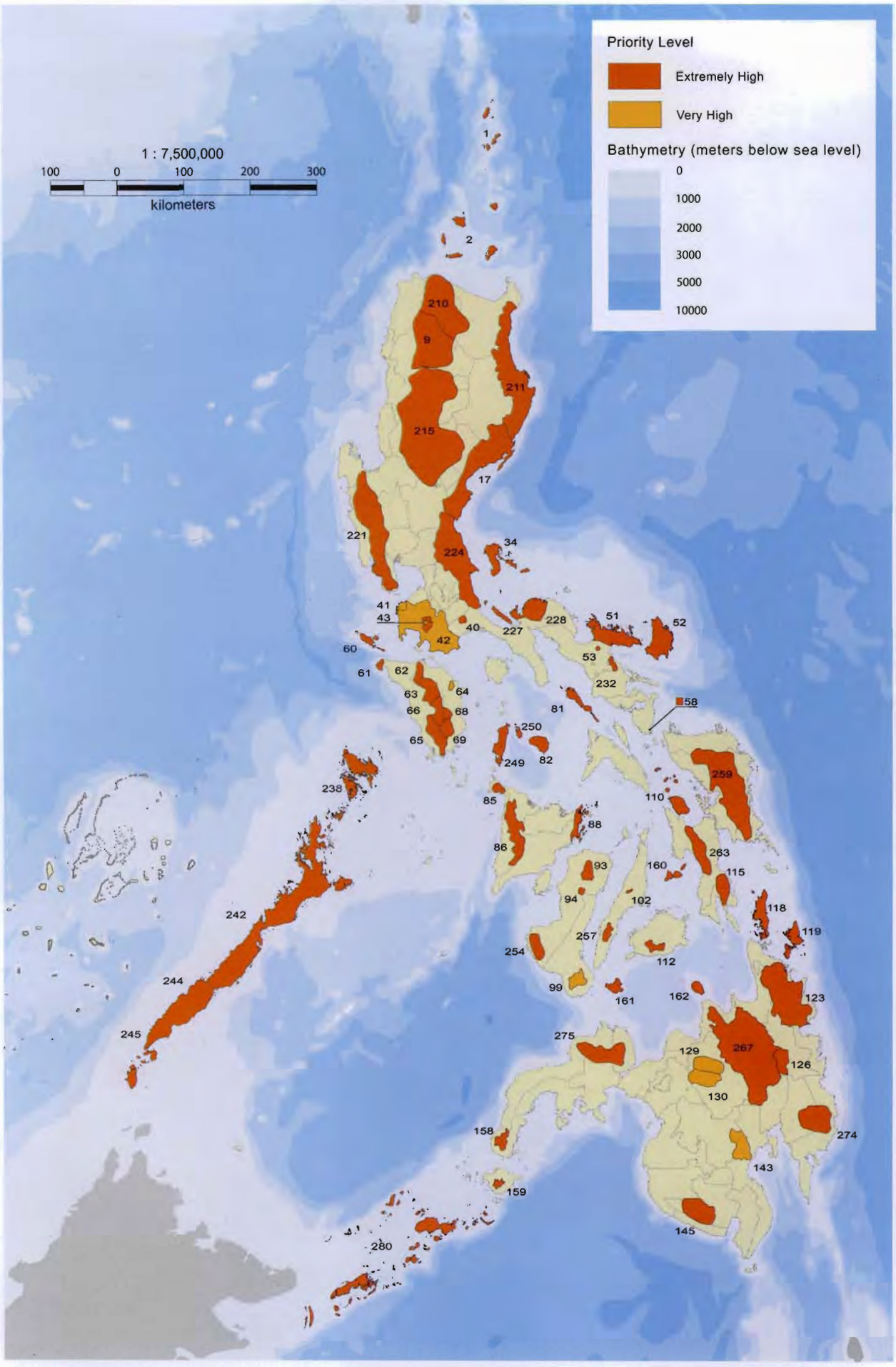


Figure 10. Conservation priority areas for amphibians and reptiles

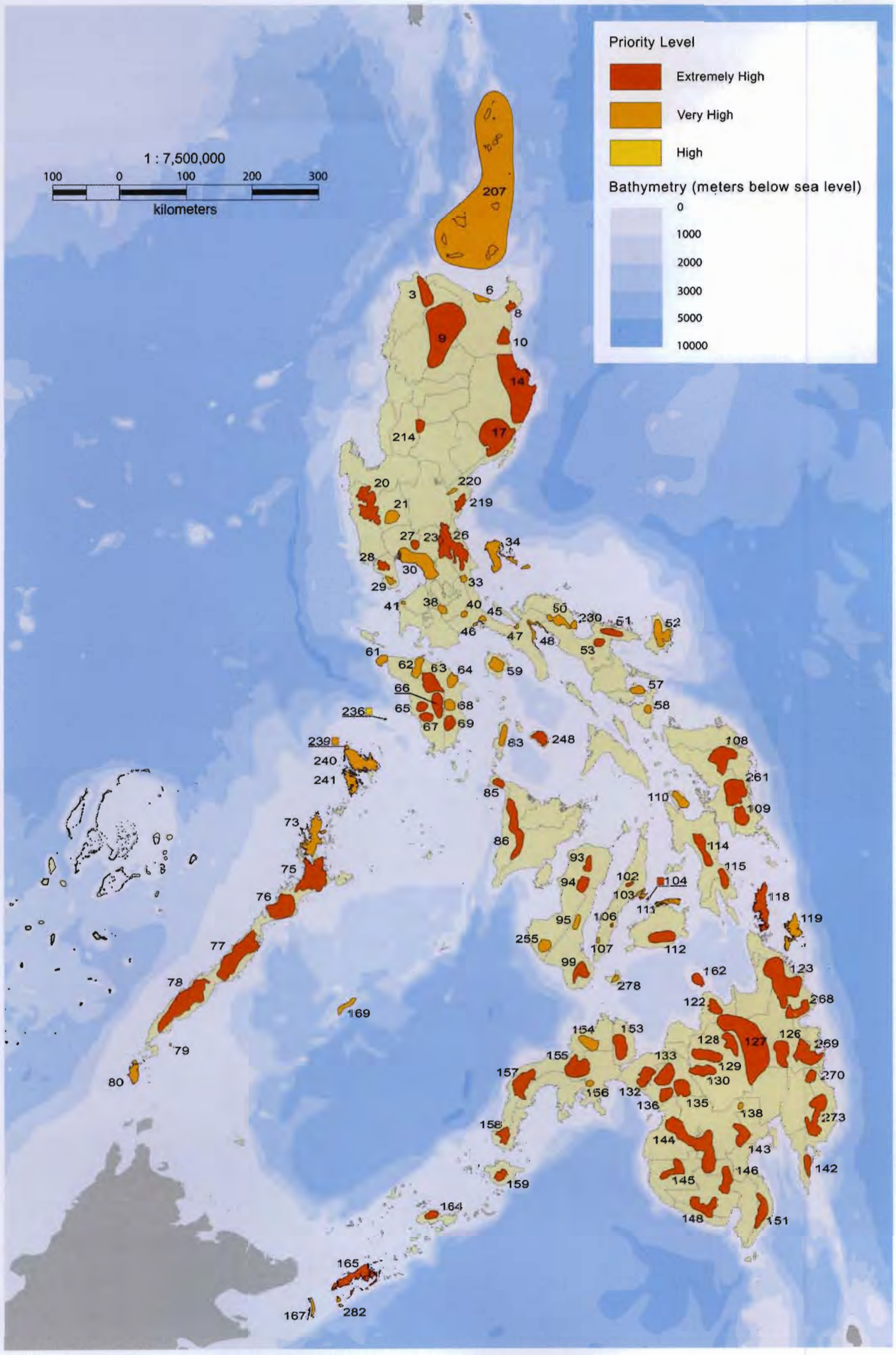


Figure 11. Conservation priority areas for birds

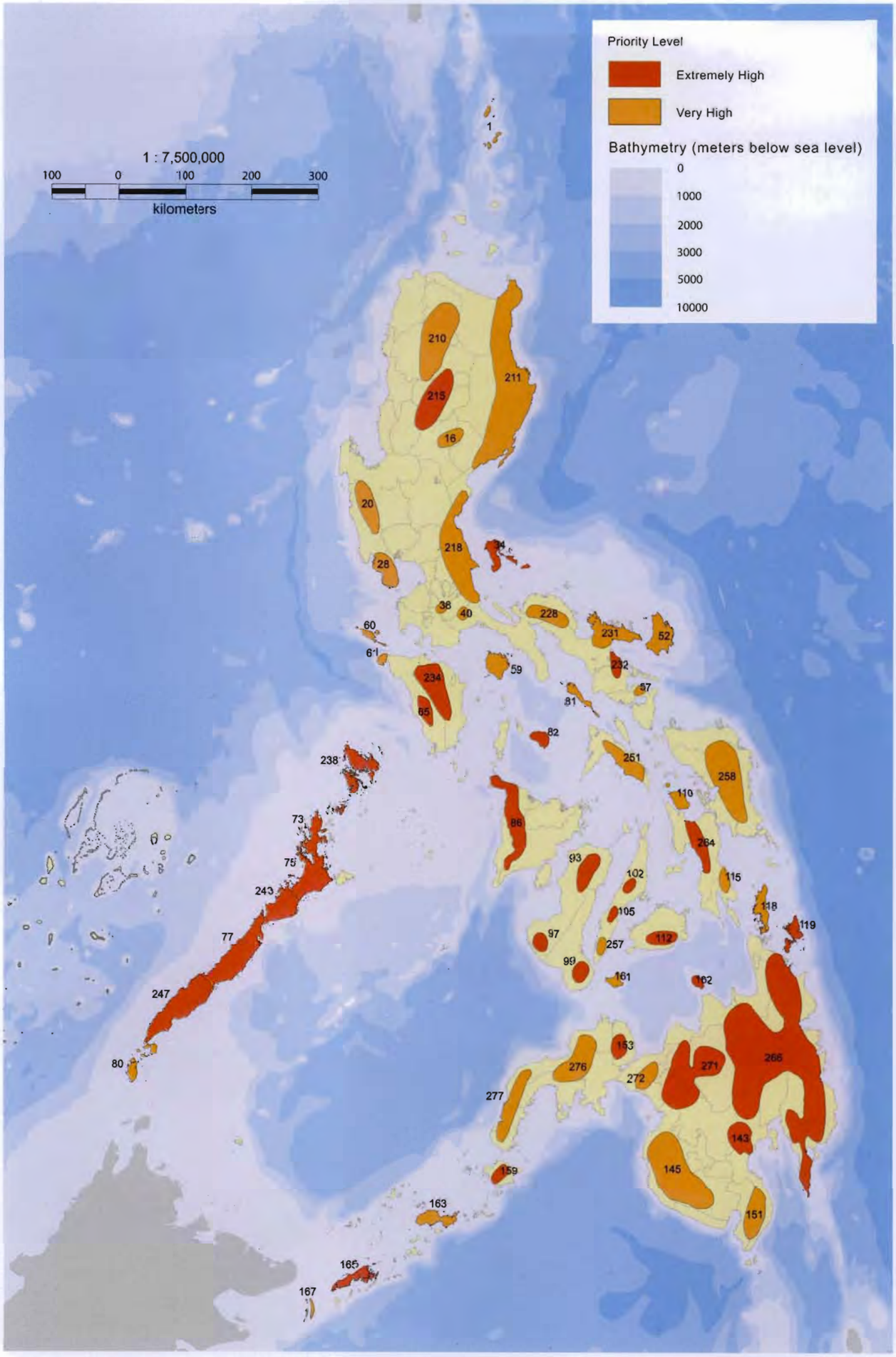


Figure 12. Conservation priority areas for terrestrial mammals

Figure 13. Conservation and research priority areas for inland waters

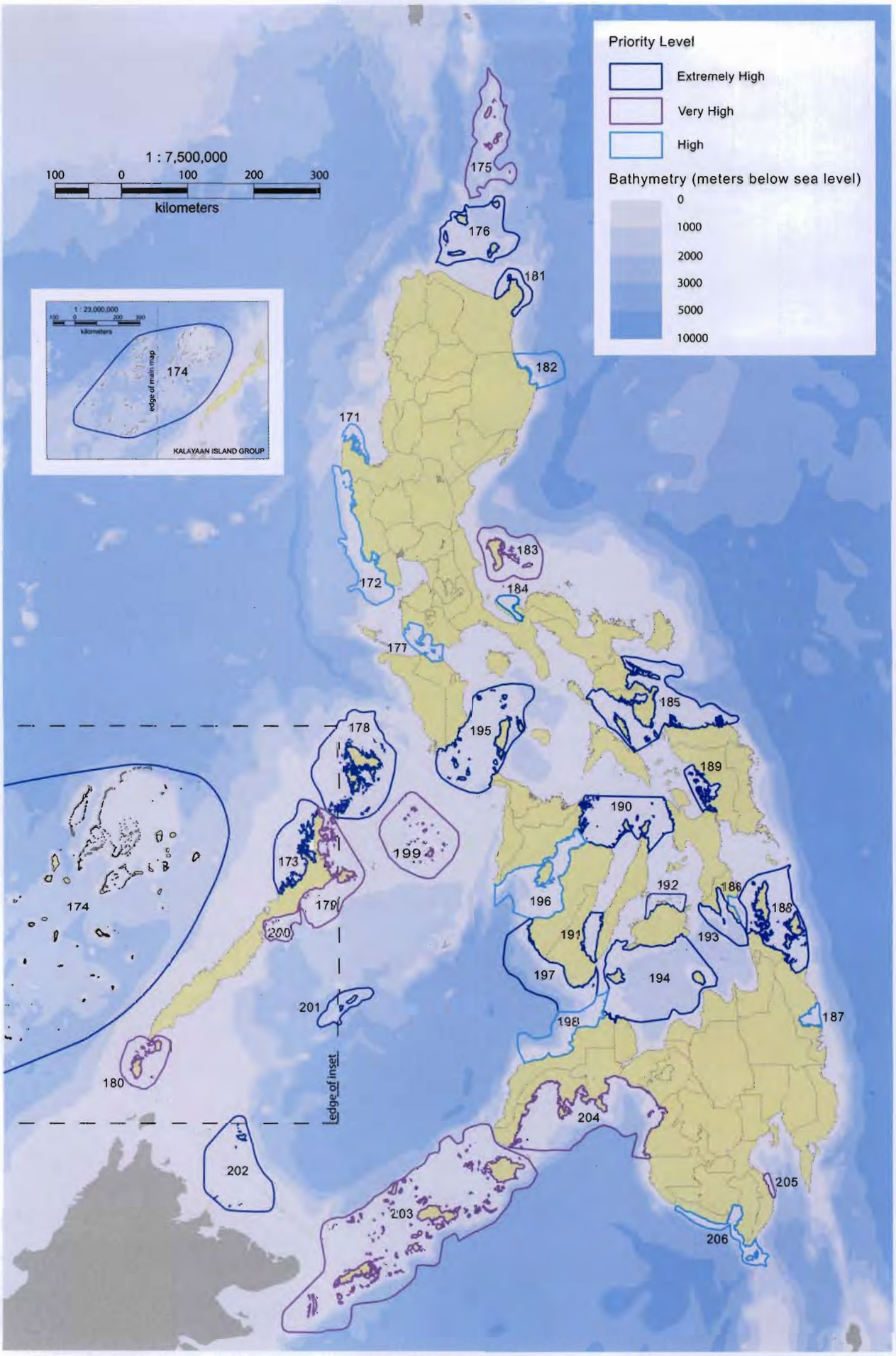


Figure 14. Marine conservation priority areas

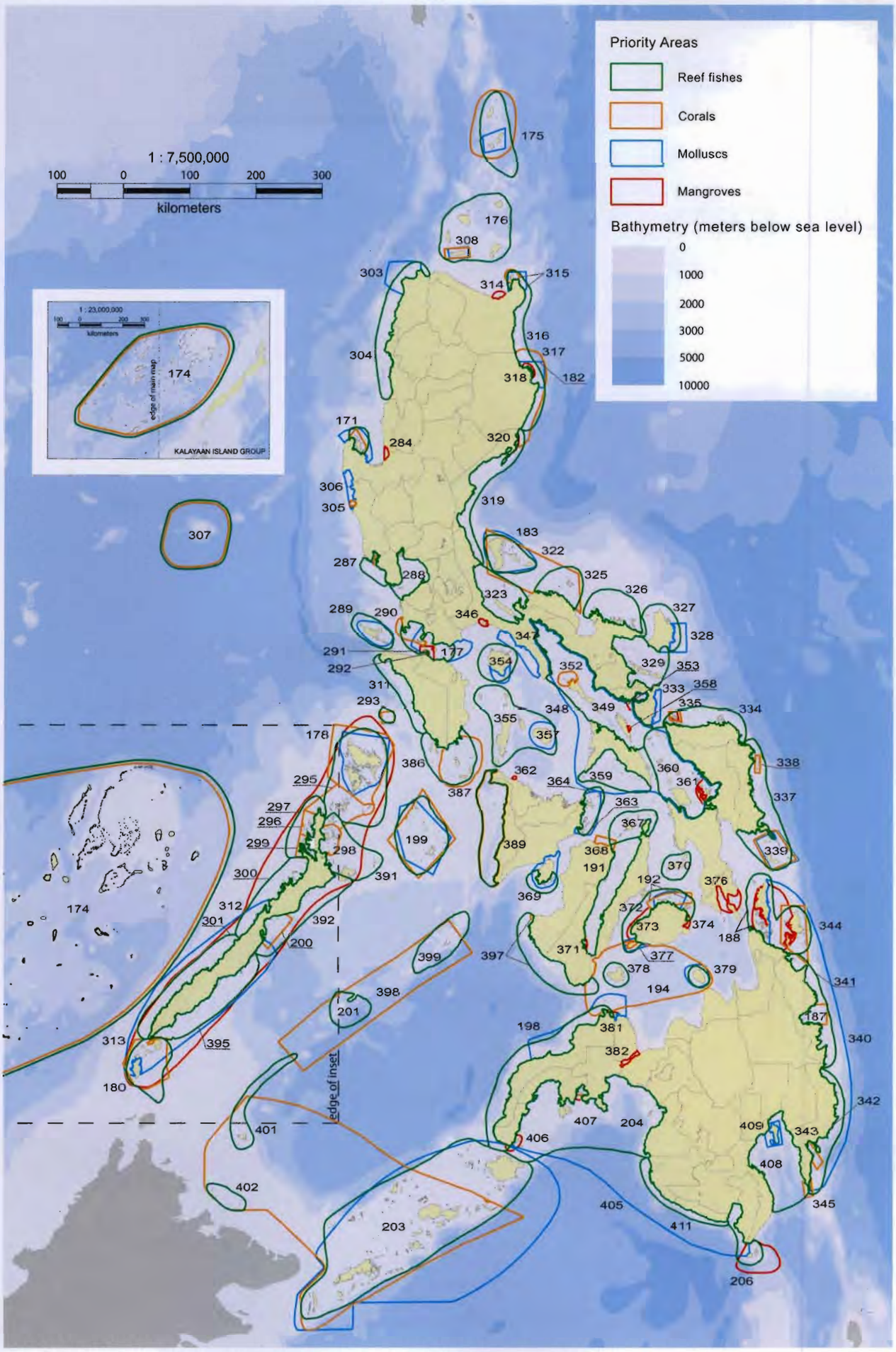


Figure 15. Conservation priority areas for reef fishes, corals, molluscs and mangroves

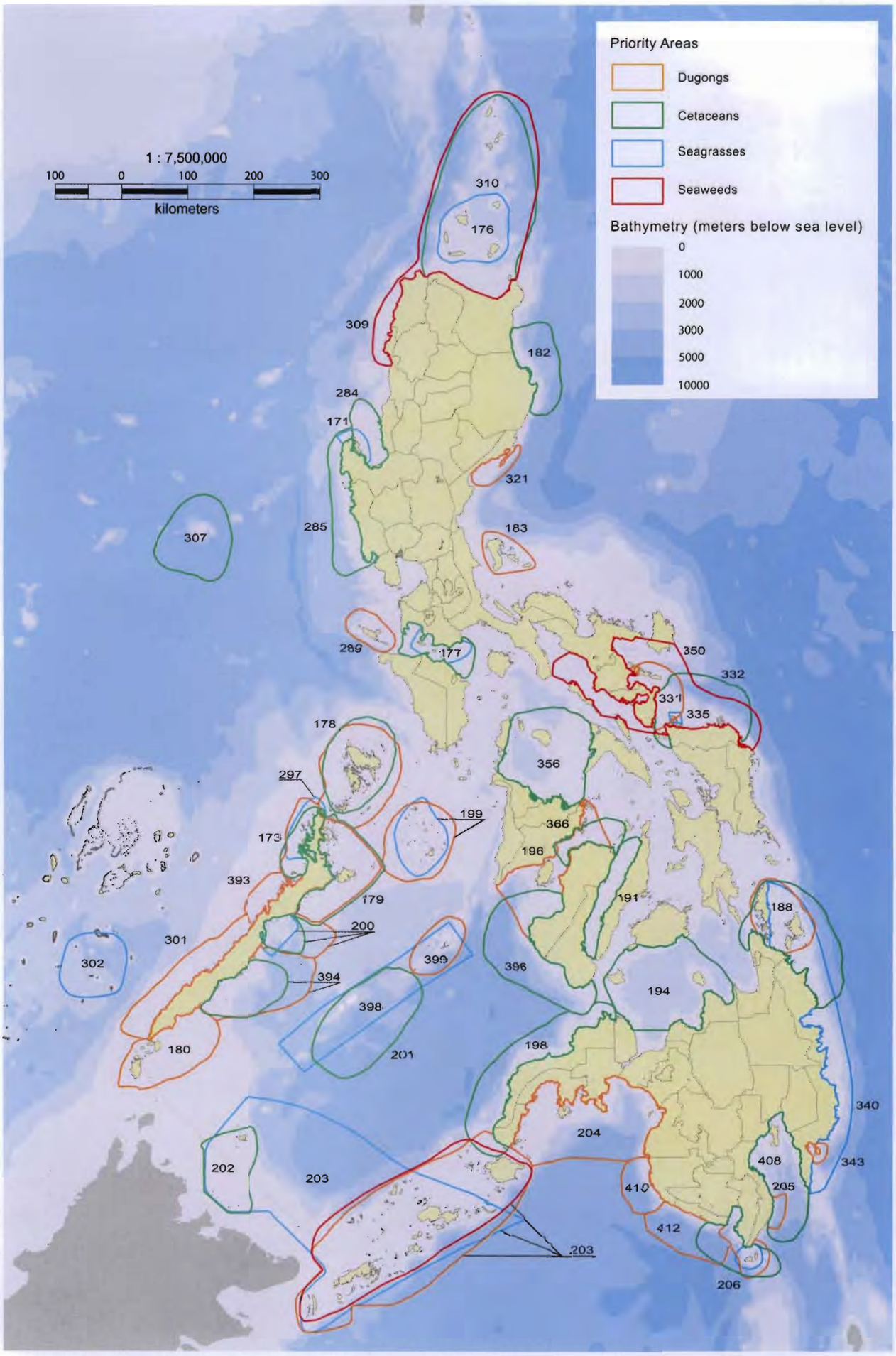


Figure 16. Conservation priority areas for dugongs, cetaceans, seagrasses and seaweeds

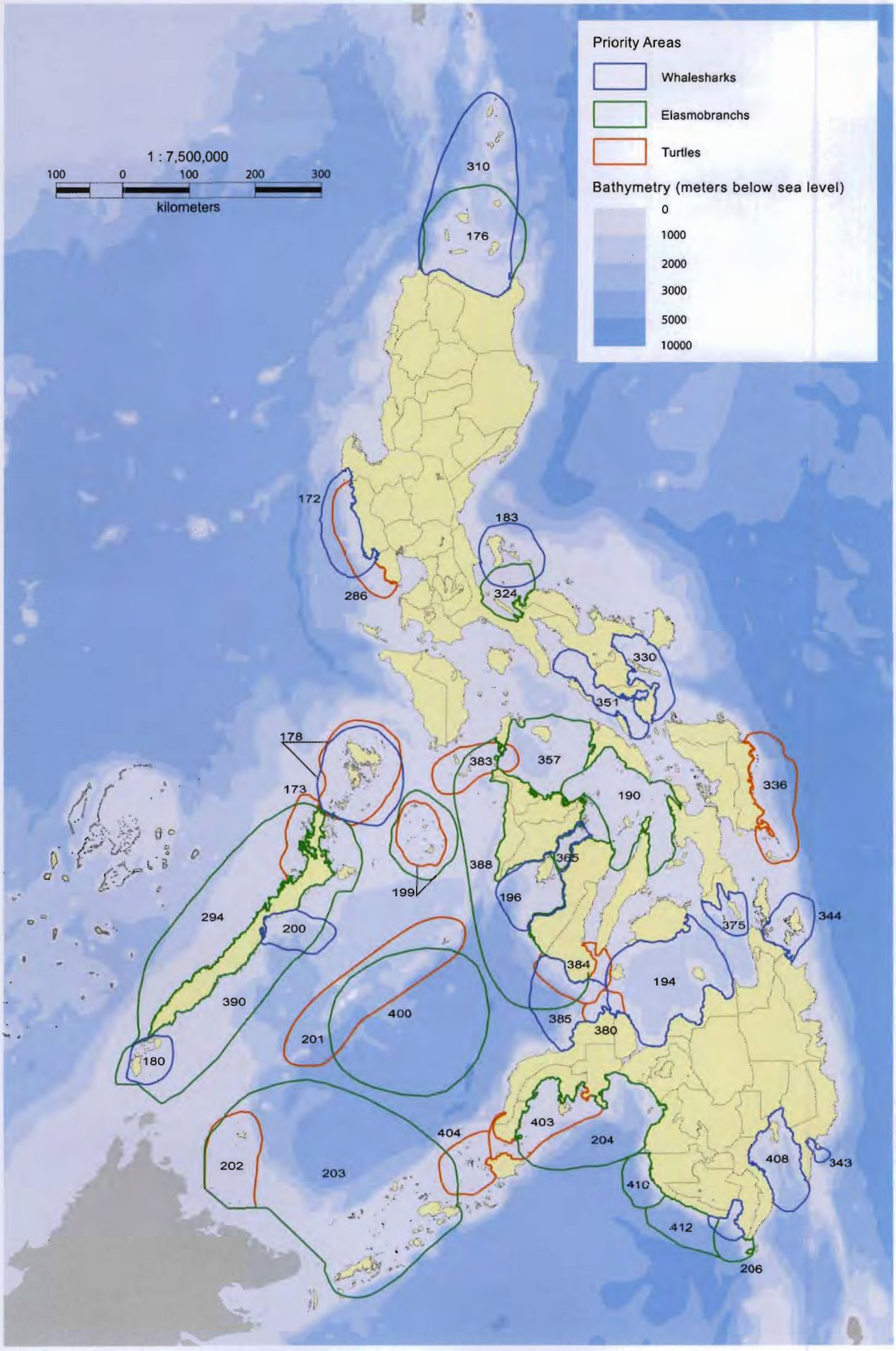


Figure 17. Conservation priority areas for whale sharks, elasmobranchs, and turtles

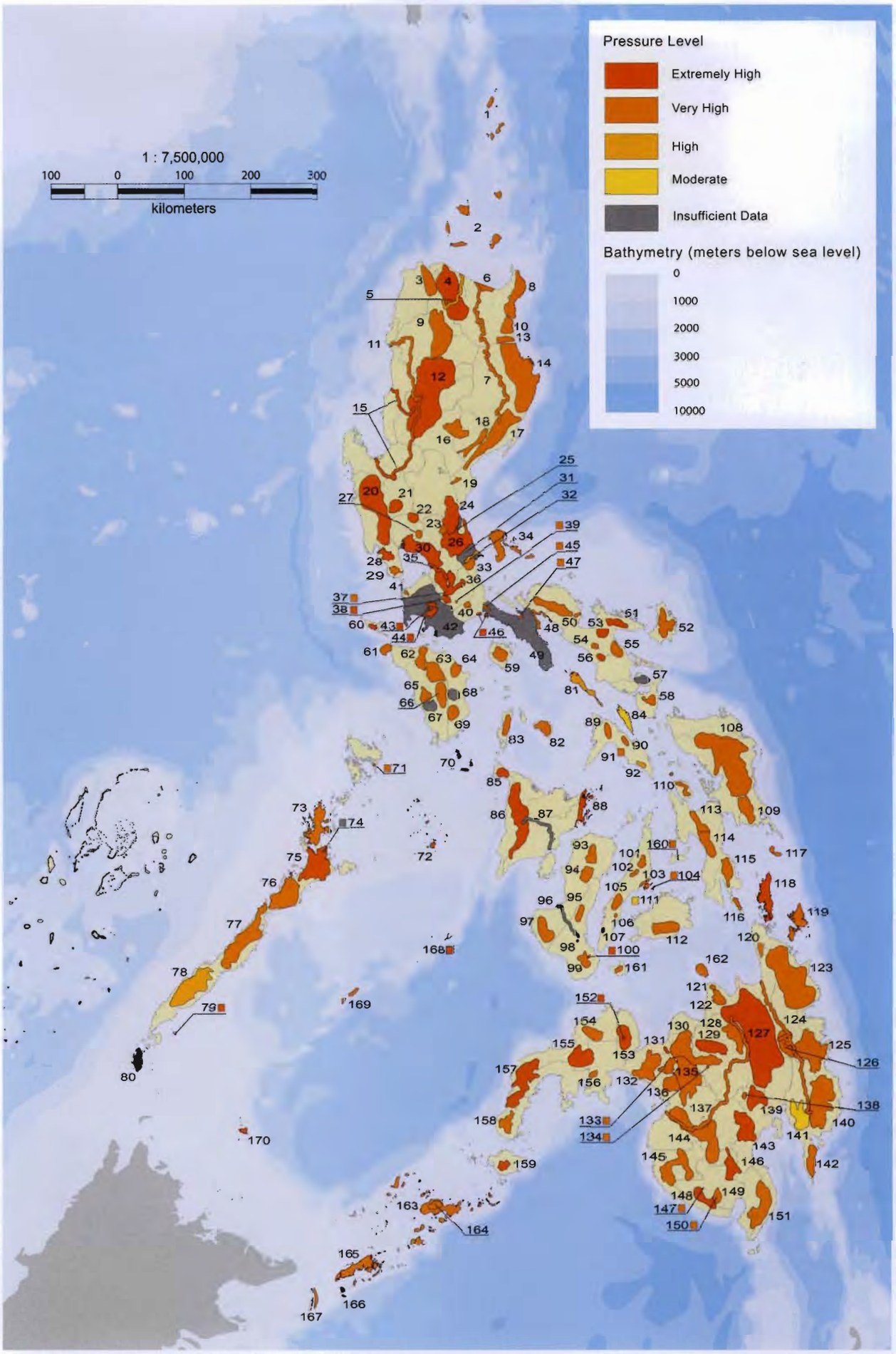


Figure 18. Socio-economic pressures in terrestrial and inland water areas of biological importance

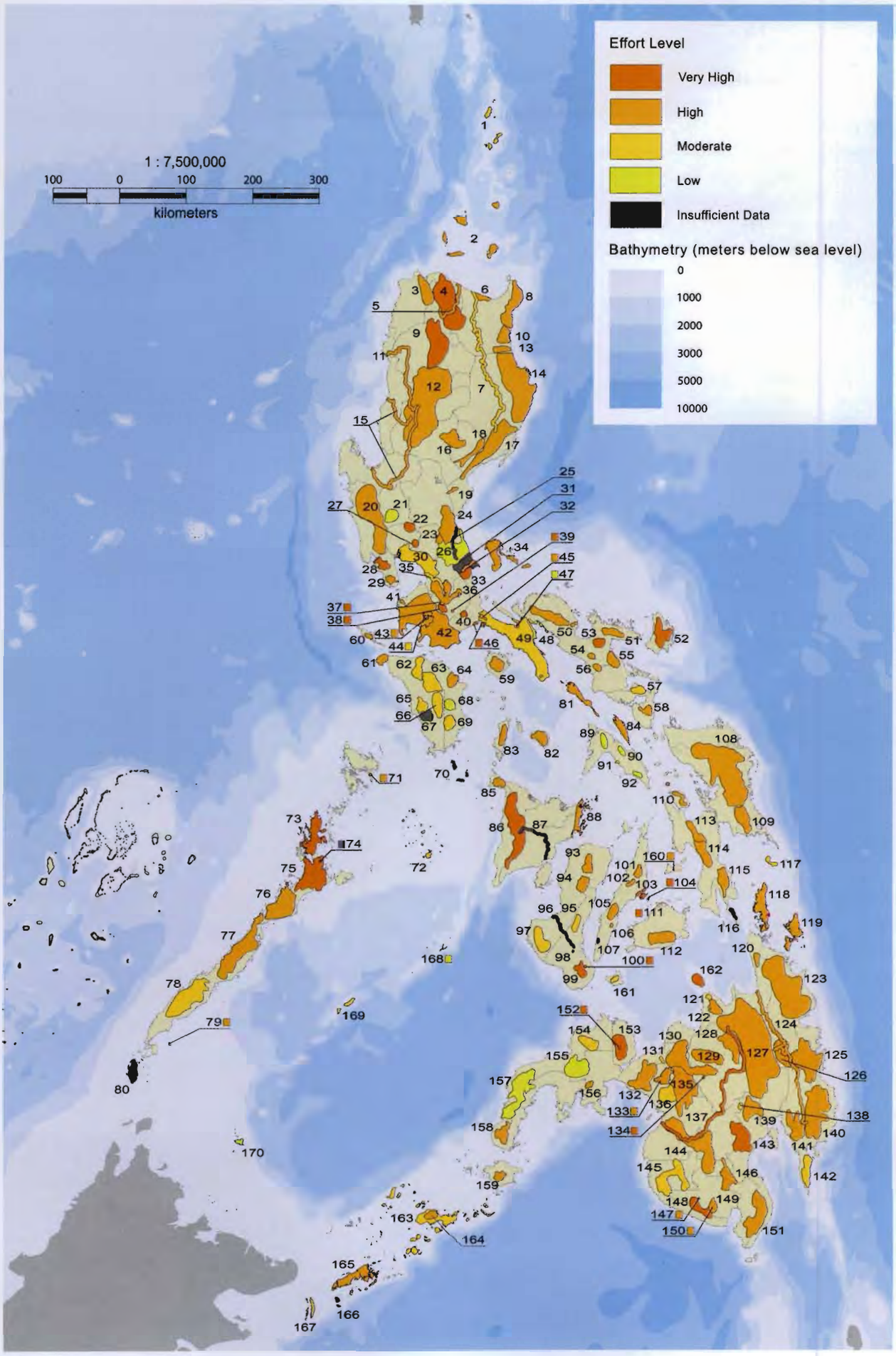


Figure 19. Conservation efforts in terrestrial and inland water areas of biological importance

The 2000 IUCN Red List includes 32 threatened amphibians and reptiles in the Philippines, and another ten species that are under lower threat categories (Hilton-Taylor, 2000). The Critically Endangered species include seven *Platymantis* frogs, one marine turtle, one freshwater turtle, and the endemic Philippine crocodile. Amphibians dominate the list while only nine species are reptiles. While a good number of species in this list are genuinely threatened with extinction, results from recent faunal inventories show that some species in the list apparently have stable populations and secured habitats. It is clear that the status of the species in such listings needs to be re-assessed periodically. The general lack of data on the ecology, distribution, population trends, and abundance of more than 85% of the amphibian fauna and more than 90% of the reptilian fauna impedes a more accurate assessment of their conservation status.

Although no cases of extinction of Philippine amphibians or reptiles have been documented, the large-scale destruction of the lowland forest—now almost completely gone in many parts of the Philippines—suggests that part of the amphibian and reptilian diversity might have been lost before it was described. Similarly, cases of declines in amphibian populations have not been documented in the Philippines. One important reason is the lack of long-term population studies being conducted on the islands, except for a few attempts on Negros.

The most immediate and clear threat to the herpetofauna is habitat destruction. Clearance and fragmentation of the lowland dipterocarp forest and even the lower montane forest affect more than 85% of the fauna. In light of recent studies showing that the highest diversity in forest frogs is found in the montane forest, the common practice of converting vast tracts of montane forest into large-scale agricultural plantations (a popular example is the so called "vegetable bowl" in the Cordilleras in northern Luzon) will be detrimental to many endemic species.

Other important threats to the amphibian and reptilian fauna are:

1. pollution of streams and rivers from mine tailings, pesticides, and herbicides run-off;
2. over hunting (especially of monitor lizards);
3. introduction of alien and invasive species;
4. unregulated trade, particularly as pets and for leather production; and

5. persecution and the unnecessary killing of animals, most especially of reptiles, which exact a heavy toll on the population of rare species.

A total of 69 reptile and amphibian priority areas were identified, 62 Extremely High and seven Very High (Figure 10).

BIRDS

Neil Aldrin D. Mallari

Between 1994 and 2001, four major publications represented the latest information on the status of birds in the country. These were Birds *to Watch 2* (Collar *et al.*, 1994), the *Philippine Red Data Book* (Wildlife Conservation Society of the Philippines, 1997), which fine tuned the conservation status of birds identified by Collar *et al.* (1994), *Threatened Birds of the Philippines* (Collar *et al.*, 1999), and the *Key Conservation Sites of the Philippines* (Mallari *et al.* 2001). These publications illustrate a fine-scale level of information that has been accumulated and analyzed for bird taxa in the Philippines and can be used as a starting point for broader biodiversity conservation.

The following accounts are summarized from Collar *et al.* (1999) and Mallari *et al.* (2001). These volumes are the first Red Data Book (RDB) and Important Bird Areas (IBAs) published for any Asian country. These two publications offer the latest and most detailed information currently available on the status of birds in the Philippines and the priority areas identified through the IBA approach.

The latest tally of birds in the country stands at 576 species, of which 395 species are resident breeders, meaning they nest and incubate their eggs in the country, in contrast to non-resident breeders, which

are wintering migratory birds or vagrants. Of the resident breeding species, 195 species are endemic while 126 are restricted range species (range size estimated to be < 50,000 sq. km.)

Using a set of internationally agreed-upon categories and criteria designed to identify areas that are of global significance for biodiversity conservation, a total of 117 IBAs were identified in the Philippines (Mallari *et al.*, 2001). These areas were selected to represent the key habitats in all the major biogeographic regions in the country. During the PBCPP Regional Consultations and the National Workshop, the 117 IBAs were further classified based on the number of (IUCN) endangered species, species richness, endemicity, and habitat into the following bird priorities: 69 Extremely High; 46 Very High; and 2 Moderately High (Figure 11).

The most important habitats in the IBAs are lowland and montane forests, with some wetland areas and seabird colonies on oceanic islets. Lowland forests are the most highly threatened habitat in many parts of the Philippines, and most of the significant remaining areas of lowland forest have therefore been selected as IBAs.

The Philippines supports a remarkable number of globally threatened species for a country of its size, and virtually all of its territory is covered by Endemic Bird Areas (EBAs), areas with two or more restricted-range bird species which rely or are confined to them, or Secondary Areas (SAs), areas which support one or more restricted range species but do not qualify as EBAs because less than two species are entirely confined to them (Mallari *et al.* 2001). It is therefore not surprising that almost all of the IBAs in the Philippines are believed to support populations of threatened species, and most of them also support the restricted-range species that are characteristic of an EBA or SA. The Philippines cover seven Endemic Bird Areas (EBAs) and three Secondary Areas (SAs), with each EBA containing unique concentrations of restricted-range bird species (many are globally threatened) and a number of more widespread threatened bird species (many are endemics).

A majority of the islands has been explored ornithologically, but the information available for many areas is incomplete or out-of-date. The inadequacy in data is exacerbated by the pattern of habitat loss in the islands. The accessible parts of the islands previously visited by ornithologists are the areas that are the most accessible for logging and agriculture. Many of these areas where threatened and restricted-range birds were previously recorded have now lost their natural habitats.

Many IBAs have been selected from the most remote and inaccessible areas, where natural habitats have survived, but where there is often little or no information available. Of the 117 IBAs in the Philippines, only 34 are considered relatively well-known ornithologically, 20 are poorly known and the information on the remainder is incomplete or lacking. There is clearly a need for surveys targeted at many of the most poorly known IBAs.

The major threat to the IBAs in the Philippines is habitat loss from on-going large-scale land conversions, particularly deforestation. In the 1970s and 1980s, legal logging caused a very rapid decline in forest cover. Another main threat to the remaining forests is clearance for agriculture and illegal logging. Other significant pressures are caused by the impacts of development of human settlements and roads, the collection of firewood and other forest products, mining, forest fires, the drainage of wetlands, and hunting.

There is evidence that habitat is being lost due to permanent and shifting agriculture (84% of IBAs), logging (76%), encroachment of human settlements in or near the IBAs (45%), mining (19%), developments for roads (19%) or tourism (9%), and draining of wetlands for agriculture or for fisheries (7%). These threats often work in synergy, and thus it is difficult to clearly differentiate the results of one threat from another. One cause of habitat loss often is a precursor of another, for example, after logging concessions have depleted an area of much of its hardwood, the improved access (*e.g.*, along logging roads) allows an influx of marginalized farmers to continue to clear the forests through shifting agriculture or kaingin farming.

At present, it is difficult or impossible to adequately protect areas in many parts of the Philippines because of the enormous pressure on the natural environment from the activities of landless people trying to make a living. Action is required at the national and regional levels to address the needs of these people, including the implementation of the National Land Use Plan, coupled with a genuine land reform program.

Other factors have a more direct effect on the fauna or flora. These include hunting for trade, trophies, and meat (57%), and collection of large quantities of firewood (including charcoal) and other forest products like rattan, peat moss, wild orchids, and

plants (46%). Other factors fall under the category of natural causes like typhoon, volcanic eruptions, El Niño, landslides due to earthquakes (7%), and forest fires (16%). The threats to some 13% IBAs are unknown.

MAMMALS

Blas R. Tabaranza Jr., Ruth Grace Rosell-Ambal, and Perry S. Ong

The Philippine archipelago is home to one of the greatest concentrations of mammalian diversity in the world and the greatest concentration of endemic mammals in the world on a per-unit-area basis. The most recent inventory of mammals includes 179 species of terrestrial mammals, 111 of which are endemic, and 25 marine mammals, for a total of 204 species of mammals occurring in the country (Heaney and Regalado, 1998; Tan, 1995; Aragones, this report).

Most major islands in the archipelago had been subjected to periodic and geographically diverse sampling for over a century. This might lead to the conclusion that the Philippine terrestrial mammals are well studied (Heaney *et al.*, 2001). However, in the last 15 years, field researches, mostly at high elevation areas, have found new species, in particular of murid rodents, in Luzon, Mindanao, and Mindoro. Moreover, several new species have been discovered in small oceanic islands such as Sibuyan (five new species) and Camiguin (two new species), catapulting these islands to a new status as centers of mammal endemism (Heaney and Mallari, 2001). These recent discoveries demonstrate why it cannot be assumed that all centers of endemism in the Philippines have been documented. Further basic field research is urgently needed in both the large and small islands.

The mammal assemblage in the Philippines is the eighth most threatened in the world, with 50 threatened species (Hilton-Taylor, 2000). Two earlier lists of threatened mammals by the IUCN (Baillie and Goombridge, 1996) and by the Wildlife Conservation Society of the Philippines (WCSP, 1997) showed 49 and 51 mammalian species, respectively. The two lists differed because the WCSP list included several unnamed species and new data.

Based on information collected over the last 15 years and continuing evaluation of the status of threatened terrestrial mammals, 52 threatened species and one possibly extinct species have been identified (Heaney and Mallari, 2001). In their list of threatened species,

Heaney and Mallari (2001) include 21 species not on the 2000 IUCN Red List (Hilton-Taylor, 2000) and six other species that have not yet been formally described. Nine species were included because of new information, while an additional six non-endemic species were added to the list because their Philippine populations are under threat. The list of threatened mammals is expected to grow in view of the continuing habitat destruction and as remaining small populations begin to suffer the effects of reduced population size. Many endemic mammals have very limited distribution and require mostly good forest to survive.

Based on expert opinion and the available information on the distribution of Philippine terrestrial mammals, a total of 60 priority areas for mammal conservation and research were identified, taking into consideration concerns for biogeographic representativeness (Figure 12). The 60 areas were given scores and ranked according to priority. To facilitate ranking, the experts used information on the range of habitats present and the degree of disturbance in the identified areas, the number of threatened species (best estimates that fit in the IUCN categories), species richness, the number of endemics, and the confidence level of experts (how much is known about the area). Since all 60 areas were already identified as conservation priorities, the group classified the areas as Extremely High (EH) or Very High (VH) mammal priority areas. Using confidence level, amount of information known from a specific area, and research priorities as additional parameters, 28 areas were designated as Extremely High Mammal Important Areas while 32 areas were designated as Very High Mammal Important Areas. The terrestrial mammal priority areas covered almost all the remaining primary forest and natural vegetation in the country.

Inland Waters Group

Adelina C. Santos-Borja

The Philippines lies within the Pacific Ring of Fire and is a geologically active country. Volcanic processes and crustal and fault movements caused the formation of a number of lakes such as the Seven Crater Lakes of San Pablo City, Laguna de Bay, and Lake Danao in Leyte (Punongbayan *et al.*, 1998). Other lakes were formed through stream processes, dissolution of rocks, down slope or mass movements, and shoreline processes, which led to the formation of major river systems. The inland waters group identified a total of 211 lakes, 18 major rivers, and 22 marshes, swamps, and reservoirs. The largest river is Cagayan River in Region 2 with 82 tributaries and a drainage area of 25,649 km^2.

Most lakes in the country are at various stages of eutrophication. Many were invaded by introduced species long before their native flora and fauna were known. Thus, endemic species might have existed prior to human-caused environmental changes. These factors, along with the lack of baseline data such as lake size and depth, make it difficult to conduct an assessment. Moreover, the information that is available needs to be validated as different sources gave different figures.

Species inventories of Philippine wetlands include 1,616 species of aquatic plants and 3,675 species of aquatic fauna (DENR, 1997). However, all wetland species, including those with marine or brackish water influence, are counted in this inventory. In relation to the extent of inland waters in the country, biological data is meager and unevenly represented. This is because a broad range of diverse expertise is needed and a considerable amount of financial resources is required to undertake detailed biological investigation, even on the larger lakes only. Most available information consists of mere listings of the aquatic biota without the necessary ecological and biodiversity assessment.

A majority of Philippine lakes were formed through volcanic activity and thus are completely landlocked. This has led to the evolution of endemic species in these lakes. For example, 13 endemic species and three endemic genera of Cyprinidae were identified in Lanao Lake, a central feature in the volcanic district of the Lanao Plateau (Herre, 1924). This led to the conclusion that the isolation took place a long time ago. Later, 17 endemic cyprinid species flocks in Lake Lanao were identified, 12 species of which were not found earlier (Bleher, 1994), making cyprinids the only fish species flocks in the entire oriental region (Davies *et al.*, 1990). However, the eleotrid *Hypseleotris agilis*, an endemic species in Lake Mainit, has been introduced to Lake Lanao. This species was found to prey on the endemic cyprinids and is therefore considered a major cause of the decline and disappearance of these fish flocks in Lake Lanao.

Taal Lake is the only habitat of the world's only freshwater sardine, *Sardinella tawilis*. The bleniid *Omobranchus ferox* is also endemic to the lake (Bleher, 1996), though the latter was not listed as such in Fish Base (1999).

Some fish species are considered very important in certain inland waters, such as pigek (*Mesopristes cancellatus*) in Cotabato River and its tributaries and the *ludong* (*Cestreaus plicatilis*) in Cagayan River and its tributaries. The latter is an expensive catadromous fish considered endemic to Regions I, II, and CAR by the BFAR-NIFEDC (National Integrated Fisheries Technology Development Center), although it is not listed as such in Fish Base (1999).

Pollution from domestic, industrial, and agricultural sources is the major reason for biodiversity loss in inland waters, causing water quality problems like massive algal blooms and oxygen depletion. Oil spills also have negative impacts on the quality and quantity of aquatic organisms. The polluted waters of the Pasig River, the only outlet of Laguna de Bay, prevent the free passage into Laguna de Bay of the larvae and young of migratory fishes, as well as the seaward migration of spawning adults (Villadolid, 1932). Recent stock assessment in Laguna Lake showed that brackish water species such as *Scatophagus argus* (kitang) are no longer found in the lake (Palma *et al.*, 1997). The diversion of rivers for irrigation and the construction of dams has affected the movement of migratory fish species, dried some riverbeds, and changed the habitat of the riverine flora and fauna.

Introduction of invasive alien species has seriously affected biological diversity and led to the loss of some endemic species. The introduction of the goby *Ophieleotris agilis* (Bleher, 1994) and later of the eleotrid *Hypseleotris agilis* in Lake Lanao has led to the extinction of 13 endemic species of cyprinids (Primavera, undated; Bleher, 1994) and, through predation, the decline in the population of the surviving species (Bleher, 1994; Mercene, 1997). Other invasive alien species with negative impacts on inland waters are the Thai catfish *Clarias batrachus*, which displaced the native catfish *Clarias macrocephalus*, and the golden apple snail *Pomacea canaliculata* from the United States, which displaced the native snail *Pila luzonica* (Guerrero, 2001).

Aquaculture, through the introduction of exotic species such as *Tilapia,* is another factor affecting biodiversity through competition for food, space, and predation. The indiscriminate use of artificial feeds, the overcrowding of fish pens and fish cages that hamper water movement, and the redistribution of natural food often result in water quality deterioration. This was observed in the seven crater lakes of San Pablo City and has become a major concern in the management of the lakes. The construction of aquaculture structures and fish traps in Pansipit River, a tributary of Taal Lake, has also affected the movement of migratory species. The decline in the population of *Mistichthys luzonensis* (sinarapan) was also attributed to the introduction of *Tilapia* in Lake Buhi and illegal fishing methods practiced in the lake.

Loss of biodiversity in inland waters as well as in other habitats is also attributed to poverty and politics. Heavy demand on the natural resource to sustain an ever-growing population without sufficient economic means contributes greatly to the problem. Conflicting water utilization policies and practices have affected freshwater taxa as well.

The inland water group identified 34 priority areas both for research and conservation (Figure 13). This list of priority areas should be considered a first iteration and viewed as the template for future priority setting. Information gaps were identified that, when filled, will make the rating of areas objectively possible and guide future studies in inland waters as well. In addition to conserving the biodiversity of inland waters, those lakes with cultural significance and those within ancestral domain should be left alone so as not to open them for possible exploitation.

Increasing demands on the environmental services offered by inland waters will always threaten their continued survival. While inland water represents a unique ecosystem, given our limited resources, there is an urgent need to focus on the set priorities for research and conservation. In particular, additional knowledge on the resource is needed in order to manage it effectively.

Marine Group

Porfirio M. Aliño and Reuben T. Campos

The Philippines, Indonesia, Papua New Guinea, and Borneo form the Coral Triangle, where the highest coral reef diversity in the world is found (McManus, 1988). Several hypotheses have been proposed which are important in understanding the evolutionary basis and the ecological patterns and processes of the diversity of marine life in the Coral Triangle (Potts, 1985; Palumbi, 1999; Aliño and Dantis 1999).

The marine group identified priorities for marine biodiversity conservation by focusing on the following sub-themes and taxa: reef fish, large invertebrates, corals, mangroves, molluscs, seaweeds, seagrasses, and charismatic organisms like cetaceans, dugongs, whale sharks, and marine turtles. The biological attributes of habitats and organisms were determined and scored using the following criteria: ecological diversity, ecosystem rarity, ecosystem function, extent of habitat, unexploredness, species status, species richness (if appropriate), endemism (if appropriate), and importance of the species. Unexploredness meant that little research has been conducted in the area.

Drawing on knowledge of the areas and organisms on which they are working on, the experts evaluated the threats that prevail in the identified areas, which include destructive fishing (*e.g.*, blast fishing, use of cyanide), poaching, mining exploration, overexploitation, coral collection, sedimentation, localized pollution (*e.g.*, from power plants and sewage), and the harvesting of sharks and dolphins.

Thirty-six marine priority areas were identified based on the overlay of the priority areas identified by each sub-theme. These priority areas cover a total area of 46,133,296 ha. The integrated priority areas were further divided into the following priority level classifications: 14 Extremely High, 12 Very High and 10 High (Figure 14).

MANGROVES

Jurgenne Primavera

There are 54 mangrove species in the world belonging to 16 families. Thirty-five of these species (1 hybrid, 1 variety, and 33 species) are found in the Philippines (Tomlinson, 1986). A new record, *Kandelia candel*, was recently found in Aurora (Anonymous, 1996) and is thought to have originated mainly from the higher latitudes of Hong Kong, Thailand, and Vietnam. The area covered by Philippine mangroves was estimated to be between 400,000 and 500,000 hectares at the turn of the century but has declined to a little over 120,000 ha in 1994 (Brown and Fischer, 1918; Primavera, 2000). This is attributable to overexploitation by coastal dwellers and conversion to agriculture, salt ponds, industry, and settlements.

Aquaculture remains the major cause of mangrove destruction—around half of the 279,000 hectares of mangroves lost from 1951 to 1988 were developed into culture ponds. Furthermore, 95% of brackish water ponds in the same period were derived from mangroves. This was due to a 1950s national policy encouraging aquaculture development, which was based on the erroneous belief that mangroves and other wetlands are wastelands. In the 1970s, valuation studies changed the way mangroves were viewed, which placed a value of US$10,000/ha per year when all marketed and non-marketed goods and services from mangroves are considered (Primavera, 1995).

The new value of mangroves led to the declaration of around 80,000 hectares of the country's remaining mangroves as wilderness and forest reserves in 1981, including all the 40,000 hectares of pristine mangroves in Palawan. This was followed by the inclusion under protection of other old growth mangroves such as the 110-ha Pagbilao, Quezon, and the 300-hectare Bais Bay, Negros Oriental mangroves (Baconguis *et al.*, 1990).

More recently, a few pristine mangrove areas were re-discovered because of their relative inaccessibility (*e.g.*, Aurora and Isabela provinces, and Dinagat-Siargao islands in Surigao) and peace-and-order threats (*e.g.*, Western Samar and Santa Cruz island in Basilan province). Even a very small forest patch, such as the 75-ha mangroves of Ibajay, Aklan (the largest contiguous mangrove in Panay island), can feature as many as 20 mangrove species, a further confirmation of the country's remarkable mangrove diversity. Figure 15 shows the priority areas for mangrove conservation.

SEAWEEDS

Edna Fortes

Approximately 1,062 species of seaweeds are reported in the Philippines. Seaweed distribution, however, has been based on uneven assessments. Thus, localities with a high number of taxa may not necessarily represent areas where seaweed diversity is correspondingly high. Rather, it may be that seaweed collections was intensive in the area.

Seaweed herbaria and seaweed information centers play an important role in seaweed biodiversity research. The Seaweeds and Invertebrates Information Center at the University of the Philippines' Marine Science Institute (UP MSI) maintains a computerized database as well as a large collection of articles published in local and foreign journals pertaining to seaweeds (among other things). The GT Velasquez Phycological Herbarium at the UP MSI also maintains the largest collection of seaweed specimens in the country, many of which represent first records for the Philippines. Other university-based institutions, such as the Silliman University Marine Laboratory and the University of San Carlos, also maintain seaweed herbaria.

The application of more sophisticated tools will significantly enhance assessment and monitoring of seaweed diversity in the country. Sustaining assessment activities by linking them to a Geographic Information System (GIS) will facilitate an efficient mapping of the distribution of seaweed species across the country. GIS can also be used to monitor the abundance of seaweed species through time. In addition to GIS, the use of molecular techniques to assess the genetic diversity of the country's seaweeds resources represents another direction of future research. Figure 16 shows the priority areas for seaweeds conservation.

SEAGRASSES

Miguel Fortes

Seagrass beds are discrete communities dominated by flowering plants with roots and rhizomes (underground stems) that grow best near estuaries and lagoons in the Philippines, where they are often associated with mangrove forests and coral reefs, often forming the ecotone between these two divergent ecosystems (Fortes, 1995). The seagrass meadows support a rich diversity of species from adjacent systems and provide primary refugia for both economically and ecologically important organisms. The plants are sensitive to fluctuations

because species coming from their neighboring systems encounter «marginal conditions» and are at the extremes of their tolerance levels to environmental alterations which makes them useful indicators of changes not easily observable in either coral reef or mangrove forest.

Southeast Asia, with its extensive combined coastline of more than 120,000 km, is the second most diverse area, next only to Australia, in relation to seagrasses, with the Philippines, Indonesia, and Vietnam contributing the greatest number of species in the region (19 or about 55%). So far, 16 species of seagrasses have been identified in Philippine waters (Fortes, 1986). Many plants and animals live in seagrass beds of the Philippines where they form a major fishery. Coral reefs with their associated seagrasses potentially could supply more than 20% of the fish catch in the country (McManus, 1998).

Fish and shrimp are probably the most important components of the beds, although coastal villages derive their sustenance from other components of the grass beds. The major invertebrates found in the beds are shrimps, sea cucumbers, sea urchins, crabs, scallops, mussels, and snails, while the major vertebrate species include fishes, reptiles, and mammals. Some threatened species of sea turtles reported in seagrass beds include the olive ridley (*Lepidochelys olivacea)*, loggerhead (*Caretta caretta*), leatherback (*Dermochelys coriacea)*, and green sea turtle (*Chelonia mydas*). The sea cow (*Dugong dugon*) is probably the most important mammal in seagrass beds of the tropics. Almost exclusively dependent on seagrasses for food, it is endangered all along its range of distribution.

From ocular surveys, the Philippines has sizeable seagrass areas spread discontinuously along the shallow portions of its coastlines. The number of species present appears to be largely a function of the extent of studies made, the length of the coastline, and the emphasis countries give on the habitats. A total of 978 km^2 of seagrass beds have been measured from 96 sites. The areas of seagrasses reported are estimates from selected study sites, not reflecting the area for the country.

Seagrasses in the Philippines are under threat from loss of mangroves and coral reefs, the former acting as a "filter" for sediment from land, coastal development, urban expansion and dredging (Leon *et al.*, 1990), the latter, serving as buffer against waves and storm surges. Other impacts include, substrate disturbance, industrial and agricultural runoff, industrial wastes and sewage discharges. In the last 50 years, between 30 and 50% of seagrass beds were lost. This is the result of industrial development, ports and recreation (Fortes, 1994).

The major obstacles to solving the environmental problems and issues with regards to the seagrasses of the Philippines include lack of trained seagrass researchers, gaps in basic knowledge i.e., extent, status, and uses lack of appreciation of seagrasses resources, limited and uncoordinated research, misguided management efforts, lack of implementation of laws, lack of effective linkages, and non-consideration of the social and cultural dimensions. Figure 16 shows the priority areas for seagrasses conservation.

MOLLUSCS

Benjamin Vallejo

The study of marine molluscs in the Philippines has taken place for more than 100 years, yet the understanding of their natural history remains largely incomplete. Molluscs comprise the second most diverse taxa in the Philippines after the Arthropods, with an estimated 22,000 species of freshwater, land, and marine molluscs. These include gastropods (68%), bivalves (27%), and scaphopods, amphineurans and cephalopods (5%) (Cabrera, 1986). Although information on mollusc distribution in the country is limited, endemicity is estimated at 2-4% (Springsteen and Leobrera 1986) but this may be higher. Some regions of diversity and endemicity are known, depending on the taxa. Olive shells are most diverse in the Sulu Sea, cowries in Samar, and cone snails in the Sibuyan Sea (Springsteen and Leobrera 1986; Vallejo 1999). The Visayas appears to be a region in which diverse taxa overlap in range.

Museums play an important role in mollusc research. The Philippine National Museum Conchological Collection is well organized, covering most of the major coral reef malacofauna, while the collections found at the University of Santo Tomas, regional universities, and private individuals have similar collection patterns. The Muricidae, Conidae, Cypraeidae, Olividae, and Buccinidae are well represented in collections while other families such as Columbellidae, Trochiidae, Costellaridae, and Mitridae are not as well represented. Many bivalve families are also underrepresented. Future collection activity should focus on these so that a clearer picture of mollusk diversity and distribution will emerge. Figure 15 shows the priority areas for molluscs conservation.

CORALS

Wilfredo Licuanan and Emmi Capili

The Philippine coral fauna is the richest in the world, with about 430 species. This is followed by Papua New Guinea (380 species) and the Great Barrier Reef (350 species). As with most marine organisms, coral endemism is limited because of the continuity of global oceans and the ability of currents to disperse planktonic larvae widely. For example, 62% of all central Indo-Pacific coral species are common to the region, with 13% (about 70 species) restricted to ranges within the continental coastlines (Veron, 1995). Only 12 species are endemic to the Philippines and Indonesia (Veron, 1995). These are *Montipora setosa, M. confusa, M. orientalis, M. florida, Acropora magnifica, Porites cumulatus, Pachyseris foliosa, Galaxea alta, Oxypora crassispinosa, Euphyllia paradivisa, Plerogyra turbida,* and *Physogyra exerta*.

Most recently, the senior author discovered a new species of coral belonging to the genus *Leptoseris* in the Kalayaan Islands that has not been seen anywhere else in the country. John E. N. "Charles" Veron, the world expert on corals, recently described 21 new species from the Calamianes Group of Islands, Northern Palawan based on a two-week rapid assessment conducted in 1998 (Veron and Ferner, 2000).

Information on the distribution of the 430 species in the Philippines is limited, largely because of the difficulty in identifying coral species *in situ* and the emphasis on resource inventories (*e.g.*, estimating coral cover and abundance) at the expense of taxonomic detail (the listing of species). The "life-form" methodology, which emphasizes the form of the coral rather than its scientific name, has allowed more survey groups to survey (and, in some cases, monitor) more reefs in order to assess their status (i.e., cover/abundance information).

Despite limited distribution information about Philippine coral fauna, local diversity can be very high. A recent expedition listed 260 species in the Tubbataha Reefs in the central Sulu Sea (van Woesik, 1996), which increased to 346 species in a latter survey (Veron and Ferner, 2000). It appears there is greater variation or turnover in species composition between adjacent embayment around large islands such as Luzon than in far offshore reefs. These patterns need to be validated, but they provide the basis for the protection of inshore reefs in small embayment, such as Puerto Galera Bay in Mindoro and Talim Bay in Western Batangas. Offshore reefs appear more homogenous, with large single-species stands in the fore-reef slopes and flats, where the coral population sizes (and presumably, the gene pool) are sufficiently large. Large areas make their protection viable in terms of their ability to supply propagules to adjacent areas.

Habitat diversity is as important as species diversity. Thus, representation of habitat types and environments for conservation should be ensured. Atolls and barrier and fringing reefs all are found in the Philippines, with the fringing reefs forming the majority of local reefs. Examples are offshore fringing reefs in typhoon belts and wave exposed areas, such as Polillo; near-shore fringing reefs (*i.e.*, around large island masses such as Luzon) under minimal human pressure, like those in parts of Aurora and Isabela; or near-shore fringing reefs under severe pressure, like those in parts of eastern Samar and in more climate-benign areas around Mindanao (*e.g.*, Lianga Bay in Surigao del Sur for inshore fringing reefs, and the Sulu Archipelago for offshore fringing reefs).

Reef atolls are relatively uncommon in the country; but are spectacular when present, such as those in the Tubbataha Reefs in the Sulu Sea, Apo Reef off Mindoro, and most reefs in the Kalayaan Islands Group (KIG). Several countries claim atolls in the KIG, however, satellite images show that the different islands actually belong to the same atoll. Thus transboundary-protected areas similar to the arrangement in the Turtle Islands between the Philippines and Malaysia might be the best management option. Barrier reefs are even rarer, with one of the few double barrier reefs found in the Danahon Banks off Bohol.

Unfortunately, Philippine reefs also face great threats and most would likely be lost in the absence of conservation strategies, especially in critical areas. A

great majority of reefs in the country thrive around the small islands of Visayas due to the relatively few rivers found here (thus there is little freshwater and sedimentation to prevent or hinder reef development). However, most poor coastal municipalities with sizable fisher populations are also found in the Visayas. Thus, the Visayas have the most number of threatened reefs because reductions in its coral cover over the last few decades have been most severe (Licuanan and Gomez, unpublished manuscript). Figure 15 shows the priority areas for corals conservation.

REEF FISHES

Vicente Hilomen, Cleto Nañola, Domingo Ochavillo, Arvin Dantis and Porfirio Aliño

Herre (1953) published the first checklist of fish for the Philippines and listed about 2,500 species, making the country one of the most diverse fish areas in the world. Over the last 2 decades, the reef and reef-associated fish has been the subject of major investigations in the country. Many of these studies focused on questions that are highly relevant to the better understanding of biodiversity and conservation among others.

Hilomen *et al.* (2000) estimated the total number of reef and reef-associated fish in the Philippines at nearly 60% (n=915) of the total number of reef and reef-associated fish worldwide. The diversity of reef fish forms part of the country's national heritage and encompasses an invaluable repository of genetic, morphological, and functional diversity.

At the regional scale, geographic origin is more important. Aliño and Gomez (1995) classified reef fish habitat into six biogeographic zones: 1) Northeastern Philippine Seas region, 2) Visayas region, 3) Southeastern Philippine Seas region, 4) South China Sea region, 5) Sulu Sea region and 6) Celebes Sea region. The highest diversity was observed in Sulu Sea, followed by South China Sea, and Celebes Sea. The poorest species diversity was found in the Southeastern Philippine Seas region. These differences might be explained by the evolutionary history of the biogeographic zones.

Diversity of reef fish in the country is threatened by various factors, primarily anthropogenic in origin. Among these are habitat degradation, pollution, high population growth, overfishing, and poverty in many tropical developing countries (see Dugan and Davis, 1993; Bohnsack, 1996). For example, the level of fishing activities in many fishing grounds in the country exceeds the natural rates of replenishment of many fisher-targeted species. Historical data from many fishing grounds support this observation. Hence, the size distribution of fish is biased towards the smaller size classes that dominate the reef fish communities in many areas in the country. This underscores the need to understand the various processes and factors that maintain the diversity of reef fish assemblages at various scales in order to provide inputs to the conservation and management of these renewable resources.

Many of the gaps in better understanding the processes and functions relate to the maintenance of reef fish diversity. Movement patterns of adult reef fish are important to address spillover effects, which could potentially enhance adjacent fished areas. Another is the question of sources and sinks of fish larvae for open populations, patterns of water circulation, and the dynamics of recruitment. The ontogenetic habitat shifts and their dynamics for reef fish is another topic about which little is known. This lack of knowledge underscores the need to protect and maintain the quality of various fish habitats. It is important that marine conservation planners and researchers gear their efforts towards these challenges so that they can help arrest the decline of fish diversity in the region. The initiative to establish a network of marine protected areas can contribute towards this goal. Figure 15 shows the priority areas for reef fish conservation.

ELASMOBRANCHS

Moonyeen Nida R. Alava

Sharks, batoids (skates and rays), and chimaeras belong to an ancient group of fishes collectively called as cartilaginous fishes (class Chondrichthyes) that evolved more than 400 million years. Less diverse than bony fishes (*i.e.*, teleosts), there are approximately 1,165 species of cartilaginous fishes worldwide (Compagno, 2000), including at least 488 species of ordinary sharks, 627 species of batoids, and 50 species of chimaeras.

The updated Philippine chondrichthyan checklist consists of at least 168 species, including three planktivorous sharks, whale shark (*Rhincodon typus*), megamouth shark (*Megachasma pelagos*) the 11th recorded in the world, accidentally caught in gillnet fishery in Cagayan de Oro in 1998, and the remains of an apparently stranded basking shark (*Cetorhinus maximus*) in Masbate in 1996 (Compagno *et al.*, in prep). The Philippines is second only to Indonesia with about 350 chondrichtyan species (Chen, 1996), followed by Malaysia with at least 89 species (Ahmad, 1998).

With the advent of improved and efficient fishing technology, commercial fisheries now are invading previously unfished areas. Chondrichthyan species now are caught indirectly and incidentally (by-catch) by both large-scale and small-scale fisheries. Focused fishery for the piked dogfish *Squalus acanthias*, began around 1967 as a result of increasing demands for squalene oil. At this time, shark by-catch also began to be reported for major fisheries, *e.g.* tuna.

Basic research is needed to gain better understanding on the biology, ecology, and threats to these taxa. Necessary research includes, but is not limited to: taxonomic research (including species description and genetic research into stock structure and dynamics); species-specific research (reproductive characteristics, critical habitats at different life cycles; growth rates and age structure; mortality for all age classes—natural and fishing; stock and relative abundance; and stock structure and migration patterns); assessment of the global and regional status of all species; and fisheries research (assessment and monitoring; socio-economic data on shark fisheries; and fishery independent data).

Elasmobranch data considered during the PBCPP process was based on BFAR's catch data for 1990. Elasmobranch areas include Northern Philippine Sea (Batanes, Lamon Bay, Celebes Sea, and Moro Gulf); Sulu Sea (East Coast, Cuyo Passage, Turtle Islands-Tawi-tawi, and East Panay-Negros); Visayan Sea (includes Sibuyan Sea); and South China Sea (including West Palawan) Figure 17 shows the priority areas for elasmobranch's conservation.

WHALE SHARKS

Moonyeen Nida R. Alava

The whale shark (*Rhincodon typus* Smith, 1828), considered the world's largest living fish with a reported length of about 18 m, is one of three very large, filter-feeding shark species in the world. It has a broad flattened head, very large nearly terminal mouth, five large gill slits, three prominent longitudinal ridges on its upper flanks, a large first dorsal fin, and a semi-lunate caudal fin. Its color generally is brown or dark blue-gray dorsally with a unique and distinctive "checker-board" pattern of white spots and stripes, with a white ventrum. The whale shark is cosmopolitan in distribution, occurring in all tropical and warm temperate areas apart from the Mediterranean, in a band between 30°N and 35°S around the equator.

In the Philippines, the whale shark can be observed singly but often is found in aggregates, particularly around mouths of bays, estuarine areas, mangroves, or coral reefs. Bohol Sea (also called Mindanao Sea) has the largest population of whale sharks, especially in April and May. Seasonal aggregates have been found in traditionally non-fishery areas: Maasin-Sogod Bay in Leyte; in Donsol, Magallanes, Bulan and Masbate along the Ticao-Burias Pass; Honda-Puerto Princesa bays in Palawan; the coast of Zambales; northern Palawan and Luzon, particularly, the Batanes islands (Alava and Kirit, 1994; Groves *et al.*, unpub; Torres *et al.*, 2000; Alava and Yaptinchay, 2000; Santos, *pers comm*). These are priority areas for its conservation.

The Bohol whale shark population has been under increasing pressure from traditional fishers of Pamilacan Island in Bohol, Talisayan in Misamis Oriental, and Camiguin Island. Current catch has shown drastic reduction compared to fishing effort, because of the increasing demand for whale shark meat by Taiwan and other Southeast Asian markets in the 1990s. This has led to the proliferation of minor fishery areas around the Bohol Sea and nearby contiguous waters such as Tanon Strait, Cebu Strait, Sogod Bay, Surigao Strait, and around Mindanao in Pujada Bay, Davao Gulf, southeastern Sulu Sea, and Iloilo. Whale sharks are listed as Vulnerable by IUCN (Hilton-Taylor, 2000) and are listed on Appendix 2 in the Convention on Migratory Species (CMS).

Studies have been undertaken on vertical and geographical movements of whale sharks in the Sea of Cortez, the northern Pacific Ocean, and Sabah and Philippines. However, the species' life history, physiology, ecology, demography, and behavior, among other characteristics, remain relatively unknown (Eckert and Stewart, 2001; Eckert et al., 2000). Only through an increased understanding of the species can effective conservation management strategies be developed and implemented, locally and globally. Figure 17 shows the priority areas for whale shark conservation.

MARINE TURTLES

Jose Angelito M. Palma and Rhodora De Veyra

Five species of marine turtles are found in the Philippines: the green turtle (*Chelonia mydas*), hawksbill (*Eretmochelys imbricata*), olive ridley (*Lepidochelys olivacea*), loggerhead (*Caretta caretta*), and the leatherback (*Dermochelys coriacea*). Only the green turtles and hawksbills occur in large numbers.

Both species are threatened by over-harvesting of eggs and shells, which has led to a significant decline in their annual egg production, particularly for green turtles. The history of exploitation of marine turtles pre-dates the Spanish period and continued through the American regime to the present day (Eckert 1993). Turtles are captured using spears, spear guns, nets, and in fish corrals. The high demand for meat, bones (cartilage), and eggs has led coastal people to hunt indiscriminately (de Celis, 1982). Virtually all nesting turtles in Central Visayas end up on the table and in souvenir shops (Alcala, 1980).

Priority areas (Figure 17) identified were based on the presence of marine turtles and significance of their use of the areas, which include nesting, feeding and development. The range and migratory paths of these species, which can extend beyond our territorial waters, should be declared as critical habitats and placed under transboundary management.

CETACEANS

Lemnuel V. Aragones

The waters of the Philippine archipelago harbor a diverse assemblage of marine mammals. To date, 25 species of marine mammals representing three orders have been confirmed out of the 120 species found worldwide. Of these, 22 are cetaceans (18 Odontocetes and four Mysticetes).

The spinner dolphin (*Stenella longirostris)* is the most commonly sighted and widely distributed marine mammal species in Philippine waters, followed by the spotted dolphins *(Stenella attenuata)*. The Irrawaddy dolphin (*Orcaella brevirostris)* has the most restricted distribution, with fewer than 30 individuals limited to the Malampaya Sound in mainland northern Palawan. Although listed as Data Deficient by the IUCN (Hilton-Taylor, 2000) the Irrawaddy dolphin could be the most threatened Odontocete species in the country since its only known habitat, the Malampaya Sound, is surrounded by fish pens.

The major threats to cetaceans and, in general marine mammals, in the Philippines are death due to accidental by-catch fisheries, habitat loss, and depletion of food sources from coastal development and pollution. Current conservation measures to protect animals from these threats are limited. The protection and conservation of whales and dolphins fall under DA-BFAR through the BFAR Administrative Order Nos. 185 (1992) and 185-1 (1997).

Cetaceans hotspots include the waters off the Southern Tañon Strait area (high cetacean diversity for a small area), the Babuyan and Batanes group (important calving and breeding area for humpbacks from the Northern Hemisphere), the Sulu Sea, and Bohol Sea (important areas both for odontocetes and mysticetes). The part of Sulu Sea covering northwest Mindanao (Zamboanga Peninsula) harbors a considerable number of inconspicuous species, including the Blainville (*Mesoplodon densirostris)* and Cuvier's beaked whales (*Ziphius cavirostris).* Figure 16 shows the priority areas for cetaceans conservation.

DUGONGS

Terry Aquino

Dugongs (*Dugong dugon*) are the only strictly herbivorous marine mammals found in the Philippines, feeding on specific species of seagrass, namely, *Halophila*, *Halodule*, and *Enhalus* spp. Their reproductive cycle is very slow – one calf is produced every 3-5 years. The calf stays with its mother for about 18 months or until the next calving. Females mature sexually in 10-17 years while sexual maturity in males is difficult to determine. Successful breeding apparently occurs when several males attempt to impregnate a female all at the same time.

Habitat destruction and degradation, such as land reclamation and pollution, are the major causes of dugong disappearance in the country, particularly in Manila Bay. Destructive fishing practices such as the use of dynamite and cyanide and the by-catch of dugongs in fish corrals are also serious problems. The negative impact of these threats is exacerbated by the dugong's slow reproductive cycle and maturation.

Classified as Endangered by IUCN (Hilton-

Taylor, 2000) and under Appendix I by CITES, dugong populations are also protected by the Philippine government. DENR has passed several Administrative Orders that address dugong conservation. Together with BFAR-DA, DOT, Silliman University Marine Laboratory, UP MSI, Marine Turtle Foundation, Bookmark, and WWF, DENR has formed an Inter-Agency Task Force for Marine Mammals Conservation to protect dugongs. Several provincial NGOs such as SAGUDA in Palawan and Mindanao Environmental Forum in Davao are also undertaking dugong conservation work.

Research priorities include biophysical and oceanographic studies of the identified hotspots, ecology, migratory movements, and home ranges. Data from these studies may provide insight as to why these animals prefer using these areas. Philippine waters most likely nurture more marine mammals than have been recorded. Therefore, more inventory work needs to be undertaken. However, these studies should be alongside other studies, focusing on abundance trends, stock assessment, and the actual levels of interactions with fisheries. Figure 16 shows the priority areas for dugong conservation.

Socio-economic Group

Rowena R. Boquiren

The socio-economic working group assessed human impacts on Philippine biodiversity. The group also assessed various conservation initiatives and opportunities in order to gain insight and direction for future conservation efforts. As part of context assessment, the group recognized, *first*, that the archipelagic character of the Philippines is the basis for its diversity in cultural systems; and *second*, that the uneven historical development of Philippine communities has led to differences in the status of biodiversity and local capabilities to address threats.

Among the more than 100 ethnolinguistic groups with distinct cultures are indigenous peoples who have retained their traditional or customary systems in various degrees of persistence. Included in these customs are natural resource management practices with sound ecological principles and that promote conservation. Historically, political and larger market forces have wielded a strong influence on how environmental resources are used and controlled in the country. Nearly five centuries of colonial and post-colonial control have resulted in serious environmental degradation that threatens Philippine biodiversity.

Indicators for human pressures were scored with a scale of 1 to 5 (1-low, 5- extremely high). Each source of human pressure was assigned weights: population pressure, poverty status, and tenurial issues received 20% each, while resource utilization issues had 40%. Conservation opportunities were also assigned weights: sustainability of efforts and community management received 30% each, political stability received 20%, and persistence of sound indigenous knowledge systems and persistence of indigenous resource control structures received 10% each.

The exercise was undertaken to facilitate the assessment rather than to arrive at a precise scoring. Exchanges between experts involved a preliminary analysis of the role of institutions that may influence the sustainability of conservation efforts.

Weighted scores for pressures were then reduced to three classes: High, Very High and Extremely High. Conservation efforts, meanwhile, were classified as Medium, High, and Very High—because of the political and economic environment, no area was considered as having an extremely high prospect for sustained protection. Areas with insufficient information were not included in the final scoring.

Context assessments, using maps that located threatened areas and protected areas, showed the following numbers of Biologically Important Areas with various degrees of pressures: Extremely High = 42, Very High = 105, and High = 5, Medium = 3, Insufficient Data = 15 (Figure 18). For conservation efforts, the results showed the following: Very High = 27, High = 90, Moderate = 28, Low = 13, and Insufficient Data = 12 (Figure 19).

Direct pressures on the status of biodiversity came mainly from extractive industries (mining and logging), infrastructure development (road building), and land conversion (from forest to agricultural land

and settlements as well as industrial estates), while poverty and migration are indirect causes. Institutional analysis revealed a weak consideration of the biodiversity conservation component in most regional and provincial development plans, which predominantly equate development with economic growth in terms of increases in gross value added from industries and agriculture.

In contrast, conservation efforts with high probability of success and sustainability have the following features: local management, institutionalized mechanisms and structures, and strong support from external sources.

IV

DISCUSSION

The emerging paradigm in the biodiversity conservation community is the attainment of "*Zero Biodiversity Loss*" (ZBL). While it seems to be a lofty and unattainable goal at first glance, what ZBL means is that we, as a species, must take a stand that we will not allow the loss of a single species anywhere in the world without a fight. Assuming ZBL as a conservation goal is part of our moral responsibility to ensure that whatever biodiversity we have inherited from our ancestors will be left for future generations. The results of the PBCPP provide a "road map" for attaining ZBL in the Philippines.

The national consensus developed during the PBCPP concerning the Philippines' biodiversity conservation priorities also represents a global consensus, because the participants included experts from the international conservation community as well. These priorities include 206 Conservation Priority Areas (CPAs), 170 terrestrial and inland waters and 36 marine areas, and 418 threatened species on the 2000 IUCN Red List (Hilton-Taylor, 2000). These priorities are starting points for conservation actions and discussions with the country's economic managers and development planners.

CONSERVATION PRIORITY AREAS (CPAS)

The PBCPP results are not meant to prevent socio-economic development. Rather, priority areas and species identified provide a decision framework on which non-traditional stakeholders, such as the business community, can base their current and future infrastructure development programs. This can be achieved either through redesigning current projects or incorporating information from the PBCPP to guide decisions for future development plans. In this way, negative impacts on the biodiversity in the CPAs and on threatened species can be reduced, if not totally eliminated, when development projects are implemented. The PBCPP results provide a means through which conservation practitioners can engage other strategic stakeholders in a constructive and productive dialogue.

Of the Philippines' total land area of ~30 million hectares and archipelagic waters of 220 million hectares, the PBCPP identified nearly 11 million hectares (36%) of the land area and approximately 46 million hectares (21%) of the country's archipelagic waters as biologically important. When both terrestrial and marine CPAs are considered together, it covers approximately 57 million hectares (23%) of the country's total land and archipelagic waters of about 250 million hectares. Based on their priority level, a total of 106 CPAs are of extremely high priority. This

BOX 2. A Preliminary Analysis of the Philippine Protected Areas System: Gaps and Recommendations

John Mackinnon

THE EFFECTIVENESS and biological representativeness of the current Protected Area System in the Philippine were reviewed, using three primary data sources: an Arc Info land cover map of the Philippines and land cover map of the NIPAS reserves of the Philippines at a scale of 1:250,000 (Presidential Task Force on Water Resources DENR, 1997) and an altitudinal cover map of the Philippines at a scale of 1:1,000,000 (Digital Chart of the World, 1992). These maps were overlaid, producing three broad categories: Natural lands (green) whose vegetation type is the original type, although not necessarily undisturbed; Converted lands (brown), the opposite of the first category, where no natural components remain, and are replaced with agricultural lands and other anthropogenic land uses; Degraded lands (yellow), whose natural areas are highly altered, resulting in secondary forests, which is in between the 1st and 2nd categories. Of the 30 million hectares in the Philippines, 46% is "degraded" (yellow), 40.5% is converted (brown), and only 13.4% is natural (green). Digitized maps of the Protected Areas (blue) were further overlaid with the preliminary map and showed that most of the PAs have very little natural vegetation left and that a lot of the remaining natural vegetation is not under any form of protection (Figure iv).

About 12.8% of the land area is legally "protected", of which only 7.8% falls within IUCN's Protected Area categories I-IV. Another 5% falls within "scenic landscapes" and areas of minor conservation category.

covers approximately 39 million hectares (70%) of the area covered by the 206 CPAs (Table 2, Appendix 2), and 16% of the country's total land and archipelagic waters.

For the terrestrial and inland waters CPAs, combining the Extremely High urgent and Extremely High critical areas covers nearly 8 million hectares (73%) of all the terrestrial and inland water areas (Table 3), which is equivalent to nearly 27% of the country's land area. The extremely high marine CPAs, on the other hand, covers approximately 31 million hectares (68%) of all marine CPAs (Table 4), which is equivalent to 14% of the country's archipelagic waters. This means that 27% of the country's land area and 14% of the archipelagic waters is of extremely high biological value and is under extremely high pressure from development and other destructive human activities.

This immediately points to the urgent need to undertake conservation actions in these CPAs and to review existing economic and development plans that are being undertaken or planned in these areas. These plans should be modified accordingly if significant progress is to be made in preserving Philippine biodiversity.

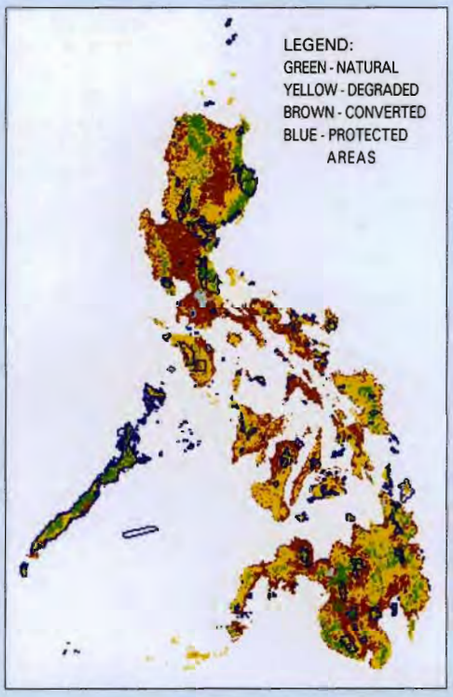
Table 2. Estimated extent covered by CPAs based on their priority levels.

Priority Level	Number of CPAs	Total area covered (hectares)	Percentage of area covered
Extremely High	106	39,542,009	69%
Very High	72	13,611,441	24%
High	13	2,943,757	5%
Insufficient Data	15	935,039	2%
TOTAL	206	57,032,246	100%

Conservation Priority Areas and Protected Areas under NIPAS

One of the cornerstones of current efforts to conserve the Philippines' biological wealth is the protected areas system. Republic Act 7586, the National Integrated Protected Areas System Act (NIPAS), was passed in 1992. The NIPAS allows for the establishment of protected areas (PAs), including both terrestrial and marine areas, in order to ensure that future generations of Filipinos will have the resources that currently are enjoyed by present generations. The NIPAS Law provides the legal framework for the establishment and management of PAs and ensures that they are kept part of the national development agenda.

Although the presence of a legal framework for the establishment and management of protected areas makes the Philippines quite advanced compared to other countries, the current protected area system is still inadequate (Mackinnon, Box 2 this report). The primary challenges for the NIPAS are to:



Inside these PAs, a lot of the land is not natural. Using IUCN's categories I-IV, only 41% is of natural vegetation, 42% is degraded, and 17% is converted. For IUCN categories V-VI, the situation is even worse. Only 20% is of natural vegetation type, 59% is degraded, and 21% is converted (Figure *v*).

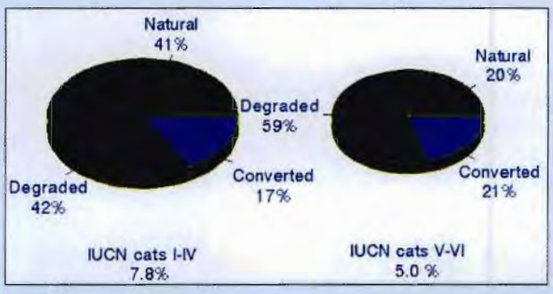


Figure v. Land classes of Protected areas in the Philippines.

The PA system in the Philippines falls far below the international minimum target of 10% of total land area and its distribution is highly uneven and biologically non-representative. The distribution of PAs along an

Figure iv. Broad land classification and the distribution of Protected Areas in the Philippines.

a. put remaining lowland dipterocarp forests under protection at all cost. Lowland dipterocarp forests are the most threatened forest type and have been severely decimated in recent decades (both outside and inside the PAs),

b. find constructive, effective and compassionate ways of reducing human pressures in protected areas;

c. bring an end to all illegal activities in all ecosystems, and in particular logging and other destructive activities, that continues in most of the protected areas.

Table 3. Estimated extent covered by terrestrial and inland water CPAs.

Conservation Priority Level	Number of CPAs	Total area covered (hectares)	Percentage coverage
Extremely High (urgent)	19	1,444,051	13%
Extremely High (critical)	73	6,518,363	60%
Very High	60	1,859,825	17%
High	3	138,672	1%
Insufficient Data	15	935,039	9%
TOTAL	170	10,895,951	100%

In 2002, the Department of Environment and Natural Resources-Protected Areas and Wildlife Bureau (DENR-PAWB) recognized 244 PAs as components of the NIPAS. Of these, five PAs have had congressional actions completed, 78 have received presidential proclamations while the remaining 161 are still being processed (Table 5). Some PAs were established because of their historical or national significance. These PAs should be clearly differentiated from those declared because of their biological importance. It is also important to note that some of the areas included have already been degraded or have been converted for other land uses, and therefore should be withdrawn or dis-established.

Out of the 244 NIPAS components, only 132 PAs overlap with CPAs (Table 5, Appendix 6). Of these, several NIPAS areas may occur within one CPA similarly one CPA may encompass more than one PA. There is a need to revisit the boundaries of

elevational gradient is skewed towards the least representative elevation gradient, i.e., more towards higher elevation (in montane areas, which has a limited area coverage and lower levels of biodiversity) than lower elevation (most common and largest in area with the highest levels of biodiversity). The higher elevation represents the least species rich areas, as species richness decreases as elevation increases, thus the total area of the Philippine PA system is biased towards the least bio-rich elevation gradient. This is best illustrated in birds, which have the highest diversity in the lowlands, but are least protected in these areas (Figure vi).

Using broad biogeographical regions of the Philippines as a parameter, the proportions of the land under protection is also very uneven, with a large bias to protection in relatively biodiversity poor Palawan, Mindoro and oceanic islets. The most bio-rich islands of Mindanao and Luzon are highly under-represented in the PA system despite having quite a lot of remaining "natural" habitat (Figure vii).

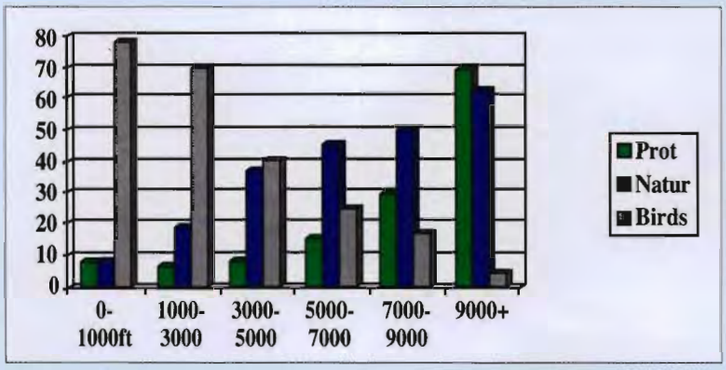


Figure vi. Bird species richness in natural and protected areas.

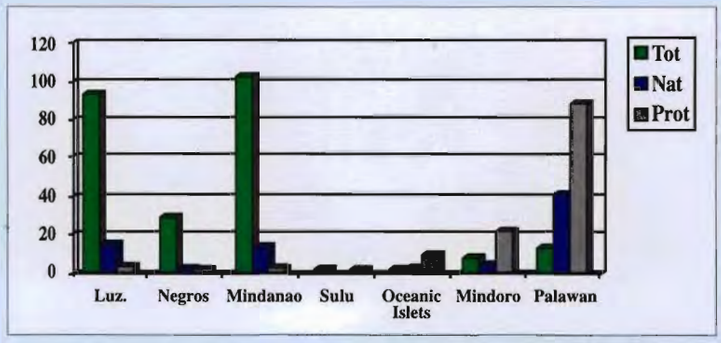


Figure vii. Proportions of natural or protected areas by broad biogeographic region.

the 132 PAs that overlap with CPAs since many of these PAs either include areas that are of poor quality or exclude areas that are of high biological importance. On the bright side, an opportunity exists to redefine boundaries for the 47 PAs that have received presidential proclamation and the 80 PAs that are still in the process of complying with the NIPAS, while congressional actions for their final proclamations are being completed.

Table 4. Estimated extent covered by marine CPAs.

Conservation Priority Level	Number of CPAs	Total area covered (hectares)	Percentage coverage
Extremely High	14	31,579,595	68%
Very High	12	11,751,616	26%
High	10	2,805,084	6%
TOTAL	**36**	**46,136,296**	**100%**

One hundred twelve NIPAS components did not overlap with CPAs. These PAs should be reassessed and reevaluated in terms of their biological significance and their suitability as components of the NIPAS. Anthropologically significant areas, such as historical monuments, which currently are part of the NIPAS, also should be identified, assessed and managed under the appropriate institution.

Once this assessment is completed, a decision can be made as to whether certain components should be disestablished and which ones should be given focus in terms of strengthening and improving PA management. The 112 NIPAS components (31 of which have undergone presidential proclamation) need to be reassessed to determine if there is a need to pursue the legal establishment under NIPAS.

Of the 206 CPAs, 98 (76 terrestrial and inland water and 22 marine areas) overlapped with NIPAS components while the rest occur outside of the NIPAS components (Table 6). While several PAs may occur within one CPA and one CPA may encompass more than one PA, the boundaries of some of the PAs overlapping with the CPAs should be reassessed to ensure that the PAs contain the appropriate biologically important areas.

When species richness of birds and mammals of the different biogeographic regions were compared, there was very little correlation between biodiversity richness and the level of protection (Figure viii).

Furthermore, the Philippines is divided into 9 endemic bird areas (EBA) (Figure ix). An analysis of the degree of protection of the different EBAs and the number of endangered and restricted species in each EBA (Figure x) shows that Palawan (EBA 06) is highly protected while many other areas are highly under protected. Thus, Palawan is disproportionately protected in relation to the number of species that are threatened or restricted compared to other EBAs.

When PA boundaries are matched against the existing forest cover, these often are poorly aligned to farmland and forest cover. Good forests often are excluded from PA boundaries as in the case of the Mt. Apo Natural Park in Mindanao (Figure xi).

Major Gaps In The Current PA System

Based on the analysis undertaken, these are the gaps in terms of representativeness and importance:

1) Luzon Lowlands,
2) Mindanao Lowlands,
3) Sulu Islands,
4) Negros,
5) Basilan,
6) Dinagat,
7) Camiguin Sur, and
8) Samar

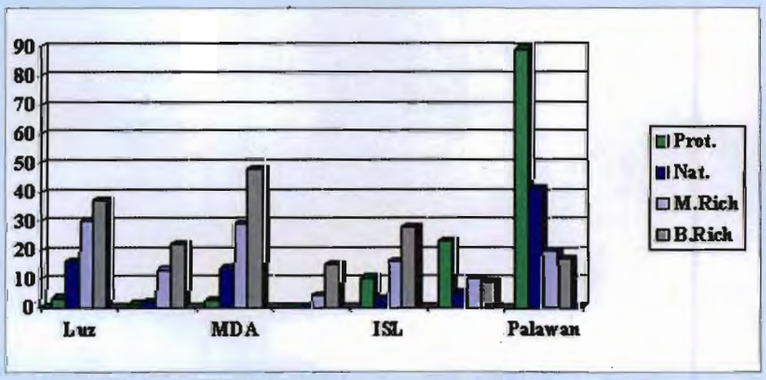


Figure viii. Percentage areas that are protected and natural by region in relation to bird and mammal species richness

On the other hand, 108 CPAs (94 terrestrial and inland water and 14 marine) are not part of the NIPAS. Thus, there is an urgent need for these CPAs to be accorded protection either through their establishment as critical habitats under the Wildlife Act or as additional components of the NIPAS (if need be). While waiting for the formal processes to be completed, any available legal instrument that can be used to ensure their protection and proper management should be employed. Further, the adoption of the 206 CPAs as a basis for establishing new PAs also ensures that there is at least one PA in every biogeographic and sub-biogeographic region in the country. The concerns and recommendations raised by Mackinnon (Box 2, this report) has been adequately addressed by the 206 CPAs.

Table 5. Extent of overlap between PAs and CPAs.

Status of PAs undergoing the NIPAS process	Number of PAs under various NIPAS process	Number of PAs that overlap with CPAs	Number of PAs that do not overlap with CPAs
w/ congressional action	5	5	0
w/ Presidential proclamation	78	47	31
to be established	161	80	81
TOTAL	**244**	**132**	**112**

CONSERVATION OF THREATENED SPECIES

For more than four decades, IUCN - The World Conservation Union - has developed a Red List of Threatened Species, on a global scale, to identify taxa that are threatened with extinction, and to promote their conservation. Four hundred eighteen Philippine species are found in the 2000 IUCN Red List (Hilton-Taylor, 2000). While this list will continuously change as new data become available, it is a good starting point to develop species-specific conservation action plans,

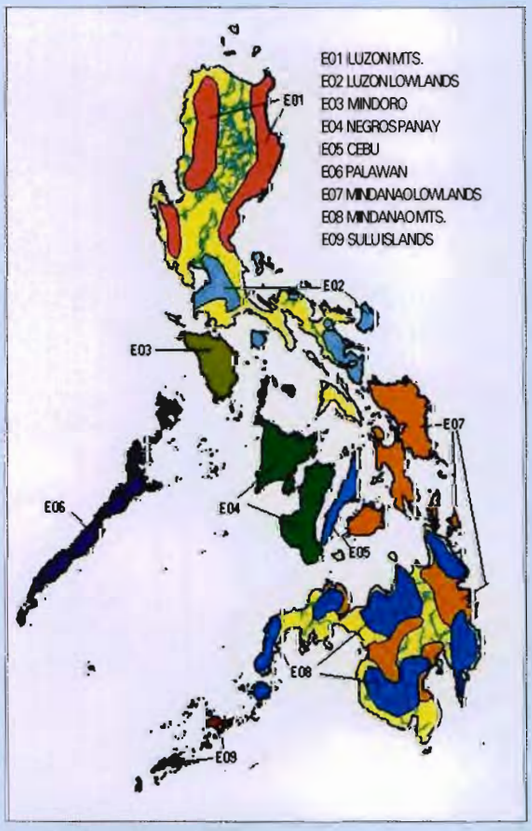


Figure ix. Philippine endemic bird areas.

Conclusions

The DENR, through PAWB, is the institution mandated to meet the requirements of the country's commitment to the Convention on Biological Diversity (CBD). However, while DENR-PAWB is doing its best to accomplish the task at hand, limited resources prevent it from fulfilling its responsibility to the fullest extent. This partly explains the gaps and weaknesses of the Philippine PA system that would lead us to the following conclusions:

1. The Philippine PA system is weak in real protection and contains a high proportion of degraded and converted habitat;
2. The PA system is poorly represented, biased for bio-poor highland areas and islands and with very uneven habitat coverage;
3. The PA system is not well related to the distribution of biodiversity;
4. The PA boundaries often show little relation to forest boundaries on the ground; and
5. Adequate natural lands still exist in most areas and should be incorporated into the Philippine Protected Areas System to make a truly representative PA system.

Recommendations

1. The PA system needs enlarging and redesigning with strong biological basis;

particularly for less well-known species (*e.g.*, invertebrates), alongside conservation actions in the 206 integrated priority areas in terrestrial, inland waters and marine CPAs.

Further, targeted conservation actions should focus on the 165 species that are either Critically Endangered or Endangered to ensure their survival in the immediate future.

Protection of ecosystems and habitats is the ideal approach in biodiversity conservation. However, for some of the most severely threatened species, there also is a need to initiate conservation interventions to ensure their survival. In many cases, integrated programs that include field-based conservation components as well as captive breeding of species should be undertaken alongside each other as part of an integrated conservation strategy. Although captive breeding will never be a substitute for successful protection of the natural habitat, it keeps alive the possibility of reintroducing endangered species into former habitats once conditions have stabilized or improved.

Table 6. Extent of overlap between CPAs and PAs.

Priority Level of CPAs	Number of Terrestrial and Inland Water CPAs that overlap with PAs	Number of Marine CPAs that overlap with PAs	TOTAL
Extremely High (EH)	50	9	59
Very High (VH)	20	9	29
High (H)	1	4	5
Insufficient Data (ID)	5	0	5
TOTAL	76	22	98

Some of the species-specific conservation programs being undertaken by the DENR PAWB include the Pawikan Conservation Program, the Tamaraw Conservation Program and the Philippine Eagle Watch Program,

2. All remaining "natural" habitat should be gazetted into the NIPAS system under DAO 24-91;
3. Some lowland forests and secondary forests are of high biodiversity value and should be acquired for protection. As such lands are the only legally logable areas in the Philippines, a strong case must be made by concerned parties for a moratorium of any extractive and place these under protection; and
4. Active restoration of small forest fragments may be needed in some areas.

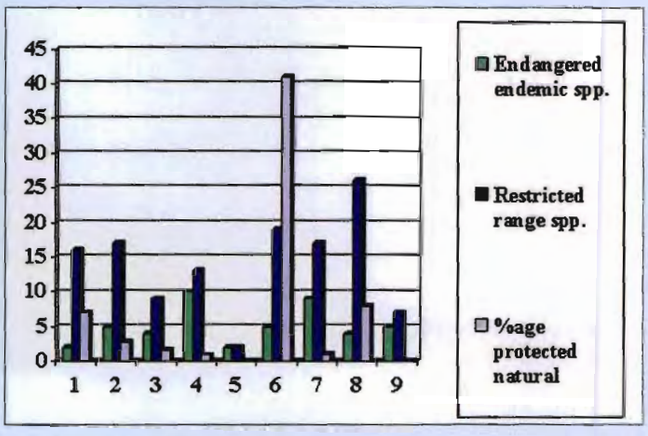


Figure x. Degree of protection in relation to endemic bird areas (EBAs).

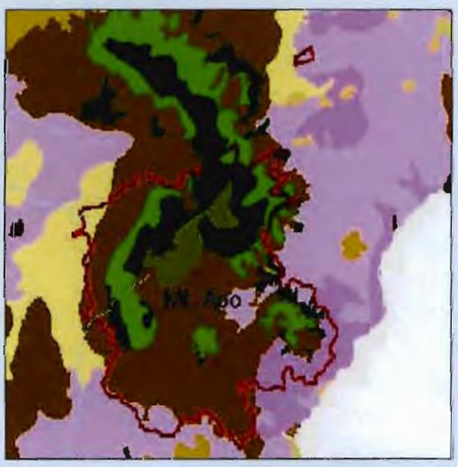


Figure xi. The boundary of the Mt Apo Natural Park excludes good quality forest (red line indicates boundary of the protected area).

among others. Captive breeding programs for the Philippine Eagle are being spearheaded by the Philippine Eagle Foundation in Davao City. Silliman University in Dumaguete City, Negros is implementing the Philippine spotted deer conservation program, which includes a component that allows local communities to view endangered native species. This has helped raise the consciousness of local people concerning Philippine wildlife and other environmental problems.

Table 7. Summary of Philippine species included in the 2000 IUCN Red List (Hilton-Taylor, 2000).

	Threatened Categories			Non-threatened Categories			Total Number of Species	Total Number of Threatened Species
	CR	EN	VU	LR/cd	LR/nt	DD		
Animals								
Amphibians	7	6	11	0	1	8	33	24
Birds	12	13	43	0	58	4	130	68
Mammals	7	14	32	2	26	13	94	53
Molluscs	1	0	2	4	0	0	7	3
Arthropods/ other invertebrates	1	6	10	0	4	3	24	17
Reptiles	3	4	1	0	0	1	9	8
Fishes	16	2	11	1	0	2	32	29
SUBTOTAL	*47*	*45*	*110*	*7*	*89*	*31*	*329*	*202*
Plants								
Bryophytes	0	2	0	0	0	0	2	2
Conifers	0	1	3	0	0	0	4	4
Monocots	0	0	8	0	3	1	12	8
Dicots	44	26	132	3	23	9	237	202
SUBTOTAL	*44*	*29*	*143*	*3*	*26*	*10*	*255*	*216*
TOTAL	**91**	**74**	**253**	**10**	**115**	**41**	**584**	**418**

Legend:
CR = Critically Endangered
EN = Endangered
VU = Vulnerable
LR/cd = Lower Risk, Conservation Dependent
LR/nt = Lower Risk, Near Threatened
DD = Data Deficient

STRATEGIC ACTIONS FOR CONSERVATION AND THE NATIONAL BIODIVERSITY STRATEGY AND ACTION PLAN

In addition to arriving at a consensus on the conservation priority areas and species conservation priorities, five strategies and actions were also identified and should be pursued to ensure that conservation in the 206 PBCPP priority areas are successfully implemented. The NBSAP provided a firm foundation on which the PBCPP strategies and actions were based. Five of the six strategic actions prescribed in the NBSAP served as the basis for fine-tuning the strategic actions recommended in the PBCPP. These are not either/or options, but actions that should be undertaken in conjunction with one another.

Harmonize Research with Conservation Needs

Information on Philippine biodiversity is limited, incomplete and widespread. A major deficiency in conserving the country's biological diversity is that baseline information often is lacking. Existing data are outdated and the status of previously recorded species needs updating in terms of biology, distribution and abundance. One means to avoid the "empty forest syndrome" (where habitat remains but is devoid of wildlife species) is to ensure that a continuing biological inventory is maintained.

It will be necessary to harmonize research with conservation needs by addressing gaps in knowledge through basic research, incorporating formal science as well as local knowledge. The role of academe in establishing data generation infrastructure, capability building, and institutionalization of biodiversity conservation should be highlighted and the involvement of academic institutions increasingly sought. Additionally, indigenous knowledge should be incorporated into biodiversity databases. Because it is a good measure of the conservation work quality and a venue to develop further research capabilities, the importance of publication also should be emphasized.

The 418 threatened Philippine species in the 2000 IUCN Red List (Hilton-Taylor, 2000) and the 206 priority areas provide a rich source of material for conservation-relevant biological studies, including teaching and extension materials. These threatened species and priority areas should form the framework of research and development in biodiversity conservation, and assist in the formation of national conservation goals.

This is a further refinement of NBSAP Strategy I (*Expanding and Improving Knowledge on the Characteristics, Uses and Values of Biological Diversity*).

Enhance and Strengthen the Protected Area System

The most effective way to conserve biodiversity is still through the protection of habitat. The NIPAS law is one measure that can help ensure protection and should be strengthened. The reality of Philippine society is that there are local communities and indigenous people living in and around PAs. Concerns of local communities and indigenous peoples over tenure and access to resources should be addressed with compassion and in a way that is consistent with conservation goals.

The existing PAs system needs to be expanded to include new areas identified during the PBCPP. By the end of 2001, the DENR had recognized 244 PAs under NIPAS, of which 132 PAs overlapped with identified priority areas (see Appendix 4). Fifty-two of these overlapping areas were established through presidential proclamations and legislative actions as PAs, while for the remaining 80 the necessary processes needed for its inclusion as part of the NIPAS framework are still being completed. The boundaries of the 132 overlapping priority and PAs also should be re-assessed to include the appropriate areas in need of protection, since some portions of the recognized protected areas do not include areas of high biological significance. Assessment of the remaining 112 NIPAS components that do not overlap with the conservation priority areas is highly recommended to determine if their value as protected areas is warranted. If not, these can be replaced with the 108 biologically important areas identified by the PBCPP that currently are outside of the system. It is highly recommended that, as an initial step, PBCPP priority areas, be included in the NIPAS system or as critical habitats under the Republic Act 9147 (Wildlife Act) or any other existing legal framework that can be used to ensure their protection and proper management.

The improvement of the PA management system should focus on building and strengthening the capacity of protected area managers. Management programs to be implemented should be participatory, with the local communities involved and informed of all activities to be undertaken. The Protected Area Management Board (PAMB) also should be strengthened and participation of members be maximized. The limited effectiveness of the NIPAS is also partly attributed to limited institutional support and the resource availability.

This is a further refinement of NBSAP Strategy II (*Enhancing and Integrating Existing and Planned Biodiversity Conservation Efforts with Emphasis on In-situ Activities*) and Strategy III (*Formulating an Integrated Policy and Legislative Framework for the Conservation, Sustainable Use and Equitable Sharing of Benefits of Biological Diversity*).

Institutionalize Innovative and Appropriate Biodiversity Conservation Approaches: The Biodiversity Corridors

A major cause of the biodiversity crisis in the Philippines has been the fragmentation of various ecosystems brought about by destructive human activities. Unless these isolated fragments, which now are literally islands of forests and marine areas surrounded by a horde of humanity, are reconnected, they are destined for extinction.

Using the biodiversity corridor approach was one strategy identified to address the problem of fragmentation.

Biodiversity corridors are large, interconnected networks of protected areas and the surrounding landscapes, which are established to protect and conserve biodiversity contained within. Corridors are designed to maintain ecosystem and evolutionary processes, which occur dynamically and stochastically in tropical systems. Corridors are a means to

reconnect natural habitats and other land in order to recolonize flora and fauna and allow for genetic migration. Corridors also incorporate the concept of biodiversity assemblages and the need to institutionalize and utilize the appropriate management approaches to biodiversity conservation in a given area.

Corridors are meant to be additive, i.e, to include as much area for conservation without the need to lock up large tracts of land. This is made possible through encouraging land owners (or their legal equivalent) to allocate part of their land for conservation without giving up their land use rights. A mosaic of land uses that may include formally established PAs, surrounding agricultural lands, ancestral domain lands and community-based forest managed areas, among others, can make up a biodiversity corridor. This ensures the survival and protection of the widest possible range of species unique to a particular region.

Table 8. Estimated extent of biodiversity corridors and the number of priority areas in the corridors.

	Number of priority corridors	Number of priority areas found within the corridors	Estimated Area covered by priority areas (hectares)	% of area covered	% of area covered compared to overall coverage of priority areas
Terrestrial	19	92	7,829,553	17%	72%
Marine	9	17	37,910,275	83%	82%
TOTAL	**28**	**109**	**45,739,828**	**100%**	**80%**

The use of landscape-level corridors as planning units can accomplish what planning at the scale of individual parks and buffer zones cannot: the optimum allocation of resources to conserve biodiversity at the least cost to society. This is fundamentally different from minimalist, "least area" solutions advocated in the past, since these approaches did not adequately address problems of fragmentation and isolation, nor did they consider how more efficient economic policy instruments might be employed to maintain large portions of the landscape friendly to biodiversity. Further, corridor-wide conservation planning significantly increases the chance for long-term biodiversity survival.

Nineteen terrestrial corridors and nine marine corridors were identified. This was the first time that the concept of biodiversity corridors, developed primarily for terrestrial landscapes, was applied to the marine landscape. The proposed terrestrial corridors include 92 priority areas covering 72% of all terrestrial priority areas with an estimated 7.8 million hectares, while the marine corridors include 17 priority areas covering 82% of the 36 marine priority areas with an estimated 37.9 million hectares (Table 8). Using the corridor approach, the conservation needs of 80% of all priority areas are addressed with an estimated 45.7 million hectares.

Currently, several corridor initiatives are being undertaken by different institutions: the Sierra Madre Biodiversity Corridor led by Conservation International Philippines and their local, provincial and regional partners; the Samar Island Biodiversity Project led by the PAWB-DENR and their local government and non-government partners; and the Sulu-Sulawesi Large Marine Ecosystems led by WWF - Philippines and their local and international partners, among others.

This is a further refinement of Strategy II *(Enhancing and Integrating Existing and Planned Biodiversity Conservation Efforts with Emphasis on In-situ Activities)* and Strategy III *(Formulating an Integrated Policy and Legislative Framework for the Conservation, Sustainable Use and Equitable Sharing of Benefits of Biological Diversity)* of the NBSAP.

Institutionalize Monitoring and Evaluation Systems of Projects and of Biodiversity

Many research and conservation projects in the Philippines do not include monitoring and evaluation (M & E) systems. On the other hand, there are already M & E systems that have been developed but that can only be used

for specific taxa or require expensive equipment. A simple but robust Biodiversity Monitoring System (BMS) for PAs was developed by the NORDECO for the PAWB-DENR (Danielsen *et al.*, 2000) pilot tested in eight PAs (NORDECO and DENR 2002). The BMS can provide up-to-date and comparable information on resources as a basis for management of protected areas. The adoption and sustainability of the BMS in all biodiversity conservation work should be a priority as a concrete and practical action. This however, does not preclude the continuing need for the monitoring of biodiversity itself as we use more systematic monitoring approaches over longer time frames.

Currently, CI Philippines is maintaining a 16-hectare Forest Dynamics Plot in Palanan, Isabela at the Northern Sierra Madre Natural Park (NSMNP) together with the NSMNP Protected Area Management Board. The plot was established as part of a global monitoring system established by the Smithsonian Tropical Research Institute's Center for Tropical Forest Studies (STRI-CTFS) and was designed to monitor the impact of typhoons on forest dynamics. Furthermore, Plan International, through a grant from the government of the Netherlands, has established 1-ha plots inside the NSMNP to monitor various habitat types and altitudinal gradients.

Other institutions maintaining long-term monitoring plots include the Philippine National Museum, through the National Herbarium, in various parts of the country; the Central Mindanao University is part of a global network of long term ecological plots (LTER) with a plot in Mount Kitanglad, Bukidnon; and the University of the Philippines Los Baños' Makiling Center for Mountain Ecosystems, which has developed several plots within Mt. Makiling in Laguna as part of the Smithsonian Institutions' Man and the Biosphere Program (SIMAB).

Synthesizing the experiences in these plots would provide the best and most cost effective methodologies in M & E for use in other areas.

This is a further refinement of NBSAP Strategy IV *(Strengthening Capacities for Integrating and Institutionalizing Biodiversity Conservation and Management).*

Develop a National Constituency for Biodiversity Conservation in the Country

Philippine society needs to share in conservation efforts, as conservation must not be seen as the responsibility of only a few government agencies, environment groups and concerned individuals. Philippine society must muster all its strength, knowledge, and commitment to advance conservation efforts. This requires a shift in the general attitude towards the environment and its conservation, and the creation of a national constituency for biodiversity conservation.

If conservation is to succeed, people's participation is a critical element. Availability of and access to information play critical roles in the empowerment of local communities and other stakeholders. Informed decisions can only be made if local communities have access to the best available information. The promotion and dissemination of the results of the PBCPP through an integrated information, education and communications (IEC) campaign will lead to a greater awareness of the general population concerning the need to protect biodiversity and, in particular, the identified priority areas. We anticipate that this will lead to a change in societal behavior to conserve biodiversity through the conservation of the priority areas and threatened species found therein.

The targets for IEC will be focused on national and local government institutions and agencies, donor agencies, NGOs/POs, private sector, academe, religious and local communities and the media. The importance of media in promoting the national biodiversity priorities cannot be over-emphasized. These sectors play key roles in biodiversity conservation and linking them through mechanisms such as the Network for Nature (see Recommendations)

will ensure the maintenance, dissemination, and promotion of information about the country's biodiversity conservation needs.

Through support from the Dutch government, the Haribon Foundation currently is embarking on a project called "Building a National Constituency for Biodiversity Conservation" part of which is the establishment of a National Biodiversity Communication Center (NBCC). The NBCC would disseminate information about the biodiversity conservation needs of the country. Part of the project involves undertaking a baseline assessment of people's perception and interest on biodiversity conservation. Initial results show that environmental issues, particularly biodiversity conservation, rank very low in people's consciousness. These results indicate the tremendous amount of work still needed before a national constituency for biodiversity conservation can be developed.

This is a further refinement of NBSAP Strategy V *(Mobilizing an Integrated Information Education and Communications (IEC) System for Biodiversity Conservation).*

V

RECOMMENDATIONS

The PBCPP is a critical first step in averting the biodiversity crisis from reaching a point of no return. The biodiversity crisis is as important, if not more so than the competing socio-economic and political crisis facing the country. The PBCPP provides concrete recommendations for actions that can be taken by Philippine society to respond to the biodiversity crisis before it is too late.

The consensus developed during the conduct of the PBCPP represents a major breakthrough in the country's conservation work and encompasses the interests of a broad spectrum of stakeholders. The results of the PBCPP provide a decision framework on which various stakeholders and policy-makers can base their conservation and development plans.

The 206 priority areas and the 418 Threatened Species included in the 2000 IUCN Red List are an effective point from which to begin constructive dialogue concerning necessary actions for biodiversity conservation in the Philippines. The PBCPP results are meant to be part of an iterative process that will allow the inclusion of additional data as it emerges and for assessment and validation during on-the-ground work by a wide variety of stakeholders. Overarching recommendations were:

- Extremely High priority areas should be given immediate priority in terms of designing effective conservation plans and implementing conservation actions through the allocation of higher levels of resources while policy reforms or initiatives that will provide additional protection to these areas should be incorporated into the respective work plans of various sectors of society.
- Biologically important areas that have insufficient socio-economic data should be given immediate attention so that their conservation status can be determined.
- The 108 conservation priority areas not currently under NIPAS should be declared as Critical Habitats under the Wildlife Act (RA 9147) as an initial step to confer some sort of protection while awaiting further processing to meet the requirements of NIPAS, if need be.
- Disseminate the information about the 418 Threatened Species included on the 2000 IUCN Red List and validate their status in the country and gather additional information about species that should be listed or de-listed as well. Develop integrated species conservation programs alongside ecosystem-based conservation programs.

STRATEGIC ACTIONS

Successful implementation of the five strategies and actions should be pursued to ensure that conservation in the 206 conservation priority areas. The first five of the six strategic actions prescribed in the NBSAP served to fine-tune the recommended strategic actions that need to be undertaken in concert.

a. Harmonize Research with Conservation Needs

b. Enhance and Strengthen of the Protected Area System

c. Institutionalize Innovative but Appropriate Biodiversity Conservation Approaches: The Biodiversity Corridors

d. Institutionalize Monitoring and Evaluation Systems of Projects and of Biodiversity

e. Develop a National Constituency for Biodiversity Conservation in the Philippines

IMMEDIATE ACTIONS

Conservation actions that transform social, political and economic realities; need to be given prime attention. This will allow a sustained diverse future for succeeding generations of Filipinos. The following actions that can be undertaken immediately to ensure that the PBCPP results are successfully implemented:

- Creating a multi-sectoral, multi-institutional mechanism, called the "Network for Nature" (N4N), which will proactively disseminate, monitor and coordinate the implementation of the PBCPP results.

  In the past, the results of similar exercises in priority-setting were left mostly with the government, through the DENR, to implement. This has led to limited impacts and success in the conservation of Philippine Biodiversity. As one of the lessons learned generated by the PBCPP,

N4N is envisioned to be the mechanism by which the responsibility of implementing the PBCPP results will be shared by a group of partner organizations with different roles and responsibilities, based on each partner organization's strengths. DENR-PAWB's role as the mandated institution to undertake the country's commitment to the Convention on Biological Diversity, through the implementation of the PBCPP results, will now be facilitated by the N4N. Thus, DENR-PAWB's main responsibility will now be broadened and shift from direct implementation of the results to ensuring that these are implemented through the N4N partners. This is consistent with the constructive relationship between the government and civil society in general.

- A "road show" that promotes the PBCPP results and helps ensure that these results are included in decision-making process of critical stakeholders (national and local government, private sector, academe, donor community, civil society and local communities) should be implemented.

  This will allow wide dissemination of the PBCPP results and can be used to raise public awareness about the biodiversity crisis what can be done to address it. The N4N will reach a wide audience and encourage positive action.

- The DENR should adopt the PBCPP results as a framework for its conservation program by ensuring that the development side of the DENR is consistent with the Department's conservation goals. A Department Administrative Order (DAO) reflecting these changes should be issued after the PBCPP results are adopted and the recommended review is carried out.

  These changes will involve a targeted IEC campaign within the different bureaus and other DENR agencies, ensuring that there is consensus within the DENR concerning the PBCPP results and their implementation.

- The DENR should recommend to the President the issuance of an Executive Order instructing government agencies to incorporate the PBCPP results into their programs of work.

  This will improve upon the Memorandum Order that former President Ramos issued in 1996 and will ensure that other government agencies are informed of the PBCPP results and be involved in its implementation according to agency mandates. This will ensure consistency across the executive branch of the government in terms of conservation work in general.

- For other government agencies (*e.g.*, the Department of Agriculture National Economic Development Authority, Department of Public Works and Highways, Department of Agrarian Reform, the Department of Science and Technology, among others), to incorporate the PBCPP results into their work plans, in particular for projects that are being planned in or near the identified priority areas. These projects should be designed to either minimize their negative impacts or to enhance biodiversity. In cases where projects are already approved and are being implemented, agencies should undertake best practices that would either minimize negative impacts or promote biodiversity.

- For the DENR to use the PBCPP results as the basis for securing donor commitments and investments for the DENR's conservation programs. Adopting the PBCPP results will place the DENR in a better position to set the conservation agenda for donors.

- Local Government Units (LGUs) should integrate the PBCPP results into their Comprehensive Land Use Plans, Physical Framework Development Plans and other municipal or regional development plans, or in their revisions if plans are already in place. Through adopting the PBCPP results, the LGUs will be in a better position to set the conservation agenda at the local level and deal with the national government regarding issues related to conservation and development plans.

LGUs can take pride in the rich biodiversity within their jurisdiction and take seriously the concomittant responsibility to conserve biodiversity by promoting alternative uses for these resources so that future generations will benefit.

- The DENR should promote the PBCPP results to the legislative and judicial branches of government so that there is consistency across all branches of the government, when issues on environmental protection and biodiversity conservation are discussed.
- The NGO community should use the PBCPP results as a basis for unity in their conservation work in the country and in developing appropriate programs either on their own or in collaboration with other stakeholders and partners.
- The academic and scientific community should use the results as a rich source of information that can be transformed into teaching and extension materials and in development of conservation-based research and in the development of teaching, research and extension work.
- The donor community should use the PBCPP results as a basis for their future investments. The donor community can be sure that whatever area or species they choose to support will contribute to Zero Biodiversity Loss.
- The private sector should use the results to guide their commitment to corporate social responsibility and as the basis for their investments by limiting the impact of investments when these would be undertaken in or near priority areas.
- The PBCPP results and the N4N should be used as the springboard to develop a national and international constituency for conservation of Philippine biodiversity.

No single organization or individual can make the campaign to save the Philippine hotspot successful. Only by building a critical mass of ardent biodiversity advocates will the biodiversity crisis become part of the national consciousness and part of the political debate. Otherwise, it will continue to receive little attention, not only from government but also from Philippine society.

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95 Ban-ban
96 Ilog River
97 Basay - Hinoba-an
98 Mansangaban
99 Cuernos de Negros (Mt. Talinis)
100 Twin Lakes
101 Catmon / Carmen
102 Tabunan Forest
103 Mactan, Kalawisan, Cansafa Bay
104 Olango Island
105 Argao
106 Nug-as and Mt. Lantoy
107 Mt. Kangbulagsing and Mt. Lanaya
108 Mt. Cabalantian - Mt. Capotoan Complex
109 Southern Samar Mountains
110 Biliran and Maripipi Islands
111 Jetafe Group of Islands (Calituban and Tahong-tahong Island)
112 Rajah Sikatuna National Park
113 Mt. Pangasugan (Northern Leyte Mountain Range); Lake Mahagnao
114 Anonang - Lobi Range
115 Mt. Nacolod - Cabalian Area
116 Panaon Island
117 Homonhon Island
118 Dinagat (Mt. Kambinlio & Mt. Redondo)
119 Siargao Island
120 Lake Mainit
121 Mimbilisan Protected Landscape
122 Mt. Balatocan
123 Mt. Hilong-hilong (Urdaneta), Agusan del Norte
124 Agusan River
125 North Diwata (Bislig, Mt. Agtuuganon - Mt. Pasian)
- 125a Mt. Hilong-hilong (Urdaneta), Agusan del Norte
- 125b Red Mountains, Surigao del Norte and Sur
- 125c Sudecor Concession, Carmen - Lanuza - San Miguel, etc. area
- 125d Lianga Bay area
- 125e Bislig Bay area
- 125f Mt. Agtuuganon - Mt. Pasian

126 Agusan Marsh
127 Mt. Kaluayan - Kinabalian (Kimangkil Ridge), Bukidnon - Agusan del Norte border
128 Mt. Tago Range
129 Mt. Kitanglad
130 Kalatungan Range
131 Olangui River
132 Munai Tambo Complex (Kolambugan uplands & associated mountains)
133 Lake Lanao
134 Lake Napalit
135 Mt. Piagayungan (Ragang) Complex
136 Mt. Butig / Lake Butig National Park
137 Pulangi River
138 Mt. Sinaka
139 Marilog Forest Reserve, Bukidnon - Davao boundary
140 South Diwata Mountain Ranges
141 Pantukan Mabini - Maco Area
142 Tumadgo Peak
143 Mt. Apo Range
144 Ligawasan Marsh
145 South Cotabato / Sultan Kudarat (Mt. Daguma)
146 Mt. Matutum
147 Lake Sebu and Mt. Three Kings
148 Mt. Busa - Kiamba
149 Mt. Parker
150 Lake Maughan
151 Mt. Latian Complex (Sarangani Mountains)
152 Lake Duminagat
153 Mt. Malindang and Lake Duminagat
154 Mt. Dapiak - Mt. Paraya
155 Mt. Sugarloaf
156 Mt. Timolan
157 Lituban - Quipit Watershed
158 Pasonanca Watershed
159 Basilan
160 Camotes Island
161 Siquijor
162 Camiguin Island
163 Sulu
164 Mt. Dajo National Park
165 Tawi-tawi Island
166 Manuk-manka Islands
167 Sibutu and Tumindao Islands
168 Cagayan Islands
169 Tubbataha Reef National Marine Park
170 Cagayan de Sulu
171 Bolinao
172 Zambales Coast
173 El Nido to Ulugan Bay
174 Kalayaan Island Group

175 Batanes

176 Babuyan Islands

177 Verde Island Passage - Batangas

178 Calamianes

179 Taytay - Dumaran Bay

180 Balabac Island

181 Tapal - Santa Ana - Valley Point

182 Palanan - Divilacan Bay Area

183 Polillo Island

184 Calauag Bay

185 Ticao - San Bernardino Strait - Lagonoy Gulf

186 South Leyte

187 Lianga Bay

188 Siargao - Dinagat

189 West Samar

190 Visayan Sea

191 Tañon Strait

192 Danajon Reef

193 Surigao

194 Bohol Triangle

195 Tablas Strait

196 Panay Gulf - Guimaras Strait

197 South Negros

198 Zamboanga del Norte

199 Cuyo Islands

200 Honda Bay

201 Tubbataha Reefs

202 Cagayan de Tawi-tawi - Turtle Island

203 Sulu Archipelago

204 Moro Gulf

205 Malita, Davao del Sur

206 Sarangani Bay

207 Batanes Islands Protected Landscape and Seascape, and Babuyanes

208 Ilocos Mountain Range

209 Northern Cordillera

210 Kalinga - Apayao

211 Northern Sierra Madre

212 Central Cordillera

213 Cordillera

214 Mt. Pulag National Park

215 Southern Cordillera

216 Isabela - Sierra Madre

- 216a Mt. Cresta Complex
- 216b Dimasalansan; Forest within the Isabela Ultramafic Complex
- 216c Palanan River Valley
- 216d Kanaipang Hills
- 216e Limestone areas of San Mariano
- 216f Other NSMNP rivers and creek: Blos, Divilacan, Dilaknadinom, Disukad, Divinisa, Digollorin, Dimatatno, Abuan, Calumangan, Catalangan, Dibuluan, and Pinacanauan
- 216g Areas outside NSMNP (i.e. Dinapigue TLA areas)

217 Aurora - Sierra Madre

- 217a Proposed Northern Aurora National Park
- 217b Aurora Watershed Areas
- 217c Maria Aurora Memorial Park - Mingan Mountains

218 Aurora Watershed Areas

219 Mt. Dingalan

220 Maria Aurora Memorial Park - Mingan Mountains

221 Zambales - Bataan

222 Mt. Tapulao

223 Northern Quezon (Central Sierra Madre)

- 223a Sierra Madre Portion along Bulacan, Nueva Ecija and Quezon border
- 223b Umiray River Basin
- 223c Karst forest around Caladang, Irid and Angelo Mountains (Bulacan - Rizal - Quezon borders)
- 223d Mt. Binuang and vicinity
- 223e Kaliwa-Kanan River Basin

224 Southern Sierra Madre

225 Polillo Watershed area

226 Southern Quezon (Southern Sierra Madre)

- 226a Mt. Banahaw - San Cristobal - Lucban Cone Complex
- 226b Pagbilao and Tayabas Bay
- 226c Quezon National Park

227 Alabat Island

228 Camarines Norte

229 Bicol National Park - Mt. Labo

230 Mt. Kulasi

231 Isarog - Caramoan

232 Mt. Malinao

233 Bulusan Lake

234 Mindoro Mountains

235 Lake Naujan

236 Apo Reef Marine Natural Park

237 Ilin Islands

238 Calamianes

- 238a Busuanga Island
- 238b Coron Island
- 238c Culion Island
- 238d Linapacan Island

239 Calauit Island

240 Busuanga Island

241 Culion Island

242 Northern Palawan

- 242a Karst forests of El Nido and Taytay
- 242b San Vicente - Taytay - Roxas Forest
- 242c Lake Manguao
- 242d Malampaya Sound
- 242e Cleopatra's Needle
- 242f Puerto Princesa Subterranean River and Ulugan Bay

243 Puerto Princesa Subterranean River and Ulugan Bay

244 Central Palawan

- 244a Anepahan Peaks
- 244b Victoria Ranges

245 Southern Palawan including Balabac Group of Islands

- 245a Tabon Cave area
- 245b Pulot Tres area
- 245c Mt. Gantung
- 245d Tarumpitao - Ransang (Taut-bato) area
- 245e Mt. Mantalingajan
- 245f Mt. Maruyug (Addison's Peak)
- 245g Bulaniao Range (Rio Tuba)
- 245h Ursula Island

246 Southern Palawan

247 Mt. Mantalingajan - Southern Palawan

248 Mt. Guiting-guiting Natural Park

249 Tablas

250 Romblon Island

251 Masbate

252 Eastern Panay

253 Guimaras Island

254 Southern Negros - Basay Caves

255 Hinoba-an

256 Cuernos de Negros Region

- 256a Mountains above Hinoba-an
- 256b Mt. Talinis

257 Alcoy Watershed

258 Samar

259 Central Samar - Capotoan Complex

260 Sohoton - Loquilocon area

261 Mt. Yacgun - Mt. Sohoton Complex

262 Lake Danao

263 Mt. Pangasugan & Anonang - Lobi Range (Northern Leyte Mountain Range); Lake Mahagnao

264 Northern Leyte

265 Eastern Leyte

266 Eastern Mindanao (from Mt. Sinaka, Mt. Kaluayan - Mt. Kinabalian, Mt. Hilong-hilong, Bislig, Mt. Puting Bato - Kampalili - Mayo - Tumadgo Peak)

267 Mt. Balatocan - Kinabalian Range

268 Mt. Diwata Range

269 Bislig

270 Mt. Agtuuganon - Mt. Pasian

271 Bukidnon / Lanao del Sur

272 Lanao del Norte

273 Mt. Puting Bato - Kampalili - Mayo Complex

274 Mt. Puting Bato

275 Mt. Malindang and Lake Duminagat - Mt. Dapiak - Mt. Paraya

276 Central Zamboanga

277 West Zamboanga

278 Mt. Bandila-an

279 Mt. Hibok-hibok

280 Sulu - Tawi-tawi

281 Tawi-tawi

- 281a Tawi-tawi Island
- 281b Sibutu and Tumindao Islands
- 281c Baguan Island

282 Simunul and Manuk-manka Islands

283 Turtle Island

284 Lingayen Gulf

285 Zambales - Pangasinan

286 Zambales Coast and Offshore

287 Subic - Bataan

288 Manila Bay

289 Lubang Island

290 Lian - Calatagan

291 Verde Island Passage

292 Puerto Galera Bay

293 Apo Reef

294 West Palawan

295 Port Barton

296 El Nido

297 Northwest Palawan

298 Taytay Bay

299 Malampaya

300 West of Central Palawan

301 Southwest Palawan

302 Kalayaan / Northeast Investigator

303 Bangui

304 Ilocos

305 Masinloc

306 Masinloc - Dasol Bay

307 Scarborough Shoal

308 Fuga Island

309 Ilocos - Babuyan - Batanes

310 Babuyan - Batanes

311 West Mindoro

312 Palawan

313 South Palawan

314 Buguey

315 Palaui Island

316 Northeast Luzon

317 Divilacan - Casapsapan Bay Area

318 Divilacan

319 Aurora - Quezon

320 Casapsapan - Dilasag - Casiguran

321 Casiguran Sound Aurora

322 Polillo Island - Camarines Norte

323 Lamon - Calauag - Lopez - Basiad Bays

324 Lamon Bay

325 Camarines Norte

326 Caramoan Coast

327 Catanduanes

328 Gigmoto

329 Lagonoy - Albay Gulf

330 Southeast Bicol Coast
331 Bacon, Sorsogon
332 Northern Samar
333 Gubat
334 North Samar
335 Biri Island - Balicuatro Islands
336 Tikling Islands
337 East Samar
338 Oras Bay
339 Guiuan
340 East Mindanao
341 Surigao del Sur
342 Davao Oriental
343 Pujada Bay
344 Siargao Island
345 Governor Generoso
346 Pagbilao Bay
347 Bondoc Peninsula
348 Ragay Gulf - Masbate - Samar Sea
349 Ragay - Ticao - Burias
350 Burias - Lagonoy Gulf - Northern Samar
351 Burias - Ticao Area
352 Templo Island, Burias Pass
353 Sorsogon Bay
354 Marinduque
355 Romblon - Sibuyan
356 Masbate - Romblon - Sibuyan Sea
357 Sibuyan Island
358 Bongsanglay
359 South Masbate
360 Samar Sea
361 Western Samar
362 Ibajay
363 Northeast Panay
364 Estancia
365 Guimaras Strait
366 Cadiz - Silay
367 Bantayan Island
368 Sagay
369 Guimaras Island
370 Camotes Island
371 Bais Bay
372 North Bohol
373 Western Bohol
374 Cablao Bay
375 Sogod Bay
376 Southern Leyte
377 Panglao
378 Siquijor
379 Camiguin
380 Dapitan
381 Baliangao
382 Panguil Bay
383 Antique - Semirara Island
384 South Negros - Sumilon Island
385 Negros - Zamboanga
386 South Mindoro
387 Semirara Islands
388 West Panay - Negros
389 West Panay (Antique)
390 East Coast of Palawan
391 Northeast Palawan
392 East of Central Palawan
393 Puerto Princesa
394 Narra - Brookes Point
395 Southeast Palawan
396 Southwest Negros
397 Southern Negros Coast
398 Tubbataha Reefs - Cagayan Islands
399 Cagayan Islands
400 West Sulu Sea
401 Cagayan Ridge
402 Turtle Island
403 Zamboanga del Sur - Zamboanga del Norte
404 Pilas Island
405 South Mindanao
406 Sta. Cruz
407 Dumanquillas Bay
408 Davao Gulf
409 Samal Island
410 Sultan Kudarat
411 Sultan Kudarat - South Cotabato
412 South Cotabato

BIODIVERSITY CORRIDORS

t1 Cordillera
t2 Caraballo
t3 Sierra Madre
t4 Bataan - Zambales
t5 Bicol
t6 Central Mindoro
t7 Palawan
t8 Panay Mountains
t9 Canlaon
t10 Talines
t11 Central Cebu
t12 Leyte
t13 Samar
t14 Eastern Mindanao
t15 Central Mindanao
t16 Kitanglad - Ligawasan
t17 Malindang
t18 Zamboanga Peninsula

t19 Tawi-tawi

m1 Babuyan

m2 Mindoro - Calavite - Tablas Triangle

m3 Ticao Pass - San Bernardino Strait - Samar Sea

m4 Panay Gulf - Guimaras Strait

m5 Bohol Sea Corridor - Surigao Strait

m6 Balabac Strait

m7 Tapiantana

m8 Sibutu Passage - Sulu Archipelago

m9 Philippine Sea

TERRESTRIAL BIOGEOGRAPHIC REGIONS/ SUB-REGIONS/ SUB SUB-REGIONS

A Batanes

B Babuyanes

C Greater Luzon

- C1 Central Cordillera
  - C1a Northern Cordillera
- C2 Cagayan Valley
  - C2a Caraballo - Dalton Pass
- C3 Sierra Madre
  - C3a Northern Sierra Madre
  - C3b Central Sierra Madre (Quirino, Aurora and N. Viscaya)
  - C3c Southern Sierra Madre (Northern Quezon, Bulacan, N. Ecija, Rizal)
  - C3d Banahaw - Makiling
- C4 Central Luzon Lowlands
  - C4a Arayat
- C5 Zambales - Bataan
- C6 Cavite - Batangas Highlands
- C7 Polillo - Bondoc Peninsula
  - C7a Polillo
  - C7b Bondoc
- C8 Bicol
  - C8a Isarog
  - C8b Catanduanes
  - C8c Malinao
  - C8d Bulusan
- C9 Marinduque Lowlands

D Lubang

E Greater Mindoro

- E1 Naujan Lake
- E2 Mindoro Mainland
  - E2a Calavite Highlands
  - E2b South Mindoro Islands (Semirara Island Group)

F Greater Palawan

- F1 Calamianes
- F2 Cuyo Island Group
- F3 Palawan and Balabac
  - F3a Northern Palawan
  - F3b Lake Manguao
  - F3c Central Palawan
  - F3d Southern Palawan
  - F3e Balabac

G Burias

H Sibuyan

I Romblon - Tablas

J Greater Negros - Panay

- J1 North Western Panay Peninsula
- J2 Madjaas - Baloi Complex
- J3 Lowland Panay - Masbate - Guimaras
  - J3a Ticao Island
- J4 Gigantes Islands - Northeastern Panay Peninsula
- J5 Negros
  - J5a Northern Negros Mountains
  - J5b Negros Lowlands
  - J5c Cuernos de Negros
- J6 Cebu

K Greater Mindanao

- K1 Samar - Leyte - Bohol
  - K1a Samar
  - K1b Leyte
  - K1c Bohol
- K2 Dinagat - Siargao - Bucas Grande
- K3 Mindanao Mountains
  - K3a Eastern Mindanao Mountains
  - K3b Pantadon Range
  - K3c Bukidnon - Lanao Complex
  - K3d South Cotabato - Sarangani Complex
- K4 Mindanao Lowlands (Agusan Marsh/River)
  - K4a Agusan Marsh
- K5 Mindanao Lowlands (Ligawasan Marsh and Cotabato Rivers)
- K6 Zamboanga
  - K6a Malindang Range
  - K6b Zamboanga Peninsula
  - K7 Basilan

L Camotes

M Siquijor

N Camiguin

O Greater Sulu

- O1 Jolo
- O2 Tawi-tawi

P Sibutu

APPENDIX 2. Philippine biodiversity conservation priority areas

(To be used in conjunction with the integrated priority areas map)

Conservation Priority Area *	Priority Level	Biogeographic Region	Estimated Area (ha)	Location	
				Region	Province(s)
TERRESTRIAL					
1 Batanes Islands Protected Landscape and Seascape	Very High	Batanes	20,084.74	II	Batanes
2 Babuyanes	Very High	Babuyanes	60,340.23	II	Cagayan
3 Kalbario - Patapat National Park	Very High	Greater Luzon	61,359.38	CAR, II, I	Apayao, Cagayan and Ilocos Norte
4 Apayao Lowland Forest	Extremely High critical	Greater Luzon	217,431.34	CAR, II	Apayao and Cagayan
5 Abulog River	Very High	Greater Luzon	34,467.67	CAR, II	Apayao and Cagayan
6 Buguey Wetlands	Very High	Greater Luzon	16,319.41	II	Cagayan
7 Cagayan River	Extremely High critical	Greater Luzon	124,084.12	II	Cagayan and Isabela
8 Mt. Cagua	Very High	Greater Luzon	91,461.14	II	Cagayan
9 Balbalasang - Balbalan National Park	Extremely High critical	Greater Luzon	145,062.56	CAR	Apayao, Abra and Kalinga
10 Mt. Cetaceo	Extremely High critical	Greater Luzon	20,274.97	II	Cagayan
11 Abra River	Extremely High critical	Greater Luzon	64,126.72	CAR, I	Abra, Mt. Province, Benguet, Ifugao and Ilocos Sur
12 Peaks of Central Cordillera (above 1000 masl)	Extremely High urgent	Greater Luzon	526,483.45	CAR, II, I	Abra, Mt. Province, Kalinga, Benguet, Nueva Viscaya, Ifugao and Ilocos Sur
13 Peñablanca Protected Landscape	Very High	Greater Luzon	35,703.38	II	Cagayan
14 Northern Sierra Madre Natural Park	Extremely High critical	Greater Luzon	317,624.44	II	Isabela
15 Agno / Amburayan River	Extremely High critical	Greater Luzon	110,277.71	CAR, III, II, I	Mt. Province, La Union, Benguet, Ifugao, Tarlac, Nueva Viscaya, Pangasinan and Ilocos Sur
16 Caraballo - Palali Mountain Range	Very High	Greater Luzon	58,596.88	II	Nueva Viscaya and Quirino
17 Central Sierra Madre Mountains	Extremely High critical	Greater Luzon	163,135.48	IV, II	Nueva Viscaya, Quirino, Aurora and Isabela
18 Casecnan River Basin	Extremely High critical	Greater Luzon	38,337.52	II	Quirino and Isabela
19 Aurora National Park	Very High	Greater Luzon	6,808.97	III, IV	Aurora and Nueva Ecija
20 Zambales Mountain Range (Mt. Tapulao and Mt. High Peak)	Extremely High critical	Greater Luzon	246,996.86	III, I	Tarlac, Pampanga, Pangasinan and Zambales
21 Camp O'Donnel	Extremely High critical	Greater Luzon	31,879.39	III	Tarlac
22 Mt. Arayat National Park	Extremely High critical	Greater Luzon	19,483.83	III	Tarlac, Pampanga and Nueva Ecija
23 Angat Watershed Forest Reserve	Extremely High critical	Greater Luzon	9,135.17	III	Bulacan
24 Sierra Madre Portion along Bulacan, Nueva Ecija and Quezon border	Extremely High urgent	Greater Luzon	99,956.49	IV, III	Aurora, Nueva Ecija, Quezon and Bulacan
25 Umiray River	Insufficient Data	Greater Luzon	22,438.42	IV, III	Aurora, Quezon and Bulacan
26 Mt. Irid - Mt. Angelo	Extremely High critical	Greater Luzon	141,387.25	IV, III	Quezon, Rizal and Bulacan
27 Candaba Swamp	Very High	Greater Luzon	9,278.79	III	Pampanga and Bulacan
28 Bataan Natural Park and Subic Bay Forest Reserve	Extremely High critical	Greater Luzon	24,943.30	III	Bataan and Zambales
29 Mariveles Mountains	Very High	Greater Luzon	13,998.24	III	Bataan
30 Manila Bay	Extremely High critical	Greater Luzon	133,761.69	IV, III, NCR	Pampanga, Manila, Rizal and Bulacan
31 Mt. Binuang and vicinity	Insufficient Data	Greater Luzon	56,575.69	IV	Quezon and Rizal
32 Kaliwa-Kanan River	Very High	Greater Luzon	11,288.25	IV	Quezon
33 UP Land Grants (Pakil and Real)	Very High	Greater Luzon	22,635.14	IV	Laguna, Quezon and Rizal
34 Polillo Island	Extremely High critical	Greater Luzon	81,115.84	IV	Quezon
35 Pasig River	Extremely High critical	Greater Luzon	17,733.85	IV, NCR	Manila and Rizal

* Numbers on the left refer to place name index

APPENDIX 2. Philippine biodiversity conservation priority areas (continued from previous page)

Conservation Priority Area *	Priority Level	Biogeographic Region	Estimated Area (ha)	Location	
				Region	Province(s)
36 Laguna de Bay	Extremely High critical	Greater Luzon	89,027.97	IV, NCR	Laguna, Manila and Rizal
37 Tadlak Lake	Very High	Greater Luzon	25.06	IV	Laguna
38 Mt. Makiling Forest Reserve	Extremely High critical	Greater Luzon	11,871.90	IV	Batangas and Laguna
39 7 Lakes of San Pablo City	Very High	Greater Luzon	1,207.77	IV	Laguna
40 Mt. Banahaw - San Cristobal - Lucban Cone Complex	Very High	Greater Luzon	7,641.59	IV	Laguna and Quezon
41 Mt. Palay-Palay - Mt. Mataas na Gulod National Park	Very High	Greater Luzon	2,863.78	IV	Cavite and Batangas
42 Mt. Malarayat Range	Insufficient Data	Greater Luzon	367,915.60	IV	Cavite, Batangas, Laguna and Quezon
43 Taal Lake	Extremely High urgent	Greater Luzon	23,897.03	IV	Batangas
44 Pansipit River	Extremely High urgent	Greater Luzon	3,989.58	IV	Batangas
45 Quezon National Park	Very High	Greater Luzon	4,450.49	IV	Quezon
46 Pagbilao and Tayabas Bay	Extremely High critical	Greater Luzon	5,109.86	IV	Quezon
47 Lalaguna Marsh	Very High	Greater Luzon	3,191.55	IV	Quezon
48 Ragay Gulf	Very High	Greater Luzon	19,492.04	V, IV	Camarines Sur and Quezon
49 Bondoc Peninsula	Insufficient Data	Greater Luzon	296,264.97	IV	Quezon
50 Mt. Labo	Very High	Greater Luzon	74,637.39	V, IV	Camarines Sur, Camarines Norte and Quezon
51 Caramoan Peninsula	Extremely High critical	Greater Luzon	28,896.06	V	Camarines Sur
52 Catanduanes Island	Very High	Greater Luzon	63,607.37	V	Catanduanes
53 Mt. Isarog National Park	Extremely High urgent	Greater Luzon	20,882.42	V	Camarines Sur
54 Lake Nabua	Very High	Greater Luzon	7,414.69	V	Camarines Sur
55 Lake Buhi / Lake Manapao / Lake Katugday	Extremely High critical	Greater Luzon	29,076.00	V	Albay and Camarines Sur
56 Lake Bato	Extremely High urgent	Greater Luzon	10,500.90	V	Albay and Camarines Sur
57 Bacon - Manito	Insufficient Data	Greater Luzon	20,794.85	V	Sorsogon and Albay
58 Mt. Bulusan National Park	Very High	Greater Luzon	19,053.15	V	Sorsogon
59 Marinduque	Very High	Greater Luzon	33,575.52	IV	Marinduque
60 Lubang Island	Extremely High critical	Lubang	6,918.78	IV	Mindoro Occidental
61 Mt. Calavite	Very High	Greater Mindoro	19,668.82	IV	Mindoro Occidental
62 Puerto Galera	Extremely High critical	Greater Mindoro	39,144.83	IV	Mindoro Occidental and Mindoro Oriental
63 Mt. Halcon	Extremely High critical	Greater Mindoro	62,949.51	IV	Mindoro Occidental and Mindoro Oriental
64 Naujan Lake National Park	Very High	Greater Mindoro	25,361.82	IV	Mindoro Oriental
65 Sablayan	Extremely High critical	Greater Mindoro	25,770.45	IV	Mindoro Occidental
66 Iglit and Baco Mountains	Extremely High critical	Greater Mindoro	47,482.84	IV	Mindoro Occidental
67 Malpalon	Insufficient Data	Greater Mindoro	25,176.44	IV	Mindoro Occidental
68 Bogbog, Bongabong and Mt. Hitding	Insufficient Data	Greater Mindoro	21,940.34	IV	Mindoro Oriental
69 Mt. Hinunduang	Extremely High critical	Greater Mindoro	29,799.91	IV	Mindoro Occidental and Mindoro Oriental
70 South Mindoro Islands (Semirara Island Group)	Insufficient Data	Greater Mindoro	12,288.96	VI	Antique
71 Coron Lakes	Extremely High critical	Greater Palawan	1,219.94	IV	Palawan
72 Cuyo Island Group	Extremely High critical	Greater Palawan	12,302.58	IV	Palawan
73 El Nido	Extremely High critical	Greater Palawan	101,985.53	IV	Palawan
74 Lake Manguao	Insufficient Data	Greater Palawan	1,226.33	IV	Palawan
75 San Vicente - Taytay - Roxas Forest	Extremely High urgent	Greater Palawan	152,430.89	IV	Palawan
76 Puerto Princesa Subterranean River National Park (Cleopatra's Needle)	Extremely High critical	Greater Palawan	134,987.00	IV	Palawan
77 Victoria and Anapalan Ranges	Extremely High critical	Greater Palawan	182,456.06	IV	Palawan
78 Mt. Mantalingajan	Very High	Greater Palawan	169,406.09	IV	Palawan

APPENDIX 2. Philippine biodiversity conservation priority areas (continued from previous page)

Conservation Priority Area *	Priority Level	Biogeographic Region	Estimated Area (ha)	Location	
				Region	Province(s)
79 Ursula Island	Extremely High critical	Greater Palawan	1,157.22	IV	Palawan
80 Balabac Group of Islands	Insufficient Data	Greater Palawan	35,277.60	IV	Palawan
81 Burias Island	Very High	Burias	42,623.21	V	Masbate
82 Sibuyan Island	Extremely High critical	Sibuyan	32,033.30	IV	Romblon
83 Balogo Watershed	Very High	Romblon - Tablas	24,666.57	IV	Romblon
84 Ticao	High	Greater Negros-Panay	32,741.16	V	Masbate
85 Northwest Panay Peninsula	Extremely High urgent	Greater Negros-Panay	19,422.52	VI	Aklan and Antique
86 Central Panay Mountains: Madjaas - Baloi Complex	Extremely High urgent	Greater Negros-Panay	178,272.45	VI	Aklan, Capiz, Antique and Iloilo
87 Jalaud River	Insufficient Data	Greater Negros-Panay	38,006.88	VI	Capiz, Antique and Iloilo
88 Northeastern Panay - Gigantes	Extremely High urgent	Greater Negros-Panay	44,249.76	VI	Capiz and Iloilo
89 Mt. Villion - Mapili	Very High	Greater Negros-Panay	18,009.75	V	Masbate
90 Mobo - Uson	Very High	Greater Negros-Panay	9,164.63	V	Masbate
91 Malbug	Very High	Greater Negros-Panay	1,703.69	V	Masbate
92 Daraga - Placer - Malatugon	Very High	Greater Negros-Panay	8,103.94	V	Masbate
93 Mt. Silay - Mt. Mandalagan	Very High	Greater Negros-Panay	31,209.86	VI	Negros Occidental
94 Mt. Canlaon National Park	Extremely High critical	Greater Negros-Panay	32,202.03	VI, VII	Negros Occidental and Negros Oriental
95 Ban-ban	Very High	Greater Negros-Panay	20,012.94	VII	Negros Oriental
96 Ilog River	Insufficient Data	Greater Negros-Panay	26,952.31	VI, VII	Negros Occidental and Negros Oriental
97 Basay - Hinoba-an	Extremely High critical	Greater Negros-Panay	58,155.69	VI	Negros Occidental
98 Mansangaban	Insufficient Data	Greater Negros-Panay	1,130.63	VII	Negros Oriental
99 Cuernos de Negros (Mt. Talinis)	Extremely High critical	Greater Negros-Panay	25,963.74	VII	Negros Oriental
100 Twin Lakes	Extremely High urgent	Greater Negros-Panay	1,227.23	VII	Negros Oriental
101 Catmon / Carmen	Extremely High critical	Greater Negros-Panay	15,794.02	VII	Cebu
102 Tabunan Forest	Extremely High critical	Greater Negros-Panay	7,859.41	VII	Cebu
103 Mactan, Kalawisan, Cansafa Bay	Extremely High critical	Greater Negros-Panay	11,215.13	VII	Cebu
104 Olango Island	Extremely High critical	Greater Negros-Panay	950.65	VII	Cebu
105 Argao	Extremely High critical	Greater Negros-Panay	24,668.49	VII	Cebu
106 Nug-as and Mt. Lantoy	Extremely High critical	Greater Negros-Panay	2,239.48	VII	Cebu
107 Mt. Kangbulagsing and Mt. Lanaya	Insufficient Data	Greater Negros-Panay	3,217.61	VII	Cebu
108 Mt. Cabalantian - Mt. Capotoan Complex	Extremely High critical	Greater Mindanao	398,116.97	VIII	Samar, Eastern Samar and Northern Samar
109 Southern Samar Mountains	Very High	Greater Mindanao	60,813.16	VIII	Samar and Eastern Samar
110 Biliran and Maripipi Islands	Very High	Greater Mindanao	18,833.52	VIII	Biliran
111 Jetafe Group of Islands (Calituban and Tahong-tahong Island)	High	Greater Mindanao	24,873.59	VII	Bohol
112 Rajah Sikatuna National Park	Extremely High critical	Greater Mindanao	60,420.43	VII	Bohol
113 Mt. Pangasugan (Northern Leyte Mountain Range); Lake Mahagnao	Extremely High critical	Greater Mindanao	36,112.59	VIII	Leyte
114 Anonang - Lobi Range	Very High	Greater Mindanao	53,405.37	VIII	Leyte
115 Mt. Nacolod - Cabalian Area	Very High	Greater Mindanao	44,525.96	VIII	Leyte and Southern Leyte
116 Panaon Island	Very High	Greater Mindanao	9,245.00	VIII	Southern Leyte
117 Homonhon Island	Very High	Greater Mindanao	10,684.23	VIII	Eastern Samar
118 Dinagat (Mt. Kambinlio & Mt. Redondo)	Extremely High critical	Greater Mindanao	85,955.42	CARAGA	Surigao Del Norte
119 Siargao Island	Extremely High critical	Greater Mindanao	62,768.54	CARAGA	Surigao Del Norte
120 Lake Mainit	Very High	Greater Mindanao	13,514.13	CARAGA	Agusan Del Norte and Surigao Del Norte
121 Mimbilisan Protected Landscape	Very High	Greater Mindanao	5,077.49	X	Misamis Oriental
122 Mt. Balatocan	Very High	Greater Mindanao	30,965.74	X	Misamis Oriental

APPENDIX 2. Philippine biodiversity conservation priority areas (continued from previous page)

Conservation Priority Area *	Priority Level	Biogeographic Region	Estimated Area (ha)	Location	
				Region	Province(s)
123 Mt. Hilong-hilong (Urdaneta), Agusan del Norte	Extremely High critical	Greater Mindanao	356,883.92	CARAGA	Agusan Del Sur, Agusan Del Norte, Surigao Del Norte and Surigao Del Sur
124 Agusan River	Extremely High critical	Greater Mindanao	120,288.06	CARAGA, XI	Agusan Del Norte, Agusan Del Sur and Compostela
125 North Diwata (Bislig, Mt. Agtuuganon - Mt. Pasian)	Extremely High critical	Greater Mindanao	168,194.72	CARAGA, XI	Agusan Del Sur, Compostela, Davao Oriental and Surigao Del Sur
126 Agusan Marsh	Extremely High critical	Greater Mindanao	70,053.80	CARAGA	Agusan Del Sur
127 Mt. Kaluayan - Kinabalian (Kimangkil Ridge), Bukidnon - Agusan del Norte border	Extremely High critical	Greater Mindanao	632,264.52	X, XI, CARAGA	Misamis Or., Bukidnon, Davao, Davao Del Sur, Agusan Del Norte and Agusan Del Sur
128 Mt. Tago Range	Extremely High critical	Greater Mindanao	67,433.80	X	Bukidnon
129 Mt. Kitanglad	Extremely High urgent	Greater Mindanao	74,419.13	X	Bukidnon
130 Kalatungan Range	Extremely High critical	Greater Mindanao	157,251.63	X, XII, ARMM	Misamis Or., Bukidnon, Lanao Del Norte and Lanao Del Sur
131 Olangui River	Extremely High urgent	Greater Mindanao	4,674.01	XI, ARMM	Lanao Del Norte and Lanao Del Sur
132 Munai Tambo Complex (Kolambugan uplands & associated mountains)	Very High	Greater Mindanao	100,732.60	XI	Lanao Del Norte and Lanao Del Sur
133 Lake Lanao	Extremely High critical	Greater Mindanao	36,268.17	ARMM	Lanao Del Sur
134 Lake Napalit	Very High	Greater Mindanao	1,233.10	X	Bukidnon
135 Mt. Piagayungan (Ragang) Complex	Extremely High critical	Greater Mindanao	173,647.52	X	Bukidnon, North Cotabato, Lanao Del Sur and Maguindanao
136 Mt. Butig / Lake Butig National Park	Very High	Greater Mindanao	49,053.49	ARMM	Lanao Del Sur and Maguindanao
137 Pulangi River	Extremely High critical	Greater Mindanao	131,002.19	X, ARMM, XII	Bukidnon, Maguindanao and North Cotabato
138 Mt. Sinaka	Extremely High critical	Greater Mindanao	5,695.19	XII, XI	North Cotabato and Davao Del Sur
139 Marilog Forest Reserve, Bukidnon - Davao boundary	Extremely High critical	Greater Mindanao	67,336.88	XI	Davao and Davao Del Sur
140 South Diwata Mountain Ranges	Extremely High critical	Greater Mindanao	217,326.12	XI	Compostela and Davao Oriental
141 Pantukan Mabini - Maco Area	High	Greater Mindanao	81,057.66	XI	Compostela and Davao Oriental
142 Tumadgo Peak	Very High	Greater Mindanao	48,681.87	XI	Davao Oriental
143 Mt. Apo Range	Extremely High urgent	Greater Mindanao	102,662.03	XII, XI	North Cotabato and Davao Del Sur
144 Ligawasan Marsh	Extremely High critical	Greater Mindanao	213,982.10	XII, XI, ARMM	North Cotabato, Maguindanao, South Cotabato and Sultan Kudarat
145 South Cotabato / Sultan Kudarat (Mt. Daguma)	Very High	Greater Mindanao	115,606.44	ARMM, XI, XII	Maguindanao, South Cotabato and Sultan Kudarat
146 Mt. Matutum	Extremely High urgent	Greater Mindanao	56,645.99	XII, XI	North Cotabato, Davao Del Sur, Sarangani, South Cotabato and Sultan Kudarat
147 Lake Sebu and Mt. Three Kings	Extremely High critical	Greater Mindanao	354.62	XI	South Cotabato
148 Mt. Busa - Kiamba	Extremely High urgent	Greater Mindanao	44,612.78	XI	Sarangani and South Cotabato
149 Mt. Parker	Very High	Greater Mindanao	19,902.94	XI	South Cotabato
150 Lake Maughan	Very High	Greater Mindanao	244.27	XI	South Cotabato
151 Mt. Latian Complex (Sarangani Mountains)	Very High	Greater Mindanao	126,350.28	XI	Davao Del Sur and Sarangani

* Numbers on the left refer to place name index

APPENDIX 2. Philippine biodiversity conservation priority areas (continued from previous page)

Conservation Priority Area *	Priority Level	Biogeographic Region	Estimated Area (ha)	Location	
				Region	Province(s)
152 Lake Duminagat	Extremely High urgent	Greater Mindanao	1,230.90	X	Misamis Occidental
153 Mt. Malindang and Lake Duminagat	Extremely High urgent	Greater Mindanao	59,398.92	X, IX	Misamis Occidental and Zamboanga Del Norte
154 Mt. Dapiak - Mt. Paraya	Very High	Greater Mindanao	42,304.11	IX	Zamboanga Del Norte and Zamboanga Del Sur
155 Mt. Sugarloaf	Extremely High critical	Greater Mindanao	87,965.43	IX	Zamboanga Del Norte and Zamboanga Del Sur
156 Mt. Timolan	Very High	Greater Mindanao	9,015.88	IX	Zamboanga Del Sur
157 Lituban - Quipit Watershed	Extremely High critical	Greater Mindanao	149,738.54	IX	Zamboanga Del Norte and Zamboanga Del Sur
158 Pasonanca Watershed	Extremely High critical	Greater Mindanao	39,889.03	IX	Zamboanga Del Norte and Zamboanga Del Sur
159 Basilan	Extremely High urgent	Greater Mindanao	19,094.16	IX	Basilan
160 Camotes Island	Very High	Camotes	396.25	VII	Cebu
161 Siquijor	Very High	Siquijor	7,768.98	VII	Siquijor
162 Camiguin Island	Extremely High critical	Camiguin	24,200.88	X	Camiguin
163 Sulu	Extremely High critical	Greater Sulu	132,181.88	ARMM	Sulu and Tawi-tawi
164 Mt. Dajo National Park	Very High	Greater Sulu	19,077.60	ARMM	Sulu
165 Tawi-tawi Island	Extremely High critical	Greater Sulu	86,111.08	ARMM	Tawi-tawi
166 Manuk-manka Islands	Insufficient Data	Greater Sulu	5,832.71	ARMM	Tawi-tawi
167 Sibutu and Tumindao Islands	Very High	Sibutu	12,775.25	ARMM	Tawi-tawi
168 Cagayan Islands	Extremely High critical	undetermined**	1,319.59	IV	Palawan
169 Tubbataha Reef National Marine Park	Very High	undetermined**	10,183.55	IV	Palawan
170 Cagayan de Sulu	Extremely High critical	undetermined**	7,569.18	ARMM	Tawi-tawi
Sub-TOTAL			**10,895,950.62**		
MARINE ***					
171 Bolinao	High	South China Sea	85,322.01	I	Pangasinan
172 Zambales Coast	High	South China Sea	603,215.00	I, III	Pangasinan, Zambales and Bataan
173 El Nido to Ulugan Bay	Extremely High	South China Sea	531,662.19	IV	Palawan
174 Kalayaan Island Group	Extremely High	South China Sea	22,846,585.83	IV	Palawan
175 Batanes	Very High	South China Sea	208,580.90	II	Batanes
		Northern Philippine Sea	527,163.64		
176 Babuyan Islands	Extremely High	South China Sea	410,641.09	II	Cagayan
		Northern Philippine Sea	339,629.34		
177 Verde Island Passage - Batangas	High	South China Sea	82,902.91	IV	Batangas and Mindoro
		Visayan Sea	84,628.78		
178 Calamianes	Extremely High	South China Sea	853,150.38	IV	Palawan
		Sulu Sea	443,711.14		
179 Taytay - Dumaran Bay	Very High	South China Sea	12,639.56	IV	Palawan
		Sulu Sea	712,367.89		
180 Balabac Island	Very High	South China Sea	256,596.32	IV	Palawan
		Sulu Sea	236,421.39		
181 Tapal - Santa Ana - Valley Point	Very High	Northern Philippine Sea	147,498.62	II	Cagayan Province
182 Palanan - Divilacan Bay Area	High	Northern Philippine Sea	275,892.21	II	Isabela
183 Polillo Island	Very High	Northern Philippine Sea	516,774.77	IV	Quezon
184 Calauag Bay	High	Northern Philippine Sea	67,441.90	IV	Quezon
185 Ticao - San Bernardino Strait - Lagonoy Gulf	Extremely High	Northern Philippine Sea	325,362.38	VIII, V	Albay, Sorsogon, Masbate and Northern Samar
		Southern Philippine Sea	377,474.37		
		Visayan Sea	428,166.38		

APPENDIX 2. Philippine biodiversity conservation priority areas (continued from previous page)

Conservation Priority Area *	Priority Level	Biogeographic Region	Estimated Area (ha)	Location	
				Region	Province(s)
186 South Leyte	High	Southern Philippine Sea	61,740.37	VIII	Southern Leyte
		Visayan Sea	1,970.78		
187 Lianga Bay	High	Southern Philippine Sea	65,872.01	CARAGA	Surigao Del Sur
188 Siargao - Dinagat	Extremely High	Southern Philippine Sea	777,477.37	CARAGA	Surigao Del Norte
		Visayan Sea	671.15		
189 West Samar	Extremely High	Visayan Sea	148,333.53	VIII	Samar and Leyte
190 Visayan Sea	Extremely High	Visayan Sea	819,665.62	VI, VII, VIII	Iloilo, Negros Occidental, Cebu and Leyte
191 Tañon Strait	Extremely High	Visayan Sea	138,561.12	VII	Negros Oriental and Cebu
192 Danajon Reef	Extremely High	Visayan Sea	120,121.41	VII	Cebu and Bohol
193 Surigao	Extremely High	Visayan Sea	244,710.03	VIII, CARAGA	Southern Leyte and Surigao Del Norte
194 Bohol Triangle	Extremely High	Visayan Sea	1,536,720.34	IX, X,VII	Bohol, Siquijor, Camiguin, Zamboanga Del Norte and Misamis Occidental
		Sulu Sea	169.64		
195 Tablas Strait	Very High	Visayan Sea	813,235.77	IV, VI	Antique, Aklan, Mindoro and Romblon
		Sulu Sea	422,167.33		
196 Panay Gulf - Guimaras Strait	High	Visayan Sea	167,612.13	VI	Guimaras, Antique, Iloilo and Negros Occidental
		Sulu Sea	551,097.72		
197 South Negros	Very High	Visayan Sea	30,515.20	VI, VII	Negros Occidental and Negros Oriental
		Sulu Sea	776,696.68		
198 Zamboanga del Norte	High	Visayan Sea	22,221.44	IX	Zamboanga Del Norte
		Sulu Sea	494,170.63		
199 Cuyo Islands	Very High	Sulu Sea	1,007,065.68	IV	Palawan
200 Honda Bay	Very High	Sulu Sea	164,589.80	IV	Palawan
201 Tubbataha Reefs	Extremely High	Sulu Sea	201,645.85	IV	Palawan
202 Cagayan de Tawi-tawi - Turtle Islands	Extremely High	Sulu Sea	1,035,136.17	ARMM	Tawi-tawi
203 Sulu Archipelago	Very High	Sulu Sea	2,615,002.97	ARMM, IX	Tawi-tawi, Sulu, Basilan and Zamboanga Del Sur
		Celebes Sea	1,750,48.17		
204 Moro Gulf	Very High	Celebes Sea	1,526,341.41	ARMM, XII, IX	Zamboanga Del Sur, Lanao Del Norte, Lanao Del Sur and Maguindanao
205 Malita, Davao del Sur	Very High	Celebes Sea	27,477.89	XI	Davao Del Sur
206 Sarangani Bay	High	Celebes Sea	237,996.50	XI	Sarangani, Davao Del Sur and South Cotabato
Sub-TOTAL			**46,133,295.73**		
TOTAL			**57,029,246.35**		

* Numbers on the left refer to place name index
** Small islands within the Sulu seas that have insufficient data to determine as to what biogeographic region they should belong to
*** Some marine priority areas are located within more than one biogerographic zone

APPENDIX 3. Conservation priority areas found within biodiversity corridors

CORRIDOR		Priority Areas*	Priority Level**	Estimated Area (ha)
TERRESTRIAL				
1	Cordillera	3 Kalbario - Patapat National Park	VH	61,359.38
		4 Apayao Lowland Forest	EHc	217,431.34
		5 Abulog River	VH	34,467.67
		9 Balbalasang - Balbalan National Park	EHc	145,062.56
		11 Abra River	EHc	64,126.72
		12 Peaks of Central Cordillera (above 1000 masl)	EHu	526,483.45
		15 Agno / Amburayan River	EHc	110,277.71
2	Caraballo	16 Caraballo - Palali Mountain Range	VH	58,596.88
3	Sierra Madre Corridor	7 Cagayan River	EHc	124,084.12
		8 Mt. Cagua	VH	91,461.14
		10 Mt. Cetaceo	EHc	20,274.97
		13 Peñablanca Protected Landscape	VH	35,703.38
		14 Northern Sierra Madre Natural Park	EHc	317,624.44
		17 Central Sierra Madre Mountains	EHc	163,135.48
		18 Casecnan River Basin	EHc	38,337.52
		19 Aurora National Park	VH	6,808.97
		24 Sierra Madre Portion along Bulacan, Nueva Ecija and Quezon border	EHu	99,956.49
		25 Umiray River	ID	22,438.42
		26 Mt. Irid - Mt. Angelo	EHc	141,387.24
		31 Mt. Binuang and vicinity	ID	56,575.69
		32 Kaliwa-Kanan River	VH	11,288.25
		33 UP Land Grants (Pakil and Real)	VH	22,635.14
4	Bataan - Zambales	20 Zambales Mountain Range (Mt. Tapulao and Mt. High Peak)	EHc	246,996.86
		28 Bataan Natural Park and Subic Bay Forest Reserve	EHc	24,943.30
		29 Mariveles Mountains	VH	13,998.24
5	Bicol	50 Mt. Labo	VH	74,637.39
		51 Caramoan Peninsula	EHc	28,896.06
		53 Mt. Isarog National Park	EHu	20,882.42
		55 Lake Buhi / Lake Manapao / Lake Katugday	EHc	29,076.00
6	Central Mindoro	62 Puerto Galera	EHc	39,144.83
		63 Mt. Halcon	EHc	62,949.51
		65 Sablayan	EHc	25,770.45
		66 Iglit and Baco Mountains	EHc	47,482.84
		67 Malpalon	ID	25,176.44
		68 Bogbog, Bongabong and Mt. Hitding	ID	21,940.34
		69 Mt. Hinunduang	EHc	29,799.91
7	Palawan	73 El Nido	EHc	101,985.53
		74 Lake Manguao	ID	1,226.33
		75 San Vicente - Taytay - Roxas Forest	EHu	152,430.89
		76 Puerto Princesa Subterranean River National Park (Cleopatra's Needle)	EHc	134,987.00
		77 Victoria and Anapalan Ranges	EHc	182,456.06
		78 Mt. Mantalingajan	VH	169,406.08
		80 Balabac Group of Islandss	ID	35,277.60
8	Panay Mountains	85 Northwest Panay Peninsula	EHu	19,422.52
		86 Central Panay Mountains: Madjaas - Baloi Complex	EHu	178,272.45
		87 Jalaud River	ID	38,006.87
9	Canlaon	93 Mt. Silay - Mt. Mandalagan	VH	31,209.86
		94 Mt. Canlaon National Park	EHc	32,202.03

APPENDIX 3. Conservation priority areas found within biodiversity corridors. (continued from previous page)

CORRIDOR		Priority Areas*	Priority Level**	Estimated Area (ha)
10	Talines	97 Basay - Hinoba-an	EHc	58,155.69
		99 Cuernos de Negros (Mt. Talinis)	EHc	25,963.74
		100 Twin Lakes	EHu	1,227.23
11	Central Cebu	101 Catmon / Carmen	EHc	15,794.02
		102 Tabunan Forest	EHc	7,859.41
		105 Argao	EHc	24,668.49
		106 Nug-as and Mt. Lantoy	EHc	2,239.48
		107 Mt. Kangbulagsing and Mt. Lanaya	ID	3,217.61
12	Leyte	113 Mt. Pangasugan (Northern Leyte Mountain Range); Lake Mahagnao	EHc	36,112.59
		114 Anonang - Lobi Range	VH	53,405.37
		115 Mt. Nacolod - Cabalian Area	VH	44,525.96
13	Samar	108 Mt. Cabalantian - Mt. Capotoan Complex	EHc	60,813.16
		109 Southern Samar Mountains	VH	18,833.52
14	Eastern Mindanao Corridor	120 Lake Mainit	VH	13,514.13
		123 Mt. Hilong-hilong (Urdaneta), Agusan del Norte	EHc	356,883.92
		124 Agusan River	EHc	120,288.06
		125 North Diwata (Bislig, Mt. Agtuuganon - Mt. Pasian)	EHc	168,194.72
		126 Agusan Marsh	EHc	70,053.80
		140 South Diwata Mountain Ranges	EHc	217,326.12
		141 Pantukan Mabini - Maco Area	H	81,057.66
		142 Tumadgo Peak	VH	48,681.87
15	Central Mindanao Corridor	121 Mimbilisan Protected Landscape	VH	5,077.49
		122 Mt. Balatocan	VH	30,965.74
		127 Mt. Kaluayan - Kinabalian (Kimangkil Ridge), Bukidnon - Agusan del Norte border	EHc	632,264.52
		128 Mt. Tago Range	EHc	67,433.80
		137 Pulangi River	EHc	131,002.19
		138 Mt. Sinaka	EHc	5,695.19
		139 Marilog Forest Reserve, Bukidnon - Davao boundary	EHc	67,336.88
		143 Mt. Apo Range	EHu	102,662.03
16	Kitanglad - Ligawasan Corridor	129 Mt. Kitanglad	EHu	74,419.13
		130 Kalatungan Range	EHc	157,251.63
		131 Olangui River	EHu	4,674.01
		133 Lake Lanao	EHc	36,268.17
		134 Lake Napalit	VH	1,233.10
		135 Mt. Piagayungan (Ragang) Complex	EHc	173,647.52
		136 Mt. Butig / Lake Butig National Park	VH	49,053.49
		137 Pulangi River	EHc	131,002.19
		144 Ligawasan Marsh	EHc	213,982.10
17	Malindang	152 Lake Duminagat	EHu	1,230.90
		153 Mt. Malindang and Lake Duminagat	EHu	59,398.92
		154 Mt. Dapiak - Mt. Paraya	VH	42,304.11
18	Zamboanga Peninsula	157 Lituban - Quipit Watershed	EHc	149,738.54
		158 Pasonanca Watershed	EHc	39,889.03
19	Tawi-tawi	165 Tawi-tawi Island	EHc	86,111.08
19 Terrestrial Corridors		**92 Terrestrial Priority Areas**		**7,829,553.09**

APPENDIX 3. Conservation priority areas found within biodiversity corridors (continued from previous page)

	CORRIDOR	Priority Areas*	Priority Level**	Estimated Area (ha)
		MARINE		
1	Babuyan Corridor	176 Babuyan Islands	EH	750,270.62
2	Mindoro - Calavite Tablas Triangle	177 Verde Island Passage - Batangas	H	167,531.67
		178 Calamianes	EH	1,296,861.67
		195 Tablas Strait	VH	1,235,403.10
3	Ticao Pass - San Bernardino Strait - Samar Sea Corridor	185 Ticao - San Bernardino Strait - Lagonoy Gulf	EH	1,131,003.23
4	Panay Gulf - Guimaras Strait Corridor	190 Visayan Sea	EH	819,665.62
		196 Panay Gulf - Guimaras Strait	H	718,709.84
5	Bohol Sea Corridor	197 South Negros	VH	807,211.87
		193 Surigao	EH	244,710.03
		186 South Leyte	H	63,711.11
		188 Siargao - Dinagat	EH	778,148.55
		194 Bohol Triangle	EH	1,536,890.56
		198 Zamboanga del Norte	H	516,391.49
6	Balabac Strait Corridor	174 Kalayaan Island Group	EH	22,846,585.83
		180 Balabac Island	VH	393,699.63
7	Tapiantana Corridor	203 Sulu Archipelago	VH	4,365,483.16
8	Sibutu Passage - Sulu Archipelago Corridor	203 Sulu Archipelago	VH	(4,365,483.16)
9	Philippine Sea Corridor	206 Sarangani Bay	H	237,996.50
	9 Marine Corridors	**17 Marine Priority Areas**		**37,910,274.48**

* Numbers on the left refer to place name index
** Priority Levels:
EHu - Extremely High urgent;
EHc - Extremely High critical
EH - Extremely High
VH - Very High
H - High
ID - Insufficient Data

APPENDIX 4. National Integrated Protected Areas System (NIPAS) components that overlapped with conservation priority areas

(See legend below)

Region	No.	NIPAS Components*	Location	Legal Instruments** / Date	Area (ha)	Conservation Priority Areas***	Priority Level	Estimated Area (ha)
CAR	1	Balbalasang-Balbalan National Park	Balbalan, Kalinga-Apayao	R.A. 6463 / June 17, 1972; Proc. 1357 / December 09, 1974	1,338.00	9 Balbalasang-Balbalan National Park	EHc	145,062.56
	2	Mt. Data National Park	Along the Baguio Bontoc National Road, Benguet, Ifugao and Mt. Province	Proc. 634 / October 8, 1940	5,512.00	12 Peaks of Central Cordillera (above 1000 masl)	EHu	526,483.45
	3	Mt. Pulag National Park	Buguias, Kabayan, Benguet, Kiangan, Ifugao and Kayapa, Nueva Vizcaya	Proc. 75 / February 20, 1987	11,550.00	12 Peaks of Central Cordillera (above 1000 masl)	EHu	526,483.45
	4	**Upper Agno Watershed Forest Reserve**	Atok, Bokod, Buguias, Itogon, Kabayan, Tublay, Kibungan and La Trinidad, Benguet; Hungduan and Kiangan, Nueva Vizcaya	Proc. 120 / November 25, 1966; Proc. 268 / April 23, 2000	77,561.00	15 Agno / Amburayan River	EHc	110,277.71
	5	Lower Agno Watershed Forest Reserve	Tuba, Itogon, Benguet, Baguio City	Proc. 2320 / November 22, 1983	39,304.00	15 Agno /Amburayan River	EHc	110,277.71
Region II	6	Batanes Protected Landscape and Seascape	Batanes	Proc. 335 / February 28, 1994; RA 8991 / January 5, 2001	213,578.00	1 Batanes Island Protected Landscape and Seascape	VH	20,084.74
						175 Batanes	VH	735,744.54
	7	**Palaui Island Marine Reserve**	Sta. Ana, Cagayan	Proc. 447 / August 16, 1994	7,415.48	181 Tapal - Santa Ana - Valley Point	VH	147,498.62
	8	**Peñablanca Protected Landscape**	Peñablanca, Cagayan	Proc. 827 / July 16, 1935 (Callao Cave National Park); Proc. 416 / June 29, 1994	4,136.00	13 Peñablanca Protected Landscape	VH	35,703.38
	9	Isabela (Monte-Alto Timber Resource Corporation Parcel 1 & 2)Wilderness Area	Echague and San Mariano, Isabela	Proc. 120 / June 19, 1987	1,095.00	14 Northern Sierra Madre Natural Park	EHc	317,624.00
	10	Northern Sierra Madre Natural Park	Palanan, Divilacan, Maconacon, San Mariano, Dinapigue, Ilagan, Tumauini, Cabagan, San Pablo, and Isabela	LOI 917 /Aug. 22, 1979 and 1917a / September 7, 1979 (Palanan Wilderness Area); Proc. 978 / March 10, 1997; R. A. 9125 / Apr. 22, 2000	247,861.00	14 Northern Sierra Madre Natural Park	EHc	317,624.00
	11	**Casecnan Protected Landscape**	Dupax del Norte and Sur, N.Viscaya, Madella and Dipacualao, Quirino, and Aurora, respectively	Proc. 136 / August 11, 1987 Proc. 289 / April 23, 2000	88,846.80	18 Casecnan River Basin	EHc	38,337.52
Region III	12	**Masinloc and Oyon Bays Marine Reserve**	Masinloc, Oyon, Zambales	Proc. 231 / August 18, 1993	7,568.00	172 Zambales Coast	H	603,215.00
	13	**Olongapo Naval Base Perimeter**	Olongapo City, Zambales	Proc. 478 / October 22, 1968	9.04	20 Zambales Mt. Range (Mt. Tapulao and Mt. High Peak)	EHc	246,997.00
	14	**Olongapo Watershed Forest Reserve**	Olongapo, Zambales	Proc 238 / April 30, 1964; Proc. 66 / March 20, 1987	6,335.00	20 Zambales Mt. Range (Mt. Tapulao and Mt. High Peak)	EHc	246,997.00
	15	Mt. Arayat National Park	Arayat and Magalang, Pampanga	Proc. 594/ June 27, 1933; Proc. 203/ September 16, 1937	3,715.23	22 Mt. Arayat National Park	EHc	19,483.83
	16	Angat Watershed Forest Reserve District (Metro Water District)	Montalban, San Jose, Rizal, Norzaragay, San Miguel, Penarada, Rizal, Angat, Bulacan; San Rafael, Nueva Ecija; Infanta, Quezon	Proc. 71 / February 10, 1927; Proc. 561 / March 9, 1933; Proc. 391 / April 30, 1968	55,709.10	23 Angat Watershed Forest Reserve	EHc	9,135.17
	17	Angat Watershed and Forest Range (Pilot)	Norzagaray, San Jose, Bulacan and Montalban, Rizal	Proc. 391 / April 30, 1968	6,600.00	23 Angat Watershed Forest Reserve	EHc	9,135.17
	18	Bataan National Park	Hermosa, Orani, Samal, Abucay, Pila, Balanga, Bagac and Morong, Bataan	Proc. 24 / December 1, 1945; Proc. 25 / April 18, 1966; Proc. 1956 / March 25, 1980; Proc. 192 / November 27, 1987	23,688.00	28 Bataan Natural Park and Subic Bay Forest Reserve	EHc	24,943.30

APPENDIX 4. National Integrated Protected Areas System (NIPAS) components that overlapped with conservation priority areas (continued from previous page)

Region	No.	NIPAS Components*	Location	Legal Instruments** / Date	Area (ha)	Conservation Priority Areas***	Priority Level	Estimated Area (ha)
NCR	19	Manila Bay National Park	Cities of Manila	Proc. 41 / July 5, 1954; PD 1085 / February 4, 1977	464.66	30 Manila Bay	EHc	133,761.69
Region IV-A	20	Simbahan-Talagas River Protected Landscape	Dinalungan, Aurora	Proc. 905 / May 22, 1992; Proc. 267 / April 23, 2000	2,266.49	17 Central Sierra Madre Mountains	EHc	163,135.48
	21	Calabgan Watershed Forest Reserve	Casiguran, Aurora	Proc. 915 / June 1, 1992	4,803.00	17 Central Sierra Madre Mountains	EHc	163,135.48
	22	Dipaculao Watershed Forest Reserve	Dipaculao, Aurora	Proc. 116 / June 10, 1987	1,786.00	17 Central Sierra Madre Mountains	EHc	163,135.48
	23	Dinadiawan River Protected Landscape	Dipaculao, Aurora	Proc. 918 / June 9, 1992; Proc. 278 / April 23, 2000	3,371.33	17 Central Sierra Madre Mountains	EHc	163,135.48
	24	Amro River Protected Landscape	Casiguran & Dilasag, Aurora	Proc. 633 / August 28, 1990; Proc. 274 / April 23, 2000	6,471.08	17 Central Sierra Madre Mountains	EHc	163,135.48
	25	Talaytay Protected Landscape	Dinalungan, Aurora	Proc. 670 / December 3, 1990; Proc. 283 / April 23, 2000	3,526.29	17 Central Sierra Madre Mountains	EHc	163,135.48
	26	Aurora National Park	Bongabon, Nueva Ecija and Baler, Quezon	Proc. 220 / November 11, 1937; Proc. 744 / August 11, 1941	5,676.00	19 Aurora National Park	VH	6,808.97
	27	Aurora Watershed Forest Reserve	Baler, Quezon	Proc. 34 / February 4, 1936	430.00	19 Aurora National Park	VH	6,808.97
	28	Dibalo-Pingit-Zabali-Malarayat Watershed Forest Reserve	Baler, San Luis, Aurora	Proc. 908 / May 25, 1992	4,528.00	19 Aurora National Park	VH	6,808.97
	29	Infanta Watershed Forest Reserve	Infanta, Quezon	Proc. 158 / February 13, 1967	384.00	31 Mt. Binuang and vicinity	I.D.	56,575.69
	30	Island of Polillo, Alabat, Cabalete, Jomalig Patnanongan, Kalotkot, Kalongkooan, Palasan, Calabao, Icol and San Rafael Mangrove Swamp Forest Reserve	Lamon Bay, Quezon	Proc. 2152 / December 29, 1981	undetermined	34 Polillo Island	EHc	81,115.84
						183 Polillo Island	VH	516,774.77
	31	Polillo Watershed Forest Reserve	Polillo, Quezon	Proc. 72 / August 7, 1966	130.00	34 Polillo Island	EHc	81,115.84
	32	Mt. Makiling National Park	Los Baños and Calamba, Laguna, Sto. Tomas Batangas	Proc. 552 / February 23, 1933; Proc. 692 / March 28, 1960	3,328.65	38 Mt. Makiling Forest Reserve	EHc	11,871.90
	33	Mts. Banahaw-San Cristobal National Park	Majayjay, Laguna and Lucban, Tayabas, Quezon	Proc. 716 / May 21, 1941	11,113.30	40 Mt. Banahaw - San Cristobal - Lucban Cone Complex	VH	7,641.59
	34	Mts. Palay-Palay - Mataas-na-Gulod National Park	Ternate and Maragondon, Cavite and Nasugbu, Batangas	Proc. 1594 / October 26, 1976	4,000.00	41 Mt. Palay-Palay - Mt. Mataas-na-Gulod National Park	VH	2,863.78
	35	Taal Volcano Natural Park	Talisay, Malvar, Tanauan, Laurel Agoncillo, Santa Teresita, Cuenca, Alitagtag, Mataas na Kahoy, Lipa City, Balete, San Nicolas, Province of Batangas and Tagaytay City	Proc. 235 / July 22, 1967; Proc. 923 / November 19, 1996	62,292.14	43 Taal Lake	EHu	23,897.03
	36	Quezon National Park	Atimonan, Padre Burgos and Pagbilao, Quezon	Proc. 740 / October 25, 1934; Proc. 594 / August 05, 1940	983.00	45 Quezon National Park	VH	4,450.49
	37	Maulawin Spring Watershed Forest Reserve	Guinayangan, Quezon	Proc. 365 / January 2, 1939; Proc. 295 / April 23, 2000	149.01	48 Ragay Gulf	VH	19,492.04
	38	Mulanay Watershed Forest Reserve	Mulanay, Quezon	Proc. 296 / July 21, 1938	26.00	49 Bondoc Peninsula	I.D.	296,264.97
	39	Lopez Watershed Forest Reserve	Lopez, Quezon	Proc. 566 / June 22, 1940	418.00	49 Bondoc Peninsula	I.D.	296,264.97
	40	Calauag Wtareshed Forest Reserve	Calauag, Quezon	Proc. 367 / January 2, 1939	328.00	49 Bondoc Peninsula	I.D.	296,264.97
	41	Binahaan River Watershed Forest Reserve	Pagbilao, Mauban, Quezon	Proc. 735 / May 29, 1991	465.00	49 Bondoc Peninsula	I.D.	296,264.97

APPENDIX 4. National Integrated Protected Areas System (NIPAS) components that overlapped with conservation priority areas (continued from previous page)

Region	No.	NIPAS Components*	Location	Legal Instruments**/ Date	Area (ha)	Conservation Priority Areas***	Priority Level	Estimated Area (ha)
Region IV-A	42	Palsabangan River up to Mazintuto River Mangrove Swamp Forest Reserve: > Bacong River up to Sandoval Point; > Palay Point up to Malunay River, Bondoc Peninsula; > Bondoc River in Aurora up to Pinamutangan Point, Bontoc Peninsula; > San Andres to Arena Point, Bondoc Peninsula (4A-MSFR-01)	Tayabas Bay, Quezon	Proc. 2152 / December 29, 1981	undetermined	46 Pagbilao and Tayabas Bay	EHc	5,109.86
Region IV-B	43	Torrijos Watershed Forest Reserve	Torrijos, Marinduque	Proc. 463 / April 6, 1932	105.00	59 Marinduque	VH	33,575.52
	44	Mt. Calavite Wildlife Sanctuary	Palauan, Occidental Mindoro	E.O. 9 (Calavite and F.B. Harrizon) / January 28, 1920; Proc. 292 / April 23, 2000	18,016.19	61 Mt. Calavite	VH	19,668.82
	45	Naujan Lake National Park	Naujan, Pola and Victoria, Oriental Mindoro	Proc. 282 / April 27, 1956; Proc 335 / January 25, 1968	21,655.00	64 Naujan Lake National Park	VH	25,361.82
	46	Mts. Iglit-Baco National Park	Sablayan, Occidental Mindoro and Bongabon, Oriental Mindoro	R.A. 6148 / November 9, 1970	75,445.00	66 Iglit - Baco Mountains	EHc	47,482.84
	47	Mt. Guiting-guiting Natural Park	Casidiocan, Magdiwang, San Fernando, Sibuyan Is., Romblon	Proc. 746 / February 20, 1996	15,268.48	82 Sibuyan Island	EHc	32,033.30
	48	Palawan Game Refuge and Bird Sanctuary	Palawan	Proc. 219 / July 2, 1967; Proc. 530B / March 8, 1968; Proc. 1232 / February 6, 1974; Proc. 1440 / June 19, 1975	763,399.00	71 Coron Lakes	EHc	1,219.94
						72 Cuyo Island Group	EHc	12,302.58
						73 El Nido	EHc	101,985.53
						74 Lake Manguao	I.D.	1,226.33
						75 San Vicente - Taytay - Roxas Forest	EHu	152,430.89
						76 Puerto Princesa Subterranean River National Park (Cleopatra's Needle)	EHc	134,987.00
						77 Victoria and Anapalan Ranges	EHc	182,456.06
						78 Mt. Mantalingajan	VH	169,406.09
						79 Ursula Island	EHc	1,157.22
	49	Entire Province of Palawan (Mangrove Swamp Forest Reserve)	Palawan	Proc. 2152 / December 29, 1981	undetermined	199 Cuyo Islands	VH	1,007,065.68
						179 Taytay - Dumaran Bay	VH	725,007.45
						173 El Nido to Ulugan Bay	EH	531,662.19
						200 Honda Bay	VH	164,589.80
						180 Balabac Island	VH	493,017.72
	50	Bacuit Watershed Forest Reserve	Bacuit, Palawan	Proc. 785 / March 28, 1935	94.00	73 El Nido	EHc	101,985.53
	51	Puerto Princesa Subterranean River National Park	Puerto Princesa, Palawan	Proc. 835 (St. Paul Subterranean National Park) /March 26, 1971; Proc. 212 / November 12, 1999	22,202.00	76 Puerto Princesa Subterranean River National Park (Cleopatra's Needle)	EHc	134,987.00

APPENDIX 4. National Integrated Protected Areas System (NIPAS) components that overlapped with conservation priority areas (continued from previous page)

Region	No.	NIPAS Components*	Location	Legal Instruments** / Date	Area (ha)	Conservation Priority Areas***		Priority Level	Estimated Area (ha)
Region IV-B	52	El Nido Managed Resource Reserve	El Nido, Palawan	Proc. 32 / October 8, 1998	89,134.76	73	El Nido	EHc	101,985.53
						173	El Nido to Ulugan Bay	EH	531,662.19
	53	Malampaya Sound Protected Landscape and Seascape	Taytay and San Vicente, Palawan	Proc. 342 / July 11, 2000	200,115.00	75	San Vicente - Taytay - Roxas Forest	EHu	152,430.89
						173	El Nido to Ulugan Bay	EH	531,662.19
	54	Palawan Flora, Fauna and Watershed Forest Reserve (Parcel 1)	Palawan	Proc. 2221 / July 14, 1982	4,776.00	76	Puerto Princesa Subterranean River National Park (Cleopatra's Needle)	EHc	134,987.00
	55	Palawan Flora, Fauna and Watershed Forest Reserve (Parcel 2)	Palawan	Proc. 2425 / November 22, 1985	3,224.00	76	Puerto Princesa Subterranean River National Park (Cleopatra's Needle)	EHc	134,987.00
	56	Tubbataha Reef National Marine Park	Central Sulu Sea, Palawan	Proc. 306 / August 18, 1988	33,200.00	201	Tubbataha Reefs	EH	201,645.85
Region V	57	Caramoan National Park	Caramoan, Camarines Sur	Proc. 291 / July 20, 1938	347.00	51	Caramoan Peninsula	EHc	28,896.06
	58	Bicol Natural Park	Basud and Daet, Camarines Norte and Sipocot and Lupi, Camarines Sur	Proc. 657 / February 13, 1934; Proc. 431 / December 29, 2000	5,201.00	51	Caramoan Peninsula	EHc	28,896.06
	59	Lagonoy Natural Biotic Area	Lagonoy, Camarines Sur	Proc. 500 as Watershed Forest Reserve / September 26, 1932; Proc. 298 / April 23, 2000	444.60	51	Caramoan Peninsula	EHc	28,896.06
	60	Abasig-Matogdon-Mananap Natural Biotic Area	San Miguel , San Lorenzo Ruiz, San Vicente and Labo, Camarines Norte	Proc. 836 / November 18, 1991; Proc. 318 / May 31, 2000	5,420.12	50	Mt. Labo	VH	74,637.39
	61	Catanduanes Watershed Forest Reserve	Virac, Bato, San Miguel, Pandan, Calolbon, Baras, Catanduanes	Proc. 123 / June 23, 1987	26,010.00	52	Catanduanes Island	VH	63,607.37
	62	Mt. Isarog National Park	Naga, Calabanga, Tinambac, Goa, Tigaon and Pili, Camarines Sur	Proc. 293 / July 20, 1938	10,112.35	53	Mt. Isarog National Park	EHu	20,882.42
	63	Tiwi National Park	Tiwi, Albay	Proc. 47 / July 10, 1954; Proc. 739 / August 14, 1970	17,661.00	55	Lake Buhi / Lake Manapao / Lake Katugday	EHc	29,076.00
	64	Bulusan Volcano National Park	Casiguran, Barcelona, Irosin and Juban, Sorsogon	Proc. 811 / June 7, 1935	3,673.29	58	Mt. Bulusan National Park	VH	19,053.15
	65	Putiao River to Malbog River Mangrove Swamp Forest Reserve: > Getumbro Point up to the Municipality of Sorsogon > Malazimbo Point to the Municipality of Juban in Sorsogon Bay > Mangroves along the banks of Donsol River > Papucha Point in Sugot up to Bo. Quidolog, Prieto Diaz boundaries divided into 2 quadrants a) Sta. Lucia to Buenavista; b) Buenavista to Dingay Point > Panuntingan Point in Gubat up to Tagdon River in Barcelona > Sinagatan Bay to Mantay Point in Ginablan	Sorsogon	Proc. 2152 / December 29, 1981	undetermined	185	Ticao - San Bernardino Strait - Lagonoy Gulf	EH	1,131,003.12
	66	Malaquing River up to Mabung River Mangrove Swamp Forest Reserve: > Cueva Point up to Kimartines Point > Kabugao Point up to Kabalog Andang Point	Burias Island	Proc. 2152 / December 29, 1981	undetermined	185	Ticao - San Bernardino Strait - Lagonoy Gulf	EH	1,131,003.12

APPENDIX 4. National Integrated Protected Areas System (NIPAS) components that overlapped with conservation priority areas (continued from previous page)

Region	No.	NIPAS Components*	Location	Legal Instruments** / Date	Area (ha)	Conservation Priority Areas***	Priority Level	Estimated Area (ha)
Region V	67	Pigbucan to Paron Point Mangrove Swamp Forest Reserve	Manito, Albay	Proc. 2152 / December 29, 1981	undetermined	185 Ticao - San Bernardino Strait - Lagonoy Gulf	EH	1,131,003.12
Region VI	68	Bago River Watershed Forest Reserve	Talisay, Murcia, Don Salvador, Benedicto, Calatrava, Negros Occidental	Proc. 604 / June 28, 1990	61,926.00	93 Mt. Silay - Mt. Mandalagan	VH	31,209.86
	69	Mt. Kanla-on Natural Park	Bago, La Carlota, La Castellana, Murcia, Canlaon, San Carlos, Negros Occidental and Vallehermosa, Negros Oriental	Proc. 721 / August 8, 1934; Proc. 1005 / May 8, 1997; R. A. 9154 / Aug. 11, 2001	24,388.00	94 Mt. Canlaon National Park	EHc	32,202.03
	70	Ilog-Hilabangan Watershed Forest Reserve	Himamaylan and Kabankalan, Negros Occidental	Proc. 602 / June 28, 1990	10,211.00	96 Ilog River	I.D.	26,952.31
	71	Kabangkalan Watershed Forest Reserve	Kabankalan, Negros Occidental	Proc. 820 / October 25, 1991	432.00	96 Ilog River	I.D.	26,952.31
	72	Taklong Island National Marine Reserve	Guimarás, Iloilo	Proc. 525 / February 8, 1990	1,143.45	196 Panay Gulf - Guimaras Strait	H	718,709.84
	73	Sagay Protected Landscape and Seascape	Sagay, Negros Occidental	Proc. 592 / June 1, 1995; RA 9106 / April 14, 2001	32,000.00	190 Visayan Sea	EH	819,665.62
Region VII	74	Olango Island Wildlife Sanctuary	Sta. Rosa and Panganan, Lapu-Lapu, Cebu	Proc. 903 / May 14, 1992	920.00	104 Olango Island	EHc	950.65
	75	Rajah Sikatuna Protected Landscape	Carmen, Sierra Bullones, Garica Hernandez, Valencia, Dimiao, Bilar and Butuan, Bohol	Proc. 129 as National Park / July 10, 1987; Proc. 287 / April 23, 2000	10,452.60	112 Rajah Sikatuna National Park	EHc	60,420.43
	76	Loboc Watershed Forest Reserve	Balilihan, Bilar, Batuan, Carmen, Garcia, Hernandez, Bohol	Proc. 450 / December 23, 1953	19,410.00	112 Rajah Sikatuna National Park	EHc	60,420.43
	77	Alijawan-Cansuhay-Anibongan River Watershed Forest Reserve	Duero, Jagna, Bohol	Proc. 881 / March 20, 1992	3,630.00	112 Rajah Sikatuna National Park	EHc	60,420.43
	78	Balinsasayao Twin Lakes National Park	Negros Oriental	Proc. 414 / November 21, 2000	8,016.05	100 Twin Lakes	EHu	1,227.23
	79	Islands of Banacon Wilderness Areas: > Basaan; > Saac; > Tambu; > Bambanon	Camotes Sea, Bohol	Proc. 2151 / December 29, 1981	1,053.00	111 Jetafe Group of Islands (Calituban and Tahong-tahong Island)	H	24,873.59
	80	Island of Bantayan Wilderness Areas	Visayan Sea in Cebu	Proc. 2151 / December 29, 1981	undetermined	190 Visayan Sea	EH	819,665.62
	81	Apo Island Protected Landscape and Seascape	Zamboangita, Negros Oriental	Proc. 438 / August 9, 1994	691.45	191 Tañon Strait	EH	138,561.12
	82	Talibon Protected Landscape and Seascape	Talibon, Bohol	Proc. 2151 as Wilderness Areas / December 29, 1981; Proc. 131 / July 19, 1999	6,455.87	192 Danajon Reef	EH	120,121.41
	83	Tañon Strait Protected Landscape and Seascape	Cebu, Negros Occidental & Negros Oriental	Proc. 1234 / May 27, 1998	450.00	191 Tañon Strait	EH	138,561.12
	84	Island of Pamasuan, Handayan, Majanay (Mangrove Swamp Forest Reserve) > Islets of Banoon and Lapinig Chico > Mangrove Areas East of Soom River, Pampang	Camotes, Bohol	Proc. 2152 / December 29, 1981	undetermined	192 Danajon Reef	EH	120,121.41
	85	Island of Panglao Mangrove Swamp Forest Reserve > Mangrove Areas from the west of Loboc River to the municipality of Laya > River to the municipality of Laya	Mindanao Sea, Bohol	Proc. 2152 / December 29, 1981	undetermined	194 Bohol Triangle	EH	1,536,889.98

APPENDIX 4. National Integrated Protected Areas System (NIPAS) components that overlapped with conservation priority areas (continued from previous page)

Region	No.	NIPAS Components*	Location	Legal Instruments** / Date	Area (ha)	Conservation Priority Areas***	Priority Level	Estimated Area (ha)
Region VIII	86	Calbayog- Pan-As Hayiban Protected Landscape	Calbayog, Samar	Proc. 318 (Pan-As Falls Hay-ban Watershed Forest Reserve) / December 15, 1967; Proc. 1158 / February 3, 1998	7,832.00	108 Mt. Cabalantian - Mt. Capotoan Complex	EHc	398,116.97
	87	Sohoton National Park	Basey, Samar	Proc. 831 / July 19, 1935	840.00	109 Southern Samar Mountains	VH	60,813.16
	88	Mahagnao Volcano Natural Park	Burauen & La Paz, Leyte	Proc. 142 as National Park / August 27, 1937; Proc. 1157 / February 3, 1998	635.00	113 Mt. Pangasugan (Northern Leyte Mountain Range); Lake Mahagnao	EHc	36,112.59
	89	Jicontol Natural Park	Maslog, Dolores Can-Avid, Eastern Samar	Proc. 882 as Watershed Forest Reserve / March 26, 1992;	6,483.00	108 Mt. Cabalantian - Mt. Capotoan Complex	EHc	398,116.97
				Proc. 1156 / February 3, 1998		109 Southern Samar Mountains	VH	60,813.16
	90	Calbiga Caves Protected Landscapes	Calbiga, Wright and Hinabangan, Samar	Proc. 1125 / November 4, 1997	2,968.00	108 Mt. Cabalantian - Mt. Capotoan Complex	EHc	398,116.97
	91	Lake Danao Natural Park	Ormoc, Leyte	Memo. Order of the President / June 2, 1972; Proc. 1155 / February 3, 1998	2,193.00	113 Mt. Pangasugan (Northern Leyte Mountain Range); Lake Mahagnao	EHc	36,112.59
	92	Taft Forest Wildlife Sanctuary	Taft, Eastern Samar	Proc. 155 / July 31 1999	3,728.98	108 Mt. Cabalantian - Mt. Capotoan Complex	EHc	398,116.97
	93	Samar Island Watershed Forest Reserve	North, Eastern, Western Samar	Proc. 744 / January 1, 1996	360,000.00	108 Mt. Cabalantian - Mt. Capotoan Complex	EHc	398,116.97
						109 Southern Samar Mountains	VH	60,813.16
	94	Biri Larosa Protected Landscape and Seascape	Lavazares, Rosario, San Jose Biri & neighboring Is. Northern Samar	Proc. 291 / April 23, 2000	33,492.00	185 Ticao - San Bernardino Strait - Lagonoy Gulf	EH	1,131,003.12
Region IX	95	Siocon Resource Reserve	Siocon, Zamboanga del Sur	Proc. 155 as Watershed Forest Reserve / September 18, 1987; Proc. 84 / February 24, 1999	793.74	157 Lituban - Quipit Watershed	EHc	149,738.54
	96	Pasonanca Natural Park	Pasonanca, Zamboanga City	Proc. 199 as Watershed Forest Reserve) / December 17, 1987; Proc. 132 / July 22, 1999	12,107.00	158 Pasonanca Watershed	EHc	39,889.03
	97	Basilan Natural Biotic Area	Lamitan, Sumisip, Tipo2 and Isabela, Basilan	Proc. 457 as National Park / September 25, 1939; Proc. 1531 / February 2, 1976; Proc. 321 / May 31, 2000	4,497.00	159 Basilan	EHu	19,094.16
	98	Mt. Timolan Protected Landscape	San Miguel, Guipos and Tigbao, Zamboanga del Sur	Proc. 354 / August 14, 2000	1,994.80	156 Mt. Timolan	VH	9,015.88
	99	Mangrove areas from the municipality of Tagalisay to the mouth of Tigbao River including east of Vitali Island (Mangrove Swamp Forest Reserve)	Sibuguay Bay, Zamboanga del Sur	Proc. 2152 / December 29, 1981	undetermined	204 Moro Gulf	VH	1,526,341.41
	100	Great and Little Sta. Cruz Islands Protected Landscape and Seascape	Zamboanga City, Zamboanga del Sur	PD 654 as National Park / February 4, 1975; Proc. 271 / April 23, 2000	1,877.00	203 Sulu Archipelago	VH	4,365,483.15
	101	Aliguay Protected Landscape and Seascape	Dapitan City, Zamboanga del Norte	Proc. 106 / May 6, 1999	2,379.40	198 Zamboanga del Norte	H	516,392.07
	102	Turtle Islands Wildlife Sanctuary	Turtle Islands, Tawi-Tawi	Proc. 171 / August 26, 1999	242,649.00	202 Cagayan de Tawi-tawi - Turtle Islands	EH	1,035,136.17

APPENDIX 4. National Integrated Protected Areas System (NIPAS) components that overlapped with conservation priority areas (continued from previous page)

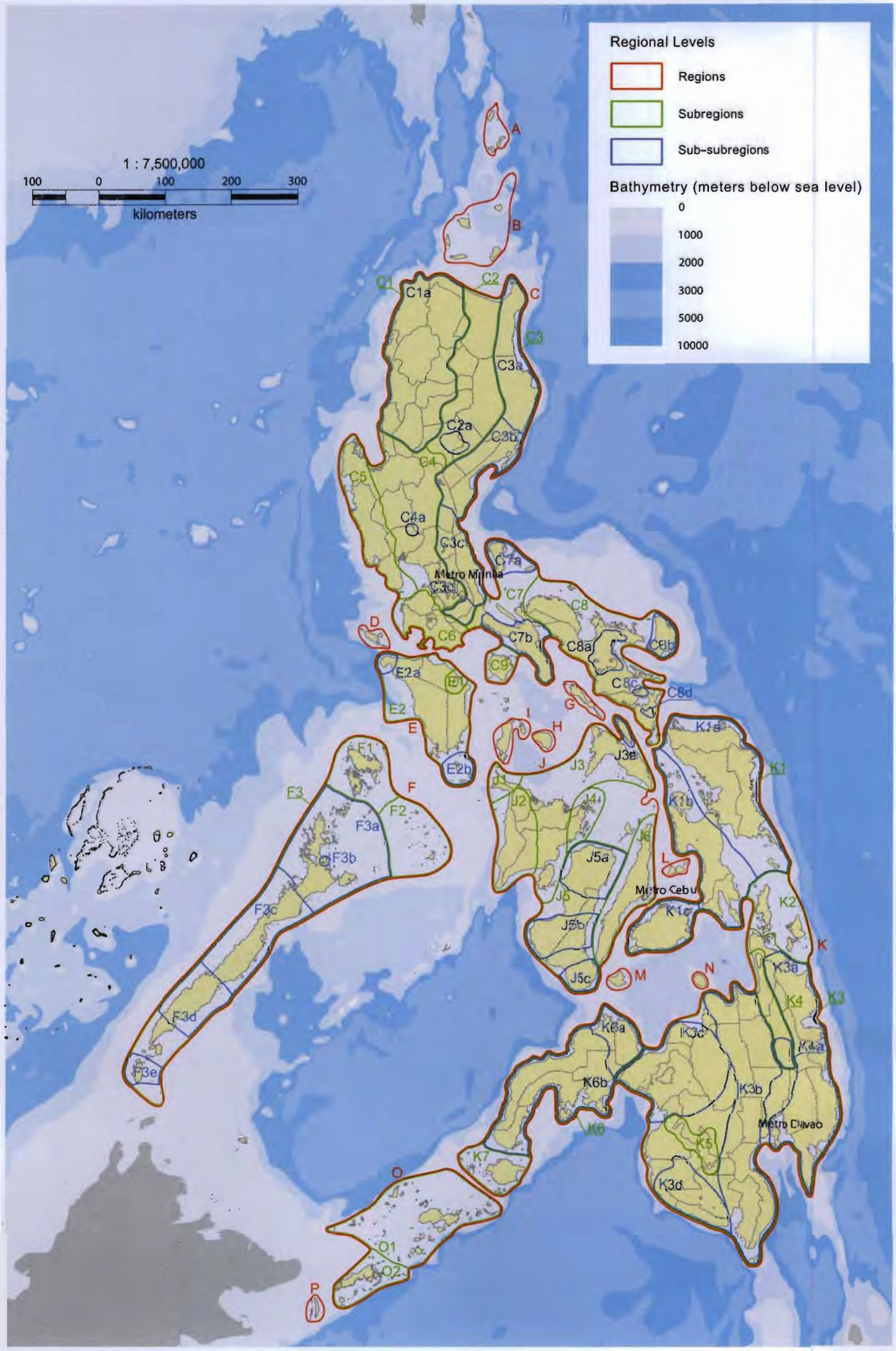
Region	No.	NIPAS Components*	Location	Legal Instruments** / Date	Area (ha)	Conservation Priority Areas***	Priority Level	Estimated Area (ha)
Region IX	103	Dumaquilas Protected Landscape and Seascape	Mun. of Malangas, Buug, Kumalarang, Lapuyan, Margo-satubig, V. Sagun, Zamboanga del Sur	Proc. 158 / August 10, 1999	25,948.00	204 Moro Gulf	VH	1,526,341.41
	104	Selinog Protected Landscape and Seascape	Dapitan City, Zamboanga del Norte	Proc. 276 / April 23, 2000	1,294.35	198 Zamboanga del Norte	H	516,392.07
	105	Murcielagos Protected Landscape and Seascape	Labason, Zamboanga del Norte	Proc. 281 / April 23, 2000	100.00	198 Zamboanga del Norte	H	516,392.07
Region X	106	Mimbilisan Falls Protected Landscape	Balingoan and Talisayan, Misamis Oriental	Proc. 51 as Watershed Forest Reserve / April 11, 1936; Proc. 134 / July 5, 1999	66.00	130 Kalatungan Range	EHc	157,251.63
	107	Muleta-Manupali Watershed Forest Reserve	Lantapan and Pangantukan, Bukidnon	Proc. 127 / June 29, 1987	61,500.00	130 Kalatungan Range	EHc	157,251.63
	108	Mt. Kalatungan Natural Park	Talakan, Valencia, Maramag and Pangantucan, Bukidnon	Proc. 305 / May 5, 2000	21,247.73	130 Kalatungan Range	EHc	157,251.63
	109	Mt. Malindang National Park	Misamis Occidental	R.A. 6266 / June 19, 1917	53,262.00	153 Mt. Malindang and Lake Duminagat	EHu	59,398.92
	110	Mt. Kitanglad Range Natural Park	Talakag, Banagon, Libona, Manolo Fortich, Sumilao, Impasug-ong, Malaybalay and Lantapan, Bukidnon	Proc. 677 as National Park / December 14, 1990; Proc. 896 / September 24, 1996; R. A. 8978 / Nov. 9, 2000	31,235.19	129 Mt. Kitanglad	EHu	74,419.13
	111	Baliangao Protected Landscape and Seascape	Misamis Occidental	Proc. 418 / November 22, 2000	295.00	194 Bohol Triangle	EH	1,536,889.98
Region XI	112	Banganga Protected Landscape	Bagangan, Davao Oriental	Proc. 195 as Watershed Forest Reserve / December 8, 1987; Proc. 269 / April 23, 2000	114.88	140 South Diwata Mt. Ranges	EHc	217,326.12
	113	Mt. Apo Natural Park	Kidapawan, Makilala, Magpet, Cotabato and Bansalan, Digos, Sta. Cruz, Davao del Sur and Davao City	Proc. 59 as National Park / May 9, 1936; Proc 35 / May 8, 1966; Proc. 882 / September 24, 1996	72,113.00	143 Mt. Apo Range	EHu	102,662.03
Region XII	114	Lake Sebu Watershed Forest Reserve	Banga and Kiamba, South Cotabato	Proc. 65 / August 4, 1966	9,900.00	147 Lake Sebu and Mt. Three Kings	EHc	354.62
	115	Allah Valley Watershed Forest Reserve	Isulan, Banga, Surallah, Kiamba, South Cotabato	Proc. 2455 / September 24, 1985	92,450.00	148 Mt. Busa - Kiamba	EHu	44,612.78
	116	Sacred Mountain National Park	Maraui City	R.A. 4190 / May 5, 1965	94.00	130 Kalatungan Range	EHc	157,251.63
	117	Lake Buluan Game Refuge and Bird Sanctuary	Koronadal, Buluan, Kidapawan, North Cotabato	Proc. 56 / December 1, 1926	6,300.00	144 Ligawasan Marsh	EHc	213,982.10
	118	Libungao Watershed Forest Reserve	Libungan and Alamada, Cotabato	Proc. 563 / May 3, 1990	52,820.00	144 Ligawasan Marsh	EHc	213,982.10
	119	Mt. Matutum Protected Landscape	Tupi, Tampakan, Polomolok, S. Cotabato & Malungon, Saranggani	Proc. 552 / March 20, 1995	15,600.00	146 Mt. Matutum	EHu	56,645.99
	120	Sarangani Bay Protected Seascape	Mitum, Kiamba, Maasim, Saranggani	Proc. 756 / March 5, 1996	215,950.00	206 Sarangani Bay	H	237,996.50
Region XIII	121	Andanan River Watershed Forest Reserve	Sibagat and Bayugan Agusan del Sur	Proc. 734 / May 29, 1991	15,097.00	123 Mt. Hilong-hilong (Urdaneta), Agusan del Norte	EHc	356,884.00

APPENDIX 4. National Integrated Protected Areas System (NIPAS) components that overlapped with conservation priority areas (continued from previous page)

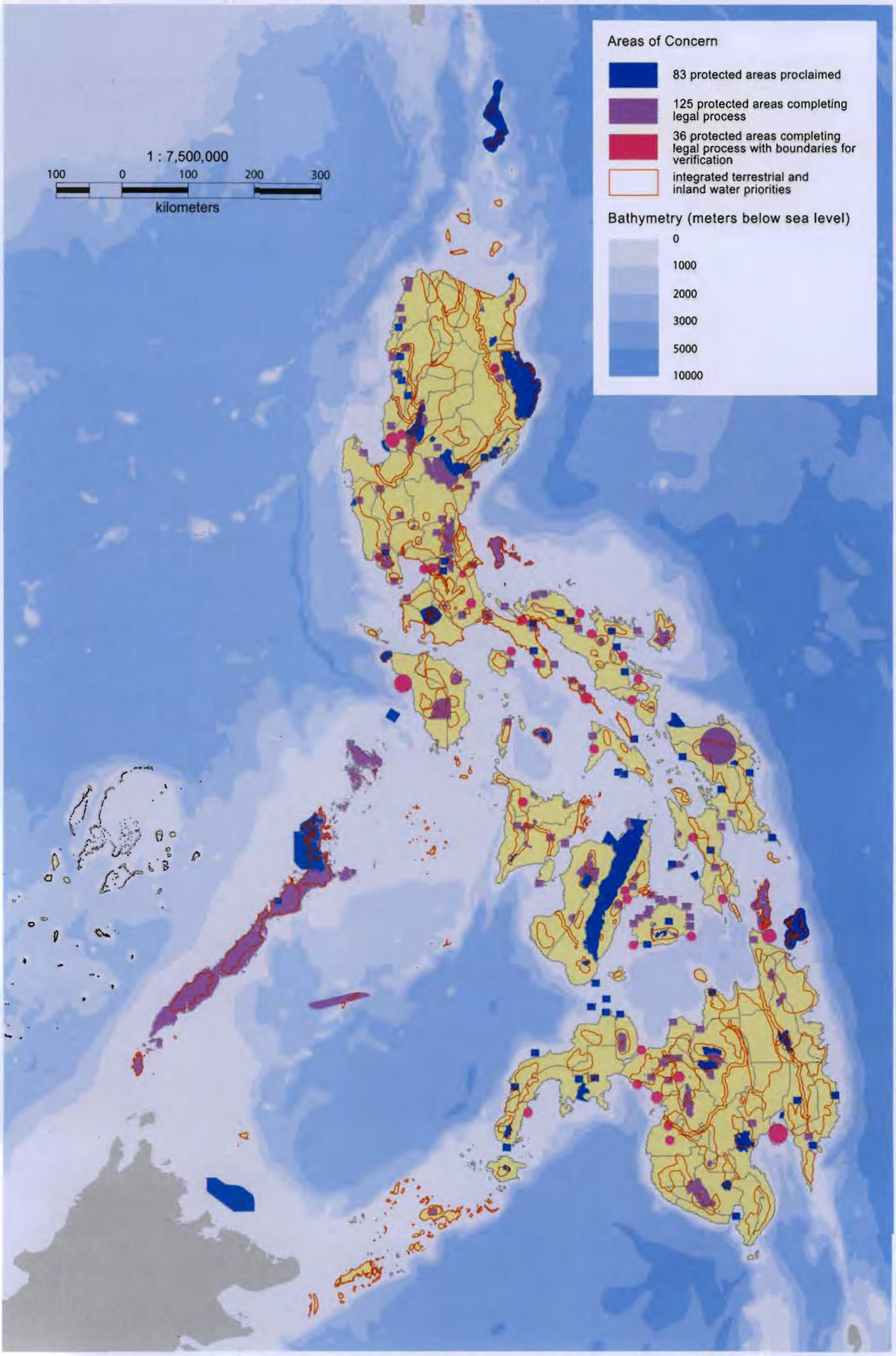
Region	No.	NIPAS Components*	Location	Legal Instruments** / Date	Area (ha)	Conservation Priority Areas***	Priority Level	Estimated Area (ha)
Region XIII	122	Siargao Island Protected Landscape and Seascape	Siargao, Surigao del Norte	Proc. 2151 as Wilderness Areas (Islands of Siargao, Poneas, Dahican, Tona, Laonan, Abanay and Bancuyo) / December 29, 1981; Proc. 902 / October 10, 1996	278,914.13	119 Siargao Island	EHc	62,768.54
						188 Siargao-Dinagat	EH	778,148.52
	123	Agusan Marsh Wildlife Sanctuary	San Francisco, Bunawan, De Ruela, Loreto & Lapaz, Agusan del Sur	Proc. 913/ October 31, 1996	14,835.99	126 Agusan Marsh	EHc	70,053.80
	124	Island of Dinagat, Hikdop, Sibale, Hanigad (Mangrove Swamp Forest Reserve)	Surigao Strait, Surigao del Norte	Proc. 2152 / December 29, 1981	undetermined	188 Siargao - Dinagat	EH	778,148.52
	125	Mangrove areas along the municipalities of Lavigan and Valencia up to Taon River of the municipality of Barcelona (Mangrove Swamp Forest Reserve) > Island of Masopelid, Mahaba, Condona, Bahagnan, Bilabid and Caye	Surigao del Norte	Proc. 2152 / December 29, 1981	undetermined	188 Siargao - Dinagat	EH	778,148.52
ARMM	126	Pantuwaraya Lake National Park	Saguiran, Lanao del Sur	R.A. 4190 / May 5, 1965	20.00	130 Kalatungan Range	EHc	157,251.63
	127	Rungkunan National Park	Ramain, Lanao del Sur	R.A. 4190 / May 5, 1965	undetermined	130 Kalatungan Range	EHc	157,251.63
	128	Lake Lanao Watershed Reserve	Lanao del Sur	Proc. 871 / February 26, 1992	180,460.00	133 Lake Lanao	EHc	36,268.00
	129	Salikata National Park	Lumba Bayambao, Lanao del Sur	R.A. 4190 / May 5, 1965	undetermined	135 Mt. Piagayungan (Ragang) Complex	EHc	173,648.00
	130	Lake Butig National Park	Butig, Lanao del Sur	R.A. 4190 / May 5, 1965	68.00	136 Butig Mts. National Park / Lake Butig National Park	VH	49,053.00
	131	Mt. Dajo National Park	Patikul and Talisay, Sulu	Proc. 261 / February 28, 1938	213.35	164 Mt. Dajo National Park	VH	19,078.00
	132	Mangrove areas from Malubog including up to the municipality of Sambalawan including the island of Pisan (Mangrove Swamp Forest Reserve)	Zamboanga del Sur	Proc. 2152 / December 29, 1981	undetermined	204 Moro Gulf	VH	1,526,341.41

Sources: NBSAP, 1997; DENR-PAWB, 2001
* Bold typeface - with Presidential Proclamation
Bold underlined typeface - with Congressional action
** Proc. - Presidential Proclamation
R.A. - Republic Act
P.D. - Presidential Decree
E.O. - Executive Order
LOI - Presidential Letter of Instruction
*** Number on the left refer to place name index.

Appendix 5. Biogeographic regions including the subregions and sub-subregions of the Philippines



Appendix 6. National Integrated Protected Area System (NIPAS) components vis-a-vis integrated terrestrial and inland water priority areas map



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He - Reptiles and Amphibians Expert
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