MINDORO BIODIVERSITY CONSERVATION PROGRAMME

RAPID ISLAND-WIDE SURVEY OF TERRESTRIAL FAUNA AND FLORA ON MINDORO ISLAND, PHILIPPINES

(With additional notes on the results of the fauna and flora inventory of selected priority areas for biodiversity conservation in Mindoro Oriental Province)

Final Report, 1999

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A report submitted to the Mindoro Biodiversity Conservation Programme, c/o Mr. William Oliver, Fauna & Flora International Philippines Conservation Programmes Coordinator, for Pilipinas Shell Foundation, Inc., Shell Philippines Exploration B.V. Corp. and the Department of Environment & Natural Resources –Republic of the Philippines.

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LIST OF ABBREVIATIONS

ARCBC	ASEAN Regional Center for Biodiversity Conservation
ARMNP	Apo Reef Marine Natural Park
ASEAN	Association of Southeast Asian Nations
GRBS	Game Refuge and Bird Sanctuary
CENRO	Community Environment and Natural Resouces Office
CI	Conservation International
CITES	Convention on International Trade in Endangered species of Wild Fauna and Flora
DECS	Department of Education, Culture, and Sports
DENR	Department of Environment and Natural Resources
DLSU	De La Salle University
EBA	endemic bird area
ERDB	Ecosystems Research and Development Bureau
ESSC	Environmental Science for Social Change, Inc.
FFI	Fauna and Flora International, U.K.
GIS	geographical information system
GPS	global positioning system
GO	government organization
IBA	Important Bird Area
ICBP/BLI	International Council for Bird Preservation/BirdLife International
IUCN	International Union for the Conservation of Nature and Natural Resources
LGU	local government unit
masl	meters above sea level
MBCFI	Mindoro Biodiversity Conservation Foundation, Inc.
MBCP	Mindoro Biodiversity Conservation Programme
MHNP	Mangyan Heritage National Park
MIBNP	Mounts Iglit-Baco National Park
MNH	Museum of Natural History
NAMRIA	National Mapping and Resource Information Authority
NIPAS	National Intergrated Protected Areas System
NGO	non-government organization
PA	protected area
PAGASA	Philippine Atmospheric, Geophysical, and Astronomical Services Administration
PAWB	Protected Areas and Wildlife Bureau
PNM	Philippine National Museum
PSFI	Pilipinas Shell Foundation, Inc.
RDB	Red Data Book
SPEx	Shell Philippines Exploration, B.V. Corporation
SSC	Species Survival Commission
TCP	Tamaraw Conservation Project (Program)
UPD	University of the Philippines – Diliman
UPLB	University of the Philippines at Los Banos
WCMC	World Conservation Monitoring Center
WCSP	Wildlife Conservation Society of the Philippines

DEFINITION OF TERMS

Alpine heath	Stunted scrub-like vegetation found around tall mountain peaks
Biodiversity	Biological diversity is the number or variety of species of plants, animals, and other biological resources occurring in an area
Biogeography	Study of the distribution of plants and animals
Dipterocarps	Ttropical hardwoord trees belonging to family Dipterocarpaceae
Endemic	Species that are unique or occur only in a particular area or region
Endemism	Percentage of endemic taxa of the the total number of taxa in a locality
Kaingin	Slash-and-burn farming
Indigenous	Native or unique to a particular area or region
Island endemic	Species endemic only to a particular island
Lowland rainforest	Tropical forest found below 900 meters, and most likely dominated by trees of the family Dipterocarpaceae
Mangyan	Indigenous cultural minority or tribal community of Mindoro
Mangrove	Tropical forest found along coasts and estuaries tolerant to saltwater
Mid-montane	Tropical forest transition usually found between 600 to 1,000 meters above sea level
Migratory	Refers to animals that have seasonal movements (migration) during winter to escape the cold conditions of temperate regions and fatten up before returning back to their spring breeding areas
Montane forest	Tropical forest found above 1,000 meters, often have densely moss-covered short trunks and twisted branches.
(Dialect)parang	Second growth vegetation, made up mostly of grasslands and low bushes and small trees
Resident	A sedentary breeding species that occurs in a particular area or region all year round (non-migratory, limited local movements)
Riparian	Refers to vegetation found along the banks of rivers and streams
Secondary forest	Forests which have re-grown over previously disturbed forests
Taxa	Taxon (singular), general term for all levels along the systematic hierarchy, such as species, genus, family, order, class, phylum, etc.
Terrestrial	Refers to organisms found on land
Vertebrates	Animals with a spine or vertebrae (i.e., fishes, sharks, amphibians, reptiles, birds, and mammals)

INTRODUCTION

THE PHILIPPINE SETTING: BIOGEOGRAPHY AND BIODIVERSITY

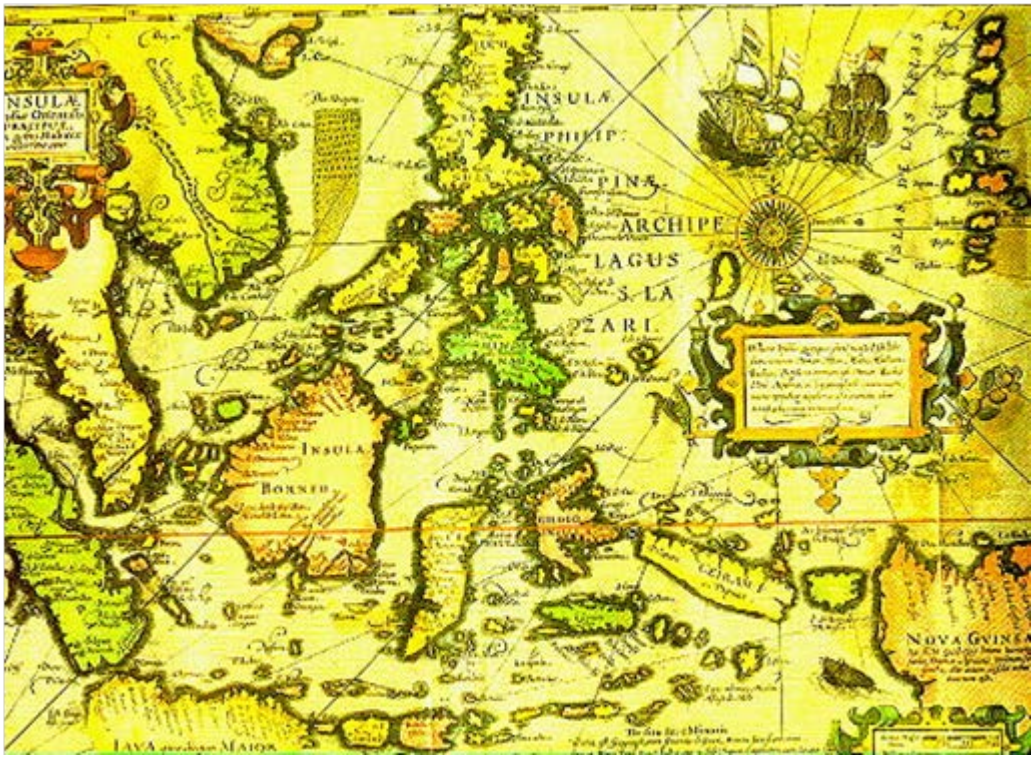
This nation of some 7,100 islands and islets only has 470 islands that aremore than one square kilometer in land area. Approximately two-thirds of these remaining smaller islands aremade up of exposed rocks, reef atolls, sand-bars; some are still nameless. The islands of Luzon and Mindanao (the country's two largest islands) have a combined land area of more than 200,000 square kilometers, makingup more than two-thirds of the total area of the country. Despite its small combined land area, the Philippines is regarded as one of the world's most mountainous places and generally has a rugged terrain, due to greater geologic movement and volcanism.

The Philippines is a fringing archipelago (almost oceanic) situated between the West Philippine Sea and the Pacific Ocean, considered to have been separate from mainland Asia since the Mesozoic era (40 million years ago). Due to this longer period of isolation from mainland Asia, there are numerous endemic forms of flora and fauna, and nearly all forest species are unique to the islands. Mindoro, which is located amongst the west-central islands of the Philippines is no exception, since it boasts numerous endemic taxa found only on the island and nowhere else. The consistent tropical wet climate and rugged terrain contributes more to the diversity of habitats and species, which results in greater endemism.

The Philippines contains an exceptionally large number of unique flora and fauna scattered in an archipelago of 7,100 islands. There are more than 1,000 species of terrestrial vertebrates known to occur in the islands, most of which are unique or endemic only to a particular island or region. It contains many distinct biogeographical regions and most have been regarded as priority sites for conservation due to their high endemism. These include greater Luzon, greater Mindanao, Negros-Panay, Palawan, and Mindoro faunal regions. The Mindoro faunal region comprises the large island of Mindoro and its few satellite islands. This faunal region is distinct from all other adjacent faunal regions, based on the formation of land bridges during the Pleistocene period.

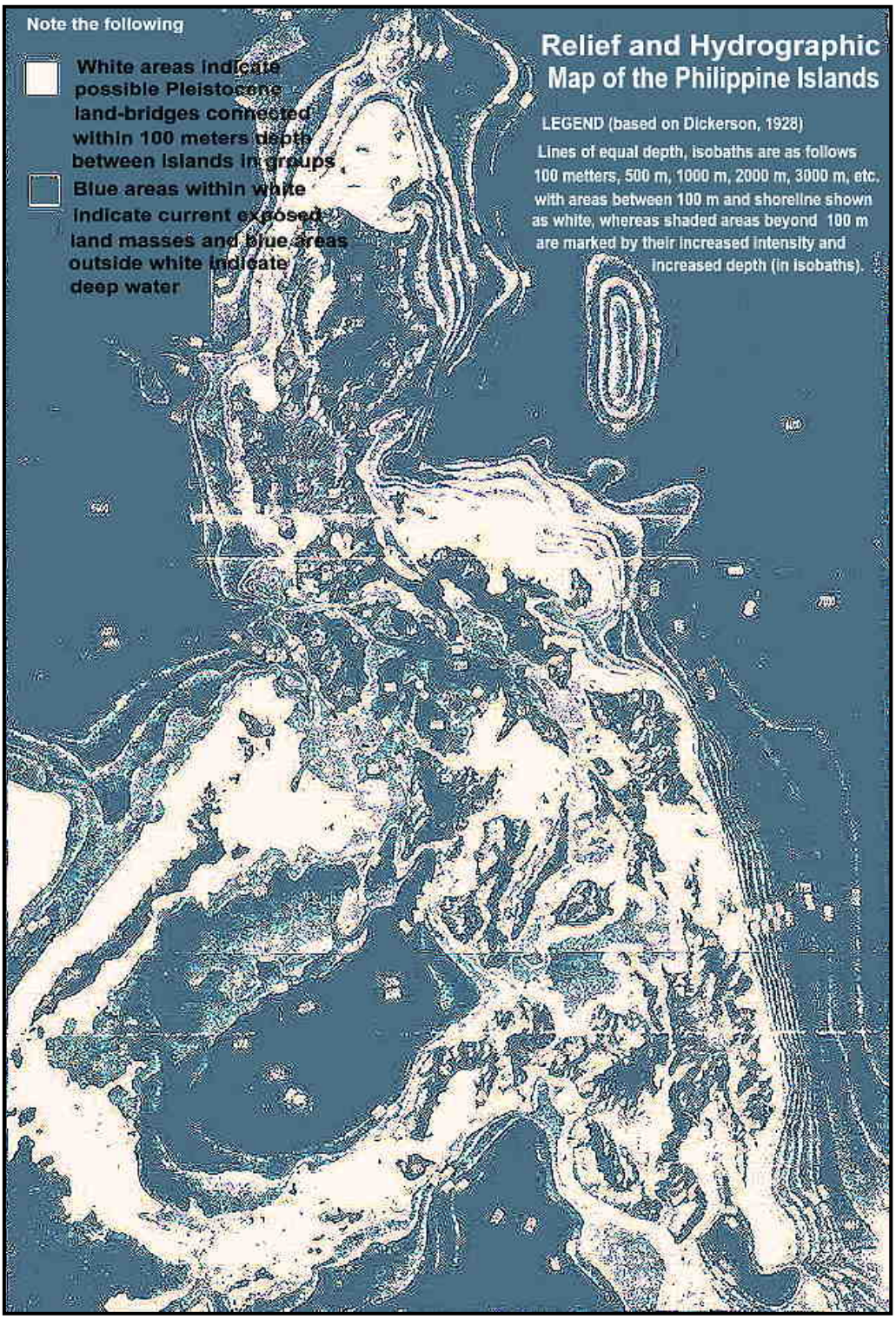
The Philippines today is regarded as one of the highest priority countries in the world for biodiversity conservation (Oliver and Heaney, 1997). This recognition was attributed to the country's rich biological diversity with one of the highest level of endemicity per-unit-area compared to other countries in the world (i.e., Brazil, Indonesia, and Madagascar). This world-wide attention focuses not only on the unique biodiversity, it is equally concerned with the country's high population growth (regarded as one of the highest in the world). The Philippines ranks 9th in the list of "hot spots" since tropical forests (Myers, 1988c in McNeely et. al., 1990) continue to decrease rapidly despite conservationists' outcry for increased efforts for its protection.

Coupled with the rapid rate of habitat destruction that has eliminated more than 90percent of its original forest cover. The present ecological crisis is further magnified by inadequate or inefficient measures to protect the environment brought by severe bureaucracy. The general lack of awareness and value for their natural heritage among the majority of the Filipino people contributes to the overall decline. These factors are now considered as principal threats to the continued existence of the country's exceptionally rich biological resources.

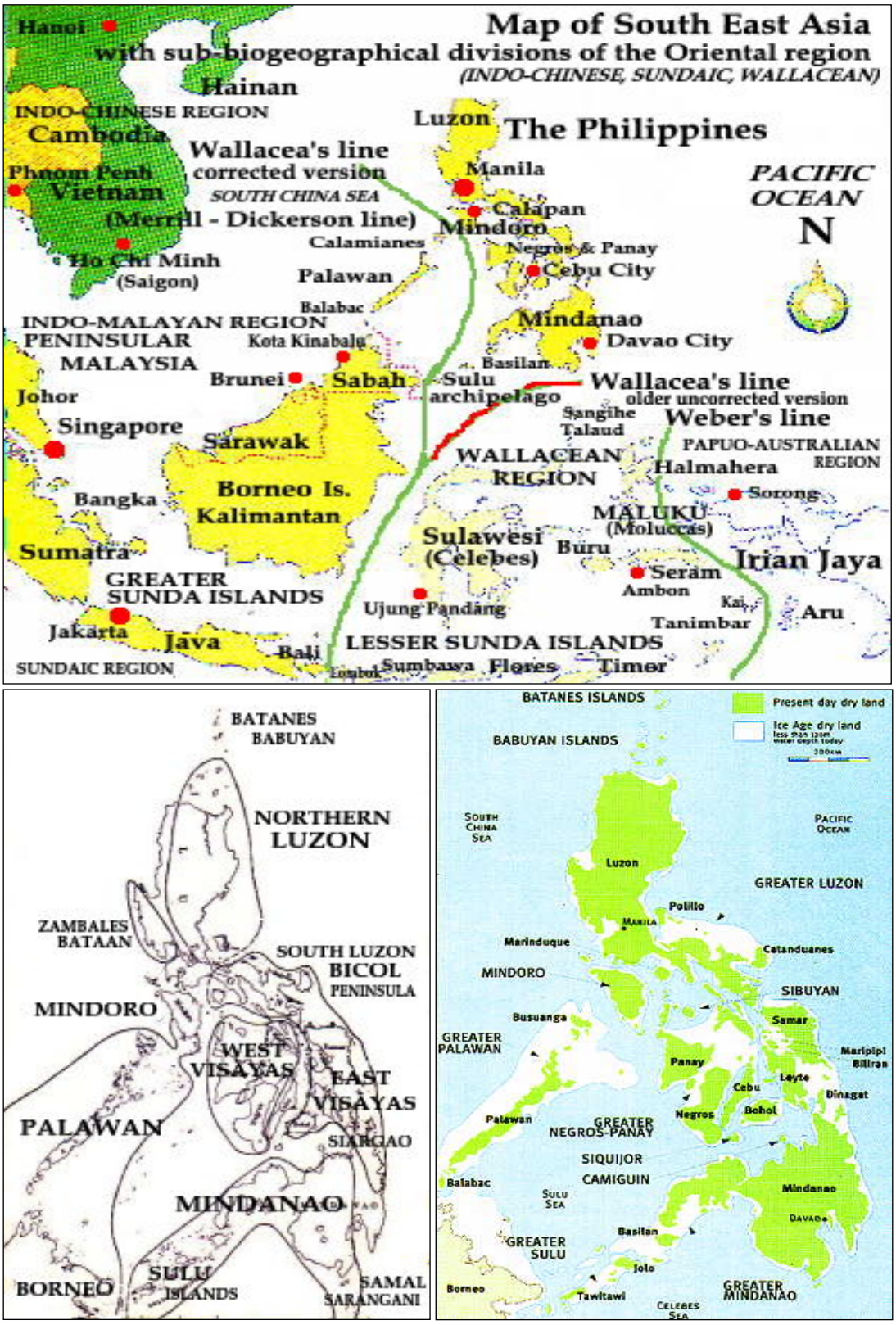


Colonial map of the East Indies, the Philippines and Spice Islands, showing the important navigational and trade routes used during the Spanish colonization.

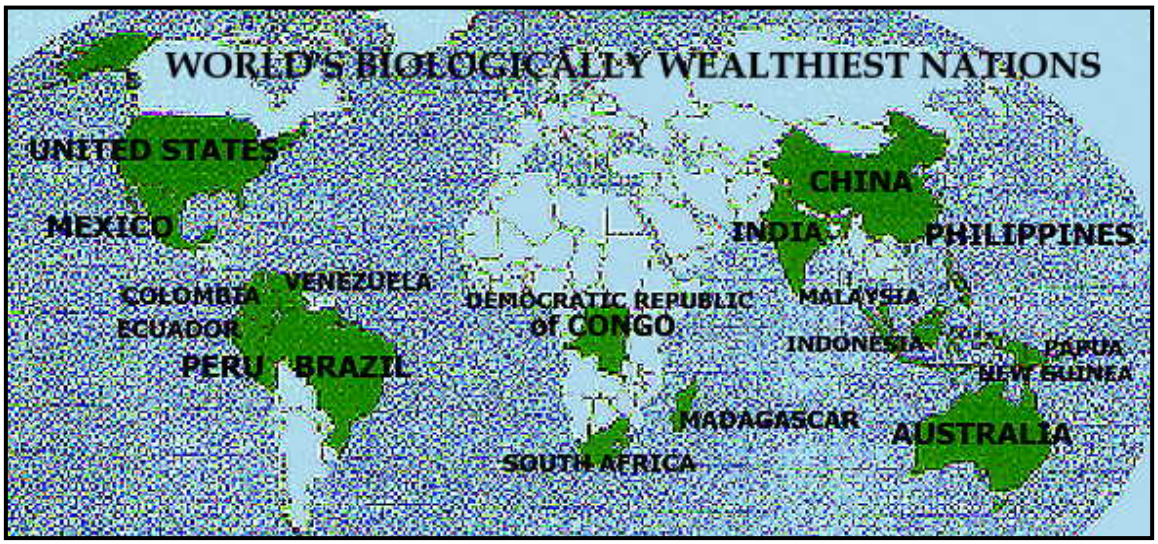
Modern map of South east Asia, showing the relatively accurate representation of the fringing islands along the Malayan peninsula stretching towards the Australasian region (New Guinea and the Australian continent).



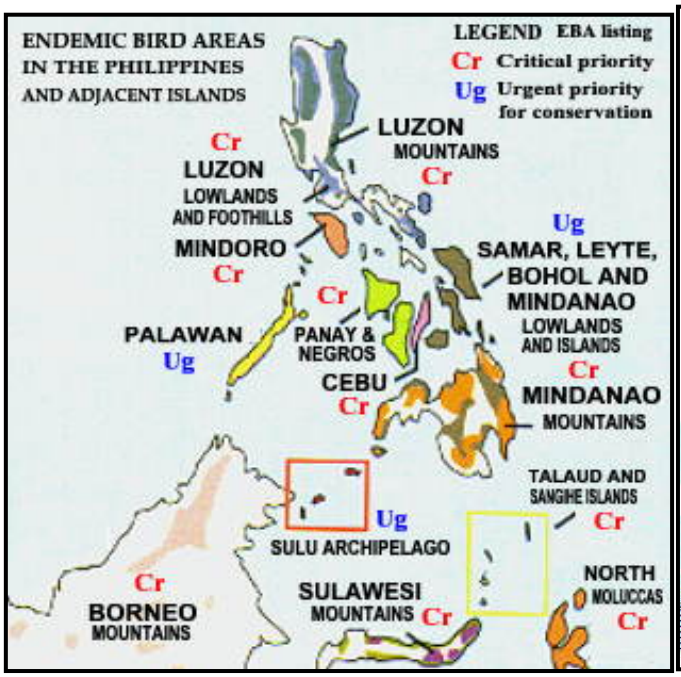
Relief and Hydrographic map of the Philippine Islands, indicating the relative contours for both height of mountains and depth of surrounding marine areas.



Map of Southeast Asia and the Philippines showing the biogeographic divisions of Wallacea, Philippine Pleistocene islands groups and Philippine faunal regions based on Dickerson (1928) and Heaney & Regalado (1998).

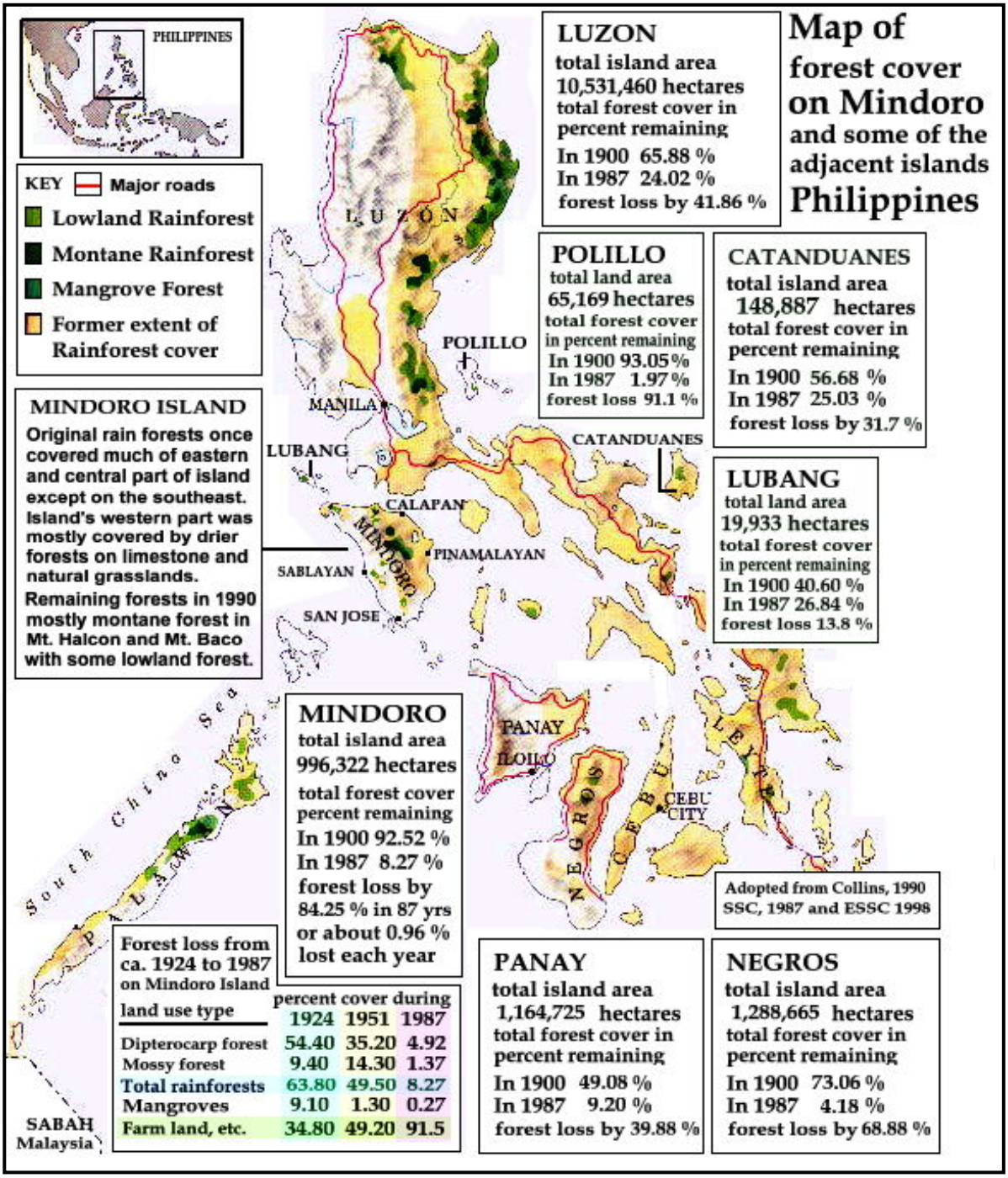


Distribution of 17 Megadiversity countries or World's biologically wealthiest nations, considered to contain more than 90 % of the total global biological diversity (adopted from Conservation International, 1998).

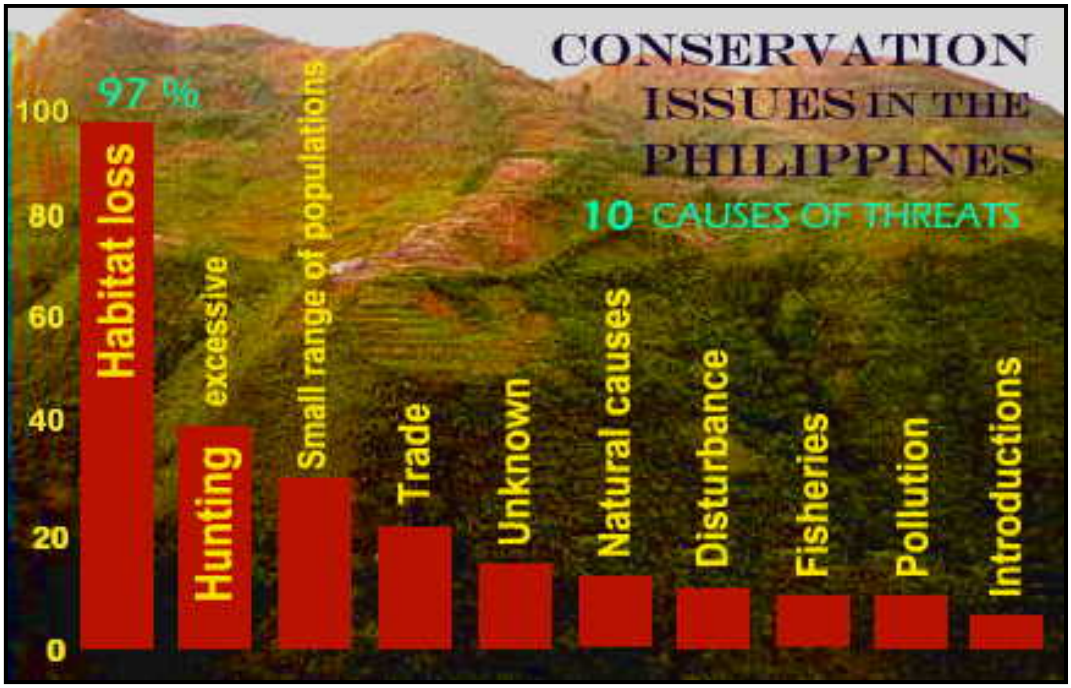


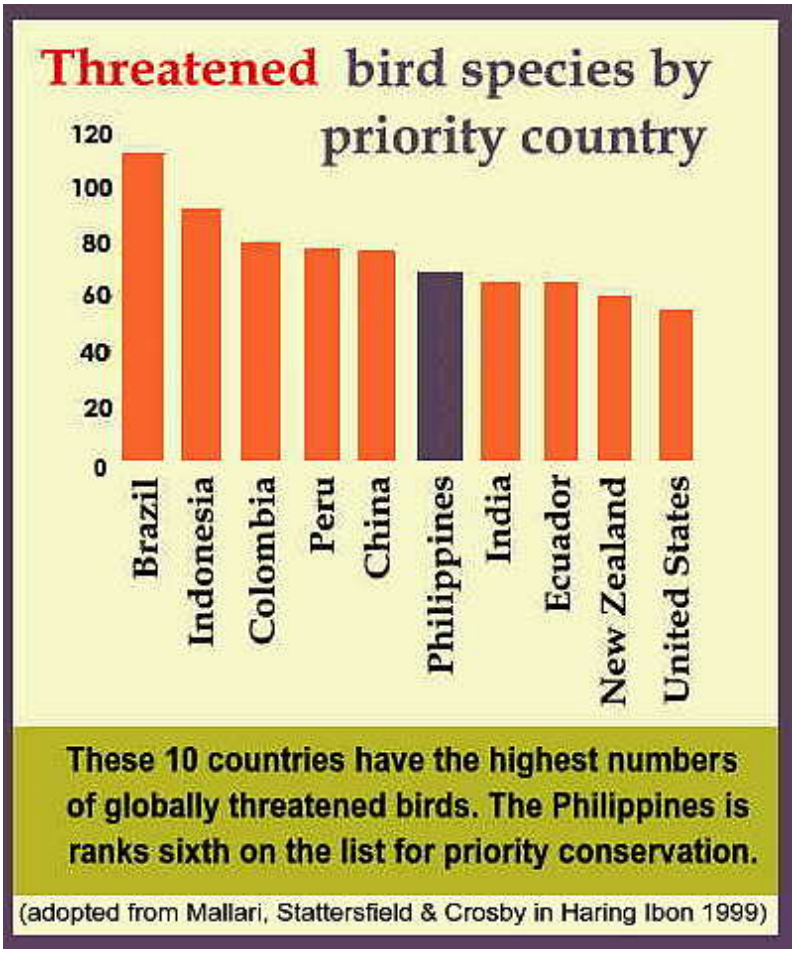
Map of Endemic Bird Areas of the Philippines (taken from Stattersfield, 1992).

Map of Avifaunal subregions of the Philippines (Dickerson, 1928)



Map of north-central and western Philippines indicating the remaining forest cover on each of the islands, particularly Mindoro Island, with a table showing the successive loss of forests from ca. 1924 to 1987.


CONSERVATION ISSUES IN THE PHILIPPINES
10 CAUSES OF THREATS
97 %
100
80
60
40
20
0
Habitat loss
Hunting excessive
Small range of populations
Trade
Unknown
Natural causes
Disturbance
Fisheries
Pollution
Introductions


Threatened bird species by priority country
120
100
80
60
40
20
0
Brazil
Indonesia
Colombia
Peru
China
Philippines
India
Ecuador
New Zealand
United States
These 10 countries have the highest numbers of globally threatened birds. The Philippines is ranks sixth on the list for priority conservation.
(adopted from Mallari, Stattersfield & Crosby in Haring Ibon 1999)

GREATER MINDORO FAUNAL REGION

The island of Mindoro is the seventh largest island in the Philippine archipelago. Its name was derived from “Mina de Oro” (Spanish) for its rich mineral resources. It is located south of Luzon, northwest of Panay and northeast of Palawan (1209′ & 13054′ N; 12001′ & 121015′ E). Mindoro is characterized by its broad rugged central spine of mountains rising to just over 2500 masl, which approximates the separation of the island into Mindoro Oriental in the east and Mindoro Occidental in the west. These are grouped around two main mountain masses, namely Mt. Halcon (2,597 masl) and Mt. Baco (2,489 masl). Two distinct climatic types are known on Mindoro island, which includes type I (with two pronounced seasons), for western Mindoro, and type IV, (with rainfall approximately evenly distributed annually) for eastern Mindoro. Many large rivers crisscross down into the flood plains and coasts from the central mountain spine and some empty into lakes, such as Lake Naujan. Mindoro is surrounded by numerous small islands and islets, such as Ilin (or Ylin), Ambulong, Pandan North, Pandan South, Semirara, Tambaron, Garza, Maestre de Ocampo, Medio, Boquette, Baco, and the Lubang islands.

Various proclamations were made for the protection of the island’s rich forested habitats for the benefit of the endangered Tamaraw (*Bubalus mindorensis*) and the indigenous people, the Mangyans. These include F.B. Harrison Game Refuge and Bird Sanctuary, Mts. Iglit-Baco National Park, Lake Naujan National Park, Puerto Galera Man and Biosphere Reserve, and Apo Reef Marine Natural Park, as well as the proposed Mangyan Heritage Natural Park.

Mindoro’s rich biological diversity can be attributed to the great diversity of habitats found around Mindoro island. The island boasts lush tropical rainforests from the lowlands to the mountain peaks, with varying forest types along an elevational gradient. These includes mossy forest, pine forest (particularly the Mindoro pine *Pinus merkusi*), mid-montane forest, lowland dipterocarp forest, beach forest, and mangroves. Much of these habitats have been reduced to patches of fragmented forests and savanna-like grasslands or second growth (*parang*) vegetation. Of the more than 200 common plant species recorded in MIBNP, 67 were Philippine endemics, including 17 endemic species of orchids, such as *Dendrochilum mindorense*, *Bulbophyllum halconense*, *Aphyllorchis halconensis* and *Eria halconensis*.

The Mindoro faunal region contains some 250 species of birds, 45 species of mammals, 15 species of amphibians, and more than 60 species of reptiles (half of the species are endemic to the Philippines). About 35 are taxa considered to be endemic only to the region, while 17 are recognized as Mindoro island endemics. Among the most notable of these island endemics are the majestic *Tamaraw Bubalus mindorensis*, and the critically threatened Mindoro bleeding-heart *Gallicolumba platenae*. New island records are being added, and new species are still being discovered. At present, two new species of mammals and one amphibian await formal description by biologists. In the MIBNP alone, there were a total of 99 species of butterflies with 17 species considered to be endemic to the region (such as *Mycalesis tagala mindorana* and *Tanaecia alpheda mindorensis*). Whereas, an endemic freshwater fish, locally known as 'pait' *Barbus* (Puntins) *hemictenus* was known to occur in the rivers near Lake Naujan.

Mindoro was once known to be covered entirely by rainforests, based on historical accounts. The rain-shadow effect along the tall central spine affects the distribution of forests, although it appears to be less on the west side (Occidental Mindoro), which is covered by small areas of montane forest.

The western highlands are often sparsely covered, except for the presence of some pine forests (*Pinus merkusi*) caused by the longer dry season, poor soil, and the influence of fire forming climax grassland vegetation. However, extensive lowland rainforests appears to grow along the limestone low ridges and slopes, and swamp forests in the floodplains. The east side (Oriental Mindoro) of the central spine the mountains and floodplains were probably covered extensively by rainforests. Mossy and mid-montane forests covered the slopes at 650 meters to the peak of tall mountains, while lowland dipterocarp forests covered most of the low hills and valleys from sea level to 400 meters. Many of these tall peaks appear to be covered extensively by forests, but a lot more are seriously degraded, especially along the slopes. Others still await discovery and exploration and retain its status as a wilderness area, much of which are known only to the indigenous cultural minorities – the Mangyans. Mindoro Island has long been known to be land richly covered by rainforests and other abundant forest resources, (Figure ?), largely based on historical accounts. Although based on the effects of the rain-shadow phenomenon caused by the central spine of tall mountains, the distribution of forests appears to be lesser on the western (Occidental Mindoro) side of the island as previously known. Little or no montane forests (except for patches of Mindoro pine *Pinus merkusi*) probably exists among the highlands of the west due to the dry climate or limited rainfall, and the influence of fire on the climax grassland vegetation.

The central range of Mindoro Island serves as the watershed of the more than 25 river systems on the island. On the northeast draining into the rich agricultural plain of Calapan, Naujan, Victoria, and Baco are the following rivers: (1) Baco River, (2) Malylay River, (3) Bukayao River, and (4) Mag-asawang Tubig. On the east are the Bongabong River, Bukayao River, and Mag-asawang Tubig River. On the western part is dominated by the Bugsanga and Lumintao Rivers. Further north are the Mongpong, Amnay, Pandan, Ramayan, and Pagbalan Rivers which, when inundated, restrict travel to that part of the island during the southwest monsoon. The most extensive is the Lumintao River (33,316 hectares [ha]) which drains the southern portion of the central mountains.

The western portion of Mindoro island receives a high amount of rainfall. December through March have the least amount of precipitation, while August has the highest rainfall. Temperature ranges from 26.4^{o}C during January to a high of 28.9°C in February. Humidity ranges from 68percent in February to 87percent during August and September. Cloud cover on the western portion of the island is more than 50percent for most part of the year except during February and April. The eastern portion receives low amount of rainfall during the months of January through April. The highest amount of rainfall occurs in October. Temperature fluctuates between 25.3°C and 28.1°C. January is the coldest month while May is the warmest. Humidity ranges between 76 percent to 84 percent, with the lowest occurring in April and the highest from August to December. Cloud cover is more than 50 percent throughout the year. The differences in climate on the west and east side of the central mountain spine has been a major influence on the rich hydrological resources of Mindoro Oriental, having Type IV climate, which results in about 1,930.40 millimeters of mean annual rainfall. As such, a total of 22 rivers traverse the eastern landscape and the largest lake on the island is found here—Naujan Lake with an area of approximately 8,000 hectares. Together with the major mountain masses or ranges, these rivers combined to form the important and essential critical watersheds of the province. These four major watershed systems are the following: (1) The Malaylay-Bucayao River watershed in Puerto Galera, San Teodoro, Calapan, and Naujan forming the northeast block; (2) The Pola River watershed found in Socorro, Pinamalayan, and Pola in the mid-east; (3) The Bongabong watershed found in Gloria, Bansud, and Bongabong at central part of the island, and (4) The Kabilyan watershed found in Mansalay and Bulalacao at the southeast portion.

The central mountain spine straddles the boundary separating Oriental and Occidental Mindoro in the central highlands. It has a rugged terrain and is mostly forested in the northern section particularly in the Halcon Range (2,505 masl). The southern part of the mountain range is dominated by grasland with the forest confined mainly to the ridges and in patches on the mountain sides. The terrain is very rugged, characterized by steep slopes, narrow valley floors, sharp ridges and peaks, deep gullies and ravines, criss-crossed by mountain streams and rivers. Prominent topographic highs are the following: (1) Mount Baco (2,488 masl), (2) Mount Iglit (2,364 masl), (3) Mount Wood (2,024 masl) and (4) Mount Sinclair (1,842 masl). Basically, its unique physiology and geologic features are mostly erosional and is dominantly underlain by a sequence of sandstone on the portion and by a metamorphic complex on the western portion. At the southern portion is cluster of limestone promontories ("Simbahan", "Bato buring", and "Bato Sungint"). They are erosional remnants of limestone deposits. Typical of karst formations, they are crowned by lush vegetation. The predominant soil type in the central mountains is the Palompon series No. 85 with profile class E. The soil varies in color from black to brownish coming from disintegrated igneous rocks of volcanic orifgin forming silt clay loam.

The geology of Mindoro Island is considered unique compared to most parts of the archipelago. Mindoro Island is popularly believed to be a part of a micro continental block which includes northern Palawan that drifted off from a zone spreading from the Asian continental margin in the Early Oligocene during the evolution of the South China Sea. This continental block migrated southward and collided with the existing magmatic arc of the Philippines during the middle late Miocene. The rocks that make up Mindoro Island ranged in the age from Carboniferous (345 mybp) to Pleistocene (approximately 2.5 mybp). The oldest rock formation identified on Mindoro Island is a series of metamorphic rocks composed of schist, phyllite, gneiss, and marble. Overlaying this formation is a thick series of sedimentary sequence, apparently deposited in varying depths of marine environment brought about by a series of uplift and subsidence. The most recent uplift is indicated by the presence of the terraces along the floodplains of the major rivers draining Mindoro Island.

This high number of these unique or endemic taxa in Mindoro (such as birds and mammals), has made it one of the most important centers of global endemism and an equally rich biological diversity. It was designated as one of the world's important "Endemic Bird Areas" (EBA 151) due to the significantly high number of island endemic birds. Together with its satellite islands, it was also regarded as a distinct faunal region (Greater Mindoro) based on the rich assemblage of island endemic mammals, which also hold true for all other groups of plants and animals, most of which have species which are dependent on forests. The archipelago, having five major faunal regions and several subregions, include Mindoro one of its major faunal regions. The island contains a rich conglomeration of flora and fauna distributed among diverse ecosystems and habitat types.

As of 12 January 1991, 656,400 hectares were classified as forest and unclassified land which represent 86percentof the total land area of Mindoro and 5percent of the national total. Of these, 43,300 hectares of 66percent of the island's total forest and unclassified land are in Occidental Mindoro and 220,100 hectares of 34percent are in Oriental Mindoro. The alienable and disposable (A and B) lands in the Mindoro total 366,000 hectares or 36 percent of its total land area. Of these, 161,500 hectares or 44 percent of total A and D in the island are in Occidental Mindoro and 204,500 hectares of 56percent are in Oriental Mindoro. Of the total forest and unclassified lands, 24,800 hectares or 4percent are mossy forests; 500 hectares or 0.076percent are pine forests; 2,700 hectares or 0.4percent are old growth forests; 58,200 hectares or 9percent are residual forests; 101,700 hectares or 15percent are grasslands; 434,100 hectares or 66percent are extensive forest lands; and 34,400

hectares or 5percent are other forest lands. The forest occupies most of the central highlands and the Calavite area.

Vegetation plays a major role in maintaining balance and high diversity, and harboring wildlife. Floral composition also serves as determinant of ecological condition and habitat status. By 1992, its forest area totaled 871 square kilometers, only 8.54percent of its total area and is sporadically scattered or fragmented within the island (Dutson et. al., 1992; DAI, 1992). The fact that it is the smallest center of endemism with the least forest cover (Dutson et al., 1992 in Bird Conservation International) should be a cause for alarm because human disturbances and habitat destruction that continue to a great extent will inevitably lead to extinction.

FOREST AND VEGETATION TYPES

The lowland rainforests on limestone and swampy lowland forests in the floodplains and valleys are evident on this side of Mindoro. From the central spine to the east coast of the island was possibly covered extensively with rainforests. Mossy and mid-montane forests (mostly *Podocarpus* and *Lithocarpus* or yew and oak forests) covered the peaks of the tall mountains and Lowland (trees of family Dipterocarpaceae are dominant) rainforests covered the low hills, valleys and floodplains. Other mountains found on the west side of the island have eastern-facing slopes covered by forests, whereas the western slopes are less vegetated or covered by grasslands, exemplified by Mt. Calavite and Mt. Malasimbo (extending into Abra de Ilog).

Valley-coastal plain

It is described by dense jungle appearance of scattered large trees crowded heavily with vines, climbing rattans, shrubs, herbs, and other undergrowth species. This forest type occurs mostly along alluvial coastal plains, river valleys, and on a limited extent along lower hills. Large trees were mostly composed of various tree species, all of commercial value, which probably was the primary reason for their rapid decline. Among these important tree species were white lauan, apitong, and malugay, all belonging to the family Dipterocarpaceae. Although, this forest type contained dipterocarp trees, it was not dominated by a single group but, rather, other equally valuable hardwoods formed the core of the valley-coastal plain forests. These include ipil, guijo, amugis, calumpit, candal-candal, balangita, and dao, all of which are typical of lowland coasts. Among the signficant species of non-dipterocarp hardwoods found in this forest, was dao (*Dracontomelon dao*) which is sometimes regarded as the 14 wonder of Mindoro, due to the greater quality of dao logs originating from the island. The Bongabong lumber company was among the popular exporters of this resource during the 1950’s, mostly brought to the U.S. Valley-coastal plain forests were once numerous along the coasts of San Teodoro and Calapan. They occur among the floodplains between Naujan and Pola, and from Pinamalayan to Bongabong.

Dipterocarp type

More popularly known as Philippine mahogany, diperocarps are indigenous hardwood that formed the dominant group of trees in this forest type which are also predominant on most of the Philippine islands. It comprised 71.87 percentof the total timber stand of Mindoro. Dipterocarps belong to family Dipterocarpaceae (Latin for two-winged seed), which is a group of commercially important trees but have no direct relation to the South American species known as mahogany (i.e., large-leaf mahogany, *Sweiteinia macrophylla*). This forest type occurs on hills and mountain slopes especially on low mountains with deep, rich soil, good drainage, and plenty of water. Apitong appears to be the

predominant species, particularly for forests found on drier ridges and slopes, with the best growth between 600 – 700 masl. Other dipterocarps found on this type include tanguile, white lauan, yakal, and palosapis. Most lowland dipterocarp stands become less dominant on higher elevations, since this approached the altitudinal limit for most diperocarp trees most do not occur beyond 1,000 masl. Yakal is probably the most valuable group of dipterocarps and often occurs in small quantities. Tanguile predomates the moist ridges and slopes at about 210 masl, where it is most numerous. Red lauan occurs best on lower hills and ridges.

Forests found at higher elevations become much poorer, on the basis of timber value and not diversity. This forest type was once widespread on the island, where it occurs on the mountain ranges of Abra de Ilog crossing up to Mt. Halcon's north-western range, and toward the eastern part of Bongabong. A larger portion of this forest type lies between the northwestern and south-central lowland areas off the main central mountain ranges. Apitong-dominated stands occur in San Teodoro, along the the Pula river and the interior of the rugged eastern mountains of Sablayan toward Bongabong.

Dry-hill type

Philippine hardwoods found in this forest type are considered to be of first class timber value, due to greater strength and durability. They are often found on rugged mountain regions, particularly on rocky soil and karst limestone formations. The predominant tree species were molave and dungon (related to teak), as well as narra, ipil, and kalantas. Narra, the country's national (tree) emblem, were numerous on open hills and valleys of northwestern Mindoro, especially in the region of Mt. Calavite.

Generally, commercially important forests are widely distributed throughout Mindoro, extending from Mt. Calavite in Paluan and the Anduyanan mountains of Abra de Ilog, and southward, crossing halfway toward the southeast part of Bongabong. The total land area of forests were approximately 679, 611 hectares or 67.4 percent of the island's area (regarded to be timberland and unclassified land, June 1951). About 35.2 percent or 354,566 hectares of this forest, were of commercial value. There is an estimated total stand of 30,267,070 cubic meters remaining on Mindoro in 1951, and overall logging operations on the island were harvesting timber at a yearly rate of 80,000 cu m. At this rate, much of the primeval forests were readily stripped of the large centuries-old old growth hardwoods. Foresters at time projected that it would take 307 years to replenish all the timber stands. Within the total area of commercial forests, about 71.87 percent or 22,358,209 cubic meters were composed of Philippine mahogany (family Dipterocarpaceae). These are divided into the different widely popular species types, namely tanguile (or tanguili with 17.24%); apitong (12.72%); white lauan (12.42%); mayapis (10.96%); palosapis (5.57%); guijo (6.84%) and malugai (6.12%).

Non-commercial forest

The rapid growth and expansion of non-commercial forests (NCF) on Mindoro Island were based on the use of the slash-and-burn farming (kaingin system) by the indigenous people. These upland farms were later abandoned by the nomadic tribes which then developed into secondary growth vegetation or locally known as "calaanan". Rapid secondary growth of pioneer forest species allows tribes to produce a second crop. This forest type comprises 144,757 hectares or 14.3 percentof the total land area (June July 1951). It occurs as patches on the western part of the island, from San Jose northward to Mamburao. It is also found around partial clearings and areas cut during lumbering. Much of this dry secondary forest-scrub occurs in the southwest portion of the high mountain chain, stretching from north to south of the Mt. Halcon range. Another NCF is found on the northwestern part of the

central highlands. Different conditions prevail on this upland area including lower temperature and well drained soil, which favor the growth of Mindoro Pines (*Pinus merkusii*). Mindoro pines are an important source of turpentine and resins. Another NCF type occurs on the south and western part of the island, often seen in clumps together with broad grass, is known as "parang" (a kind of savanna forest). Large areas of natural grasslands were found on the west coast and were interspersed with these parang forests. Another NCF type occurs on the higher exposed portions of Mt. Halcon. It is characterized by dense, small trees that are stunted and gnarled, with a dense mass of orchids and ferns. This is more popularly known among ecologists as the mossy forest type.

Swamp vegetation. More often this type is not actually regarded as forests, although some grow to be dense enough to form a forest structure. Vegetation occurring in flooded areas along coasts, secluded bays, low-lying plains, lakes, estuaries, and rivers appear swampy and water-logged, especially during the wet season. The most common of these swamp vegetation are the mangroves, which covered an area of about 1.3 percent or 13,250 hectares (June July 1951). They usually grow along large rivers which form deltas near the estuaries (mouth of river) leading to the sea, particularly on the seaward end, ehere portions of saltwater from the sea mix freely with the freshwater from the river ("brackish water"). Vegetation is dominated by a group of salt-tolerant tree species of the family Rhizophoraceae (as well as other plant families and associates), particularly the bacawan, busiin, potatan, tangal, api-api, and pagatpat. These were commonly found along the coasts of San Jose, Roxas, and Bongabong. Another mangrove species occurs in more inland parts of the delta and often predominate the vegetation, almost occurring as a pure stand. Nipa (*Nypa fruticans*) or sasa grows on the tidal portion of streams and rivers of the western portion of the island. A similar single-species dominant swamp vegetation that occurs in low-lying areas of floodplains is dominated by the Buri palm (*Corypha elata*), and like the nipa, the juice taken from the sap of the flower stalk is made into the beverage called "tuba" or wine. Buri often occurred along the coastal floodplains of Bongabong and Pinamalayan up to Roxas and Mansalay in the east, and San Jose, Sablayan, and Mamburao in the west.

Calaanan type

This vegetation was often regarded as artificial forest, being a result of regenerated secondary forest-scrub re-grown over an area cleared after kaingin. Kaingin is method of slash-and-burn farming used by the indigenous tribes, adjacent to dipterocarp forests. The vegetation is characterized by fast-growing pioneer tree species mixed with grasses and low shrubs, such as cogon, tibig, tanigisang-bayawak, binunga, alom, basa, lipa, bantel, hagimit, and other secondary growth species.

Grasslands

Unlike the open, treeless, grassy landscape commonly found throughout the Philippine islands, natural grassland vegetation occurs on the western portions of Mindoro. These grasslands were known to be of the cogonales type, dominated by cogon (*Themeda*) mixed with some calaanan or dry-hill forests. Those grasslands found in the lowlands near human habitation have scattered clumps of cultivated bamboos, betel nuts, and palms. In July of 1951, an estimated 233,580 hectares out of the total 1,007,793 hectares of island area were covered by open land (grasslands and calaanan), while 261,690 hectares were cultivated by man.

Much of the degradation is owed to the increasing human encroachment and severely high rate of population growth supplemented by massive immigration. The population of the province can be estimated at around 600,000 people in 1990, with the highest densities in Calapan (which is only

26,520 ha) with a population of 87,344 and Naujan (at 52,800 ha) with a population of 72,189. The towns with the least density were San Teodoro (at 36,910 ha) with a population of 12,205 and Puerto Galera (at 22,350 ha) with a population of 17,053. However, only 50,000 of the total population of Oriental Mindoro are known to comprise the indigenous cultural minorities of Mindoro or the Mangyans, with six of the seven major tribal groups are found. These are the Iraya, the Buhid, the Hanunuo, the Tao Bukid, the Alangan, and the Tadyawan Mangyans. Although they make up a very small percentage of the population, and occupy a limited area (mostly concentrated in the uplands), the Mangyans and their practice of nomadic kaingin or slash-and-burn farming has been regarded by the lowlanders (who encroach into ancestral land) as the major cause of forest degradation on the island.

Reports made by the Provincial Development Staff of Oriental Mindoro, were compiled into a status report on the Ecological Profile of Mindoro Island, possibly in 1993 by the ERDS of DENR Region 4. Oriental Mindoro is a province found on the eastern side of Mindoro Island and includes a total of 15 municipalities (and several small offshore islands). The crude birth rate of these indigenous and upland communities is about 44 per 1,000 populations, while the crude death rate is 41 per 1,000 populations. Infant mortality is very high at 7.5 deaths per thousand live births. Though the birth rate is higher than the provincial average of about 30 per thousand, the death rate among indigenous people is also higher than the provincial average of 5.5. The high rate of infant mortality effectively offsets the very high birth rate. Population growth, however, is higher than average, primarily because of in-migration. Health services do not reach these communities nor can sick members or pregnant women be brought to the medical services available in lowland centers.

The higher slopes are associated with the activities of the Mangyans. These indigenous people are semi-sedentary swidden agriculturists and hunters/gatherers. The swidden patches or farms are located along the alluvial deposits of river banks and on the hillsides where upland rice, corn, cassava , and sweet potato are cultivated. The entire area is utilized by the tribes as a communal area for hunting wild pig, deer, and birds; for fishing in the rivers and streams; for gathering food such as yam (Nami: *Dioscorea hispida* which is similar to the sweet potato), honey, and palm hearts. The area is also a source of rattan vines and almaciga resin (*Agathis alba*) which are traded for salt and bolos. The illegal uses and activities in the area are the occassional (1) poaching for deer and wild pigs, (2) bird specimen collection, (3) tamaraw hunting, and (4) gold panning. The average density in 1990 was 81 persons per square kilometer and an average annual growth rate of 3percent. Its population density is projected to double in 2018. The most densely populated municipalities are Roxas, Calapan, Pinamalayan, and Pola which are all located in Oriental Mindoro.

The Mangyans are composed of seven (7) tribes which are ethnolinguitically different from one another. They are as follows:

(a) Iraya occupies the northern portion of Mindoro Island covering Calaviute and the mountainous coasts from Abra de Ilog to Puerto Galera;

(b) Alangan occupies the foothills and slopes of Mount Halcon and the watersheds of Mag-asawang Tubig, Aglubang, and Amnay Rivers;

(c) Batangan occupy the mountainous portions of Mount Baco, Mount Iglit, Mount Sinclair, and the watersheds of Bongabong River, Mongpong River, Patrick River, Anahawin River, Lumintao River, Bugsanga River, and Batangan rivers;

(d) Tadyawan occupies the northern edge of Lake Naujan and the eastern foothills;

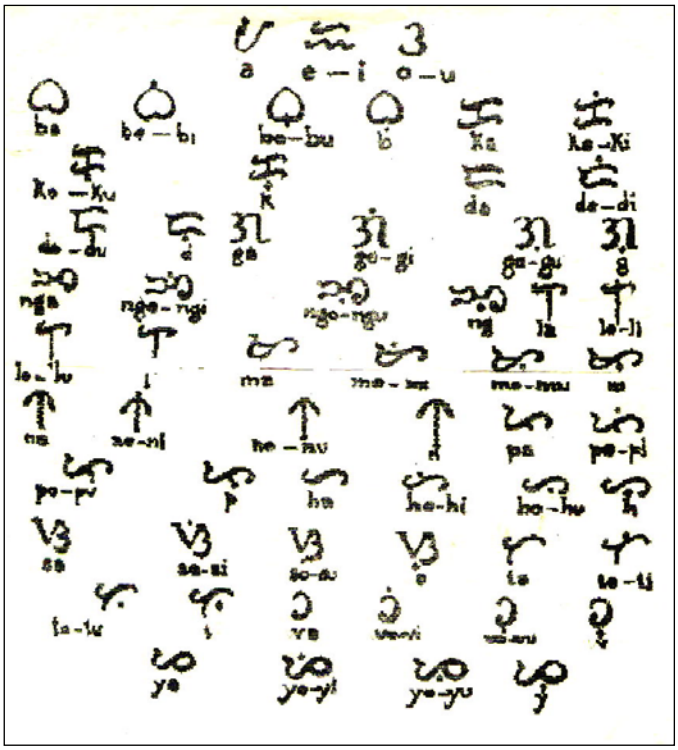
(e) Buhid occupies the agricultural plains of Calintaan and San Jose. Batangan tribe on the south and southwestern portion;

(f) Hanuno occupies the southeastern coast and the watershed of the Cagway River. They are the most culturally intact indigenous group retaining up to the present the old syllabic script called Banghayin;

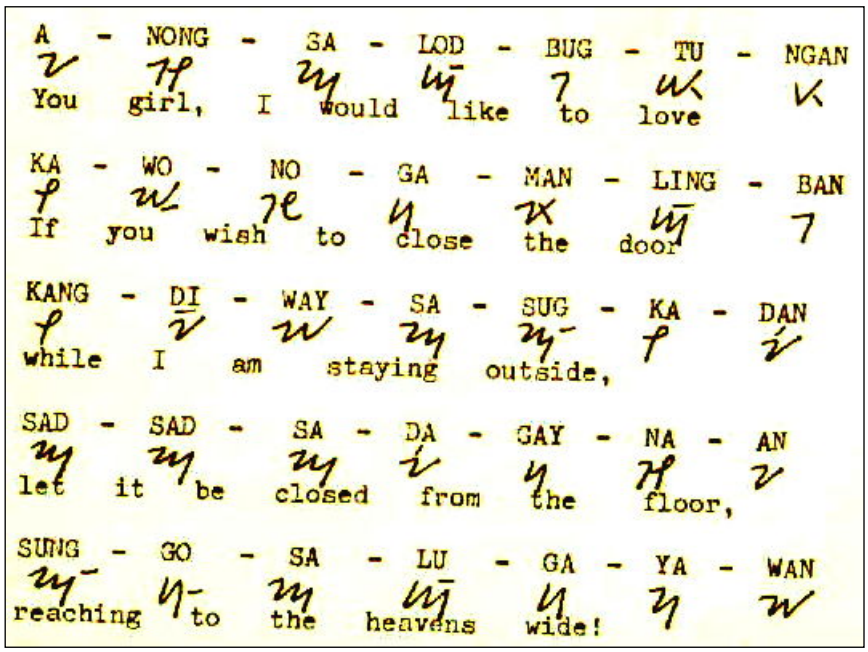
(g) Ratagnon occupies the southern coast of Mindoro particularly the municipality of Magsaysay. They are often referred to as the Visayan Mangyans.

At present, Mindoro province is a virtual melting pot. It is home to Tagalogs, Ilocanos, Visayans, Bicolanos, Kapangpangans, and other ethnic groups. The Tagalog dialect is used by about 80percent of the population of Oriental Mindoro while the Visayan dialect is used by about 5percent. In Occidental Mindoro, the Tagalog dialect is spoken by about 50percent of the population, Ilocano by 20percent, Visayan by 20percent while the remainder speaks Kapangpangan, Bicolano, and other southern Luzon dialects. For example, the inhabitants of Maburao, Calapan, Puerto Galera, Victoria, Naujan, and Mansalay speak with a lilting Batangueño accent. The Mangyans speak their own dialects.

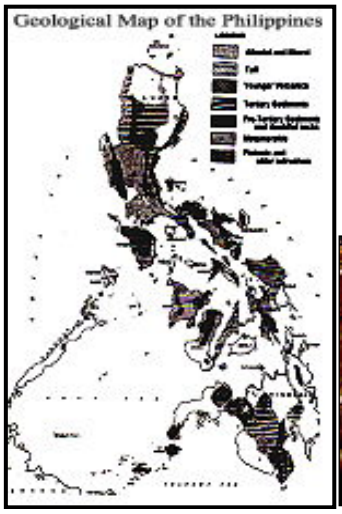
Map of Oriental Mindoro Province showing Mansalay & Bulalacao



Banghayin alphabet, culturally intact indigenous syllabic script of the Hanunuo-Mangyans



An example of a Banghayin poem (translated to English), etched on a splinter of bamboo, which is still practiced by the Hanunuo's.

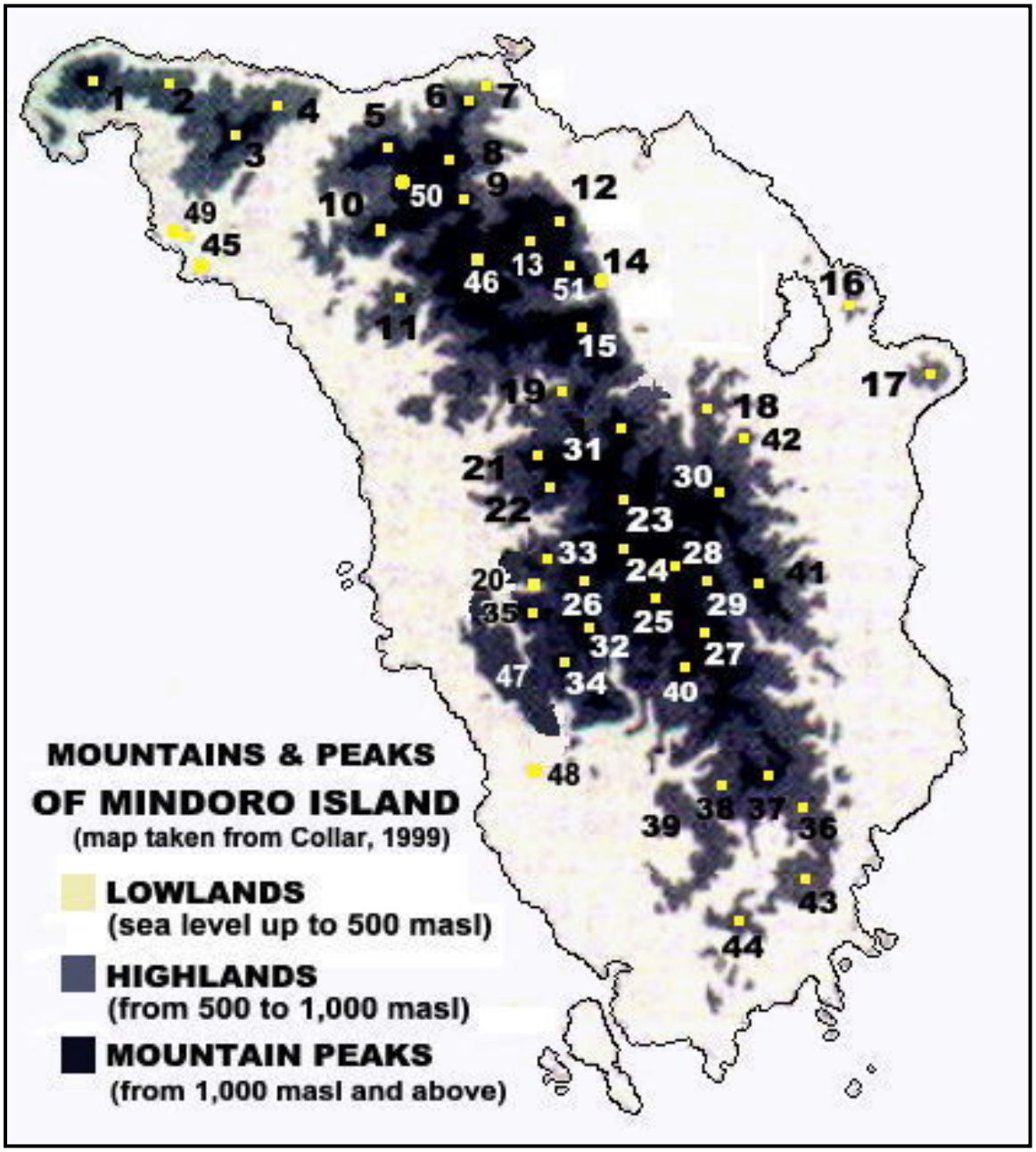


Generalized geological map of the Philippines.

A large ammonite fossil from Mansalay

Karst limestone formation in southeast Ylin Island

A Relief map of the Northwest-central islands of the Philippines, with reference to the submerged insular relationships between Mindoro and adjacent islands, and the deeperChannels and straits that clearly separate the surrounding islands from Mindoro.



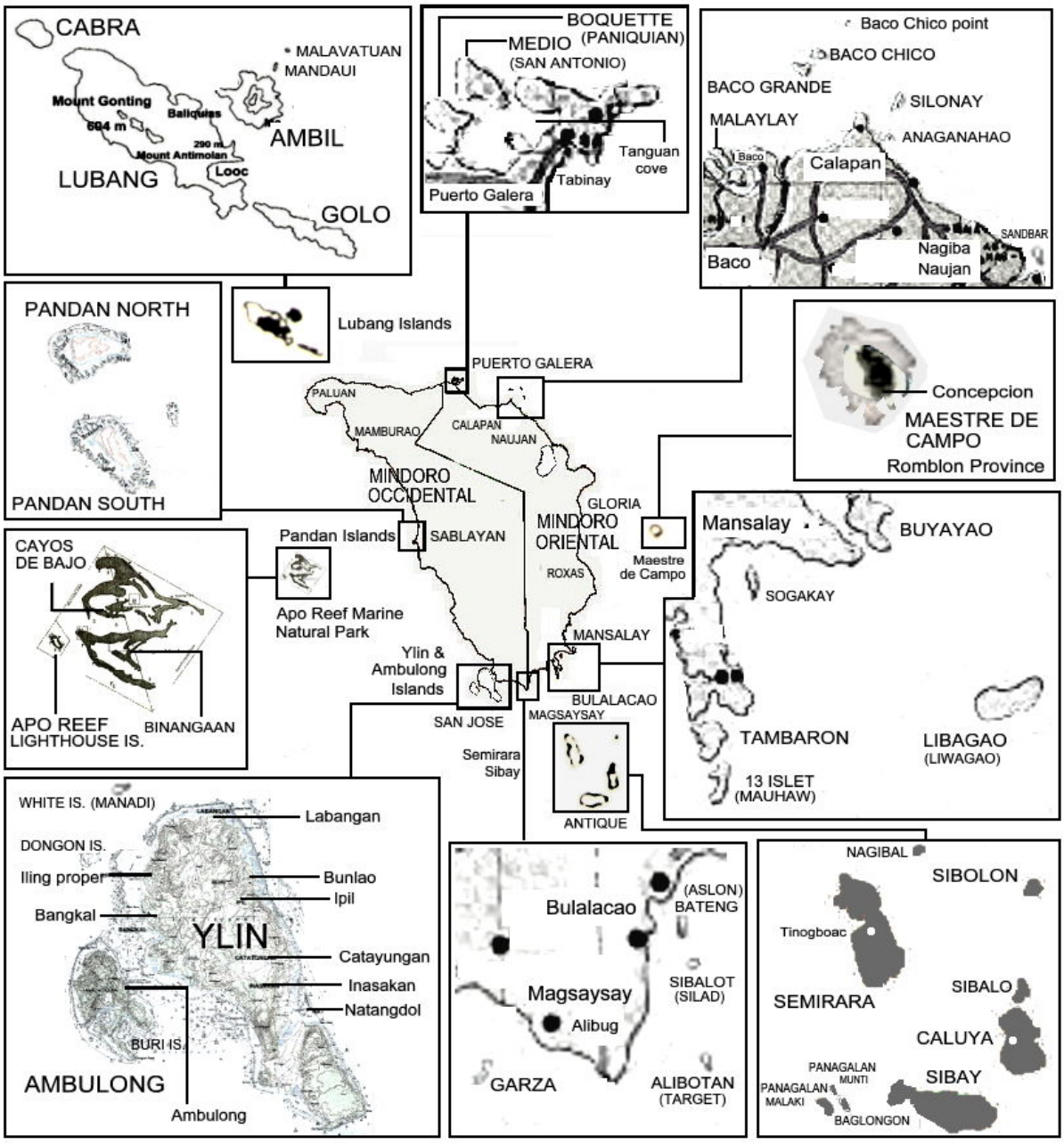
Distribution of major mountains and peaks within Mindoro Island, Philippines

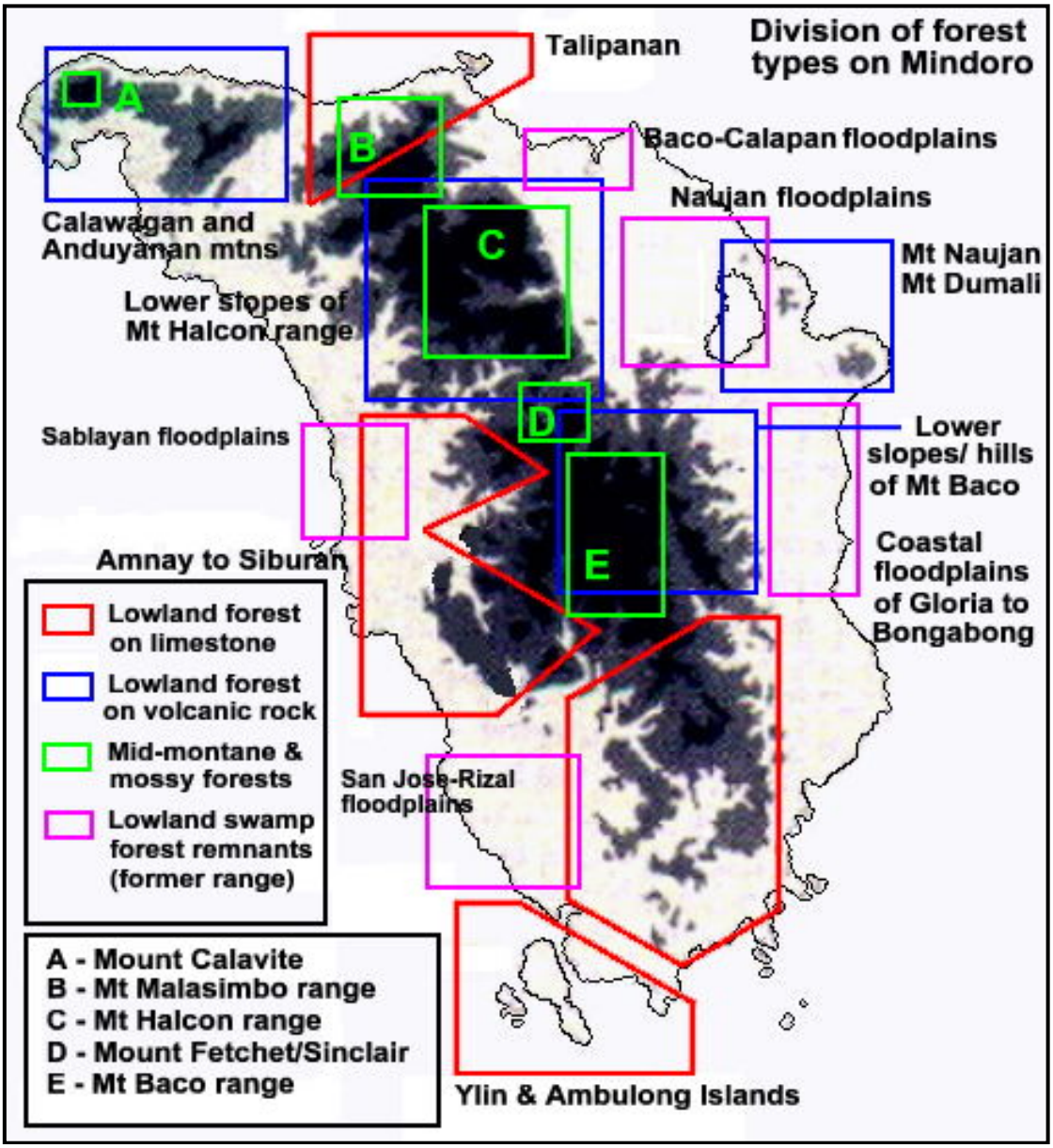
A List of mountains and peaks of Mindoro Island, Philippines.

No.	Mountain or peak	height (m)	Municipality covered
1	Mt. Calavite	1521	Paluan
2	Mt. Tiko-tiko (Calawagan mtns)	777	Paluan, Abra de Ilog
3	Anduyanan mountains	701-814	Paluan, Mamburao, Abra de Ilog
4	Mt. Abra de Ilog	1018	Abra de Ilog, Paluan
5	Mt. Burburugan	936	Mamburao, Abra de Ilog
6	Mt. Talipanan	-	Puerto Galera, Abra de Ilog
7	Mt. Alinbayan	-	Puerto Galera
8	Mt. Malasimbo	1229	Puerto Galera, San Teodoro
9	Mt. Balatic (Halcon range)	1430	Mamburao, San Teodoro, Baco
10	Tandrac peak	740	Mamburao, Abra de Ilog
11	Mt. Pamucuban	1028	Mamburao, Sta Cruz
12	Mt. Dulungan (Dulangan)	2505	Baco, Calapan
13	Mt. Halcon (High peak)	2582	Baco, Calapan, Naujan
14	Barawanan peak (Halcon range)	2145	Naujan, Baco
15	Mt. Palong, Ibalo-San Andres	-	Naujan, Victoria, Sablayan
16	Mt. Naujan	-	Naujan, Pola
17	Mt. Dumali	-	Pola, Pinamalayan
18	Mt. Kiblatoy	-	Victoria, Socorro
19	Eagle pass	-	Victoria, Sablayan
20	Batangan pass	-	Sablayan
21	Mt. Inirawan (Amnay mountains)	-	Sablayan
22	Mt. Indie	1636	Sablayan
23	Mt. Patrick	1656	Sablayan
24	Northern Blue mountains	2230	Sablayan, Bongabong
25	Mt. Roosevelt (South Blue mtns.)	2108	Sablayan, Calintaan
26	Mt. Sinclair (Victoria gorge)	1842	Sablayan
27	Mt. Wood (Woods, Baco range)	2248	Sablayan, Bongabong
28	Mt. Baco	2488	Sablayan, Bongabong
29	Mt. Worcester	2024	Sablayan, Bongabong, Calintaan
30	Mt. Mary (Mt Merrill, Baco range)	2232	Sablayan, Gloria, Pinamalayan
31	Mt. Fetchet (Fechel)	1314	Sablayan, Sta Cruz
32	Mt. Iglit (Mt. Mangibok)	2364	Sablayan, Calintaan
33	Mt. Tallulah	1162	Sablayan
34	Tusk peak	897	Sablayan, Calintaan
35	Mitchell peaks	879-1050	Sablayan
36	Knob peak	-	Bulalacao, Mansalay
37	Mt. Hinunduang	-	Bongabong, Mansalay, Roxas
38	Aruyan-Mapad mountains	-	Calintaan, San Jose, Mansalay
39	Hagdanan peak	-	San Jose, Calintaan, Rizal
40	Mt. Exline	-	Calintaan, Sablayan
41	Bokbok (Bongabong mountains)	-	Bongabong
42	Mt. Katmuran	-	Victoria, Socorro
43	Carabawen (part of Knob peak)	-	Bulalacao, Mansalay
44	Malugtok (Malotoc) uplands		Bulalacao, Magsaysay
45	Mt. Masombrero (Tayaman hill)	323	Paluan, Mamburao
46	Mt. Micnic (Halcon range)	1201	Mamburao, Sta Cruz, Baco
47	Bato-buring, Bato-singit, Simbahan	-	Sablayan, Calintaan
48	Mt. Sair	-	Sablayan, Calintaan
49	Mt. Binarira, Igsoso, Mahabang-buhangin	-	Paluan, Mamburao
50	Bangili mountains	1242-1524	Paluan, Mamburao, Abra de Ilog
51	Ilong peak (Halcon range)	-	Baco, Calapan, Naujan

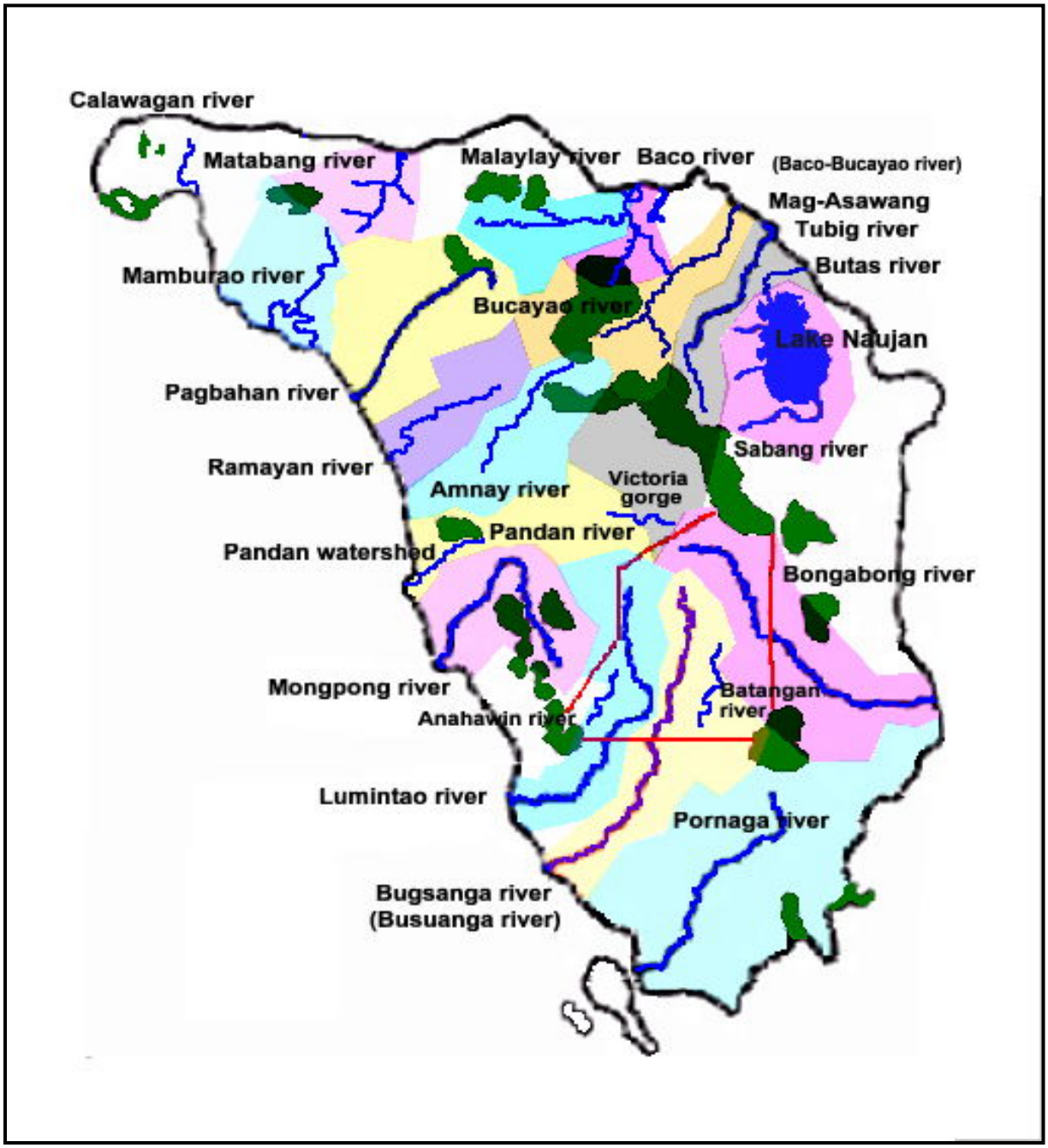
SMALL ADJACENT ISLANDS OF MINDORO

Small islands found within the Greater Mindoro faunal region and other associated islands including Lubang islands, Semirara, Caluya-Sibay group, Maestre de Campo & Apo reef

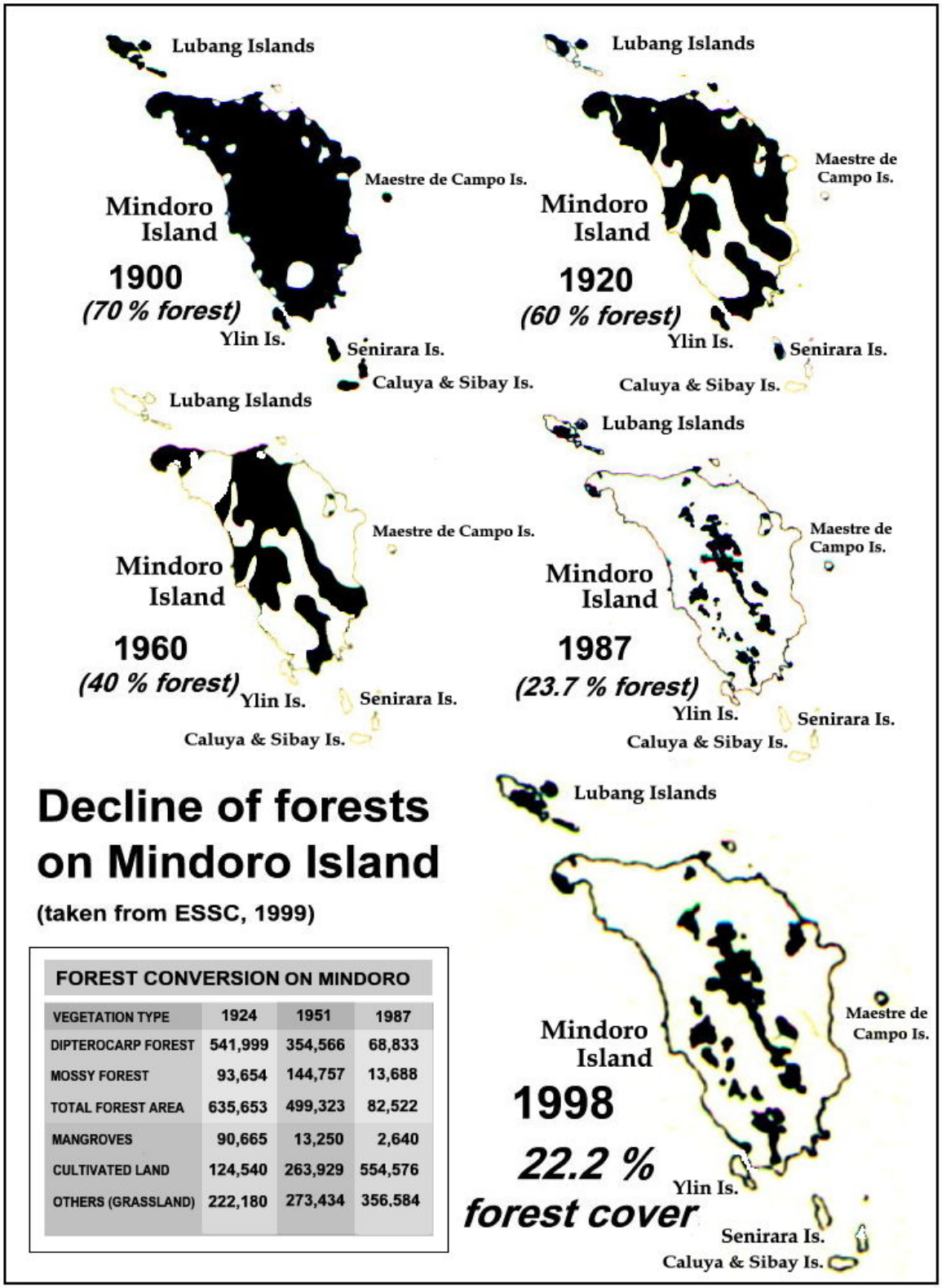




Map of Mindoro Island, Philippines, showing the distribution of four different major forest types known to occur on the island.



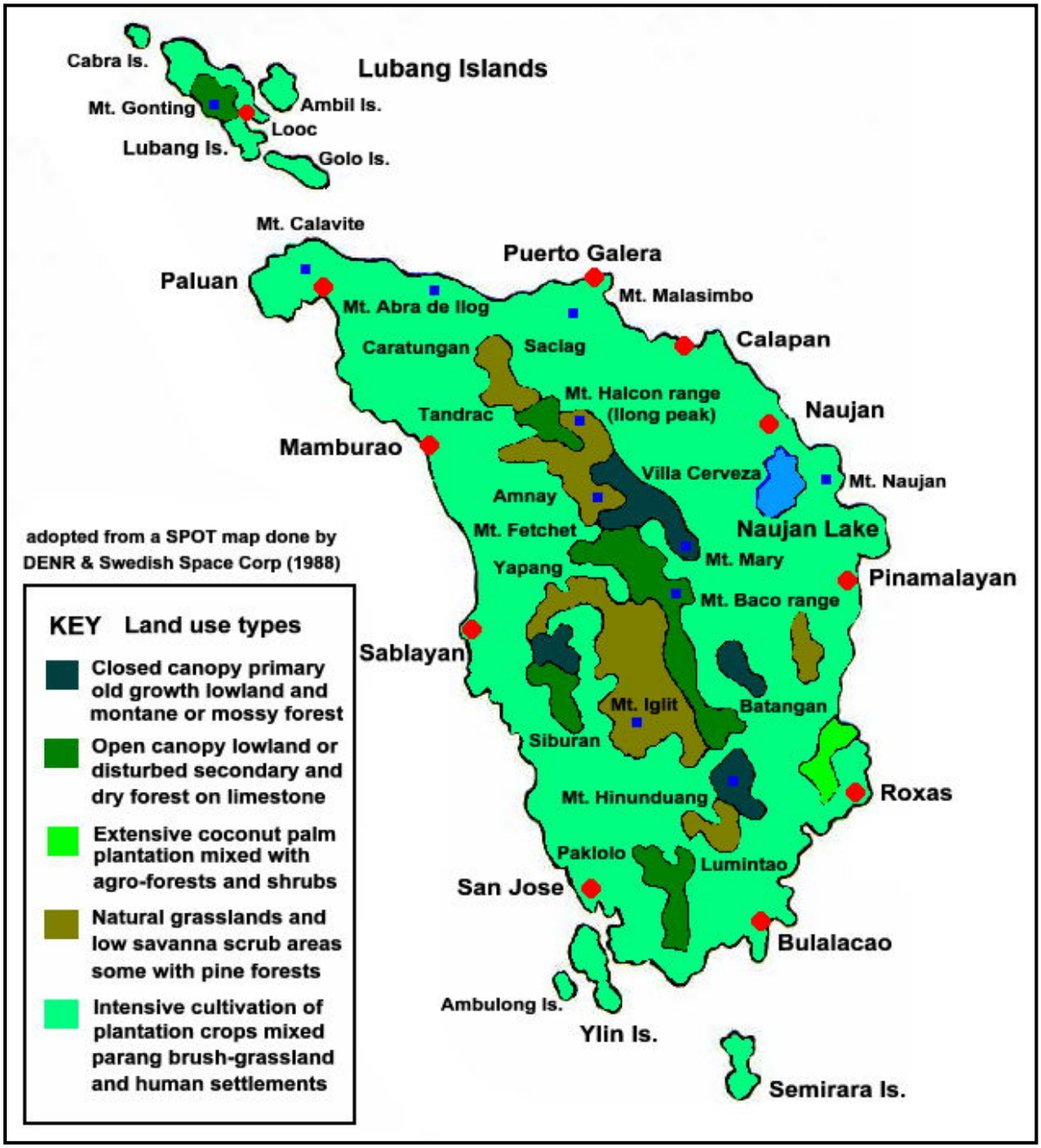
Distribution of designated watershed forest reserves along major river systems on Mindoro Island, Philippines.



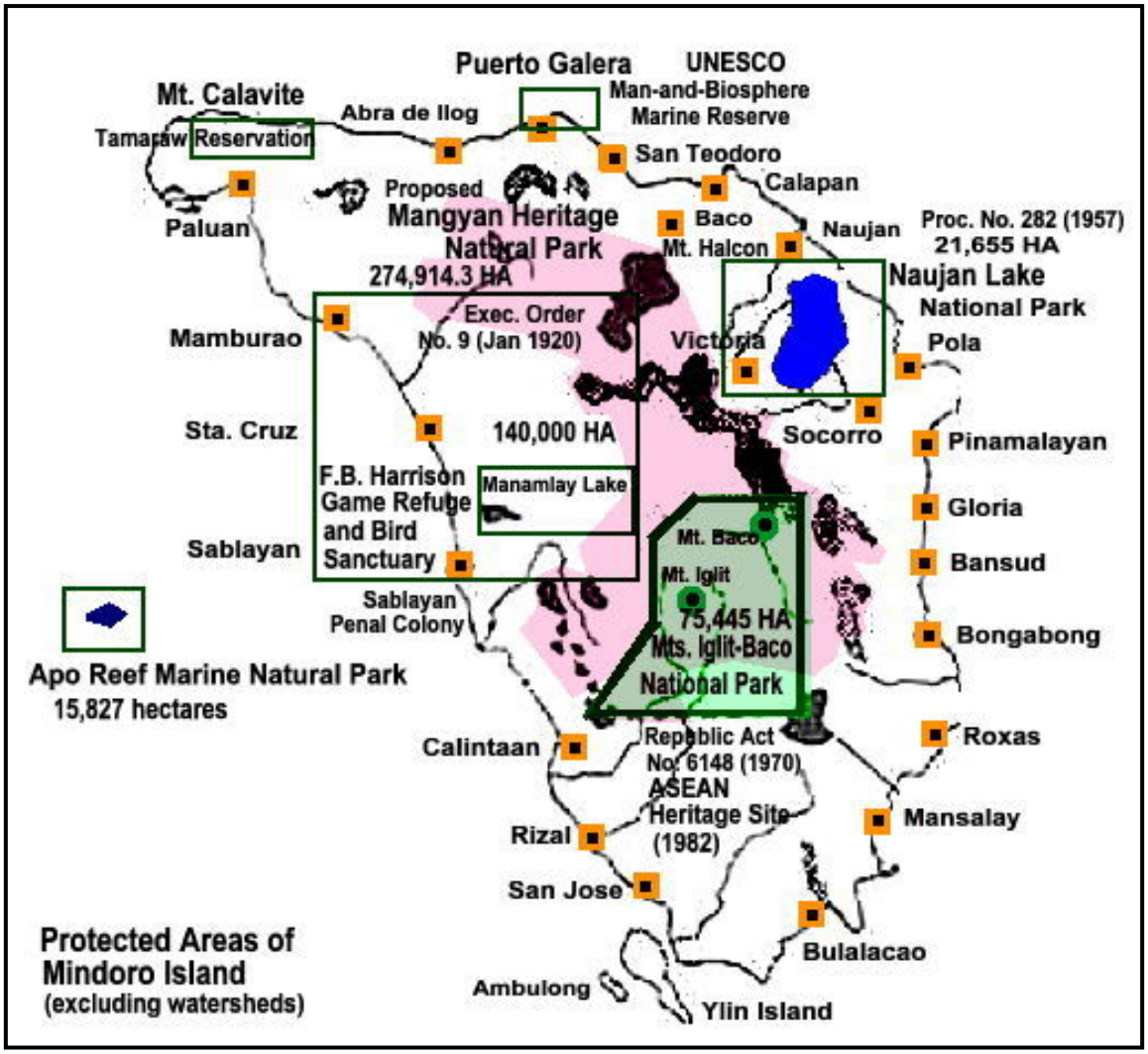
FOREST CONVERSION ON MINDORO

VEGETATION TYPE	1924	1951	1987
DIPTEROCARP FOREST	541,999	354,566	68,833
MOSSY FOREST	93,654	144,757	13,688
TOTAL FOREST AREA	635,653	499,323	82,522
MANGROVES	90,665	13,250	2,640
CULTIVATED LAND	124,540	263,929	554,576
OTHERS (GRASSLAND)	222,180	273,434	356,584

Map of Mindoro Island showing the successive decline of forest cover from 1900 to 1998, and includes a table that enumerates the area of forests and other land use types on Mindoro Island from year ca. 1924, 1951 and 1987.



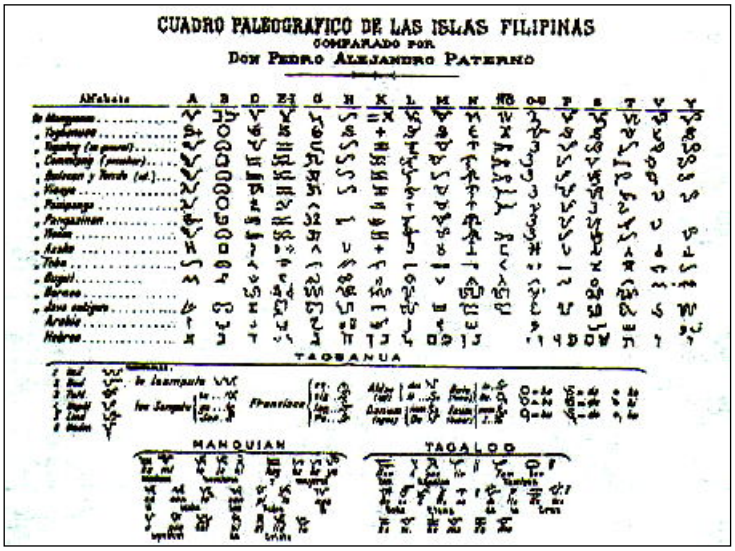
Distribution of remaining forests (open and closed canopy) and other land use types on Mindoro Island, Philippines, based on recent 1987 SPOT analysis (SSC-DENR, 1988).



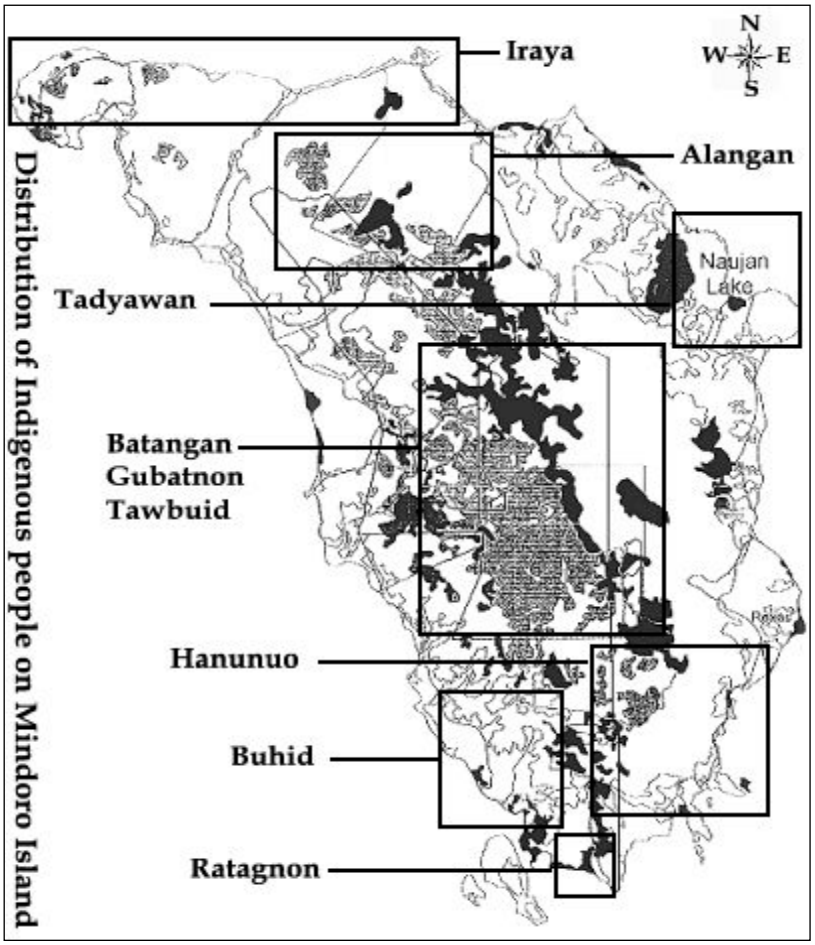
Distribution of protected areas (national parks, game refuges and marine reserves) within Mindoro Island and adjacent islands, Philippines (excluding watershed reserves).

Forests and grassland along Mount Calavite range, within the Mt. Calavite Tamaraw Reservation area.

Natural grasslands along the base of Mount Iglit, MIBNP.



Summary of Philippine indigenous syllabic scripts used by ancestral Filipinos (taken from Villarica, 1998).



Map of Mindoro Island showing the distribution of seven major Ethnolinguistic groups of indigenous people (the Mangyans).

MINDORO BIODIVERSITY CONSERVATION PROGRAMME

Mindoro has long been recognized as one of the world's highest conservation priority areas by international conservation agencies. Despite the strong global (and local) recognition of the island as an important conservation area (primarily due to the Tamaraw), there was no effective management system employed to address the needs of any protected area system. Although many interested groups have been involved in the protection of unique island wildlife, some of these had insufficient institutional capacity to develop and sustain a meaningful biodiversity conservation program. (ICBP 1982; Oliver & Heaney 1997). Mindoro is fortunate in having many large protected natural landscapes covering varied ecosystems designated to protecting Mindoro's unique biodiversity. These are MIBNP, Mt. Calavite Reservation, FB Harrison GFBS (proposed MHNP), Lake Naujan National Park, Puerto Galera Man-and-Biosphere Reserve, and ARMNP. Through the years, numerous conservation programs have been developed for Mindoro's wildlife, more particularly for the island's critically endangered flagship species the Tamaraw (TCP) and the rich marine resources (CPPAP-NIPAP for ARMNP). Since 1976, TCP had entirely overlooked the wider conservation requirements of the region and a new management team was appointed in 1995 with increased funding levels to accommodate a range of additional education, research, and conservation activities. However, this initiative also floundered owing to diverse administrative problems, and funding support was halved in 1998. Sadly, among the original proposed NIPAS priority sites, Mts. Iglit-Baco National Park was excluded due to political reasons.

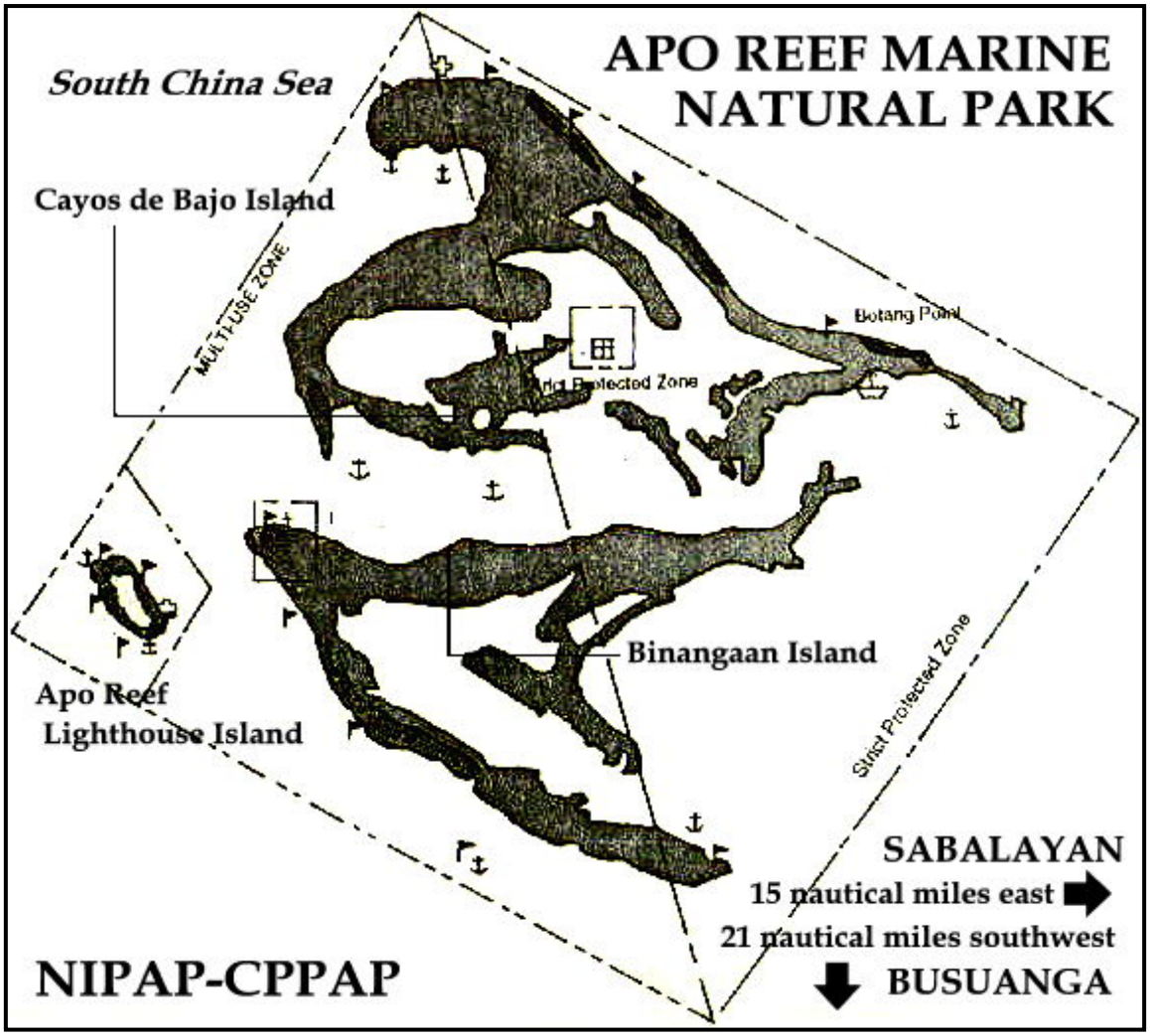
In the interim, after several years of networking and planning, funding support for the first two years of a proposed new 'Mindoro Biodiversity Conservation Programme (MBCP)' was finally obtained from Shell Philippines Exploration BV (SPEX) through Philippines Shell Foundation Inc. (PSFI) in early 1998. In collaboration with relevant municipal, provincial, and national governmental agencies, a suite of priority projects were initiated immediately with the assistance of biologists from the University of the Philippines at Los Banos (IBS-CAS and UPLB-MNH). These activities included island-wide faunal and floral rapid assessment surveys, detailed inventories of selected priority sites, development of a computer database on the fauna and flora of Mindoro, and GIS mapping of remaining habitats and other resources, and existing land use. The latter projects collectively constitute the 'Mindoro Biodiversity Information System (MBIS)', which is intended to establish a comprehensive, and integrated biological and geographic information source on the biodiversity of region, providing data and linked maps on all remaining native vegetation, watersheds, species distributions, protected areas, ancestral domains, and other land usage. Other important activities were the Mindoro Biodiversity Conservation Workshop and Teachers' Training Course, *'Mindoro Biodiversity Handbook'*, development of photo library for scientific reference, reports and educational materials production; development of a slide presentation for use in fundraising, networking, and public awareness meetings; setting-up of the first website; and establishment of a new 'Mindoro Biodiversity Conservation Foundation (MBCF)' to help manage these projects and facilitate future fundraising and development of collaborative agreements with other stakeholders and interest groups. To these ends, a funding application for a GEF grant has also been developed in collaboration with PAWB and the Foreign Assisted and Special Projects Office of the DENR. If implemented successfully, this is expected to result in a much larger grant application for implementation of proposed new protected area management plans, diverse training and other community assistance schemes, and alternative livelihood incentives in relevant areas.

CONSERVATION OF MINDORO'S THREATENED SPECIES

The Philippines ranking (9th) in the list of "hot spots" for tropical forests (Myers 1988c in McNeely et. al. 1990) continue to lower rapidly despite conservationists' outcry for increased effort for its protection. The archipelago, which has five major faunal regions and several subregions, include Mindoro as one of its major faunal regions. The island contains a rich conglomeration of flora and fauna distributed among diverse ecosystems and habitat types. Mindoro is considered to be one of the world's hotspots for biodiversity conservation due to the high number of highly restricted island endemic species, which are now in danger of extinction due to the continued destruction of their tropical forest habitats. BirdLife International considers Mindoro as one of the world's most important endemic bird areas (EBA), due to the present of six island endemic bird species which are also included in the IUCN-Red list of threatened animals. This is a result of the continued forest habitat destruction due to logging, non-traditional methods of kaingin, conversion to pasture areas, and more recently uncontrolled forest fires, due to severe dry conditions. Human disturbance and intrusion of non-native species have badly affected most of the Mindoro endemic flora and fauna. Only 871 square kilometers of tropical forest remains on Mindoro, this accounts for 8.5 percent of the 10,190 square kilometers of the land area. Entire mountain ranges have been reduced to dry rocky areas with little vegetation.

Studies on the plants are limited to a few areas such as Mt. Halcon (Mandia 1998) Mt. Iglit (Callo 1983, Gruezo et al 1995), Puerto Galera (Agoo 1997), Tamaraw Gene Pool in Busuanga River Watershed (Catibog-Sinha 1989), a comprehensive study of Naujan Lake (Gruezo et. al. 1997), and various isolated localities around Mindoro as part of a nationwide inventory of the Philippine National Museum (Madulid, Co, etc. 1990's). Prior to conservation is the need for baseline data that can be used to direct any program or project. A comprehensive floral account can be an essential factor to any environmental management or environment-related action plan. This study will serve to as a comprehensive study on Mindoro's flora and fauna and existing vegetation types/ wildlife habitats. Its attempt is to provide an account of terrestrial plant & animal species and their distribution among different types of vegetation and which will eventually allow mapping of vegetational characteristics of the island. The covered sites have various vegetation types. These are primary lowland dipterocarp forest, secondary growth lowland forest, *parang* type of vegetation (grassland-bushland), grassland, beach forest, mangrove forest, and mixture of secondary growth trees, fruit trees, rice fields, banana-corn-root crops plantation, kaingin, and abandoned swidden farm.

Similarly, the faunal aspect of Mindoro's biodiversity have long been studied by numerous expeditions, museum collections, and academic initiatives (Platen, Whitehead, Bourns, and Worcester (year), Mcgregor and other collectors from the Philippine Bureau of Science (National Museum) (year?), Rand and Rabor (year?), among others. It was not until the late 1970's that any conservation-based surveys were conducted to help develop management plans to protect the island's rich and unique faunal diversity. Despite the many individual inventories employed in various localities around Mindoro, none has been able to establish a more comprehensive island-wide account of the status of these important wildlife species and the extent of their natural habitats. More recent species accounts done by prominent conservation groups have been noted which in turn provided the necessary baseline information for the development of designated protected areas, and the re-organization of existing ones. From a recent collated review of these current data focusing on the status of Mindoro's threatened bird fauna, most of these studies had been limited to known protected sites, both established and proposed. As a result, other important areas not covered by any of these previously selected localities were largely overlooked and remained unprotected.



Map of Apo Reef Marine Natural Park, off the eastern coast of Sablayan, Occ. Mindoro.

Map of the proposed Mangyan Heritage Natural Park in Mindoro Island, Philippines.

Table 1. List of threatened native and endemic taxa of greater mindoro faunal region.

Common Name	Scientific Name	IUCN Category
Mammals (at least endemic 10 species, of which 4 are awaiting formal description), including:		
Tamaraw	*Bubalus mindorensis*	EN
Mindoro rusa deer	*Cervus mariannus barandanus*	VU
Mindoro warty pig	*Sus philippensis oliveri*	VU
Ilin Island cloud rat	*Crateromys Paulus*	CR
Mindoro climbing rat	*Anonymomys mindorensis*	VU
Mindoro pygmy flying fox	*Pteropus* sp. nov.	NL
Birds (about endemic 20 taxa, several of which are seriously threatened), including:		
Mindoro bleeding-heart pigeon	*Gallicolumba platenae*	CR
Mindoro imperial pigeon	*Ducula mindorensis*	EN
Spotted Imperial pigeon	*Ducula carola*	NL
Philippine hawk eagle	*Spizaetus philippensis*	NL
Mindoro scops owl	*Otus mindorensis*	VU
Mindoro hawk-owl	*Ninox mindorensis*	NL
Philippine cockatoo	*Cacatua haematuropygia*	CR
Blue-naped parrot	*Tanygnathus lucionensis*	NL
Blue-crowned racquet-tail	*Prioniturus discurus mindorensis*	NT
White-bellied woodpecker	*Dryocopus javensis mindorensis*	NL
Mindoro tarictic hornbill	*Penelopides mindorensis*	EN
Black-hooded coucal	*Centropus steerii*	CR
Mountain shrike	*Lanius validirostris*	NT
Ashy thrush	*Zoothera cinera*	VU
Black-bibbed cicadabird	*Coracina mindanensis*	VU
Green-backed whistler	*Pachycephala albiventris*	LC
Scarlet-collared flowerpecker	*Dicaeum retrocinctum*	CR
Other vertebrates such as reptiles, amphibians, and fish are still poorly known (i.e., undoubtedly many new species to be discovered); those currently recognized or believed to be threatened include:		
Philippine crocodile	*Crocodylus mindorensis*	CR
Mindoro frog	*Philautus schamekeri*	NL
Mindoro barb or 'pait'	*Barbus hemictenus*	NL
Mindoro hillstream loach	*Gastromyzon* sp. nov.	NL
Butterflies		nl, At least 17 endemic species many are threatened, but none listed by IUCN
Plants	At least 70 endemic species; many highly threatened; including 3 species of threatened endemic dipterocarps	
Manggachapui Yakul-saplungan' Malaanonong	*Hopea acuminate* *H. plagata* *Shorea polita*	The region also supports one of only two known stands of Philippine pine (*Pinus merkussi*) and Ilin Is. is one of only two known locations for the highly endangered Philippine teak (*Tectona philippensis*).

Note: N.B. Endemic taxa are highlighted
IUCN status categories as follow: CR = critically endangered, EN = endangered, VU = vulnerable, NT = near-threatened, LC = least concern (but restricted range). The designation NL means that though the taxon is not listed by IUCN, it is nonetheless considered threatened.

METHODS

ISLAND-WIDE RAPID ASSESSMENT OF IMPORTANT FAUNA AND FLORA IN MINDORO ISLAND

Island-wide Surveys

A preliminary account of biological diversity on the entire island of Mindoro can be approximated by visiting nearly all the accessible communities on both provinces (Oriental and Occidental), using the passable road systems, which runs north to south, on either side of the island. A central mountain range cuts across the island like a spine, and flat alluvial plains are found from the foot of the highlands to the coasts. Much of the lowlands have been cleared for agriculture and human habitation, and nearly all the remaining forest habitats (important to Mindoro's threatened endemic fauna and flora) are found in the central highlands and low hills adjacent to them. Much of the survey can be conducted along the main provincial roads mostly traverse the lowlands near the coasts, but have some access roads inward to the mountains.

It is necessary to visit all the townships of the island, and the major tribal ethnic communities in order to conduct brief interviews to determine if their area still contains important habitats for wildlife, and the presence status of key indicator species. If forest habitats are readily accessible through the major roads, a direct ocular inspection of the area can be conducted, and data can be supplemented with interviews of the local inhabitants. However, if there is no significant habitat (sufficient forest cover) observed in the area, other adjacent areas can be explored, as suggested by the locals. Further interviews and surveys can be therefore be done on the communities adjacent to the site suggested earlier, in order to fill in the information gaps. Data indicating the absence of a species in a site, is better than the lack of data about the site or the species.

Extending inward to the mountains far from the main provincial and municipal roads is done to reach areas (which are accessible by motor vehicle) considered by the locals to have significant forest cover remaining. It is also important to make an approximate coverage of as much of the island's area as possible, and avoid gaps. But exploration beyond the townships provincial roads are confined because of the limited field time, manpower, and resources, and should be implemented only with sufficient basis or supporting data. The need to do more extensive fieldwork beyond the main communities (towns or large barangays) can be supported by significance of the claims of the local people on the presence of key indicator species. Nonetheless, the lack of suitable forest habitats and/or the absence of indicator species are still valuable data because they indicate the areas which have no value to wildlife, and cannot be selected for priority conservation. Mapping out these areas can help show the restrictions in distribution of habitats and key indicator species. The various sites visited should be plotted on the maps, indicating the approximate coverage made by the survey, and the status of the indicator species or habitats can be represented by differences in the grids made on the map. Different points (colors and shapes) on the maps can show the distribution of represented indicator species, and help classify the visited areas by the amount of diversity. This therefore indicates the biodiversity rich areas which need to be prioritized for conservation in Mindoro Island and possibly harbor the most number of important species.

A recently published road map of Mindoro Island and adjacent islands, indicating the

relatively widespread distribution of road systems around the island. Most of the coastal roads within and between the municipal centers are well developed, while roads traversing the rugged mountain interior remain undeveloped, others are basically trails.

Significant mountain and insular formations found within Mindoro Island and adjacent islands, Philippines, indicating the major associated central mountain masses.

In addition to direct ocular observation along the roads and communities visited, the survey also uses ethno-biological interviews to acquire secondary data from local people who are more knowledgeable about the history and status of habitats and wildlife in the area. Interviews can be conducted in the different communities visited along the road, or can be defined by having interviews done for every 2-3 kilometers (a definite amount of measure can be designated, i.e., 2 kilometers, 4 miles, etc.) traversed by the vehicle/observer. Each site or location visited should be described individually (i.e., for the presence of forest habitats, designated as a protected area). Documentation with photographs is ideal for showing the current state of the area, and to compare this with the changes that may occur later on (given that the area will be monitored) or with changes that had already been done (based on past photographs taken).

Ethno-biological Interviews

This procedure involves the brief interview of locals about the present status of the remaining forest cover in the area and other possible habitats for endangered and endemic plants and animals. Interviews can be done by approaching the leader of the communities visited, who could then direct the interviewers to concerned individuals or to members of other communities who can serve as informants. Hunters, members of the tribal communities, and DENR field personnel can serve as possible informants who are familiar with the landscape of the area and the present status of its biological diversity. Information needed must be recent, placing emphasis on the amount of forest cover remaining in the area, and the presence or absence of key indicator species of fauna and flora. All data resulting from this ethno-biological survey are considered to be unconfirmed reports, unless further evidences are shown or observed during the interview to make the report reliable. Reliability of the reports can be judged by the amount data (which directly describes the species or condition of habitats in retrospect) that can support the claims, as well as considering the personality or behavior of the person being interviewed.

The length and extent of the interview can be based upon the amount of significant information collected, time availability of the individuals being interviewed, and the willingness and support of the communities visited. Questions are limited only to topics which are significant to the conservation of Mindoro's rich biological diversty, often pertaining only to the presence/absence (and their current status) of a particular key-indicator species. Other comments on behavior and biology, distribution, and socio-cultural importance of the species are also important.

Reports of Key-indicator Species of Flora and Fauna

Confirmation of these reports can be based on more physical evidences, such as direct observation, specimens, skeletons or other remains, calls, footprints and scats, or photographs. These key indicator species usually represent Mindoro's endemic species which are most threatened from habitat loss and perturbation of the environment through human disturbance. This includes species which are considered to be endemic only to Mindoro, and where the status is known to be (to some degree) rare or endangered. Among these are the Mindoro endemic birds and mammals, most of which are considered to be critically threatened, namely the Mindoro hornbill, black-hooded coucal, Mindoro imperial-pigeon, Mindoro mountain scops-owl, scarlet-collared flowerpecker, the *Tamaraw*, Mindoro climbing rat, Mindoro mottle-winged flying fox and the Ilin Island bushy-tailed cloud rat. Other plants and animals, endemic to the Philippines, not only for Mindoro and have similar threatened status are also included in the list of species to be emphasized in the interviews and field observation.

Among these species are the Philippine teak, Philippine cockatoo, Philippine crocodile, Philippine hawk-eagle, golden-crowned flying fox, little mottle-winged flying fox, and Mindoro striped shrew-rat. Some of these species may have restricted ranged, but have declined significantly in recent years; others are important for its Mindoro-endemic subspecies or races. Other species to be considered are those that are readily recognized by local people (ethno-biologically significant) due to their significance to cultural or religious practices, or because they have direct effects on their livelihood (like pests). Some are simply commonly seen or heard and are too large, too loud, and conspicuous, and may be popular as a pet or hunted for food. These species often have distinct vernacular or local names (which are variable among the communities, especially between different dialects of the many tribal and ethnic groups) and are easily recognized by most members of the community. These include the Philippine warty pig, Philippine brown deer, long-tailed macaque, reticulated python, cobras, forest frogs, swallowtail butterflies, and others.

Information about the indicator species acquired from the rapid survey can be classified based on its method of observation and the status or history of the account given. Results can be classified into the following categories: “wild specimens seen”, “captive specimens seen”, and “skins/skull seen or collected” all indicate the presence of the species in the area and be recognized as a “confirmed location”; or was based on unconfirmed interviews and were “reported by local people”; and whether the “continued survival is doubtful” for the species in the area or that it “no longer survives in the area” and may have been extirpated. If the area contains no suitable habitats for the species and was never reported there before (up to the present), their absence can be designated as “reported not to occur in area” than with a blank grid (otherwise, if data is lacking, then “no data available” is indicated). The category “continued survival doubtful” denotes that the animals were known to local informants but had not been seen recently (i.e., within the last two or three years) or that only a very small number of individuals (<10) were known to survive in a single area.

All confirmed and unconfirmed reports resulting from the survey can therefore be compiled to serve as the current data known for the species in the locations/sites visited, and help identify its present status. A review of past records from field studies or in captivity, from historical accounts in interviews, and other related literature can help provide the status of the species as previously known. Together, the distribution of the species can be determined, and identified as well as the still known to contain the species or their required habitats, areas of the species decline (or rapid decline), and the threats which affect their survival (continuing or halted). In this regard, the present status of a species can be identified from the results of the survey, which in turn can help recommend changes in the conservation status (based on IUCN).

The following categories should be discussed for each key-indicator species: vernacular names, distribution, previous known status, present known status, status of threats to survival, recommended IUCN status, and priority recommendations (reasons for designating a new status and possible solutions for conservation). Apparently as a result of extensive interviews and field coordination on an island-wide coverage, the data collected should be properly referenced (by person/people involved/interviewed, date and location, with necessary remarks), and that all those supporting the activity (individuals or organizations) must be properly acknowledged in a written report.

DETAILED FLORAL AND FAUNAL INVENTORIES OF SELECTED SITES IN ORIENTAL MINDORO

Selection of Study Sites

Site selection for the field study of terrestrial fauna can be based on several conditions which are often dependent on the area's terrain, available time, budget, and the prevailing weather. Some areas may have mountains, which then allow greater variation of ecosystems present due to differences in altitude, whereas others may have less variety of terrestrial components. Among the conditions which need to be considered are the presence of varying habitat types, elevation, and disturbance gradients. Although accessibility of the chosen site is also important, this factor can have less weight compared to the larger significance of choosing a site which exemplifies an ideal study site. The issue of whether a chosen site is accessible or not, is based on the availability of resources (both manpower and materials), which would be able to augment this limitation. However, the most important basis for selection of a study site for the faunal and floral inventory is the presence of extensive stands of rainforests which are essential to the survival of Mindoro's endemic and endangered plants and animals, with a particular emphasis on and preference for the occurrence of old growth or primary lowland rainforests. The site should represent one of the few known wilderness areas in Mindoro with a large amount of remaining forest cover, and great potential for conservation. These sites for selection can be part of a recognized protected area or not, has not been studied extensively, and thus requires urgent attention for biodiversity conservation. These sites can be recommended based on the high incidence of reports in the site of key-indicator species made during the island-wide rapid assessment.

It is valuable to consider the presence of different habitat types in the study area in planning an inventory, and considering the importance of varying elevation and disturbance gradients on the selection sites for the camp, sampling plots, trap/net lines, and transects. The availability of potable water around the camp area, and the possibility of setting up a camp in that site are important, inclusive of which is the prevailing political safety. The inventory usually takes at least 3 to5 sampling days per site, excluding travel and setting-up of the camp. This allows enough time for the standard methods to acquire maximal data on site, assuming that weather remains constant. It is experienced that after 3 to 5 days of sampling, the number of species observed remains the same and fewer species are added to the list through time. This can be monitored through the use of the species-effort curve, wherein, the curve levels off, and fewer or no additional species are recorded with the same amount of effort used.

Habitat Evaluation of Survey Areas

Some survey areas may sometimes contain various types of habitats, from forest and non-forest, to wetlands and coastal ecosystems, as well as other existing biomes. It is important that habitat types be considered to help determine what extent of biological diversity each may contain and in the study area as a whole. In the Philippines, rainforests are made up of different types (depending on tree dominance, elevation, soil type, etc.) Such as the lowland, mid-montane, mossy forests, or the dipterocarp, molave, or pine forest, as well as mangroves (salt-resistant trees), swamp forests (along flooded marshes), riparian forests (along rivers), cloud forests (consistently wet), and deciduous forest (seasonally dry). Others are classified by soil type such as forest on limestone, beach forest, and ultra-basic forests, and whether they are primary, secondary, residual or old growth.

Evaluation of these habitats found within the selected sites can be based on the visual description of the prevailing conditions in the vegetation, climate, soil, water source, type and extent of forest cover, and stratification. Notes on significant plants and forest trees, and the extent of human disturbance are also important. The criteria used were based on a list of parameters for qualitative habitat evaluation for wildlife from the Southeast Asian mammal survey sheet (see Appendix). Standard habitat description can be done to determine the characteristic vegetation and condition and therefore evaluated on the degree of disturbance, elevation, and other physical gradients such as forest structure, canopy height, understorey growth, and ground cover. The presence of free water source, cover and light penetration, forest litter density, moss and epiphyte density, substrate types, and climate must also be taken into account. Floristic inventories would help provide ecological information, extent of plant diversity and dominance, and relative abundance of the important species of plants, particularly the endemic species.

In summary, a general site description of the study area should include the following parameters:

- Climate and rainfall (average and seasonal temperature/rainfall patterns)
- Topography (dominant landform, slope description, and measurements)
- Elevational gradients (lowland vs. montane, average gradients)
- Major floral community types (forest types vs. open areas)
- Dominant or common tree species
- Tree or herbaceous species important to wildlife (species list and density)
- Water availability (availability, distance, and seasonal changes)
- Human settlements/encroachment into the area (disturbance and affected areas or species)
- Natural perturbations (type and severity)
- Known critical habitat features for wildlife (geologic and floral)

Standard Field Techniques for Data Gathering

It is believed that when conducting a field inventory, it takes a lot of time and effort as well as resources to complete it. Therefore it is important that an observer must collect as much data in the field as possible in order to gain maximum results for a given effort. It must also be well planned and coordinated to avoid delay and any unnecessary replication. There are five major types of observation to be considered which approximates the greatest percentage of data collected, as follows

Ocular observation employs the visual collection of data. Recording the data seen or with the help of optical equipment like telescopes and binoculars. Transect counts and circular plot counts are among the methods that can be used. Detailed descriptions, field notes, and photographs are valuable means of documentation. Audio or observation by hearing the animal's audible sounds is another important way of collecting data. This is most particular to very vocal species like birds, frogs, and some mammals which communicate through calls and songs. They can be learned through experience or identified through the use of recordings, and other sound-sensitive recording equipment. Trapping and mist-netting or capturing the animals with the aid of traps and nets are also important, since many important data can be directly taken from captured specimens (some animals are difficult to identify or study unless a specimen is collected). Some species may be difficult to observe (are cryptic, nocturnal, or crepuscular) unless captured or collected with the aid of snares and traps.

Physical disturbance is an observation made with other clues because the animal cannot be observed directly. Many animals leave evidences (…) of their existence in an area, and can be identified to the species (footprints, nests, eggs or larva, burrows, roosts, or even animal remains such as skeleton, skin, feathers, or other carcasses). Ethnobiological accounts employ the use of interviews with the local communities or people inhabiting the protected area, whether resident or transient. These people may have regular or incidental encounters with the local wildlife and can provide secondary (unconfirmed) data that may prove useful (as described in the methods used for the island-wide rapid assessment). Note that some people may have varying degrees of perception, others may prove to be very knowledgeable while others may give reports that is somewhat inconclusive or even exaggerated. Local residents can also provide important historical data for some species (describe the decline of a species or those that are no longer observed) or report those species which are difficult to observe (rare or cryptic) and therefore can be later confirmed.

It is imperative that standard methods would be used to allow data to be readily compared with results from surveys made on other sites, other inventories done in the past, or as basis for monitoring. Keeping the procedures standard means that the probability of bias is reduced; replication is avoided; time, resources, and effort are maximized and proper data management and analysis are facillitated. Some procedures can be changed to some extent, in response to the changes in the conditions available on the site. However, it is important to maintain consistency with the number of transect hours (40 man-hours), traps set (300 trap-nights), mist-nets used (75 net-nights), and field days spent for all study sites.

Collection and Identification of Terrestrial Vertebrates

In this inventory of terrestrial fauna of priority areas for conservation on Mindoro island, emphasis is given to the four higher vertebrate groups: amphibians, reptiles, birds, and mammals. Standard techniques were employed to survey for these four tetrapod groups independently or in combination. All specimens captured alive should be released after necessary biometrics and important data are taken, and a positive identification is made. Identification of animals can be done with the use of field guides, taxonomic keys, and other relevant literature descriptions to support validity. If the identification is uncertain or unknown however, it becomes necessary to collect voucher specimens for further analysis in the laboratory, and be compared with known specimens in the museum (especially the types), and possibly determine if these unknown specimens are new to science.

It is essential for specimens to be collected as a voucher to have numbered field tags and/or labels attached to it for reference to its identification, its origin, and other necessary information taken with it. These include the date and place of collection; the collector; habitat and elevation; some biometrics; and notes on its external parts, especially the descriptions of its color before being preserved in fluid or dried as a study skin. It is important to have the same data and other more detailed notes written down in the field catalogue sheet, together with the same field number designated on the specimen’s tag or label. Voucher specimens can be preserved either as a study skin, or in fluid (pickled in a preservative solution). A specimen captured alive but cannot be identified at this point and are considered unknown, should be collected as a voucher and must be killed humanely with either an injection of poison or through suffocation. Vouchers collected as study skins (mostly for birds and mammals to retain the plumage or pelage) should be prepared by an experienced field biologist or taxidermist so as not to spoil the value of the specimen. Proper skinning can be learned and perfected with practice done on common species (like pigeons, sparrows, and field rats).

Specimens preserved whole in fluid must be washed (in soap and water), then fixed in 10 percent buffered formalin (formaldehyde solution is used as a fixative bath for about 2 to3 weeks) and washed again in water and later transferred to 80 percent ethyl alcohol for storage. Specimens can also be preserved as a skeleton. Some tissues and organs can be dissected, kept in "Nunc" tubes and frozen in liquid nitrogen while in the field, and later analyzed or kept in cold storage in the lab. All voucher specimens should be deposited at a reputable museum for storage to allow access to other researchers. Among the local museums are the Museum of Natural History in the University of the Philippines at Los Banos, and the Philippine National Museum in Manila.

Herpetofauna

To sample the herpetofauna or the diversity of amphibians and reptiles, a combination of the following sampling techniques will be employed. Notably two types of sampling efforts will be performed, one is done by sampling in a given habitat type, and the other by sampling across a gradient of habitat types and elevations. In the former, a particular habitat (e.g., rainforests, habitats along rivers and streams, grasslands, and swamps) will be sampled for any occurring species, and the efforts will be concentrated only around such a habitat. In the latter, the sampling efforts are done on transect lines, which often traverse through varying habitat types.

Transects: Some existing pathways within the study site can serve as transect lines for sampling (such as forest trails from the base of the mountain up to the summit). The same transect used for observing birds can also be employed, but if this transect is unsuitable for herpetofaunal surveys, additional transect lines can be applied.

Microhabitat sampling: Specific microhabitats (e.g., aerial ferns, forest-floor litter, tree holes, leaf axils of pandan, bananas, and aroids) found along the transect or within the study site will be searched for any species occupying therein. A considerable amount of time will be spent for each microhabitat type (ranging from 5 to 30 minutes) to ensure thorough searches of any occurring specimens.

Plot sampling: Square plots measuring 10 x 10 meters will be chosen in forest habitats. Tools such as shovels, rakes, or spades will be used to probe the forest floor litter and other appropriate covers (e.g., rotting logs, burrows, shrubs, etc.) within the plot to locate any occurring species. The use of plots, which is effective for sampling plants, can provide a representative dataset of the entire area, but does not necessarily show the total diversity for animals, since some species may be overlooked.

Tape-recording of calls: Mating calls of male frogs (as well as other amphibians, and probably some reptiles) are species-specific and should be recorded (when possible) with the use a portable tape-recorder, or any other sound-recording equipment that can be fitted with a sensitive uni-directional microphone, to aid in the identification of specimens. These can be played back to lure females or induce other males to call and come out, sometimes aiding in its capture. Calls can be later compared with recorded calls of known species, or analyzed with a sonogram or a computer-based program for measuring sound waves.

Most amphibians and reptiles are difficult to identify unless they are captured or collected, and examined further in the laboratory. As such, to record the diversity of herpetofauna in an area, it is ideal to capture them. Most species are also highly cryptic or shy and difficult to observe, many are nocturnal, and others are incidental observations. Collecting by hand or with the use of traps are the most efficient methods to record data for herpetofauna. One can make use of pit-fall traps to capture terrestrial amphibians, small lizards, and sometimes snakes. To aid in the capture of snakes, large

hand nets or poking rods would be helpful; dip-nets would be useful to catch turtles, frogs, and tadpoles.

Native traps and snares can be used to catch lizards and large snakes. Large rubber bands are useful for catching arboreal lizards such as flying lizards, tree skinks, and geckos. The presence/absence of amphibian larval stages or tadpoles (eggs that undergo direct development have no tadpole stage) are useful in determining the amphibian fauna. The identification of tadpoles can be based on the position of the gills, labial teeth, pigmentation (also in eggs), or the presence of a horny beak. Physical disturbance can be recorded through the examination of eggs (i.e., leathery eggs of snakes, calcareous eggs of geckoes), burrows (i.e., snake dens), and nests (i.e., foam nests of tree frogs, turtle's mound-nests).

Captured specimens of amphibians and reptiles are processed by measuring biometrics and other conditions which are important to help identify the specimen prior to release or collection as a voucher. The measurements taken vary depending on the specimen (note: biometrics can be measured with a ruler, caliper, and/or tape measure; whereas the weight can be taken with the use of a spring scale or balance) but may include any of the following: snout-to-vent length; total length; head length; tibia length; tail length; forelimb length; hindlimb length; body weight; age; sex; condition of tympanum/ear; fang type (for snakes only); presence/absence and condition of pads; presence/absence and condition of webs; tongue type; iris color; scale topography; and scale counts.

Avifauna

For birds, a two-kilometer line transect will be employed to record species observed seen or heard (in approximately two hours). A total of 40 man-hours of data will be recorded, including the number of individuals observed, and notes on their behavior and microhabitat. In addition to transect counts, mist-nets will be employed to catch cryptic understorey birds. Some 10 to 20 mistnets will be put up (both ground-nets and sky-nets) and the number of captures plotted against the total net-days. Similarly, these mist-nets will be kept open at night to capture nocturnal birds (e.g., owls and nightjars).

Birds can be readily studied through practical means by use of the naked eye. One can easily distinguish one species from the other based on their external characteristics (plumage patterns, color, shape of the tail, feet type, and bill shape). This can be done with the use of binoculars and spotting scopes. Transects offer a venue for which observations can be standardized. Birds flushed and observed along transect lines can be measured mathematically to represent diversity. Counting the number of species and its represented population along the standard length of the transect would be a practical measure of diversity. Transect lines may measure from one to two kilometers in length, with an effective width of 50 meters. One can make use of old trails or pathways as transects, as long as it represents a particular site or habitat. As such, transects offer a standard measure, keeping note that time is also kept constant.

Transect counts for birds can be done within two hours of one pass through a two kilometer line. Several observers can pass through the same transect to maximize time. Note that activity of these birds is greatest during the early morning (6:00 am to 10:00 am) and late afternoon (3:00 pm to 6:00 pm). In addition, other methods for observation of birds as well as other terrestrial vertebrates can be done within or along the same transect line. Although some birds are easily flushed and observed, others are cryptic, nocturnal, or crepuscular and require alternative methods to be observed such as by

capturing with the use of nets. Mist-netting is an important method to capture birds to allow measurements to be taken, and be banded prior to release, and if necessary to collect a voucher.

Mist-nets are made of soft nylon mesh (34 mm) which are handy and lightweight to bring into the field and easily set-up. Mist-nets can be set on the ground to catch understorey birds in the forest or in reed-beds; this is set up on poles placed across the net line, along suspected flyways for birds or on ridges of mountains or near a river. Mist-nets set higher than four meters above the ground, attached to ropes and pulleys, and set across the canopy of trees are called “sky-nets”.

Other methods of capture, such as native traps and snares can also be used. Sometimes, ground birds are caught in traps intended for catching mammals, or are taken directly from nests or on roosts. Nets are kept open during the daytime to catch diurnal birds and left open at night to capture nocturnal birds and even bats. Nets are checked for captured birds every two hours from sunrise to late afternoon. Nets are checked again at 8:00 pm and 10:00 pm for nocturnal species. Netted birds are carefully removed and placed in cloth bags to minimize stress prior to handling for data collection. Specimens can be identified up to the subspecies level and standard biometrics measured using a dial caliper, ruler, and pesola spring scale which should be noted on standard field catalogue sheets. Some birds can be marked or banded before release. Birds to be collected as vouchers should be preserved as study skins (taxidermy specimens) to retain the plumage (valuable for identification), or in fluid (i.e., in buffered formalin or ethyl alcohol solution to preserve internal parts and tissues).

Netting success can be computed from the number of species captured over the total number of net-days on each site (wherein, one net-day is equivalent to one net operated for one day). Calls and songs are distinguishing characteristics to certain species, and can be learned through experience, and/or recorded with the use of a microphone (with a parabolic reflector) and portable tape-recorder. This method is very useful when taking data along transect routes because in the rainforest, most of the birds are more easily heard than seen. Physical disturbance or determining the presence of the species through its roost, nests, and eggs, can help identify the bird if the nest appears distinctive (i.e., flycatchers have cup-shaped nests, and pigeons have platform nests) as well as any remains of the bird (feathers, skull, or parts of the skeleton). Captured birds are measured for their biometrics and examined for distinguishing marks which would be useful for identification of the species. These include the following (note all measurements are made in millimeters, with the use of a ruler and/or caliper): wing length; tail length; total length; tarsal length; bill length; body weight; age; sex; color of soft parts; skull ossification; fat deposition; plumage condition; and ring/band number (if present).

Mammalian Fauna

Various portable traps will be used to capture small mammals. The number of captures will be plotted against the total number of trap-nights. Some 40 to 50 traps will be employed each day to reach a total of approximately 300 trap-nights per study area. Large to medium-sized mammals can be listed through direct observations (based on direct sightings or other visible clues, like animal remains and footprints) made along the transect or within the vicinity of the site, or as unconfirmed reports acquired from ethnobiological interviews. Small non-volant/flying mammals can be surveyed using the removal trapping method described by Rickart (1993). Murid rodents and shrews can be captured in a trap-line consisting of 20 to 50 traps placed singly (one trap/station a long a pathway) at 5-15 m. intervals. The traps consist mainly of Victor snap traps, national live traps or improvised cage traps, and Sherman live traps that can be set in places where some evidences of small mammal activity can be inferred. Trap locations may include holes or burrows with possible runways, under fallen logs,

within hollow trunks, or in openings of tree root system. Most traps are placed on the ground but some can be placed on top of fallen logs, slanted trunks, and on large horizontal branches and woody vines.

Traps are baited with freshly-cooked coconut meat coated with peanut butter, and some can be baited with live earthworms (other invertebrates can also be used as bait). Earthworms proved to be effective in capturing bait-specific rodents like the vermivorous (and insectivorous) shrew-rats, forest mice, and shrews. Traps should be checked and re-baited everyday during each dawn and late afternoon to keep baits fresh and attractive (they easily loss attractiveness due to rain, spoilage, and ants).

Mist-nets employed to catch birds, should be kept open at night to be used to catch volant (flying) mammals such as bats, (also useful for catching nocturnal birds). The same number of nets and net-lines can be used for both birds and bats, but instead of measuring net-days (referring to the number of nets kept open for the day) for netting success, net-nights are applied otherwise (referring to the number of nets kept open for the night). It is important that all bats captured in the nets be removed by dawn (sunrise) to allow the nets to catch birds that are becoming active in early morning.

It is also important to guard the nets at dusk (sundown) for an hour or two thereafter to wait on small insectivorous bats that are very active at this time. These small bats are not easily captured because they often chew themselves free from the net leaving large holes on the mist-net and reducing their usefulness. It is also necessary to make last checks on the nets late at night (around 10:00 pm) to remove any bats caught on the nets. They may die from stress, starvation, and heat loss when kept hung all night until dawn (especially when it rains regularly) or even become severely entangled from struggling and cause damage to the nets. Morphological descriptions (i.e. color and condition of pelage), external, and cranial measurements of mammalian specimens are important to aid in identification. Biometrics can be performed using Pesola spring-scales, tape measure/ruler, or dial calipers. All cranial measurements should be made to the nearest 0.01 mm using a digital caliper.

Standard Field Techniques for Flora Inventory

Two methods were used in conducting the study: inventory and variable transect method (Foster et al., 1995). Inventory is the listing of all species of plants identified in every location visited. This provides a picture of all plant species that grow in the area, notwithstanding whether it is cultivated or naturally growing, found in the wild or cultivated in community gardens. Variable transect method was used to characterize selected sampling sites. This method is used to facilitate possible comparison among the sampling areas. This was adapted as method of sampling since it is a faster and easier way of sampling and identifying critical plants. The method provides a way of comparing composition and diversity of habitats and classes of plants. The transects were based on number of individuals to be sampled instead of the area while its length depends on the number of species recorded for each category. When the predetermined number of individual plants is met within the first length, for example 30 meters, the length will not be extended further. Four categories were established - emergent/trees, understorey/shrubs, herbs, and vines/llanas. For each category, a hundred individuals was chosen as the standard sampling size per area. The transect direction, the global coordinates of the site, and its elevation were also recorded.

This study will serve as a comprehensive study o Mindoro’s flora and fauna and existing vegetation/habitat types. It attempts to provide an account of plant and animal species and their distribution among different types of vegetation and eventually be able to map out the vegetational characteristics of the island.

Study sites were chosen as priority areas for field research on flora in the Mindoro faunal region. These sites were selected based on the extent of remaining forest habitats, which may harbor a number of threatened endemic species, and on the lack of sufficient information available on the area, with concern to wildlife conservation. Each study area represents a strategic location in the Mindoro faunal region.

Data Collection for Floral Inventory

Two methods were considered in conducting the study: inventory and variable transect method (Foster et al. 1995). Inventory involves the listing of all species of plants identified in every location visited. This provides a picture of all plant species that grow in the area, whether cultivated or naturally growing, and whether found in the wild or cultivated in community gardens.

Variable transect method, on the other hand, is used to characterize selected sampling sites, which may then be used to facilitate possible comparison among the sampling areas. This was adapted as method of sampling since it is a faster and easier and allows identification of critical plants. The variable transect method also provides a way of comparing composition and diversity of habitats and classes of plants.The transects were based on the number of individuals to be sampled instead of the area while its length depended on the number of species recorded for each category. When the predetermined number of individual plants is met within the first length, for example 30 meters, the length will not be extended further. Four categories were established such as emergent/trees, understorey/shrubs, herbs and vines/lianas. For each category, 100 individuals were chosen as the standard sampling size per area. The transect direction, the global position of the site, and its elevation were also recorded. A total of 18 sites in Occidental Mindoro were sampled.

Other known data on flora for the following sites in oriental Mindoro based on recent literature (1990 to present) were also included:

- Mt. Talipanan ridge forests, Brgy. Talipanan, Puerto Galera (Agoo 1996)
- Secondary forests at catchment area, Brgy. San Isidro, Puerto Galera(Agoo 1996)
- AFI Iraya-Mangyan center, Brgy. Talipanan, Puerto Galera (Agoo 1996)
- Mangroves of Medio Island and Balatero cove, Puerto Galera (Gonzalez 1992)
- Secondary forests of Mt. Alinbayan, Brgy. Tabinay, Puerto Galera (Gonzalez 1992)
- Secondary forests of Tamaraw falls, Brgy. Villaflor, Puerto Galera (Gonzalez 1992)
- Mid-montane forests of High peak, Mt. Halcon, Baco (Mandia 1997)
- Mossy forests of High peak, Mt. Halcon, Baco (Mandia 1997)
- Alpine heath forests of High peak, Mt. Halcon, Baco (Mandia 1997)
- Secondary forests of Mt Kiblatoy-Katmuran, Victoria (Gruezo 1997)
- Secondary forests of Mt Naujan, Naujan and Pola (Gruezo 1997)
- Secondary forests of Concepcion, Victoria and Socorro (Gruezo 1997)
- Swamp vegetation of Naujan Lake, Victoria and Naujan (Gruezo 1997)
- Aquatic vegetation of Lake Naujan, Naujan and Pola (Castillo 1997)
- Mt. Baco range along Bongabong rivers, Bongabong (Sinha 1990)

Sample Data Sheet for Island-wide survey

Island-wide Rapid Assessment of Terrestrial Fauna of Mindoro Island, Philippines.
Locality _____
Grid No. _____ Sheet No. _____ Map locality _____ Date _____
Habitat type/s present _____ Elevation _____
Status of habitat/s _____ Source/s _____

Indicator species for the Mindoro island-wide rapid survey	No.indiv	Remarks
Threatened island-endemic species		
Mindoro Imperial Pigeon *Ducula mindorensis*		
Mindoro Bleeding-heart *Gallicolumba platenae*		
Black-hooeded Coucal *Centropus steerii*		
Mindoro Mountain Scops-Owl *Otus mindorensis*		
Mindoro Tarictic Hornbill *Penelopides mindorensis*		
Scarlet-collared Flowerpecker *Dicaeum retrocinctum*		
Tamaraw *Bubalus mindorensis*		
Mindoro Flying Fox *Pteropus* sp.		
Mindoro Climbing Rat *Anonymomys mindorensis*		
Large Mindoro Forest Mouse *Apomys gracilirostris*		
Ilin Hairy-tailed Cloud Rat *Crateromys Paulus*		
Mindoro Anglehead *Gonocephalus interupttus*		
Threatened/near-threatened island-endemic subspecies		
Blue-crowned Racquet-tail Parrot *Prioniturus discurus mindorensis*		
Philippine Hanging-Parrot *Loriculus philippensis*		
Philippine Hawk-Owl *Ninox philippensis mindorensis*		
White-bellied Woodpecker *Dryocopus javensis mindorensis*		
Black-bibbed Cicadabird *Coracina mindanensis elusa*		
Mangrove Blue-Flytcatcher *Cyornis rufigastra mindorensis*		
Green-backed Whistler *Pachycephala albiventris mindorensis*		
Mountain Shrike *Lanius validirostris tertius*		
Golden-yellow White-eye *Zosterops nigrorum mindorensis*		
Mindoro Lowland Scops-Owl *Otus* sp.		
Bar-bellied Cuckoo-shrike *Coracina striata mindorensis*		
Mindoro Warty Pig *Sus philippensis oliveri*		
Mindoro Brown Deer *Cervus mariannus barandanus*		
Other threatened, near-threatened or restricted-range species		
Philippine Hawk-Eagle *Spizaetus philippensis*		
Tabon Scrubfowl *Megapodius cumingii*		
Spotted Imperial-Pigeon *Ducula carola*		
Nicobar Pigeon *Caloenas nicobarica*		
Philippine Cockatoo *Cacatua haematuropygia*		
Blue-naped Parrot *Tanygnathus lucionensis*		
Ashy Ground-Thrush *Zoothera cinerea*		
Rufous Paradise-Flycatcher *Terpsiphone cinnamomea*		
Luzon Water-redstart *Rhyacornis bicolor*		

Indicator species for the Mindoro island-wide rapid survey	No.indiv	Remarks
Indigo-banded Kingfisher *Alcedo cyanopectus*		
Chinese Egret *Egretta eulophotes*		
Philippine Duck *Anas luzonica*		
Mindoro Shrew *Crocidura mindorus*		
Mindoro Striped Shrew-Rat *Chrotomys mindorensis*		
Large Rufous Horseshoe Bat *Rhinolophus rufus*		
Philippine Crocodile *Crocodylus mindorensis*		
Indo-Pacific/Saltwater Crocodile *Crocodylus porosus*		
Philippine Sail-fin Lizard *Hydrosaurus pustulatus*		
Other non-threatened Philippine endemic/resident species		
Philippine Serpent-Eagle *Spilornis holospilus*		
Philippine Falconet *Microhierax erythrogenys*		
Pink-bellied Imperial-Pigeon *Ducula poliocephala*		
Philippine Pygmy Woodpecker *Dendrocopus maculatus*		
Coleto *Sarcops calvus*		
Red Junglefowl *Gallus gallus*		
White-bellied Sea-Eagle *Haliaeetus leucogaster*		
Green Imperial-Pigeon *Ducula aenea*		
Pied Imperial-Pigeon *Ducula bicolor*		
Greater Flameback *Chrysocolaptes lucidus*		
Malay Monitor Lizard *Varanus salvator*		
Reticulated Python *Python reticulatus*		
Long-tailed Macaque *Macaca fascicularis*		
Malay Civet *Viverra tangalunga*		
Common Palm Civet *Paradoxurus hermaphrodites*		
Other indicators for habitat condition		
Limestone caves with bats		
Large Stangling figs *Ficus* sp. with fruits or “Balete”		
Large trees with nest-holes or cavities for nesting		
Flying fox colonies (*Pteropus* sp.)		

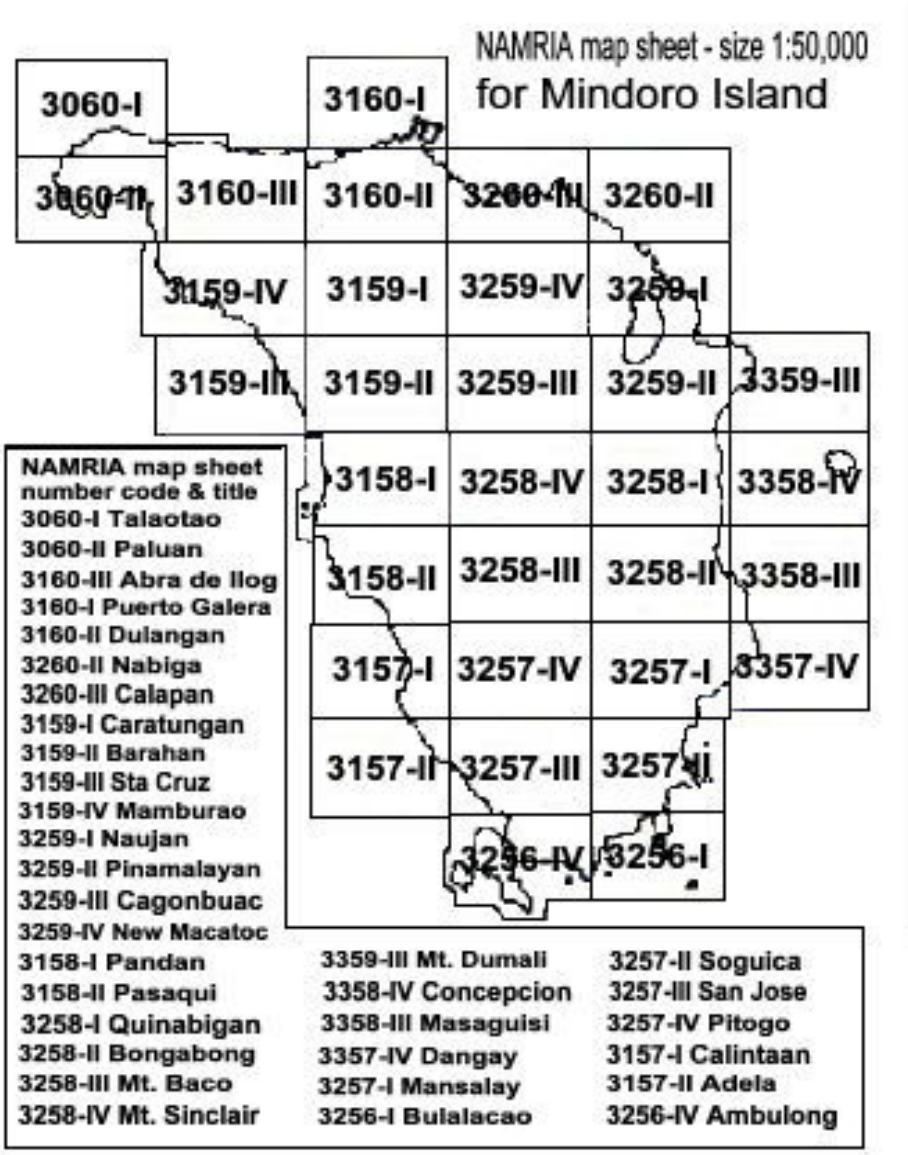
In addition to the surveys and interviews, courtesy calls and meetings with the officials of local governments (part of the prior informed consent (i.e., governor, mayors, barangay captains, Mangyan elders) were made to follow proper protocol in acquiring permission to conduct surveys, and field inventory of fauna and flora in the chosen sites. Direct observations and notes from interviews (with emphasis on date and place of observation) were plotted into grids on the map of Mindoro Island. The resulting map plots showed the distribution of important indicator species (mostly threatened and/or endemic island species).

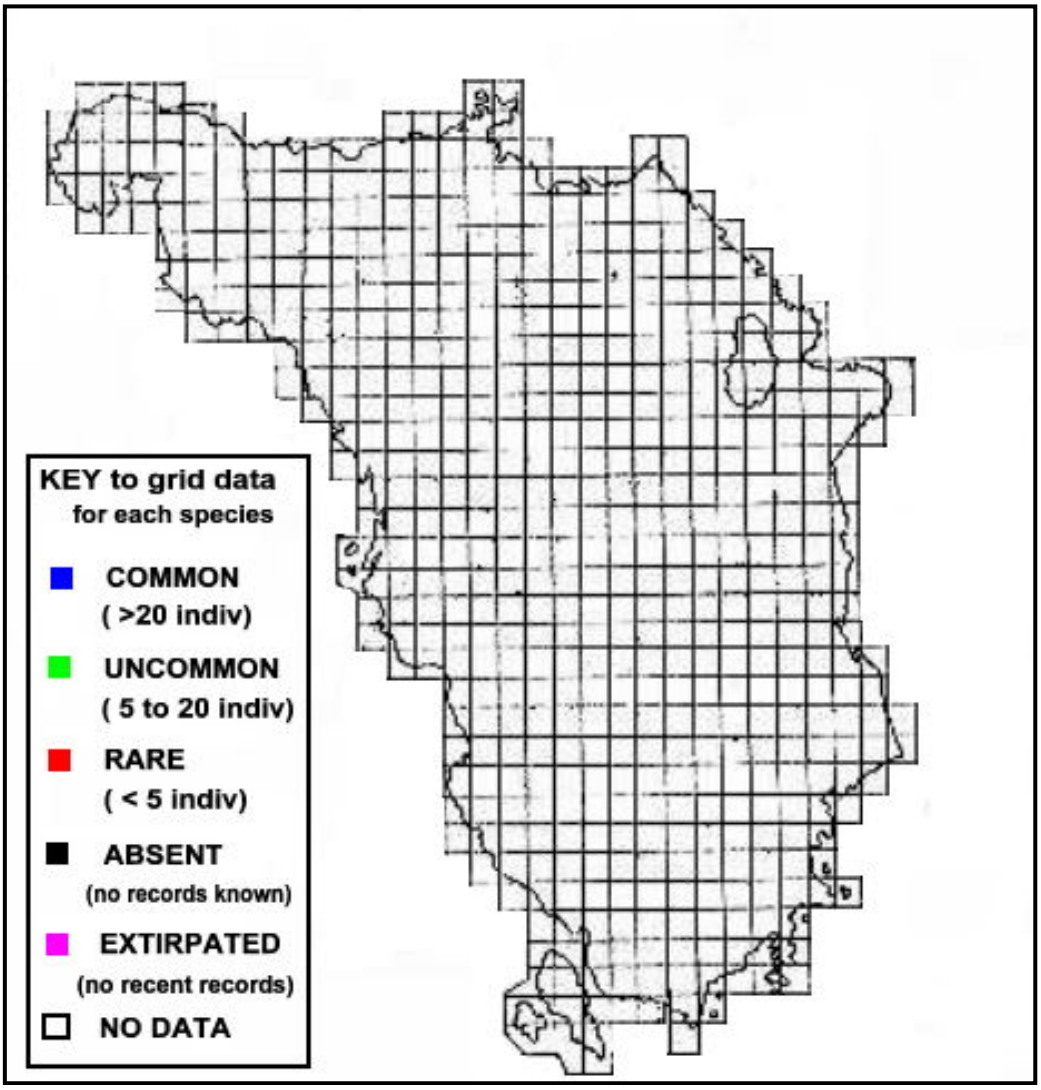
Sites visited include the Mangyan communities in Brgys Balete, Paitan, Masagana, Kagburan, and Evangelista in Naujan; Villa Cerveza and Alcate in Victoria; and Baet in Mansalay. These preliminary surveys were necessary for establishing the priority sites for Oriental Mindoro, wherein the standard field inventories were conducted.

Confirmation of reports of fauna can be based on physical evidences, such as direct observation, specimens, skeletons or other remains, calls, footprints and scats, or photographs. These key indicator species usually represent Mindoro's endemic species which are most threatened by habitat loss and human disturbance. These include species which are considered to be endemic only to Mindoro, and where the status are known to be (to some degree) rare or endangered. The Mindoro endemic birds and mammals, most of which are considered to be critically threatened, include the Mindoro hornbill, black-hooded coucal, Mindoro imperial-pigeon, Mindoro mottle-winged flying fox, and the Ilin Island bushy-tailed cloud rat. Other non-island endemic plants and animals, which are nonetheless endemic to the Philippines and have similar threatened status, are also included in the list of species to be highlighted in the interviews and field observation. Among these are the Philippine teak, Philippine cockatoo, Philippine crocodile, Philippine hawk-eagle, golden-crowned flying fox, and little mottle-winged flying fox. Some of these species may have restricted ranges, or widespread but have declined significantly in recent years. Other species are also important because they have existing Mindoro endemic subspecies or races. Other species to be considered are those that are readily recognized by local people (ethno-biologically significant) due to their significance in cultural or religious practices, or have direct effects on their livelihood (like pests). Some are simply commonly seen or heard and are too large or loud to be conspicuous, and may be popular as a pet or hunted for food. These species often have distinct vernacular or local names and are easily recognized by most members of the community.

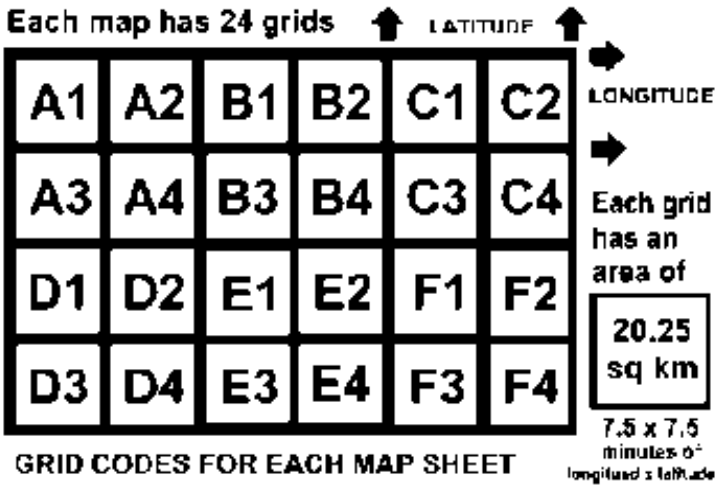
The Grid mapping method was used to determine presence/absence and abundance of indicator species and plot out the status on maps for these indicator species and conservation status. Indicator species included significant island endemic species and subspecies, threatened species, and ethnobiologically significant species of fauna and flora. Grid sampling also incorporates previous records to show mapping of historical background (previous status); in comparison with the remaining forests and other habitats in order to compare the current status and ecology, history, changes in forest cover/habitats, and disturbance gradients. Map information derived from the use of the old series of topographic maps from NAMRIA (DENR) due to the lack of a complete NT series available for Mindoro Island (with a few exceptions; NT series were printed for Lubang Islands and Semirara Island). The NT series was developed to replace the older versions and provide more up-to-date topographic maps, unlike the older series which were based mostly from data taken in the 1960's and 1970's. Much has changed in the geo-political, infrastructure, and vegetative cover of the island in past 30 to40 years. Information produced by this island-wide survey can be used to review these maps and add or plot the necessary updates and corrections based on direct ground surveys and interviews.

Summary and analysis of data derived from surveys conducted from 1998 to1999 were compared with previous studies and current/recent status of habitats/species to determine the overall status of Mindoro Island. These comparisons were intended to provide insight on the development of other management plans and priority listings recommended by previous programmes that were unable to put existing local plans into context. These include local watershed areas, and re-designated or new protected areas; recent management initiatives of the local DENR and/or the Provincial Government (i.e., RG Valencia's extensive plans for tree plantations); recent compilations developed by different conservation organizations (i.e., CI Philippines, BirdLife International–Philippines, Cambridge Philippine Rainforest Project, DENR-CPPAP, NIPAP, PAWB, some which were mostly maps with some details discussed). Putting all of these issues into perspective with regards to the current results from this survey offers a far different approach to the selection of sites most important for biodiversity conservation. These different conservation prospectus must be considered in the new management plan in order to identify priority sites for habitat protection/management.





Map of Mindoro Island showing the relative position of the active grids used to conduct the MBCP rapid island-wide survey (each grid is approx. 20 sq km).



RESULTS OF ISLAND-WIDE SURVEY OF MINDORO ISLAND

Mindoro Island has suffered severe deforestation within this century, brought about by extensive logging and clearing of forests for agriculture due to increasing population pressure (including the massive influx of landless migrants from other islands). Rapid degradation has left Mindoro island with only 8.5 percent of its original forest cover (ESSC 1999; SSC 1988). Much of these remaining forests are now concentrated in the uplands, particularly the mid-montane and mossy forests found above 1,000 masl. A total of 871 square kilometers of forest remain on the island (based on estimates made in 1988), of which 140 square kilometers are mossy forests, 704 square kilometers are lowland (of which only 203 square kilometers are closed canopy) and 27 square kilometersare mangroves (Dickinson et al 1991). Unfortunately, much of the destructive practices done on these forests still continue to the present, with the rapidly increasing demand for forest resources and land due to rising human population. Probably about half of the remaining forests in 1988 may have already been cleared, although no recent estimates of forest cover are known. Current evidence of continued logging activities in the remaining accessible forest patches were observed within the municipalities of Baco and San Teodoro, in Oriental Mindoro, and also observed in Sablayan and Ylin Island (San Jose), Occidental Mindoro. However, it is clearly visible that nearly all these remaining forest blocks are seriously fragmented.

Significantly, the high endemism and very restricted range of Mindoro's wildlife coupled with the rapidly decreasing forest habitat, has led much of the island's flora and fauna neatly at the brink of extinction. Unless immediate actions are done to stop and prevent further habitat loss, many of Mindoro's unique biological diversity will disappear. As such, Mindoro has been considered as one of the world's most important hotspots for biodiversity conservation, apparently due to the high number of threatened species (most of which are endemic only to the island). Particular international interest is given for taxa that are regarded as among the world's most critically threatened wildlife such as the tamaraw, Mindoro warty pig, Mindoro hornbill and the black-hooded coucal. With this high global concern for protecting the remaining forests of Mindoro, urgent measures need to be adopted and priority areas for conservation on the island be designated. In this regard, valuable baseline information are significant for developing management schemes and support the necessary action plans for protecting an integral part of Mindoro's natural heritage.

Results of these surveys are important for establishing the necessary baseline information in order to help protect these forest sites, and apply the needed conservation measures. Further knowledge on the ecology and distribution of various endemic and threatened taxa were determined, and were valuable to establishing a current status report for each important species. Among the most significant bird records made in 1998 to1999 were confirmed observations of the Mindoro hornbill, Mindoro bleeding-heart, scarlet-collared flowerpecker, black-hooded coucal, Mindoro colasisi, Mindoro blue-crowned racquet-tail, and spotted Imperial Pigeon.

Apprently, the results of the grid sampling method for the status and distribution of both the Mindoro hornbill and a selected group of indicator species all around the island showed relatively similar areas where their populations are concentrated. It can be assumed that the island-endemic Mindoro hornbill provides a possible representative data set that can also reflect the distribution of all the other important threatened and endemic forest species of Mindoro. In any case, it appears that for both maps, all these critically important forest indicators are found in highly restrictive and fragmented habitats that remain throughout the island. At this point, these already limited areas offer little assurance for the survival of most of these endemics and that they would continue to have viable

populations unless these remaining fragments are protected and more areas restored to provide vital corridors connecting now isolated populations.

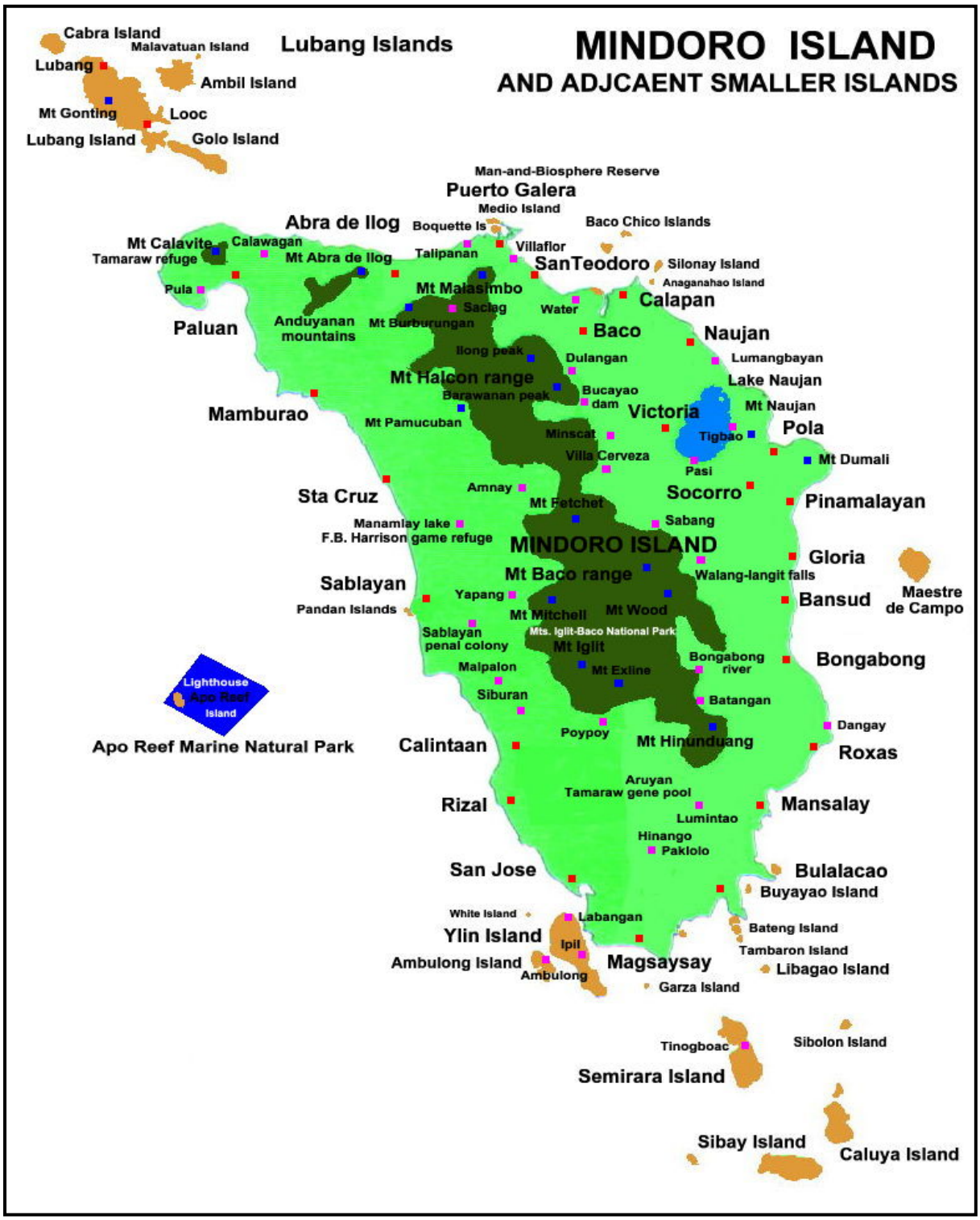
List of Identified important forest, wetlands, and marine sites based on island-wide surveys on Mindoro conducted by MBCP 1998 to1999

1. Mindoro Occidental

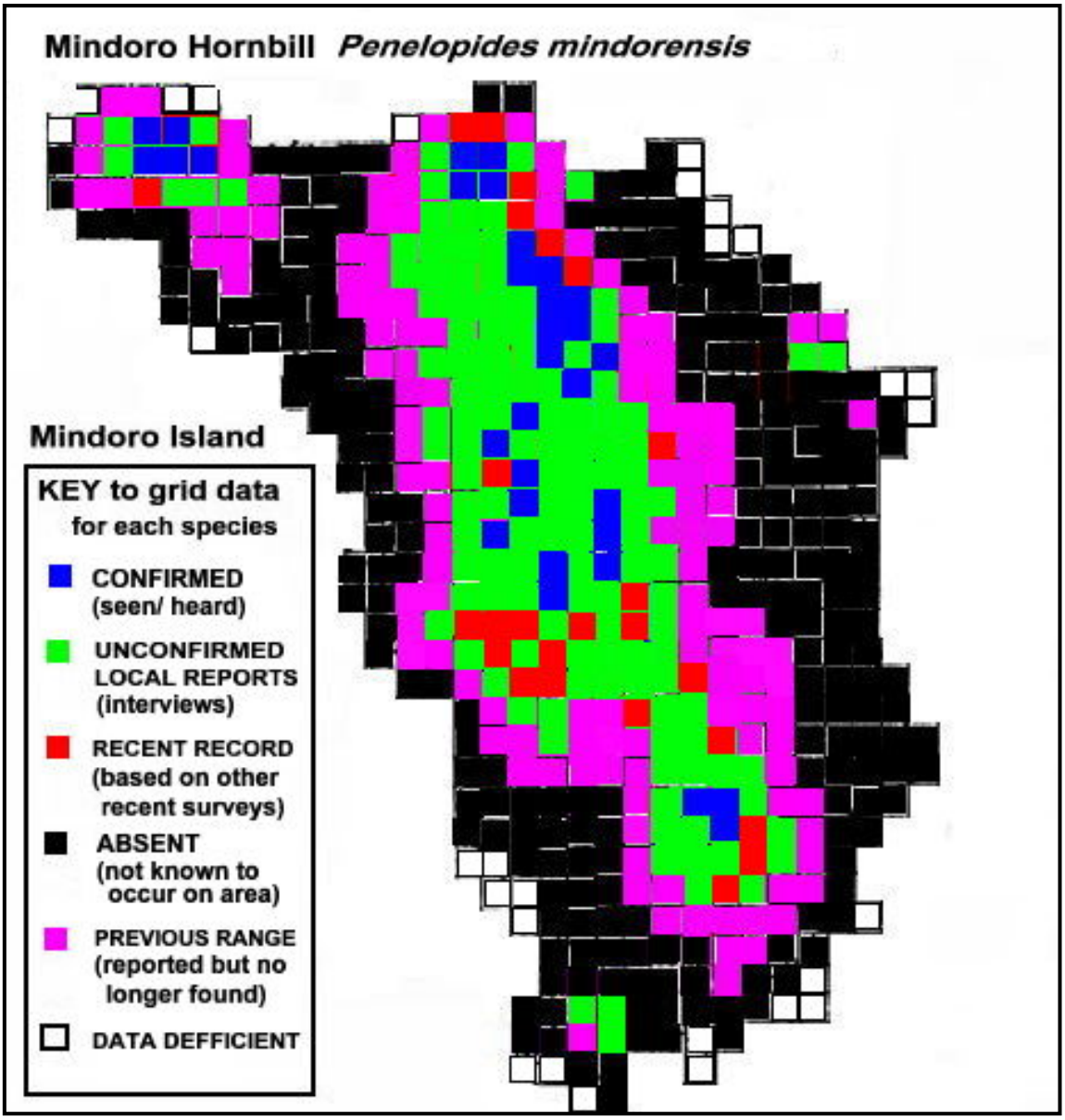
- Mt. Calavite and Calawagan River Watershed Paluan
- Lubang & Ambil Islands – Lubang
- Ilomano & Mt. Abra de Ilog range – Abra de Ilog – Mamburao
- W Mt. Talipanan range – Abra de Ilog
- W Mt. Halcon range – mamburao – Sta. Cruz & Anduyanan mtns.
- Amnay watershed
- F. B. Harrison Game Reserve & Manamlay Lake
- Colasisi & Mt. Sinclair
- W Mts. Iglit-Baco National park & Victoria gorge – Sablayan Calintaan
- Pandan Islands
- Siburan (Sablayan Penal Colony)
- San Jose-magsaysay mountain range
- Ilin & Ambulong Islands
- Apo reef/Lighthouse Island/Natural Park – Sablayan
- Aruyan mountains
- Rizal-Calintaan, Sablayan-amnay & mamburao-Sta. Cruz floodplains, estuaries & other wetlands

2. Mindoro Oriental

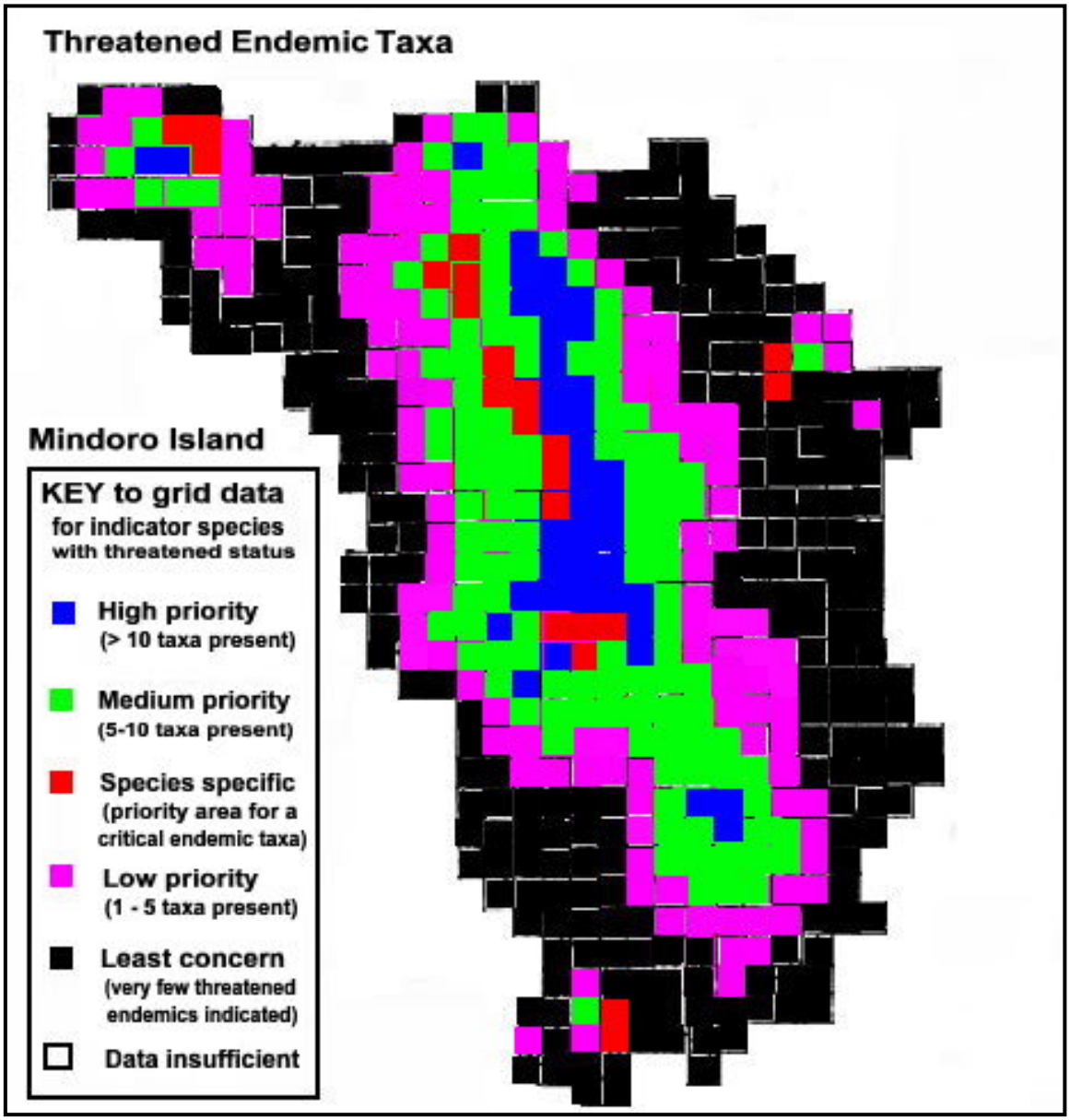
- Talipanan-Malasimbo mountain range
- Baco-San Teodoro-mamburao Saddle (between Malasimbo & halcon)
- Coastal/Marine Puerto Galera & San Teodoro & Calapan Islands
- E Mt. Halcon mountain range along Alag, Dulangan and Baco-Bucayao rivers
- Naujan Lake and Calapan-Naujan-Vicoria-Pola floodplains
- Mt. Naujan
- San Luis-Villa Cerveza & Socorro-Victoria Mtns.
- NE Mt. Baco range, Mt. Wood & Mt. Merrill
- SE Mt. Baco range
- W Mt. Baco & Central peak
- Roxas-Bongabong-Bansud floodplains & coasts
- Lumitao valley-mansalay-Bulalacao mtns.
- Coastal Mansalay-bulalacao & small Islands



A generalized geo-political map of Mindoro Island, Philippines, indicating a various localities visited during the 1998-1999 MBCP rapid island-wide survey.



Map of Mindoro Island showing the distribution of the threatened endemic Mindoro Tarictic hornbill (*Penelopides mindorensis*) records on designated grids based on the results of the MBCP rapid island-wide survey 1998-1999.



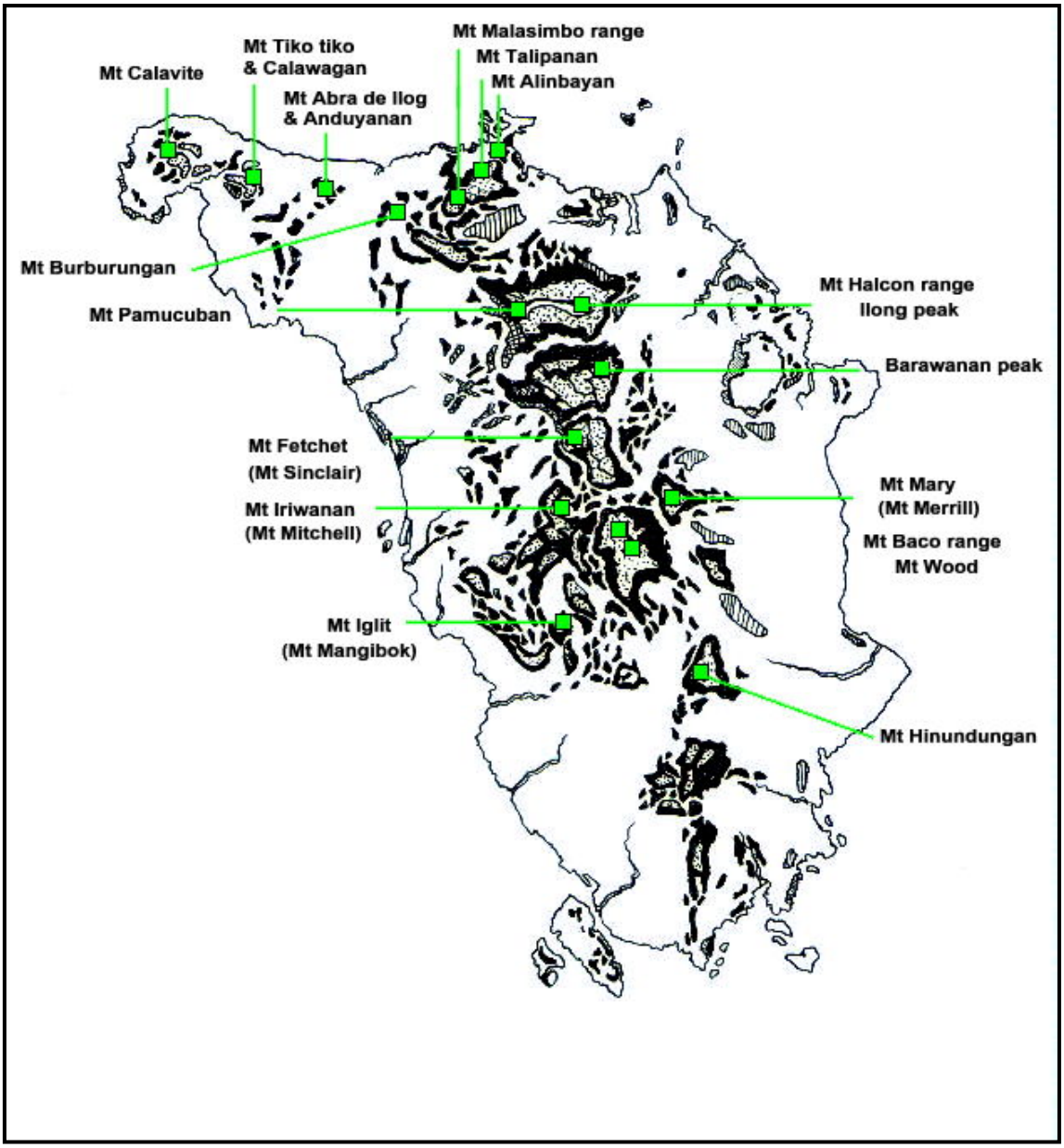
Map of Mindoro Island showing the distribution of threatened endemic taxa used as indicator species for selecting sites for biodiversity conservation. Priority status are designated on grids based on results of the MBCP rapid island-wide survey 1998-1999.

Based on the accounts made from the grid sampling method, important areas where critically important indicator species were found to concentrate in isolated forest fragments that remain near or within the rugged mountain interior of Mindoro Island. This was further supported by taking into consideration the current areas where both old growth and secondary forest habitats remain, based on direct ocular observations which more clearly provides an estimation of the extent of forest cover for the entire island. In such cases, most of the Mindoro forest-dependent endemics are now seriously isolated from other adjacent populations with the increasing encroachment and disturbances in these previously inaccessible upland areas.

It is important to note that not all the indicator species used for this grid mapping survey were entirely forest-dependent species, but other equally critically-threatened species were also included. Thus, the inclusion of other non-mountain forest sites among the selected priority sites which appear to provide the most extent of forest cover among all the other sites sampled, and contains the most number of indicator species noted for that locality. Among these non-forest sites were remote coralline limestone islands of greater importance to the marine environment than to terrestrial systems, but nonetheless important as feeding or breeding areas for other threatened species. Listed below is a summary of 12 suggested sites for priority biodiversity conservation for Mindoro island, based on the results of the grid sampling methods and direct observations made from ground surveys of the remaining habitats (forests, wetlands, coastal areas) important to threatened and endemic species from Mindoro.

List of 12 selected priority sites for biodiversity conservation in Mindoro Island

1. Mt. Calavite, Mt. Ilomano, and Mt. Abra de Ilog
2. Mt. Malasinbo-Talipanan mountain range & Baco-San Teodoro saddle
3. W Halcon range & Andulayan mountains
4. E Halcon range to Amnay watershed
5. Villa Cerveza and Colasisi, andFB Harrison
6. Mt. Iglit to Siburan & Aruyan mountains
7. Mt. Baco range to Victoria gorge
8. Naujan Lake & floodplains & Mt. Naujan
9. Mansalay-Bulalacao & San Jose-Magsaysay mountains
10. Ilin, Ambulong, and Bulalacao Islands
11. Apo Reef & Pand Islands
12. Puerto Galera-Calapan Islands/coasts



Map of Mindoro Island showing relative forest cover, old growth shown as spotted areas, Disturbed secondary as black areas and reforestation as stippled/striped areas. With particular reference to selected priority sites based on the results of the MBCP rapid island-wide survey, 1998-1999.

STATUS OF SELECTED INDICATOR SPECIES FOR MINDORO

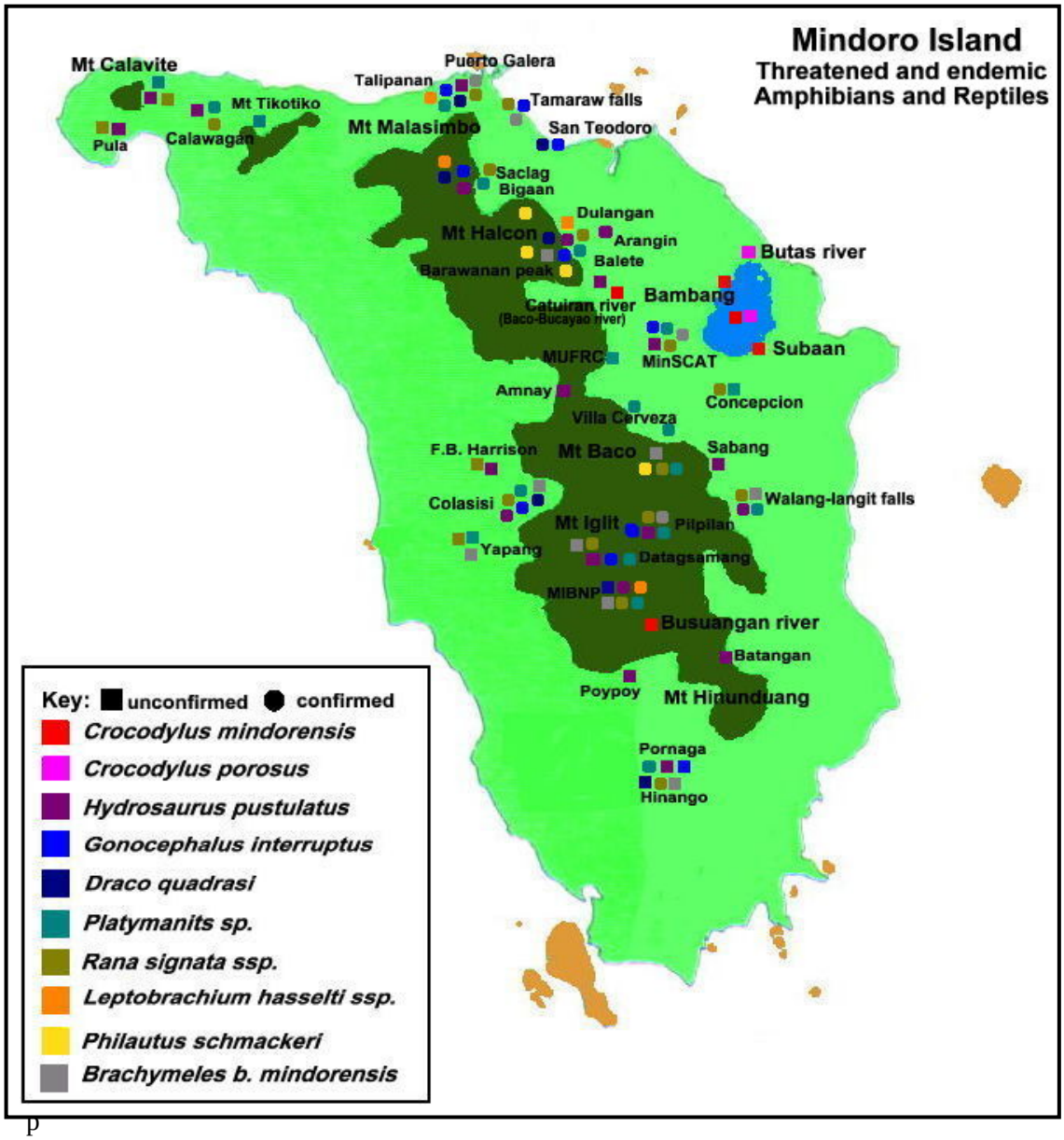
AMPHIBIANS AND REPTILES:

A total of 94 species of Herpetofauna (Amphibians and Reptiles) have been recorded on Mindoro island, which constitutes some 18 species of amphibians and 76 species of reptiles. Among these many taxa, only a few selected species were included as important indicators primarily on the basis of threatened status and/or restricted distribution as island endemic species. On this account, a collective dataset for their current distribution taken from both direct observations and interviews provide a relatively reasonable estimated of the remaining populations, possible restricted ranges, or even lack of sufficient observation due to their highly cryptic nature to be poorly observed or simply the inherently limited population size.

As with the case of the widespread species of litter toad (Pelobatidae) known as Hasselt's Pelobatid frog (*Leptobrachium hasselti*), which has a relatively small range based on its limited distribution to the forests of northeast Mindoro, and thus appears to be restricted either by habitat preference or isolation by mountains. Whereas, the more common and widespread diminutive frog species of lowland forests such as the corrugated forest frog (*Platymantis corrugatus*) and common forest ground frog (*Platymantis dorsalis*) appears were rather common to locally common in the remainingold growth and secondary lowland to mid-montane forests all around Mindoro. Recent taxonomic changes in the general species composition and biogeographic partitioning of the major islands of the Philippines results in an explosion of many new species of this genus, all endemic to only one island or mountain range. With nearly all the major and even minor islands having distinct populations of forest frog species, it is rather unlikely that no known endemic taxa exists on a well recognized Pleistocene isolate like Mindoro. According to various accounts made by prominent herpetologists, it seems very possible, given a thorough systematic review and a wider series of collected specimens to analyze, that several new and possibly endemic species of *Platymantis* would be described for the island. As such, the genus *Platymantis* is an important group of forest frogs that needs to be given more critical consideration for conservation.

A very similar account can be noted for the following five island-endemic taxa, that were selected as important indicators species. Their highly limited island range and their more restrictive preference for habitats increases the concern for their conservation and the protection of their remaining habitats. Among these island-endemic taxa were the still undescribed Mindoro taxa of the variable-backed frog (*Rana signata*), the poorly known endemic Rhacophorid, Schmaker's tree frog (*Philautus schmakeri*), the rarely seen and cryptic Mindoro burrowing skink (*Brachymeles boulengeri mindorensis*), the rarely observed Agamids, namely the Quadras' flying lizard (*Draco quadrasi*), and the Mindoro anglehead (*Gonyocephalus interruptus*).

In addition to these unique island taxa, were species which have been known to occur on Mindoro but have been rarely observed, much like the rest of their range in the Philippines. These include the white-spotted anglehead (*Gonyocephalus semperi*) and the dark-spotted anglehead (*Gonyocephalus sophiae*). Other species included as critical indicators are well recognized as threatened species due to their extensive history of perturbation, habitat loss, and hunting pressure. These are the Philippine sailfin lizard (*Hydrosaurus pustulatus*), the Philippine crocodile (*Crocodylus mindorensis*) and the saltwater crocodile (*Crocodylus porosus*). Five other species that were notable but no longer included in the maps for their rapid decline based on the interviews and consistent lack of observations include the Malayan freshwater turtle, green sea turtle, hawksbill turtle, Malay water monitor lizard, and the reticulated python.



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of Mindoro Island showing the distribution of records for significant species/ taxa of amphibians and Reptiles (island endemic & threatened species) based on the results of the MBCP rapid island-wide survey 1998-1999

Birds

More than 300 species of birds have been recorded on Mindoro Island, a quarter of which are known to be endemic only to the Philippinesand three quarters to be seasonal migrants. Mindoro also harbors a rich island-endemic bird fauna, where six or so species are found to occur only on the island and nowhere else, particularly restricted to forest habitats as a result they have been included in the threatened list. Because of the serious deforestation of the island, these island-endemics were considered to be among the most critically endangered birds in the world. In addition to these island-endemic species, are a number of island-endemic subspecies and races which also deserve an equal degree of conservation attention.

A number of bird species have not been recently recorded on Mindoro Island and may have been extirpated like all other island populations in most of its previous range in the Philippines. Among these birds were the oriental darter and woolly-necked stork. Other species were known to be widespread but have declined significantly from its original range, but still occur in isolated accounts around Mindoro, namely the Tabon scrubfowl and the endangered migratory Chinese egret. Other species are already restricted due to their endemism to the Philippines, but have also been known to have declined rapidly in recent times throughout its range. They still appear to survive in scattered populations around the island this is particularly true for two threatened endemic birds the Philippine duck and the Philippine hawk-eagle.

Many of the unique and threatened birds known to occur on Mindoro Island are included in the list of indicator species due to relatively higher incidence of observations by both the survey team, previous records, and accounts by local people. As such, a larger dataset has been given to these threatened and endemic birds some of which have been pooled together in their common taxonomic groups as with the case of the pigeons, parrots, and owls, which have been popular species for illegal trade/hunting and easily succumb to serious habitat loss. Greater importance is given to the endemic Mindoro hornbill which greatly represents much of the status and distribution of all the other indicator species aside from the fact that it is one of the islands's critically endangered endemic species. Additional maps were plotted for the status and distribution of two other sets of island endemic birds all at the subspecific level or race which are grouped by their relative abundance in the island. One group of endemic races were composed of species known to be rare or have declined significantly, whereas the the other group represents island endemic species which are known to occur fairly well throughout the island.

Among the important observations pointed out by the survey was the confirmation of several rare and threatened endemic birds that have been poorly known due to limited or absecnt recent evidence. Or these could be known to be in lesser threat but have been evaluated in this survey to have declined significantly due to rapid habitat conversion on the entire island. Among these important bird species include the pigeons (Columbidae), such as the island-endemic Mindoro imperial-pigeon, threatened spotted imperial-pigeon, and pied imperial-pigeon, the critically endangered Mindoro bleeding-heart, and the Nicobar pigeon. Also included as indicator bird groups were the parrots (Psittacidae), which include the Philippine cockatoo, an endemic race of the blue-crowned racquet-tail, the declining blue-naped parrot, and the rarely seen endemic race of the Philippine hanging-parrot. The owls (Strigidae) are well represented on Mindoro and includes several taxa within the faunal region, such as the endemic Mindoro scops-owl, the widespread Mantanani scops-owl (race *romblonis* from Semirara, brown hawk-owl (with two races, endemic and migrant), Philippine hawk-owl whose Mindoro race is now considered distinct by some biologists, the uncommon short-eared owl and a

possible unknown owl of the genus *Otus* which was reported to be similar to the endemic lowland scops-owl.

The endemic birds of Mindoro were split into two based on altitudinal requirements:

Predominantly lowland species that persist in primary or old growth to secondary lowland forests below 300 to500 meters elevation (some reach up to 800 to900 meters but not more than that). This includes *Gallicolumba platenae, Penelopides mindorensis, Centropus steerii, Dicaeum retrocinctum*, and *Ninox philippensis mindorensis* (= *Ninox mindorensis*). It also includes two non-Mindoro endemic but equally important restricted-range Philippine endemic species such as *Zoothera cinerea* and *Pachycephala albiventris.* Other endemic birds (but not restricted in range) includes the *Spizaetus philippensis, Ducula carola,Tanygnathus lucionensis, Cacatua haematuropygia*, *Alcedo cyanopecta*, and *Anas luzonica*.

Island-endemic races from lowland Mindoro includes the following:

Loriculus philippensis mindorensis, Prioniturus discurus mindorensis, Centropus viridis mindorensis, Coracina striata mindorensis, Coracina mindanensis elusa, Cyornis rufigastra mindorensis, Ixos philippinus mindorensis, Dryocopus javensis mindorensis, Megalurus timoriensis mindorensis, and *Zosterops nigrorum mindorensis.*

Predominantly montane species that persists in primary to secondary montane to mid-montane forests from 1,000 meters up (rarely go down beyond 500 meters elevation). This includes *Ducula mindorensis, Otus mindorensis,*and *Lanius validirostris tertius*.

Island-endemic races from montane Mindoro includes the *Brachypteryx montana mindorensis, Turdus poliocephala, mindorensis,* and *Zosterops montana halconensis,*

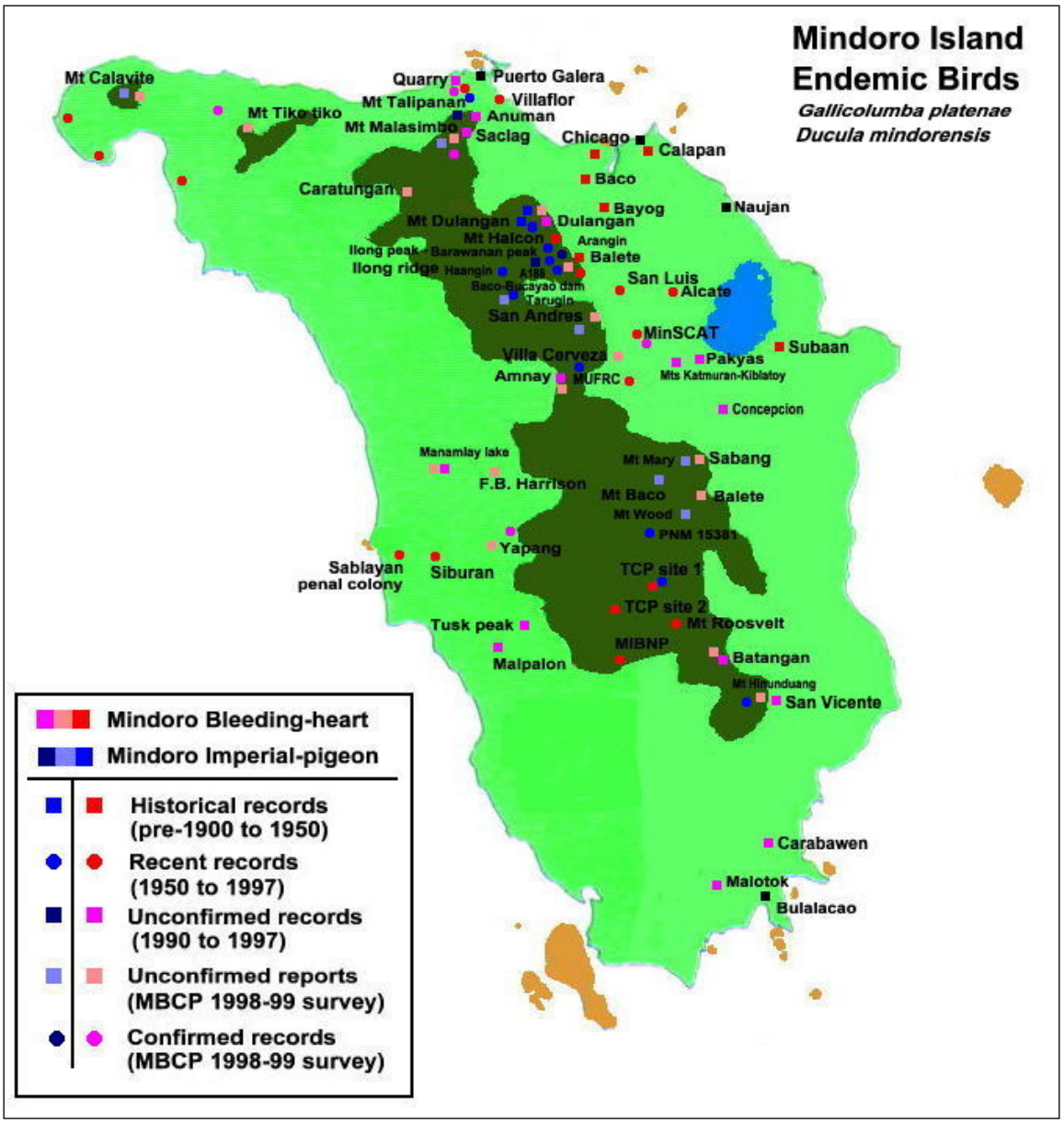
Other Philippine endemic species included were *Rhyancornis bicolor.*

Endemic taxa of birds recorded for Mindoro, several of which are seriously threatened:

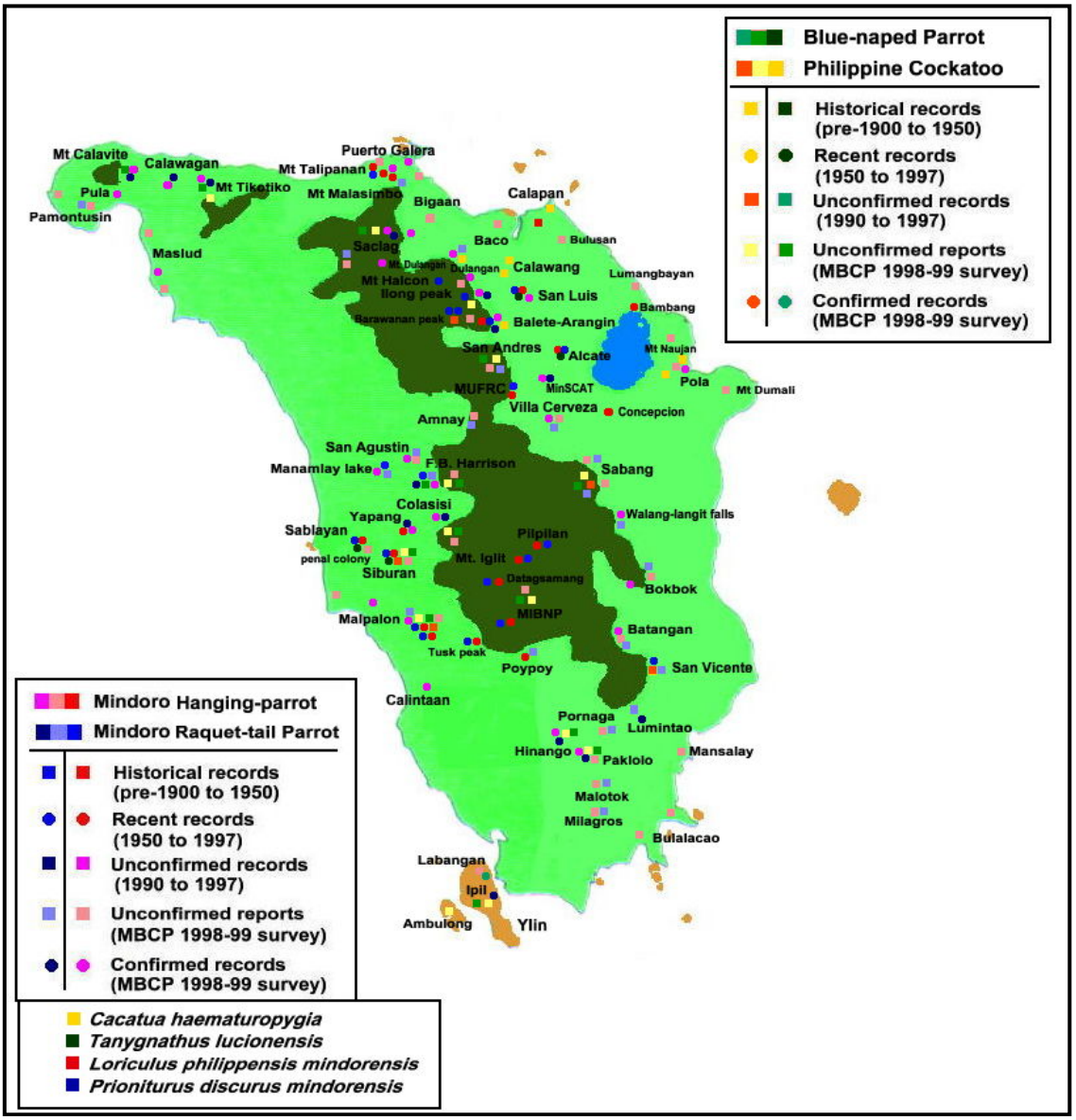
Common Name	Scientific Name	IUCN Status
Mindoro bleeding-heart pigeon	*Gallicolumba platenae*	CR
Mindoro imperial pigeon	*Ducula mindorensis*	EN
Spotted imperial pigeon	*Ducula carola*	NL
Philippine hawk eagle	*Spizaetus philippensis*	NL
Mindoro scops owl	*Otus mindorensis*	VU
Mindoro hawk-owl	*Ninox mindorensis*	NL
Philippine cockatoo	*Cacatua haematuropygia*	CR
Blue-naped parrot	*Tanygnathus lucionensis*	NL
Blue-crowned racquet-tail	*Prioniturus discurus mindorensis*	NT
White-bellied woodpecker	*Dryocopus javensis mindorensis*	NL
Mindoro tarictic hornbill	*Penelopides mindorensis*	EN
Black-hooded coucal	*Centropus steerii*	CR
Mountain shrike	*Lanius validirostris*	NT
Ashy thrush	*Zoothera cinera*	VU
Black-bibbed cicadabird	*Coracina mindanensis*	VU
Green-backed whistler	*Pachycephala albiventris*	LC
Scarlet-collared flowerpecker	*Dicaeum retrocinctum*	CR

Note: N.B. Endemic taxa are highlighted

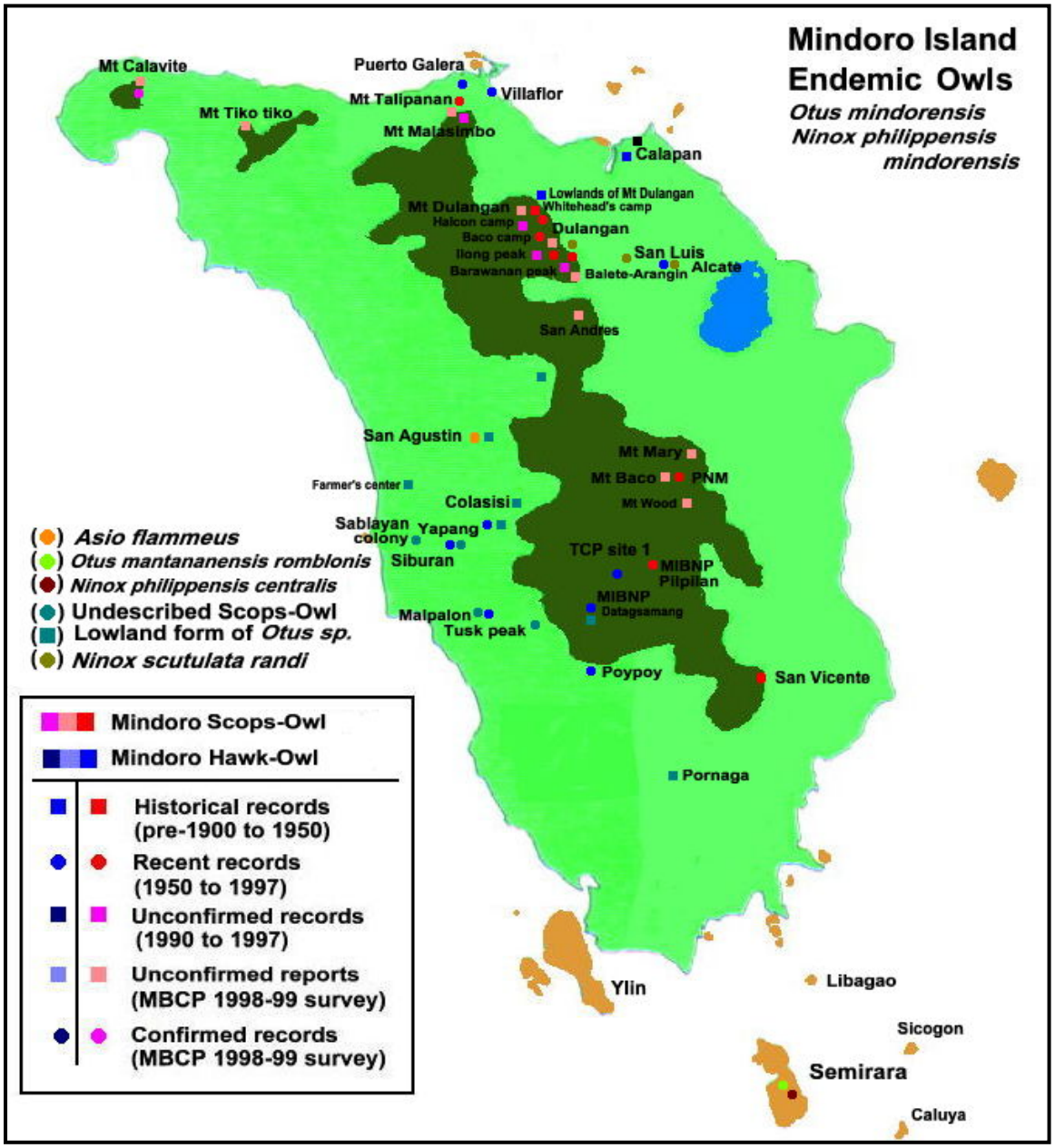
IUCN status categories as follow: CR = critically endangered, EN = endangered, VU = vulnerable, NT = near-threatened, LC = least concern (but restricted range). The designation NL means that though the taxon is not listed by IUCN, it is nonetheless considered threatened.



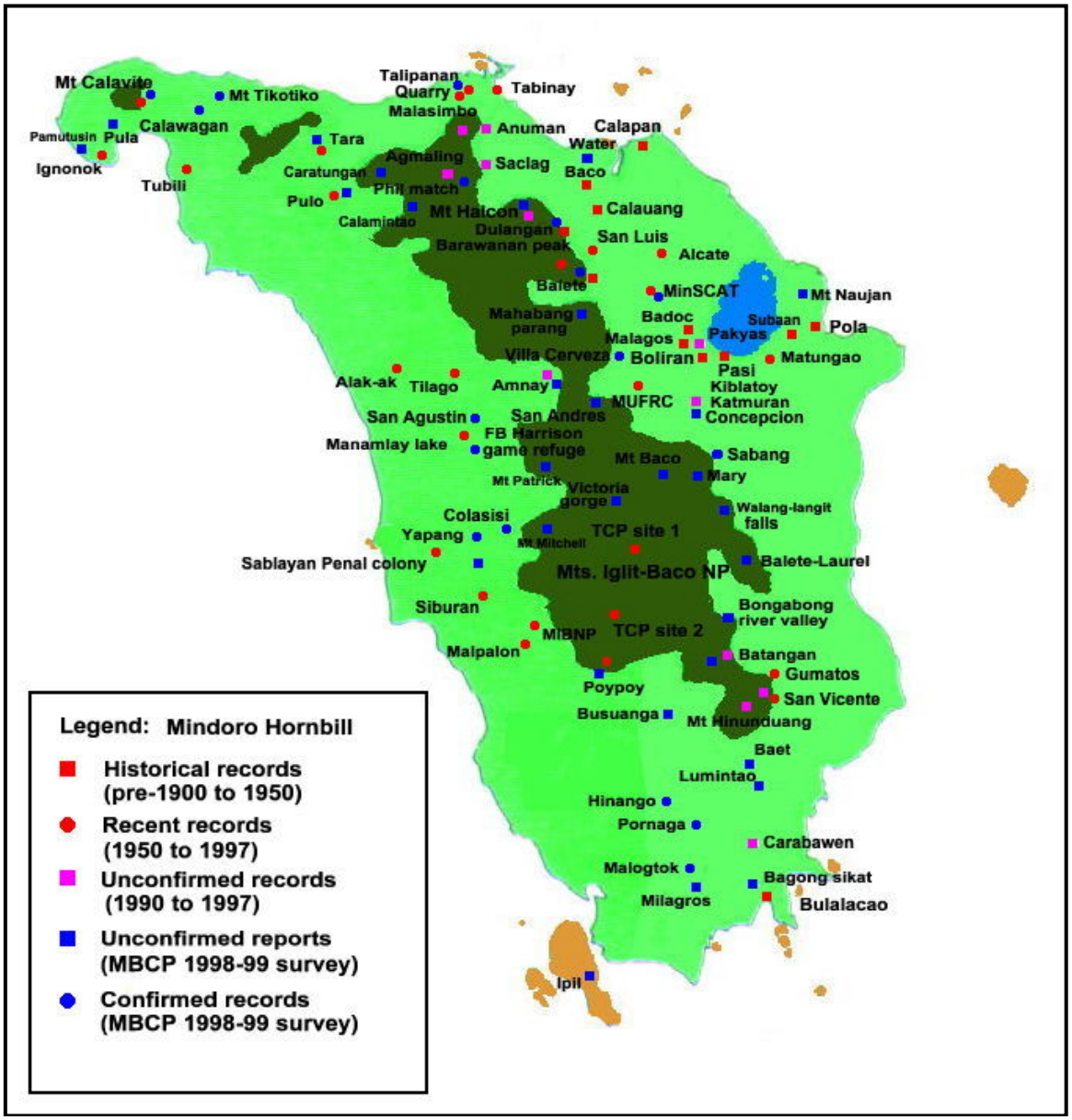
Map of Mindoro Island showing the distribution of records for threatened island endemic Pigeons (Columbidae: Columbiformes) based on the results of the MBCP rapid island-wide survey 1998-1999.



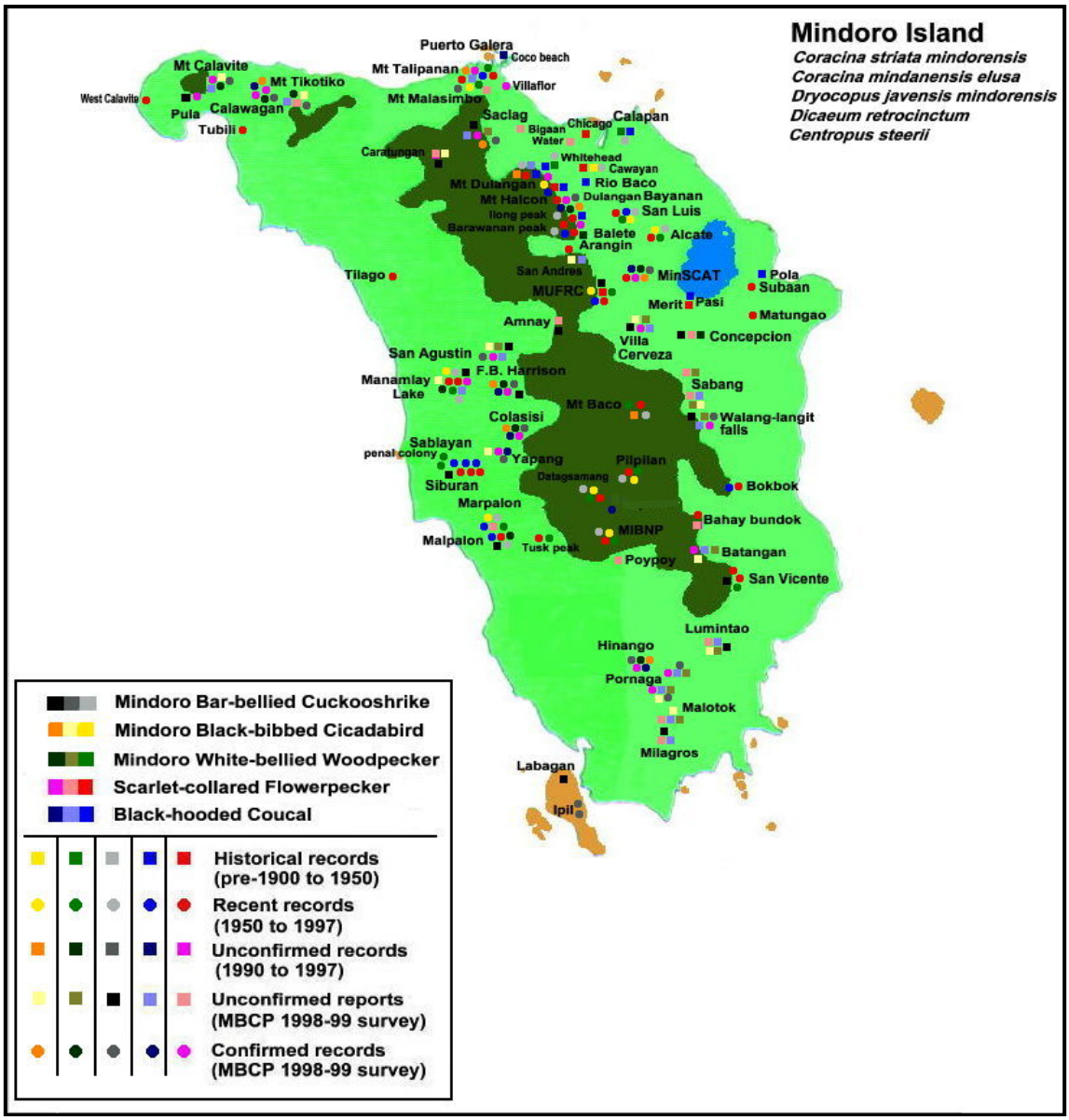
Map of Mindoro Island showing the distribution of significant records of different Parrot taxa (Psittaciformes) based on results of the MBCP rapid island-wide survey 1998-1999.



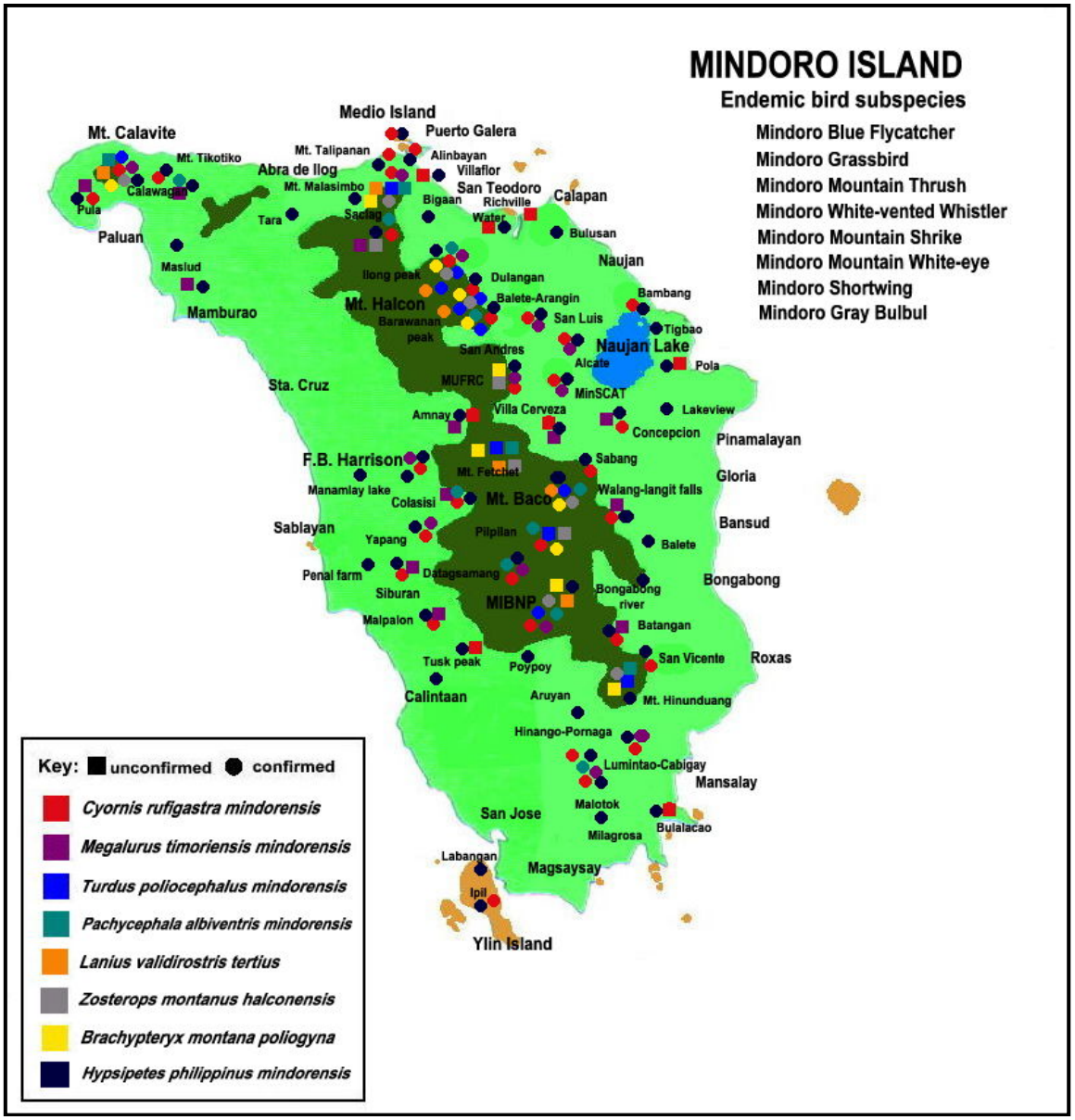
Map of Mindoro Island showing the distribution of significant records of different Owl taxa (Strigiformes) based on the results of the MBCP rapid island-wide survey 1998-1999.



Map of Mindoro Island showing the distribution of threatened endemic Mindoro Tarictic hornbill (*Penelopides mindorensis*) records based on the results of the MBCP rapid island-wide survey 1998-1999.



Map of Mindoro Island showing the distribution of records for rare and threatened island endemic bird taxa based on results of the MBCP rapid island-wide survey 1998-1999.



Map of Mindoro Island showing the distribution of records for non-threatened endemic island bird taxa based on the results of the MBCP rapid island-wide survey 1998-1999.

Mammals

There are at least 10 endemic species of mammals recorded on Mindoro Island, of which four await formal description. There are six threatened species including the endangered Tamaraw (*Bubalus mindorensis*), vunerable Mindoro rusa deer (*Cervus mariannus barandanus*), vulnerable Mindoro warty pig (*Sus philippensis oliveri*), critically endangered but possible extinct Ylin Island cloud rat (*Crateromys paulus*), vulnerable Mindoro climbing rat (*Anonymomys mindorensis*), and the Mindoro pallid flying fox (*Pteropus* sp.).

Fish

Other vertebrates such as reptiles, amphibians, and fishes of Mindoro Island are still poorly known and undoubtedly many new species await to be discovered. Eventhose species that are currently recognized as one species, appear to be composed of several closely related taxa that requires systematic review. Among the fishes known to occur on Mindoro island are following: Mindoro barb or 'pait' (*Barbus hemictenus*) from Naujan Lake and its tributaries. A relatively new and undescribed barb (*Barbus* sp.) was collected from the Anahawin River in Calintaan. Several other interesting fishes are known to enter Naujan Lake through the Butas River estuary such as Mullets (*Liza* sp.). Unfortunately many new exotic species have been introduced into the lake, which may affect the overall ecological relations.

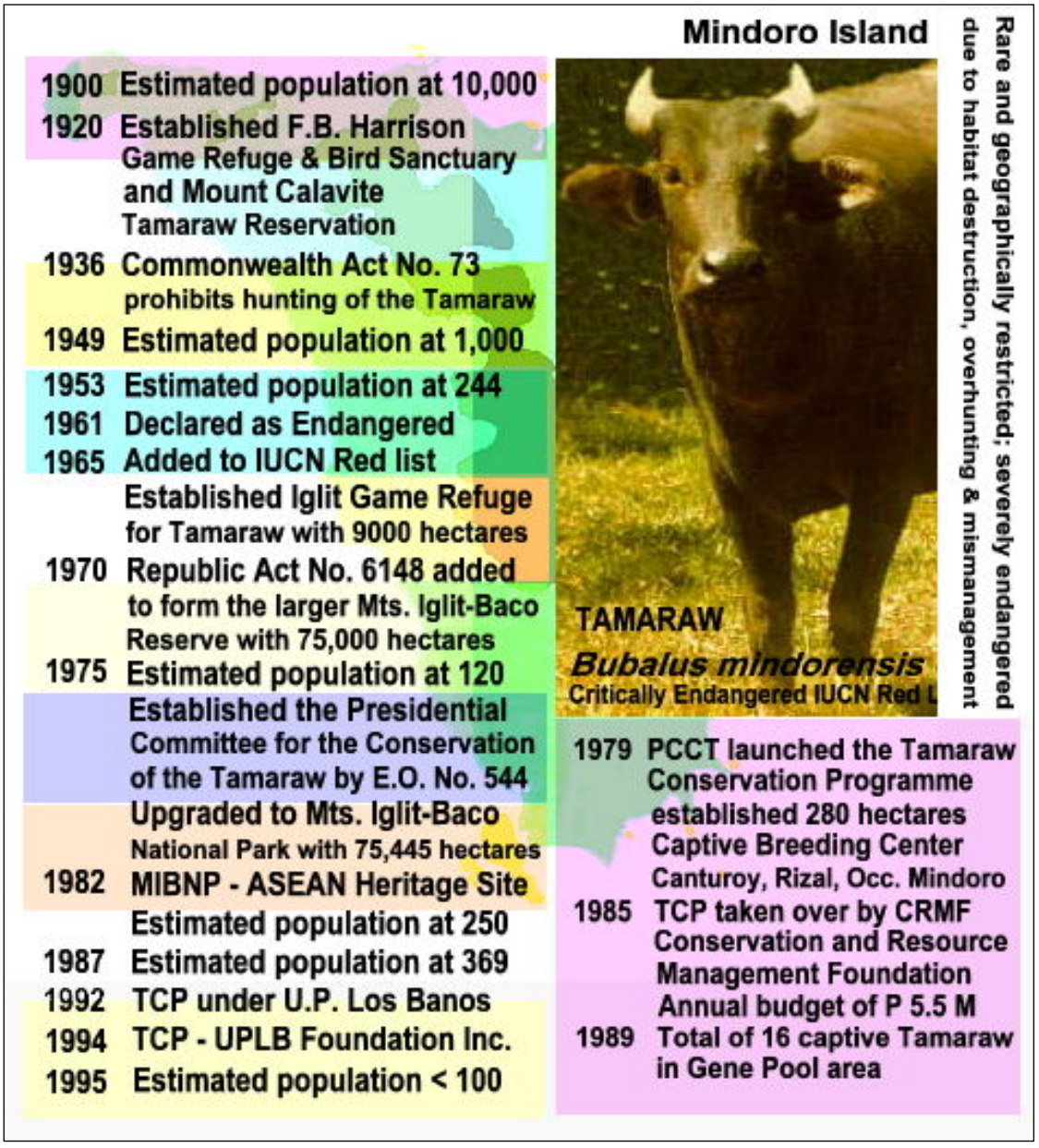
Butterflies

At least 17 endemic species and taxa out of a total of over 50 species/subspecies of butterflies (Order Lepidoptera) were recorded on Mindoro Island. These represent about five families, the most important of which is Papilionidae, where many island-endemic taxa are known to be seriously threatened and are listed by IUCN (1994). Large birdwings (*Troides rhadamanthus*) were commonly observed around forests in Mindoro island.

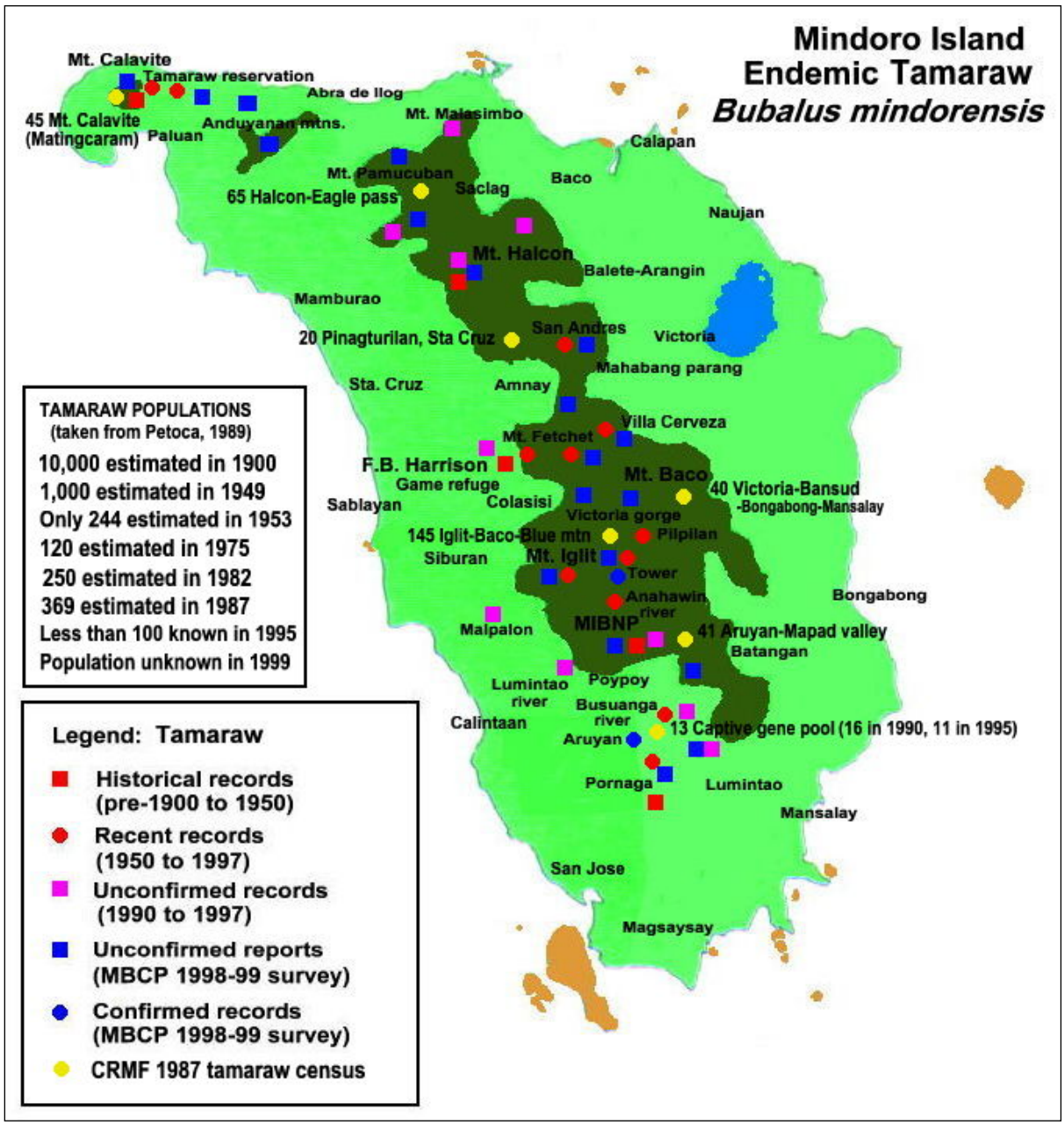
Flora

Among the numerous indigenous terrestrial seed-bearing plants and spore-bearing plants known to occur on Mindoro Island. At least 70 endemic species of flora were unique to the island. Among the interesting plants observed on Mindoro island were members of family Orchidaeceae, such as various *Dendrobium*, *Aerides*, *Callanthe*, *Bulbophyllum*, *Eria*, *Trichoglottis*, and *Spathoglottis*. One of the most significant orchid species collected were *Phalaenopsis stuartiana* from Mt. Halcon, *P. amabilis* and *P. equestris* from Baco and Calapan, *Grammatophyllum scriptum* from Mt. Halcon, *Renanthera philippinensis* from Gloria, *Vanda lamellata, Paphiopedelium* from Calapan, and *Dendrobium dreari* from Baco. Similarly, several flowers of the endemic jade vine (*Strongylodon macrobotrys*) were observed hanging among the tangled vegetation along secondary forests in MinSCAT, Victoria. An unknown species of epiphytic pitcher plants (*Nephenthes* sp.) were also observed in Baco, often brought down from Mt. Halcon by Mangyan traders who sell them in the market.

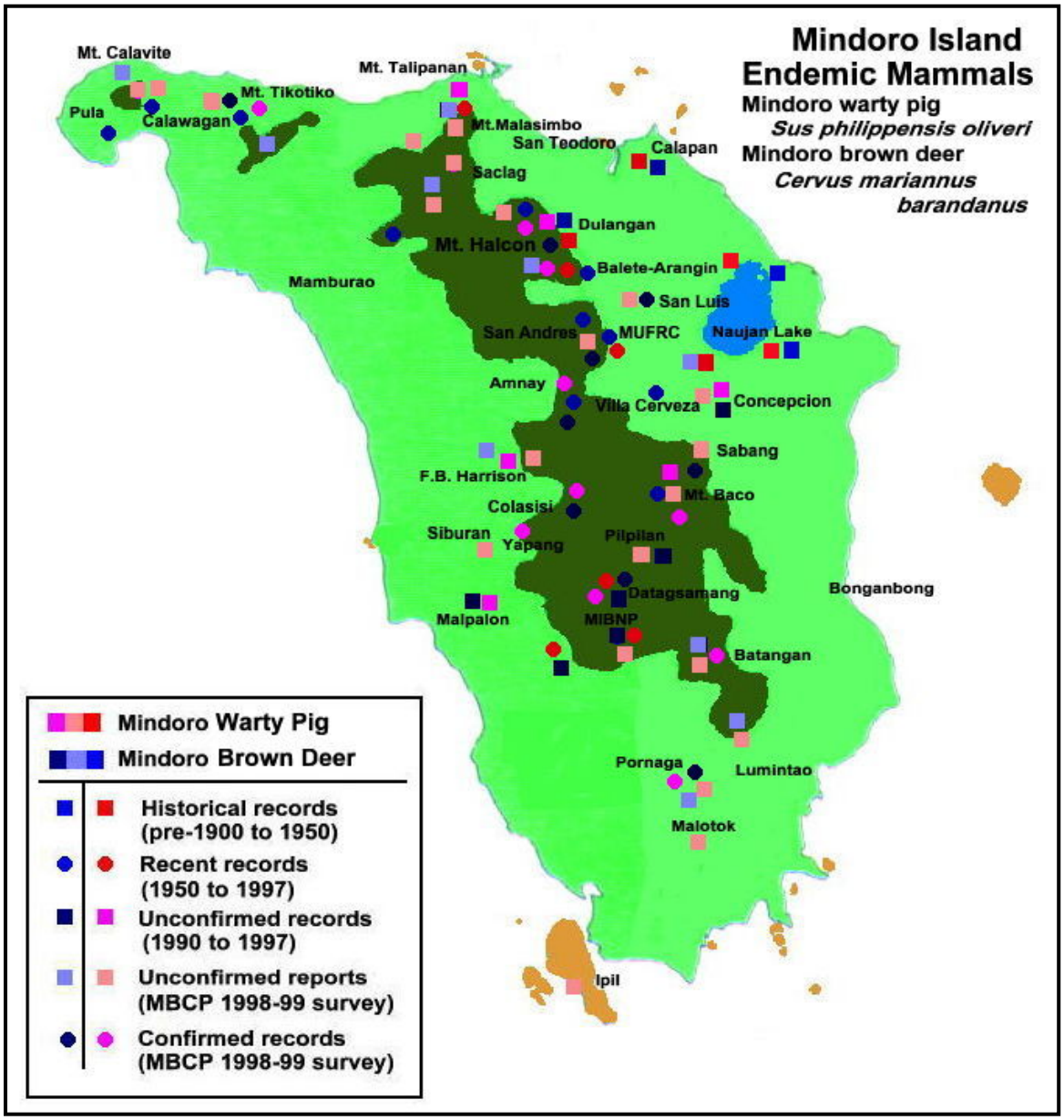
Many highly threatened species of plants include the rare Philippine mahogany (Family Dipterocarpaceae), which includes three threatened endemic Dipterocarps, namely 'manggachapui' (*Hopea acuminata*), 'yakul-saplungan' (*H. plagata*), and 'malaanonong' (*Shorea polita*). The Greater Mindoro biogeographical region also supports one of only two known stands ofendemic Philippine pine or Mindoro pine (*Pinus merkussi*). Ylin Island is known to be one of only two known locations where the highly endangered Philippine teak (*Tectona philippinensis*) occurs.



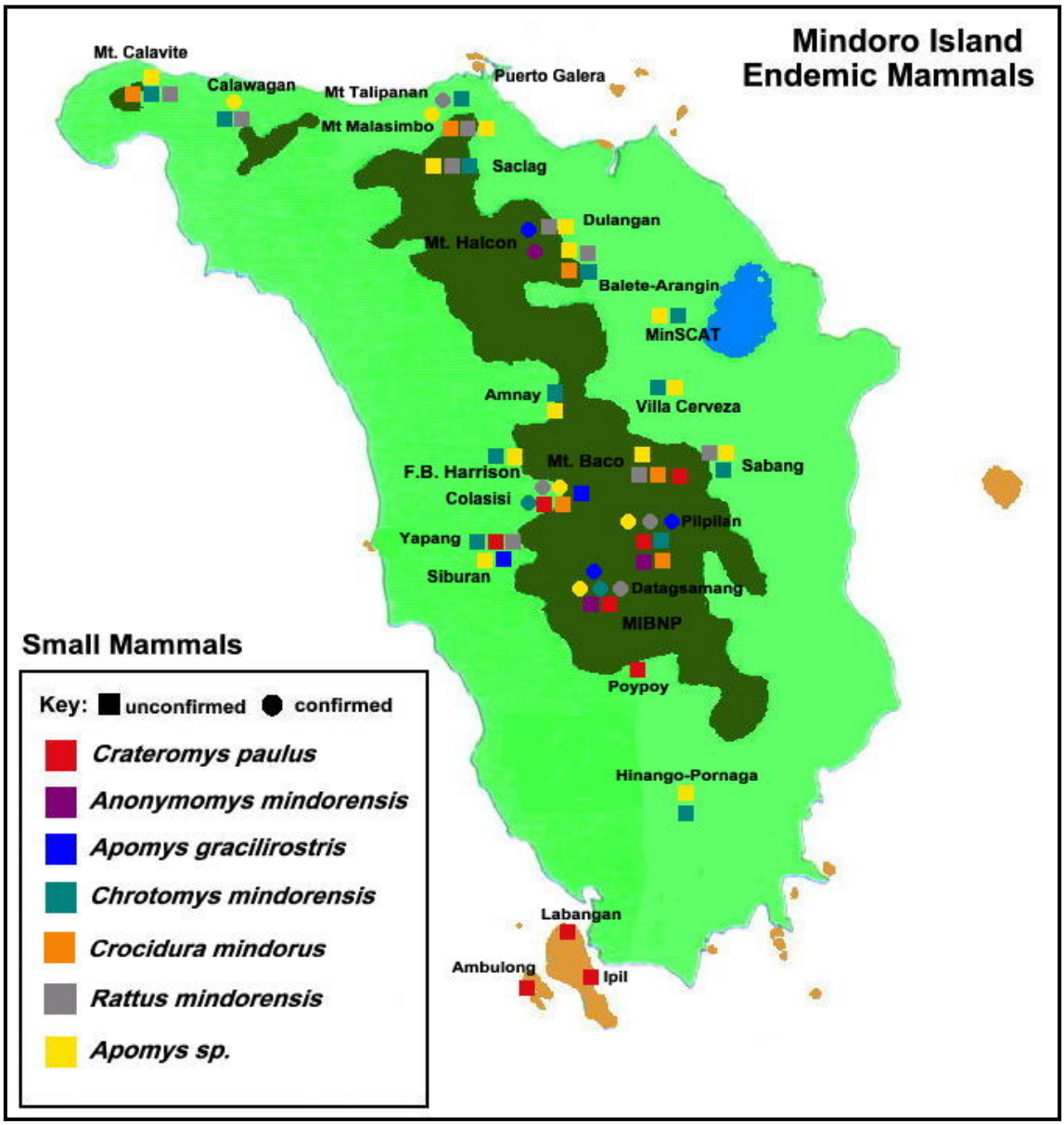
Time table of events showing the successive decline in population of the Mindoro Island endemic and critically endangered Tamaraw (*Bubalus mindorensis*) based on the data 9), Santiapillai (1990) and TCP, DENR-UPLBFI (1995).



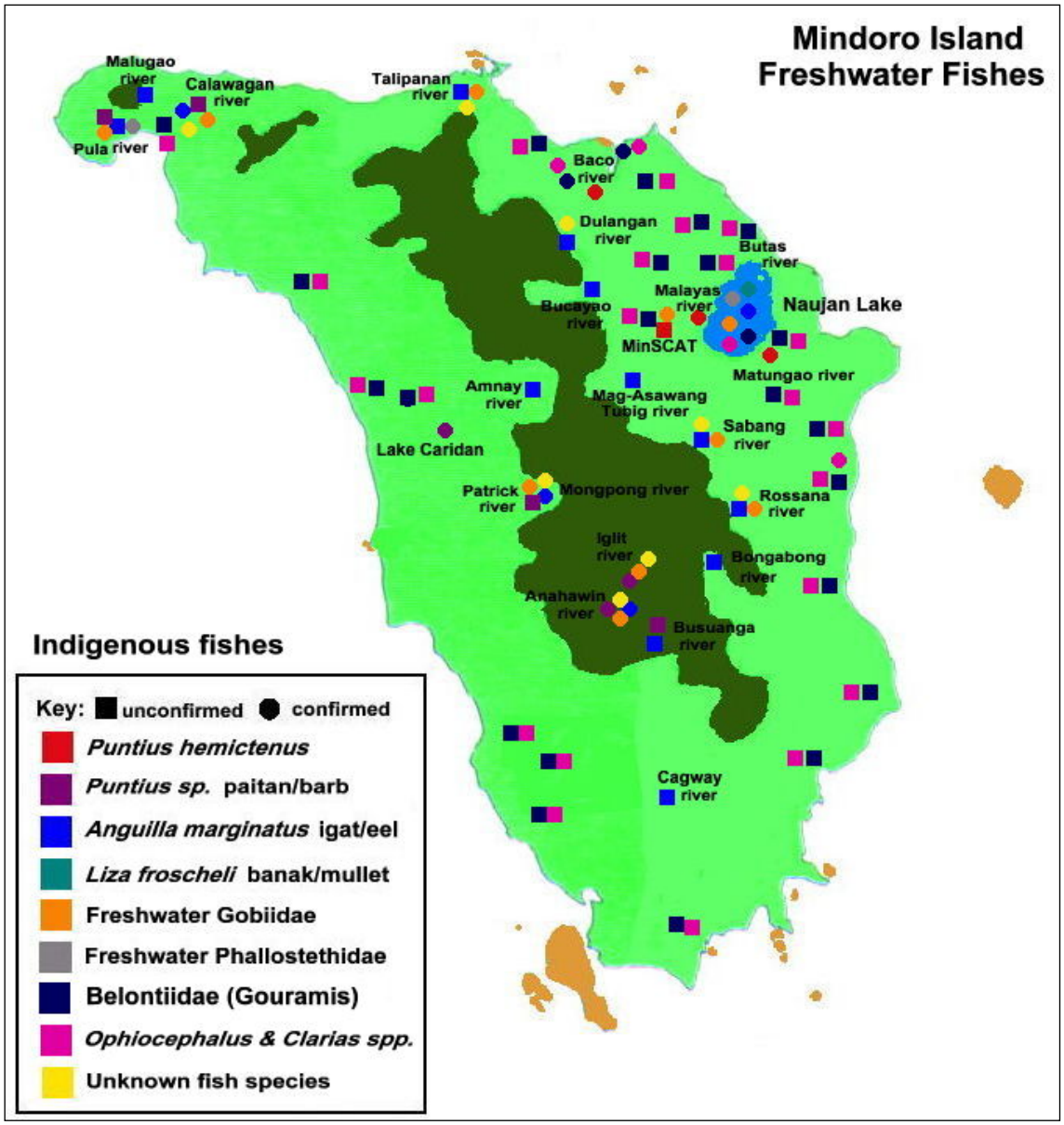
Map of Mindoro Island showing the distribution of records for the threatened Tamaraw (*Bubalus mindorensis*) based on results of the MBCP rapid island-wide survey 1998-99.



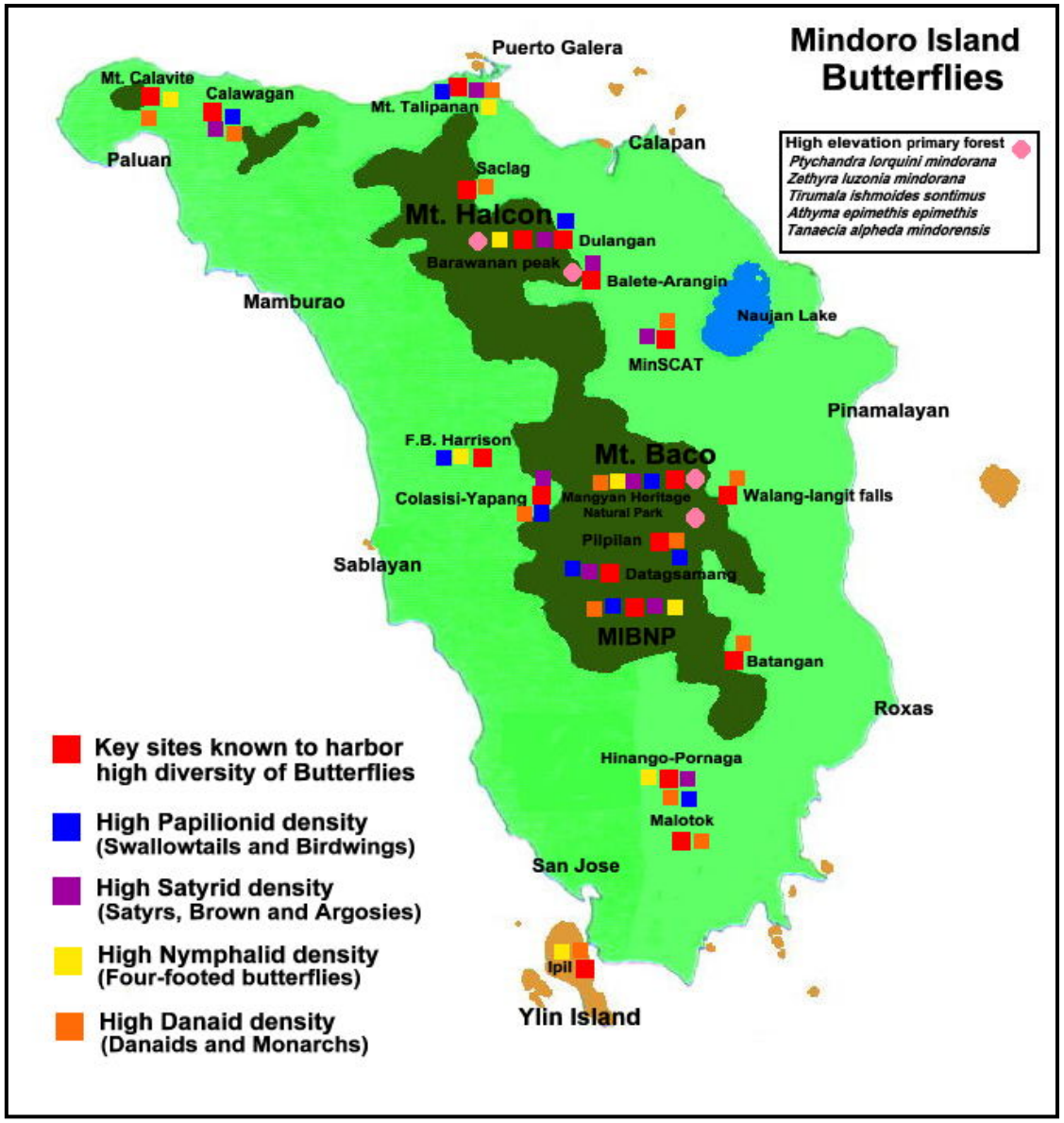
Map of Mindoro Island showing the distribution of significant records of endemic brown deer (*Cervus mariannus barandanus*) and warty pig (*Sus philippensis oliveri*) based on results of the MBCP rapid island-wide survey 1998-1999.



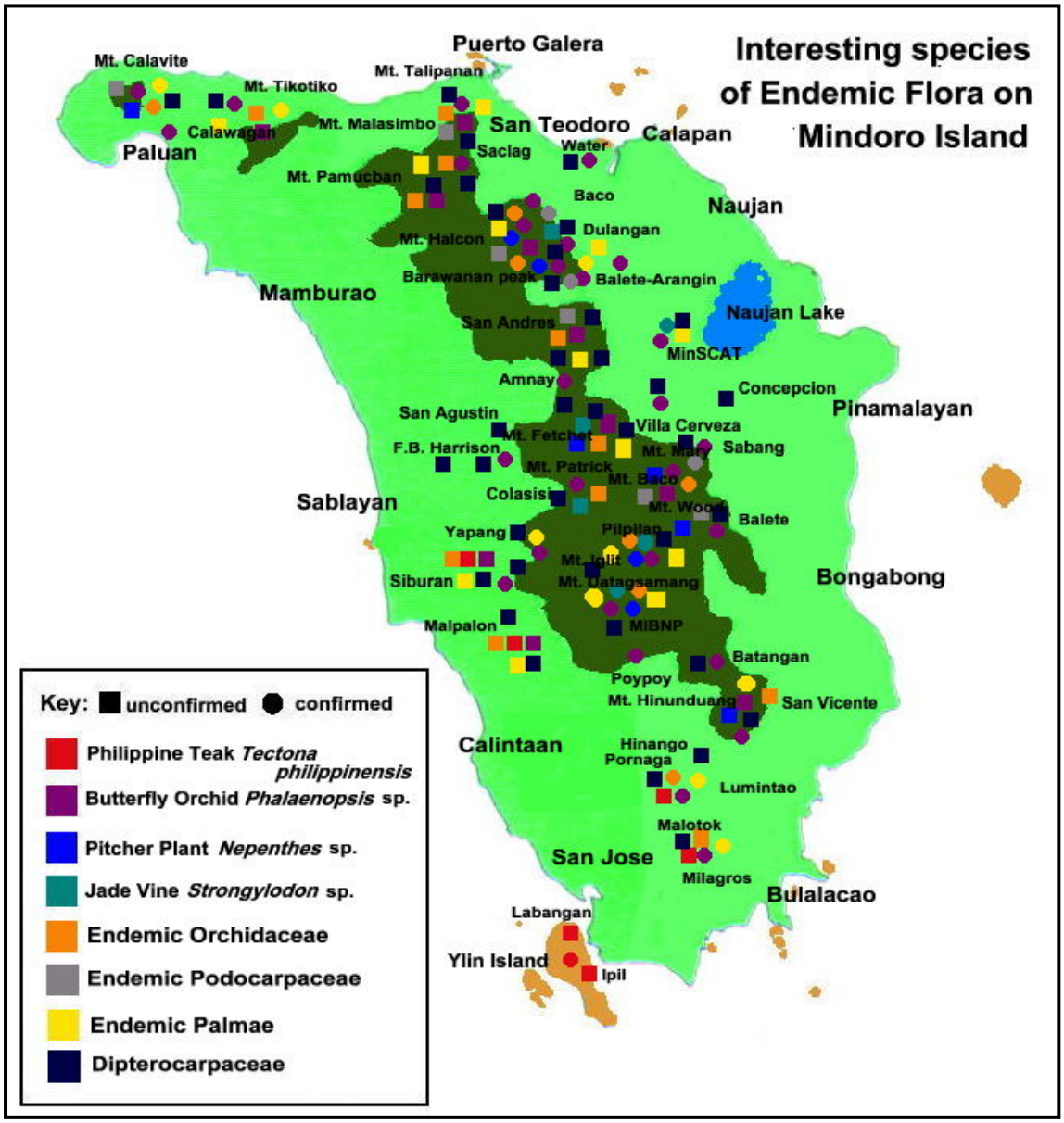
Map of Mindoro Island showing the distribution of records for island endemic small mammals (Muridae: Rodentia & Soricidae: Insectivora) based on the results of the MBCP rapid island-wide survey 1998-1999.



Map of Mindoro Island showing the distribution of records for significant species/ taxa of Freshwater fishes (Osteichthyes) based on the results of the MBCP rapid island-wide survey 1998-1999.



Map of Mindoro Island showing the distribution of records for significant Butterfly taxa (Lepidoptera) based on the results of the MBCP rapid island-wide survey 1998-1999.



Map of Mindoro Island showing the distribution of records for significant plant/flora taxa (species/ groups) based on the results of the MBCP rapid island-wide survey 1998-1999.

RESULTS OF INVENTORY OF FAUNA AND FLORA OF MINDORO ORIENTAL

The rapid island-wide survey of terrestrial fauna and flora of selected study sites on Oriental Mindoro were conducted from May toAugust, 1998 and January and October to November 1999. The areas covered include all the municipalities of Oriental Mindoro that includes Puerto Galera, San Teodoro, Baco, Calapan, Naujan, Victoria, Socorro, Pinamalayan, Pola, Gloria, Bansud, Bongabong, Mansalay and Bulalacao. The Malasimbo MountainRange was partially surveyed (Dans and Gonzalez, Madulid and Agoo in 1997) and was later visited by Afuang and Gonzalez in February, March, and August 1998. Among the priority areas surveyed were the Dulangan River system and Mt. Halcon Range in the municipality of Naujan and Baco; wetlands of Bambang, Subaan, Tigbao, Pasi, and Butas river in the municipalities of Naujan, Victoria, and Pola; Carabawen and Milagros in the municipality of Bulalacao; Alcate and Villa Cerveza in the municipality of Victoria (eastern part of Eagle pass); Mt. Merrill, Wood and Hinunduang along Mt. Baco range in the municipalities of Bongabong, Roxas, Bansud, Gloria and Pinamalayan; coastal mangroves of Puerto Galera, Naujan, Pola, Roxas, and Bulalacao. All these sites are situated within the province of Mindoro Oriental (Table 2). Each site was surveyed for an average of 4 days each, inclusive of travel. Most of these sites covered were considered to be moderately accessible.

The sampling sites for variable transect method for faunal and floral inventory are composed of the forested areas within the municipalities of Bulalacao (May, 1998), Puerto Galera (August, 1998), Baco-Naujan-Victoria-Socorro and Bongabong- Roxas (January, 1999) and San Teodoro & Pinamalayan (October-November, 1999). A summary of the areas covered for the floral inventory are listed below (Table 3a). These areas were chosen due to their unique features and the available time for the study. In Puerto Galera, Mt. Talipanan was chosen for its remnant patches of old growth lowland forests on limestone and good primary montane forests. Dulangan river along Mt. Halcon range in Paitan, Naujan and the mixed old growth and reforestation areas in Brgy. Saclag, San Teodoro, and agroforests of Brgy. Bulusan, Calapan. The primary forests in Carabawen were typical movale-dungon dry hill typem that could possibly contain the rare endemic Philippine Teak (*Tectona philippinensis*). And lastly, the primary and secondary forests of Alcate and Villa Cerveza, Victoria, which are the home of many Mangyan communities but very prone to logging and destruction. The covered sites have various vegetation types. These are primary and secondary lowland dipterocarp forest, secondary growth dry hill (molave-dungon) forest, mid-montane forests, parang type of vegetation (grassland-bushland), grassland, beach forest, mangrove forest, and mixture of secondary growth trees, fruit trees, rice fields, banana-corn-root crops plantation, kaingin and abandoned swidden farm.

The map shows the 15 municipalities of the province of Mindoro Oriental, and the sites visited by the MBCP survey team (Jan 1999), considered to be priority areas selected for further inventory of fauna and flora (see succeeding map).

Extensively larger wilderness areas were found more on the western side due to the establishment of several large reserves as early as the 1940's. Mindoro probably contains the largest (if not, one of the largest) proportion of reserves by percentage of total land area, of any island in the archipelago. The total size of the protected area amounts to nearly 150,000 hectares. Among protected areas in Occidental Mindoro are F.B. Harrison GRBS, Mts. Iglit-Baco National Park (ASEAN Heritage Site), Mt. Calavite Tamaraw Reservation, Tamaraw Gene Pool in Aruyan, and Apo Reef Natural Park off

Sablayan. Only two protected areas were proclaimed in Oriental Mindoro, which includes the Puerto Galera Man-and-Biosphere Reserve and the Lake Naujan National Park. Although Mt. Halcon is not designated as a park, it is to some degree protected.

Significant threats to rainforest habitats in Mindoro Oriental

- Destructive practices in the past such as large-scale selective commercial logging and small-scale carabao logging operations.
- Vast tracts of forests in floodplains converted to farmlands.(such that Mindoro was designated one of the “rice baskets” of the Philippines)
- Formation of extensive ranches and haciendas with limited land ownership
- Government classification of forests was unclear and misleading with particular bias to timber extraction wherein other habitat types were regarded as alienable and disposable land
- Attracted desperate landless farmers to clear forests for upland farms or kaingin, as well as the massive influx of migrant settlers and refugees from nearby islands
- Rapidly increasing population growth among local residents and indigenous people, due to increased medical service and improved health practices
- The lack of implementation of rules in protected areas allowed settlements within the boundary of national parks and game refuges.
- Mindoro became a melting pot of languages, dialects, and cultures; farming methods applied by recent migrant settlers not suited to the terrain unlike the methods of slash and burn agriculture used by the indigenous people

POPULATION STATUS

Comparatively, the density of human population in eastern and western Mindoro Island is largely unbalanced. There is greater density of people living in Oriental Mindoro than in Occidental Mindoro. This unequal human distribution was more the result of closer proximity to adjacent islands, despite the fact that Occidental Mindoro covers larger land area than Oriental Mindoro.

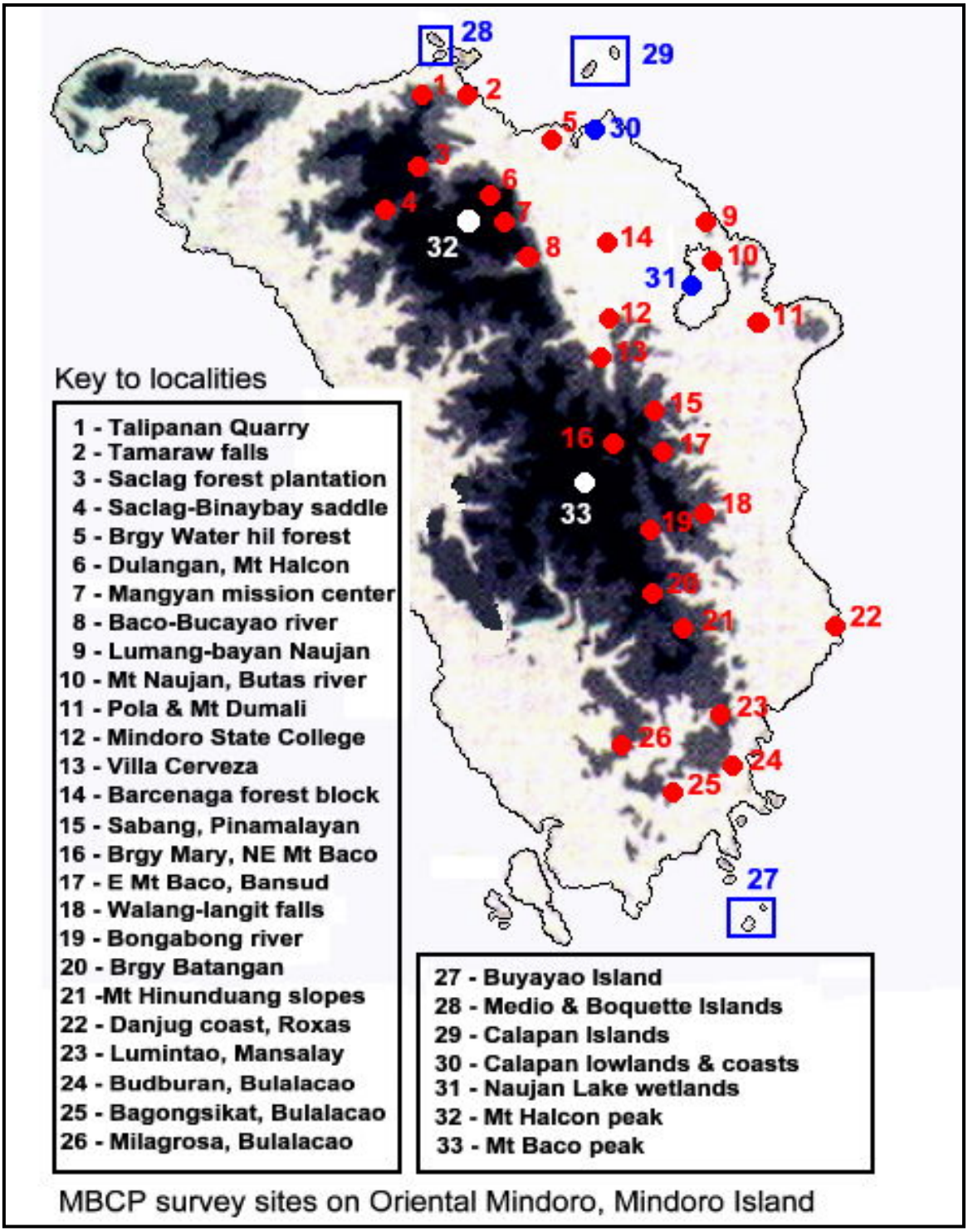
Most of the indigenous people of Mindoro, the Mangyans, were not provided social equity and even suffered from growing prejudice and persecution from migrant settlers. Tribes were either driven away from their ancestral land by previous land grabbing politicians or were relocated to allow the so-called “productive” members of the community (voters) to invest and benefit more from the land to help build the economy.

Various factors contribute to these differences:

1. Access
2. Rugged mountain terrains vs. floodplains
3. Rain shadow effect and climate type
4. Substrate base
5. Relatively better maritime protection in the east due to more secluded bays important to trade and commerce, easy access to piers/harbors
6. History of settlements
7. Mass migration from eastern Philippines, influx of migrant settlers
8. Central mountain spine dividing island restricts accessibility

Flora and fauna inventory of selected sites aims to identify significant/highlights of indicator species

- To increase awareness and programs for biodiversity conservation on different selected areas in Oriental Mindoro; provide important insights and implications for proper management and conservation initiatives; (describe)
- ethno-biological factors and sources of migration; (describe)
- Positive issues have increased conservation concern for Mindoro, which managed to get attention from UP Diliman, CI, TEP, NIPAP (CPPAP), KalikaMind, and DENR/PNM



Map of Mindoro Island showing the different localities visited for Phase II – Oriental Mindoro Province based on results of the MBCP rapid island-wide survey 1998-1999.

Table 2. Summary of areas covered for faunal and floral field inventory in Oriental Mindoro, May-August 1998 and January & October-November 1999

Location of Study Area	Municipalities/Province Covered	Date Surveyed
Carabawen forest, Brgy. Milagros,	Bulalacao, Oriental Mindoro	May 1998
Marble quarry site, Brgy. Talipanan	Puerto Galera, Oriental Mindoro	Aug 1998
Butas River mangroves, Brgy. San Jose	Naujan, Oriental Mindoro	Jan 1999
Mindoro State College, Brgy. Alcate	Victoria, Oriental Mindoro	Jan 1999
Mangyan Mission Center, Brgy. Paitan	Naujan & Baco, Oriental Mindoro	Jan/Nov 1999
Coco Beach, Brgy. Dangay	Roxas, Oriental Mindoro	Jan 1999
Phil. Match forest plantation, Brgy. Saclag	San Teodoro, Oriental Mindoro	Oct 1999
Calapan rainforest park, Brgy. Bulusan	Calapan, Oriental Mindoro	Oct 1999
Municipal reforestation area, Sabang	Pinamalayan, Oriental Mindoro	Oct 1999
Lake Naujan, Brgy. Pasi and Tigbao	Pola and Socorro, Oriental Mindoro	Nov 1999
Walang-langit Falls, Brgy. Balete	Gloria and Bansud, Oriental Mindoro	Nov 1999
Mt. Mary (Merrill), Brgy. Sabang	Pinamalayan, Oriental Mindoro	Nov 1999

In addition to the surveys and interviews, courtesy calls and meetings with the officials of local governments (i.e., governor, mayors, barangay captains, Mangyan elders) were made to follow proper protocol in acquiring permission to conduct surveys, and possibly further field inventory of fauna and flora in the chosen sites. Direct observations and notes from interviews (with emphasis on date and place of observation) were plotted out into grids on the map of Mindoro island. To map the present status of distribution of important indicator species (mostly threatened and/or endemic island species). Sites visited include the Mangyan communities in Brgy. Balete, Paitan, Masagana, Kagburan, and Evangelista in Naujan; Villa Cerveza and Alcate in Victoria; and Baet in Mansalay.

Brief accounts regarding fauna and flora were also noted from various localities around Mindoro Island, which includes the following areas:

1. Puerto Galera – Mt. Talipanan-Malasimbo range (including Tamaraw Falls)
2. Baco-San Teodoro saddle between Mt. Halcon and Malasimbo ranges
3. NE Mt. Halcon range – Mt. Halcon peak & Dulangan ridge via Baco
4. SE Mt. Halcon range – Mt. Ilong & Barawanan peaks via Naujan and Victoria
5. Villa Cerveza – San Luis mountain range (Minscat, Alcate)
6. Naujan Lake and (Naujan, Calapan-Pola) floodplains and Mt. Naujan (Lumangbayan)
7. Victoria-Socorro – Pinamalayan mountain range
8. NE Mt. Baco range – Mt. Merrill via Gloria-Bansud
9. SE Mt. Baco range – via Bongabong-Roxas (forests on limestone cliffs and slopes)
10. W Mt. Baco range – Mt. Baco peak (additional accounts from Mr. Efren Garcellano)
11. Puerto Galera-San Teodoro coasts and islands, Calapan islands
12. Roxas, Mansalay and Bulalacao coasts and Islands
13. Mansalay-Bulalacao mountain range (forest savanna/dry limestone forests)

Additional preliminary notes on other sites: (adjacent islands to Mindoro)

- Lubang Islands (Lubang, Looc, and Ambil)
- Semirara Island and Maestre de Campo Island
- Verde, Maricaban, Lighthouse, and Fortune Islands

Apparently, due to the limited sampling period for fauna and flora inventories, three relatively remote localities appeared to have great potential for more extensive fauna and flora inventories on Mindoro Oriental. The inaccessibility of these forest habitats, however, provide a natural protection from rapidly advancing disturbances from the lowlands, but also deter biologists from making any important accounts of its biodiversity that would eventually provide the necessary baseline to help conserve these habitats in the near future. In this regard, these sites would be an important area for further biological survey.

Selected sites to be surveyed for priority conservation in Oriental Mindoro, Philippines

1. Southern portion of Mt. Malasimbo-Talipanan range in San Teodoro
2. Southwestern portion of Mt. Halcon range through the Dulanagan river in San Luis, Naujan to Villa Cerveza and Alcate, Victoria.
3. Eastern portion of Mt. Baco range from the northern limits in Pinamalayan andGloria to
1. Southernmost part in Bansud and Bongabong.

The montane fauna and flora of Mindoro's rugged mountainous landscape is still relatively poorly known. Only recently had botanists been able to take into account the unique alpine vegetation typical of extremely tall mountain peaks in isolated islands. More would be discovered given access to any of the numerous peaks that make up the two large mountain massifs of the central range. These are Mt. Halcon (2,586 m), the tallest peak in Mindoro Island, center of northern mountain massif; and Mt. Baco (c. 2,300 m), 2nd tallest peak in Mindoro Island, center of southern mountain massif. According to a local mountaineering club based in Calapan City, the primeval cloud forest of Mount Baco was only recently conquered, but it had taken them 16 days to reach the peak from the nearest drop off point. Much of this mountain's surrounding slopes and lower peaks appear to be thickly covered by dense forests reminiscent of Mindoro's expansive wilderness areas. As in as the case of many other mountain peaks around the Philippines that harbor extremely restricted unique taxa of flora and fauna often endemic only to the mountain these areas offer insight to the wealth of undiscovered species that may remain undescribed to this time. These mountain peak includes the following:

1. Camp Good Hope (1,912 m), Camp Abana (1,793 m) and Camp Bliss (1,613 m) in Baco, forming the northeast slope of Mt. Halcon called the Dulangan range.
2. Mt. Wood (1,899 m), Mt. Vanschaick (1,400 m), Mt. Mearns (1,400 m), Mt. Davidson (1,000 m) in Bongabong and Centavo Pass (1,341 m) in Roxas, forming the eastern mountain massif of the Mt. Baco range in Oriental Mindoro.
3. Mt. Merill (1,405 m), Mt. Hitchings (1,200 m), Mt. Vraidex (1,000 m) and Mt. Porter (800 m) in Bansud, and Mt. McGregor (1,200 m), Mt. Worcester (1,200 m) and Mt. Bayer (900 m) in Pinamalayan, forming the subordinate mountain masses in between Mt. Halcon and Mt. Baco ranges. They are immediately opposite the low mountains forming Mt. Naujan, facing the southern part of Naujan Lake.
4. Mt. Malasimbo (1,228 m), Mt. Talipanan (1,185 m) and Mt. Alinyaban (1,086 m) in Puerto Galera, forming the eastern part of Malasimbo range which extends into Abra de Ilog.
5. Mt. Al Bongabon (936 m), Knob Peak (917 m) and Mt. Franks (900 m) in Mansalay and Panagiran Peak (721 m) in Bulalacao, forming the low but contigiuous limestone outcrops towards SW Mindoro (in San Jose, Magsaysay and Calintaan, Occ. Mindoro).

Table 4. Summary of five core priority sites for biodiversity conservation on Mindoro Island, Philippines.

Core Priority Site	Specific Localities Included	Indicator Species	Habitat Types Present
Northwestern Mindoro highlands	Mt. Calavite range Anduyanan mountains Calawagan-Mt. Tiko tiko Mt. Abra de Ilog	Tamaraw, Mindoro hornbill, black-hooded coucal, scarlet-collared flowerpecker, Mindoro bleeding-heart, Mindoro brown deer and warty pig	Mid-montane forest Dry-hill molave forest Lowland rainforest Savanna grassland
Northern Mindoro highlands	Mt. Malasimbo-Alinyaban range Mt. Talipanan-Burburungan range Mt. Halcon-Dulangan range Caratungan-Saclag saddle	Tamaraw, Mindoro hornbill, black-hooded coucal, scarlet-collared flowerpecker, ashy thrush, litter toad, jade vine, Mindoro butterflies, Mindoro alpine plants, redstart, Mindoro bleeding-heart, Mindoro imperial pigeon, Mindoro mountain birds, sailfin lizard, Mindoro forest frogs, Mindoro forest mice, climbing mouse, Mindoro shrew, Mindoro barb, Mindoro brown deer andwarty pig	Mid-montane forest Lowland rainforest Mossy forest Pine forest Alpine heath Savanna grassland
Central Mindoro highlands	Mt. Baco-Wood-Mary range Mt. Fetchet-Sinclair-Roosvelt range Mt. Mitchell-Iglit-Exline range Amnay-San Agustin-Yapang Sablayan coastal mountains	Tamaraw, Mindoro hornbill, black-hooded coucal, scarlet-collared flowerpecker, Mindoro bleeding-heart, spotted and Mindoro imperial pigeon, Mindoro mountain birds, sailfin lizard, Mindoro forest frogs, Mindoro forest mice, Mindoro flying fox, Mindoro butterflies, jade vine, Rafflesia, Mindoro barb, Philippine duck, Mindoro brown deer and warty pig	Mossy forest Mid-montane forest Pine forest Savanna grassland Lowland rainforest Dry-hillmolave forest
Southern Mindoro Highlands	Mt. Hinunduang range Carabawen-Malugtok Pornaga-Aruyan-Baet	Tamaraw, Mindoro hornbill, black-hooded coucal, scarlet-collared flowerpecker, Mindoro bleeding-heart, brown deer and warty pig	Mid-montane forest Lowland rainforest Dry-hill molave forest Savanna grassland Forest on limestone
Speciesspecific sites	Mts. Naujan-Dumali Lake Naujan-Butas river Tributaries of Naujan Lake	Crocodiles, Philippine duck, wetlands birds, Mindoro barb	Mangrove swamp Wetlands-marshes Lowland rainforest Lake and rivers
Speciesspecific sites	Apo Reef Marine Natural Park Garza, White and Target Islands Silonay and Pandan Islands	Sea turtles, Tabon scrubfowl, terns and other seabirds, *Pemphis*, giant clams, marine mammals	Mangrove swamp Coastal scrub forest Beach forest Coral reefs

Core Priority Site	Specific Localities Included	Indicator Species	Habitat Types Present
	Buyayao and Libagao Islands		
Speciesspecific sites	Ylin and Ambulong Islands	Ylin Is. cloud rat, blue-naped parrot, wetland birds, Philippine teak	Dry-hill molave forest Forest on limestone Coastal scrub forest Mangrove swamp Coral reefs

Note: Selected notes on significant indicator species for Mindoro Island

The Mindoro endemic bird area (EBA) is one the highest priorities of global EBA for conservation, with *Penelopides mindorensis* and *Gallicolumba platenae* in immediate threat of extinction.

Mindoro bleeding-heart Pigeon - *Gallicolumba platenae* (Salvadori); Conservation status: Critical

Bleeding-hearts in general were described as one of the most remarkable endemic Philippine species, and one of the strangest looking birds in the world. They are very popular as captive birds (mostly pertaining to the Luzon species only) and have long been favorites in American and European aviaries. The Mindoro bleeding-heart can be considered as probably the most threatened bird on Mindoro, because of its inherently rare status due to its restricted-range and preference for closed canopy or old growth to secondary lowland forests. It is known only from a handful of records and specimens, all of which were taken strictly in lowland forests. Much of the lowlands of Mindoro were once covered with lush multi-layered lowland rainforests dominated by giant trees more popularly known worldwide as the “Philippine mahogany” (Family Dipterocarpaceae), occurring in several forest types based on the soil, slope, water, and species dominance. These various Dipterocarp forest types include swamp forests near sea level, ridge forests growing along inclined slopes and valleys around rivers, forests on karst limestone formations, and those found on relatively higher elevations above 400 m (but still below 900 m). The great diversity of species of Dipterocarps, classifies them into closely-related groups which were then classified based on the dominance of a certain species or group, such as Lauan type, Yakal, Apitong, Tanguile, or a combination of each as the dominant species. Although not directly dependent on Dipterocarp trees, most lowland forest birds like the Mindoro bleeding-heart rely on the associated tree species in these lowland habitats, many of which are strangling figs and other fruit-bearing trees. Their preference for these giant forests is probably attributed to the nearly closed-cover of the canopy layer, limiting light and keeping the undergrowth sparse. It is the relatively open areas of the forest floor that is preferred, allowing them to forage for fruits and seeds on the thick leaf litter, and easily see and escape predators.

However, much of these uniquely diverse lowland forests have been largely decimated by human encroachment. The massive influx of migrant settlers from Marinduque Island, Luzon, and western Visayas. They have pushed the Mangyan tribes further up the mountains, where their sustainable methods of kaingin are less applicable to the rugged slopes. Large tracts of lowland forests have been stripped of their giant trees by numerous logging companies (mostly American Lumber Co.) which were later cleared for agriculture. Nearly all of these lowland forests are now gone and a handful of fragmented patches remain in remote localities. They continue to conduct small-scale “carabao”

logging operations due to the current high prices for "good" timber. The few isolated records of the bleeding-hearts on Mindoro in recent times were a result of the increasingly fragmented forest habitats, which in turn leads to genetic isolation of populations and a threat to their survival. Of the less than 10% remaining original forest cover on Mindoro, only a fraction of this are lowland rainforests. Much of these were montane or high elevation forest found near the peaks of tall mountains such as Mt. Baco and Mt. Halcon. Additional threats come from hunting the fairly medium-sized bird with considerable meat, in addition to the fact that bleeding-hearts are popular in the pet trade. Surprisingly little to none have been seen kept for aviculture. There were evidences of trapping in the penal colony in Sablayan, using traps primarily intended for catching junglefowl.

The preference for old growth or closed canopy lowland forests by bleeding-hearts is based on their habits as terrestrial frugivores or ground-dwelling pigeons. They need relatively open understorey to be able to forage on the forest floor where they feed on berries, small fruits, and seeds as well as certain small fruit figs like "balete" which are often associated with primary forests strangling on large dipterocarps. Insufficient old growth forests also means insufficient canopy cover to restrict sunlight and keep the understorey sparse. The large-scale selective-logging operations in Mindoro opened many light gaps that allowed dense undergrowth to cover the forest floor. The loss of dipterocarp giants also mean the loss of host-trees for strangling figs, reducing the food sources of many fig-dependent species like the bleeding-heart.

Mindoro tree frog *Philautus schmackeri* (Boettger); Conservation status: proposed as Vulnerable

Little is known about this rarely observed diminutive tree frog of the genus *Philautus* (family Rhacophoridae). It was first described by Boettger from specimens brought down by Schmacker. Also called Schmacker's tree frog, it was considered endemic and common in the high altitude forests of Mindoro (Alcala 1986) but more recently Alcala and Brown (1998) regarded them as endemic and rare, possibly due to the changes brought about by serious deforestation on the island. Of the less than 10% remaining forest, much these are still montane forests and there is already evidence of encroachment in these areas. The Mindoro tree frog is with a SVL of only 19-28 millimeters for mature specimens, males being comparatively smaller than females. It belongs to the *Aurifasciatus* group due to its shared features namely the acutely pointed snout or snout obtusely pointed (all shared by *P. acutirostris, P.leitensis, P. longicrus,* and *P. schmackeri*).

It inhabits primary forests, being arboreal and nocturnal feeding on invertebrates. The microhabitat was low vegetation in primary forest. It was collected by Alcala (1986) on leaves of shrubs and low trees in tropical rainforests at altitudes of 800 to 1,500 meters, particularly from the extensive mountain forests on several peaks of Mt. Halcon range. Later Alcala (1998) noted that the altitudinal range was from 30–1,450 m in lowland dipterocarp up to montane forests. Due to the extensive loss of lowland forests much of these lowland populations are highly at risk.

The Mindoro tree frog is known only in a few localities on the island of Mindoro and restricted to cloud forests. They occur in high elevation montane or mid-montane forests on large mountains particularly within the two largest massifs of Mt. Halcon and Mt. Baco. Due to the differences in climate on either side of the island brought about by the rain-shadow effect on the rugged central mountain spine limiting rainfall in the west side, most of the montane forests are limited to the eastern side of the island. There is evidence that the last La Nina drought that caused severe damage due to persistent forest fires (even up to the peak of Mt. Halcon) throughout the island, which proved

devastating to this intolerant species. There is also continued encroachment into lowland forests and more recently into the fragile montane forests. The harsh conditions of persistent windy and cold conditions in montane forests are evident from the stunted gnarled or twisted and slow growth of trees. It would be a lot more destructive than several La Ninas combined. Once the protective cover of the canopy is removed, the undergrowth is exposed causing them to become dry and would prove deleterious to these sensitively moist-skinned animals.

Important Terrestrial Fauna of Mindoro Island, Philippines

Common Name	Scientific Name	IUCN Category
Threatened Mindoro Island-endemic species		
Mindoro zone-tailed/imperial pigeon	*Ducula mindorensis*	Endangered
Mindoro bleeding-heart	*Gallicolumba platenae*	Critical
Slack-hooded/Steere's coucal	*Centropus steerii*	Critical
Mindoro mountain/Mindoro scops-owl	*Otus mindorensis*	Vulnerable
Mindoro tarictic or Mindoro hornbill	*Penelopides mindorensis*	Endangered
Scarlet-collared/Mindoro flowerpecker	*Dicaeum retrocinctum*	Critical
Tamaraw/Mindoro dwarf-buffalo	*Bubalus mindorensis*	Endangered
Mindoro shrew	*Crocidura mindorus*	Vulnerable
Mindoro flying fox	*Pteropus sp*.	Rare
Mindoro climbing rat	*Anonymomys mindorensis*	Indeterminate
Large Mindoro forest mouse	*Apomys gracilirostris*	Indeterminate
Ilin hairy-tailed cloud rat or cloud runner	*Crateromys Paulus*	Endangered
Mindoro anglehead or forest dragon	*Gonocephalus interupttus*	Indeterminate
Rare or Threatened Mindoro Island-endemic subspecies		
Mindoro blue-crowned racquet-tail	*Prioniturus discurus mindorensis*	Uncommon
Mindoro colasisi/ hanging-parrot	*Loriculus philippensis mindorensis*	Uncommon
Mindoro hawk-owl or Boobook owl	*Ninox philippensis mindorensis*	Uncommon
Mindoro white-bellied woodpecker	*Dryocopus javensis mindorensis*	Uncommon
Mindoro black-bibbed cicadabird	*Coracina mindanensis elusa*	Vulnerable
Mindoro blue-flycatcher	*Cyornis rufigastra mindorensis*	Uncommon
Mindoro green-backed w histler	*Pachycephala albiventris mindorensis*	Uncommon
Mindoro mountain shrike	*Lanius validirostris tertius*	Uncommon
Mindoro golden-yellow white-eye	*Zosterops nigrorum mindorensis*	Uncommon
Mindoro lowland scops-owl	*Otus (megalotis group) sp.*	Uncommon
Mindoro bar-bellied cuckoo-shrike	*Coracina striata mindorensis*	Uncommon
Mindoro warty pig	*Sus philippensis oliveri*	Indeterminate
Mindoro brown deer	*Cervus mariannus barandanus*	Rare
Other Mindoro Island-endemic subspecies		
Mindoro coucal	*Centropus viridis mindorensis*	Common
Mindoro white-browed shortwing	*Brachypteryx montana mindorensis*	Common
Mindoro thrush	*Turdus poliocephalus mindorensis*	Common
Mindoro grassbird	*Megalurus timoriensis mindorensis*	Common
Mindoro mountain white-eye	*Zosterops montanus halconensis*	Common
Lubang lovely sunbird	*Aethopyga shelleyi rubrinota*	Not known
Threatened, near-threat, restricted-range endemic species		
Philippine hawk-eagle	*Spizaetus philippensis*	Vulnerable

Common Name	Scientific Name	IUCN Category
Spotted imperial-pigeon	*Ducula carola*	Vulnerable
Philippine or red-vented Cockatoo	*Cacatua haematuropygia*	Critical
Ashy ground-thrush	*Zoothera cinerea*	Vulnerable
Luzon water-redstart	*Rhyacornis bicolor*	Endangered
Indigo-banded river kingfisher	*Alcedo cyanopectus*	Near-threat
Philippine duck	*Anas luzonica*	Near-threat
Mindoro striped shrew-rat	*Chrotomys mindorensis*	Uncommon
Large Rufous horseshoe bat	*Rhinolophus rufus*	Indeterminate
Golden-crowned flying fox	*Acerodon jubatus*	Endangered
Philippine nectar bat	*Eonycteris robusta* (Lubang)	Rare
Philippine crocodile	*Crocodylus mindorensis*	Critical
Indo-Pacific/saltwater crocodile	*Crocodylus porosus*	Endangered
Philippine sail-fin lizard	*Hydrosaurus pustulatus*	Vulnerable
Tabon scrubfowl	*Megapodius cumingii*	Near-threat
Blue-naped parrot	*Tanygnathus lucionensis*	Endangered
Rufous paradise-flycatcher	*Terpsiphone cinnamomea*	Near-threat
Nicobar pigeon	*Caloenas nicobarica*	Threatened 1988
Chinese egret	*Egretta eulophotes*	Endangered
Non-threatened Philippine endemic species		
Philippine serpent-wagle	*Spilornis holospilus*	Common
Philippine falconet	*Microhierax erythrogenys*	Uncommon
Pink-bellied imperial-pigeon	*Ducula poliocephala*	Uncommon
Philippine pygmy woodpecker	*Dendrocopus maculatus*	Common
Coleto	*Sarcops calvus*	Common
Black-and-white triller	*Lalage melanoleuca*	Uncommon
Non-threatened non-endemic resident species		
Red junglefowl	*Gallus gallus*	Uncommon
White-bellied sea-eagle	*Haliaeetus leucogaster*	Uncommon
Green imperial-pigeon	*Ducula aenea*	Common
Pied imperial-pigeon	*Ducula bicolor*	Uncommon
Malay monitor lizard	*Varanus salvator*	Common
Reticulated python	*Python reticulatus*	Common
Long-tailed macaque	*Macaca fascicularis*	Common
Malay civet	*Viverra tangalunga*	Uncommon
Common palm civet	*Paradoxurus hermaphroditus*	Common
Birds recorded previously on Mindoro Island, but have since become rare and have little or no recent records, and may have declining local populations		
Malayan night-heron	*Gorsachius melanolophus kutteri*	
Schrenck's bittern	*Ixobrychus eurhythmus*	
Wooly-necked stork	*Ciconia episcopus*	
Black-headed ibis	*Threskiornis melanocephalus*	
Malaysian plover	*Charadrius peronii*	
Black-naped tern	*Sterna sumatrana*	
Peregrine falcon	*Falco peregrinus calidus*	
Osprey or fish hawk	*Pandion haliaetus*	
Grey-headed fish-eagle	*Ichthyophaga ichthyaetus*	
Changeable hawk-eagle	*Spizaetus cirrhatus*	
Pheasant-tailed jacana	*Hydrophasianus chirurgus*	
Purple swamphen	*Porphyrio porphyrio pulverulentus*	
Great thick-knee	*Esacus magnirostris*	
Nutmeg or pied imperial pigeon	*Ducula bicolor*	
Short-eared owl	*Asio flammeus*	
Metallic pigeon	*Columba vitiensis griseogularis*	

Common Name	Scientific Name	IUCN Category
Thick-billed green-pigeon	*Treron curvirostra erimacra*	
Pompadour green-pigeon	*Treron pompadora axillaris*	
Brown hawk-owl	*Ninox scutulata randi* (endemic race), *japonica* (migrant race)	
Birds not recorded previously on Mindoro Island, but may be recorded soon after		
Spot-billed pelican	*Pelecanus philippensis*	Vulnerable
Black-faced spoonbill	*Platalea minor*	Critical
Japanese night-heron	*Gorsachius goisagi*	Vulnerable
Baer's pochard	*Aythya baeri*	Threatened
Bristle-thighed curlew	*Numenius tahitiensis*	Threatened
Little curlew	*Numenius minutus*	Near-threat
Nordmann's greenshank	*Tringa guttifer*	Endangered
Asian dowitcher	*Limnodromus semipalmatus*	Threatened
Chinese crested-tern	*Sterna bernsteinii*	Critical
Roseate tern	*Sterna dougallii*	Near-threat
Edible-nest swiftlet	*Collocalia (Aerodramus) fuciphaga germani*	
Flame minivet	*Pericrocotus flammeus*	
Ijima's leaf-warbler	*Phylloscopus ijimae*	Vulnerable
Streaked reed-warbler	*Acrocephalus sorghophilus*	Vulnerable
Mantanani scops-owl	*Otus mantananensis romblonis* (recorded in Semirara)	
Spangled drongo	*Dicrurus hottentottus cuyensis* (recorded in Semirara)	
Birds lacking records on Mindoro Island, and needs further study/ review		
Dark-throated oriole	*Oriolus xanthonotus*	
Philippine oriole	*O. steerii* group	
Fairy bluebirds	*Irena puella* or *I. cyanogaster*	
Velvet-fronted nuthatch	*Sitta frontalis*	
Babblers	*F. Timallidae*	
Tailorbirds	*F. Sylviidae, Genus Orthotomus* *Note:* A ringing record of *Orthotomus castaneiceps chloronotus* from Mindoro (McClure and Leelavit 1972) was not accepted due to the lack of further confirmatory evidence	
White-browed shama	*Copsychus luzoniensis* *Note:* Whitehead 1899, believed it occurs on Mt. Dulungan –but no specimens or other observations exists from Mindoro	
Lowland forest leaf-warblers	*Phylloscopus olivaceus* or *cebuensis*	
Birds described previously as Mindoro Island-endemic taxa but were recognized as synonyms of other nominate races, may need further review		
Mindoro white-eared brown-dove	*Phapitreron leucotis mindorensis* *Note:* Holotypes lost during WWII, fire burned down the Museum - Bureau of Science in Manila, later Manuel (1956) provided neotypes – but did so without adequate justification (Parkes, 1958), thus these taxa were placed under nominate species or subspecies, only as synonyms.	
Mindoro snowy-browed flycatcher	*Ficedula hyperythra dulangana*	

Common Name	Scientific Name	IUCN Category
	Note: Although the Mindoro race was considered as the nominate race for both Mindoro & Luzon, it is still unclear whether the two populations are actually inseparable, and there is a possibility of having two races recognized, wherein the race *F h. trinitalis* is known from Luzon.	
Mindoro lovely sunbird	*Aethopyga shelleyi minuta* *Note:* This race was originally described for Mindoro, but central & southern Luzon populations are lumped to this race, and was initially not recognized because the holotype was lost, though valid.	
Mindoro drongo cuckoo	*Surniculus lugubris mindorensis*	
Mindoro tree-swift	*Hemiprocne comata barbarae*	
Mindoro dwarf-kingfisher	*Ceyx erithacus vargasi*	
Mindoro balicassiao drongo	*Dicrurus balicassius mindorensis*	
Mindoro coleto or bald starling	*Sarcops calvus mindorensis*	
Birds considered to be new records to Mindoro Island, and currently have no subspecific affinities, and may need further review		
Philippine frogmouth	*Batrachostomus septimus*	
Philippine tailorbird	*Orthotomus castaneiceps*	
Greater flameback	*Chrysocolaptes lucidus*	
Yellow-wattled bulbul	*Pycnonotus urostictus*	
Birds recorded on Mindoro Island, but with populations unclear or lumped together with other species/subspecies (mostly Luzon) and therefore needs further review to clarify their taxonomic affinities or may prove to be new		
Philippine pygmy woodpecker	*Dendrocopus maculatus*	
Coppersmith barbet	*Megalaima haemacephala haemacephala*	
Elegant tit	*Parus elegans elegans*	
Mountain leaf-warbler	*Phylloscopus trivirgatus nigrorum*	
Little pied flycatcher	*Ficedula westermanni rabori* *Note:* Record based on sight record on Mt. Halcon, at 4,500 ft	
Rufous paradise-flycatcher	*Terpsiphone cinnamomea unirufa*	
Plain-throated sunbird	*Anthreptes malacensis birgitae* *Note:* Mindoro population probably this race, since no skins now extant, affinities could not be resolved by reviewers	
Orange-bellied flowerpecker	*Dicaeum trigonostigma xanthopygium*	
Tawny-breasted parrotfinch	*Erythrura hyperythra brunneiventris*	
White-cheeked bullfinch	*Pyrrhula leucogenis leucogenis* *Note:* An immature AMNH 714669 obtained by Everett from the collection of the Dept. of Forestry is reputedly from Mindoro, but there is no subsequent record to substantiate this, thus rejected.	
Magpie robin	*Copsychus saularis deuteronymus* (Lubang), *mindanensis* (Mindoro)	

DISCUSSION

SIGNIFICANT ISSUES AND OTHER IMPLICATIONS

This section discusses significant issues and implications of the MBCP island-wide survey on biodiversity conservation on Mindoro in general and on its fauna and flora inventory in particular.

1. MBCP was the first to employ grid sampling method in the selection of priority areas for biodiversity conservation. Groundsurveys compliment interviews to confirm the presence or absence of indicator species with the grids outlined in the maps. Standard 20 square kilometers were used to estimate the number of species occupying each defined locality visited. These sites correspond to a particular grid area on the topographic map that provides a practical approach to completing an island-wide coverage of the island. Rather than traversing all possible points on the map, each grid represents a dataset that approximates the distribution of a species on the island. However, variable habitat types found within each grid should always be a consideration. Grid sampling was useful in identifying important representative points that would otherwise be difficult to survey due to inaccessibility, calamity, or insurgency. Through rapid sampling techniques (direct counts & interviews, the grid results were used to make an plausible estimate of the general distribution and status of each indicator species) as a basis for identifying key areas for priority conservation.

2. Survey results and fauna and flora inventories were able to determine possible new discoveries or potential new taxa and distribution records. The most significant of these was the Luzon water redstart and the MBCP surveys provided the necessary evidence to support its records on Mindoro. Among the important finds of this survey were the possibility of two new taxa of frogs (genus *Platymantis* and *Leptobrachium*) discovered in the eastern rainforests. Notable records of rarely observed bird fauna were confirmed in the survey, from threatened migratory birds (Chinese egret and osprey from the eastern coasts), to uncommon resident species (red-bellied eagle), threatened endemics (spotted imperial-pigeon, Philippine hawk-eagle), and critically threatened island-endemics (Mindoro hornbill and Mindoro bleeding-heart). Similarly, other fauna were also notable records that either extend their known distribution or confirmed their inherent sedentary habitats and otherwise remained as restricted-range species. Most significant was the comprehensive inventory of Ylin and Ambulong islands, which did not provide sufficient evidence to confirm the presence of the endemic bushy-tailed cloud rat in the last remaining disturbed patches of fragile Taluto forests on karst limestone. Enormous cage traps were not successful in providing more evidence, and maybe better bait is determined. However, some local accounts appear to be hopeful and additional reports from the western lowland forests of mainland Mindoro about the large cat-sized rat “siyang” were also promising. Unfortunately, the lack of reports and the residents’ unfamiliarity with a giant rat only provides stronger evidence that the “siyang” does not occur in the eastern portion of the island.

3. Additional records (both confirmed and unconfirmed) derived from the surveys were able to identify immediate and projected scenarios concerning the status and distribution of important indicator species particularly for species being considered for conservation, whether their current status appears to be more threatened or otherwise. The status and distribution of the elusive Mindoro race of both the Philippine brown deer and warty pig continues to be poorly

known. The island-wide search revealed the increasing threat of extinction for these large mammals. All the presumably wild pigs kept in captivity ended up to be hybirds of the warty pig with t free-ranging domestic breeds; and all the otherwise reported pure specimens were either lost or eaten. Similarly, all the captive deer observed in Mindoro were actually imported stock from Luzon. Males did not display the enormous antlers typical of the Mindoro subspecies as observed from trophies hung on nearly every household in both provinces. Furthermore, continued hunting pressure and demand for wild pig or deer meat from both the Mangyans and local townsfolk were readily observed in several localities. Unfortunately, these were also the same limited sites that confirmed remaining populations of deer and/or warty pig. Based on the accounts of locals, deer and warty pigs have significantly declined on the island, and were rapidly disappearing from most of their former range. The relatively steep forested slopes of tall mountains (Calavite, Halcon, Baco, and Hinunduang) provide a few refuges for these beleaguered island-endemics. Unlike the Tamaraw, little or nearly none has been done to help protect these species considering that hunting pressure and hybridization occurs in close proximity to designated protected areas (national parks and game refuges).

4. Apparently, more serious attention needs to given to the rapid decline of less popular island-endemic taxa like the deer and warty pig. Many species with endemic subspecies should warrant the same protection since they often share the same habitats. The status of island endemic taxa are often unknown until more serious issues make them more conspicuous. Cebu's island endemic birds were not well recognized until many of them had become extinct, which made conservation programs take notice. Unless more extensive surveys can help disprove our assumptions regarding the evident decline of several island endemic taxa, it would be best to included them in a provisionary list of threatened animals in order to attract the much needed conservation attention before it is too late. Endemic montane birds appear to be least threatened with much the remaining mountain forests still intact, especially on the eastern side. However, many lowland endemics have shown rapid decline throughout their former range, such as the Mindoro races of the colasisi, white-bellied woodpecker, bar-bellied cuckoo-shrike, black-bibbed cicadabird, and blue-crowned racquet-tail.

5. Conservation programs need not be exclusive to only one species (single-species conservation), rather these should be usedas flagship species that would protect not only the habitat, but all the other species which depend on it. The primary goal of these large protected areas was to provide sufficient areas to include varied habitats types within the landscape and protect as much of the wildlife that goes along with it including the flagship species. Unfortunately, effective implementation has been a consistent problem for protected areas in the Philippines. Despite the numerous laws and sanctuaries created for Mindoro's wildlife, threats continue to degrade the island's unique diversity. Compared to the other islands in the archipelago, Mindoro is among the more fortunate areas with regard to conservation related programs and proclamations. It contains one of the largest protected areas system by percent island area than any other (except probably Palawan). It received one of the largest known budgets for single-species conservation for the Tamaraw, probably more than any other Philippine species. Much of the island remained relatively wild for some time and not as densely populated as all the other large islands considering its proximity to Manila and very long history of colonization.

6. The status, distribution, and ecology of critically endangered and/or endemic species from Mindoro and associated islands within the faunal region were confirmed. The MBCP survey was able to identify key points in the past and current distribution of some of the poorly known island endemic species. Brief accounts of their ecological preferences and strategies for adaptation provide insights on the degree to which a threatened species would be able or unable to cope with the current environmental scenario and how these conditions may be resolved in the immediate future. This was evident for the Tamaraw which had conflicting records about its distribution and habitat use. Clearly, this bovine was well adapted for grazing along the extensive natural grasslands of the western and southern highlands and only took refuge in adjacent forests. All reports regarding its occurrence in montane forests of the east appears to be a misnomer brought by inconsistency in the names of localities. Apparently, it is true that the Tamaraw inhabit Mt. Halcon range (a large mountain massif) which is covered by dry grasslands on its western slopes, where boundaries for Oriental and Occidental Mindoro are not distinct. Like the native wildlife, the indigenous people of the island are not bounded by invisible political boundaries and readily traverse mountain ranges from east to west and vice versa. Similarly, hunting trophies taken by people from the east travel westward to the hunt beyond the natural border dividing the eastern and western zone. Supposedly, Tamaraw specimens taken from the Oriental side of the Eagle pass (Villa Cerveza and San Luis) actually were taken around the fringing grasslands within proximity if not in the Occidental side. It is apparent that the western grasslands naturally maintained by fire (just like the Mindoro pine) are equally important habitats as forests, vital to the survival of wild Tamaraw.

7. The total counts of Tamaraw trophies hung on the walls of Mindoro's elite (taken during the 1960's to 1970's) are consistent with accounts made by indigenous tribes who also served as guides regarding poachers (some in helicopters). The encroachment of large cattle ranches introducing exotic grasses and diseases, followed by the influx of upland migrant settlers from other islands has seriously reduced the grazing areas of the Tamaraw. The high mortality rate that accompanied the creation of the gene pool added to their demise, and the enclosures only restricted them from their natural free-ranging and territorial behavior. Altogether, these disturbing issues provide a clearer picture of how severe hunting pressure and other disturbances to its habitat have greatly reduced the Tamaraw population, despite the presence of a conservation program. The increasing number of people on Mindoro pushes these inherently shy species to endure survival in their shrinking space. According to iMangyan elders, before the Tamaraw was not as shy, and were often found in small family groups grazing in the uplands. When they began to disappear, some them adopted crepuscular habits in order to graze safely away from man and his gun. In the late 1980's, population counts often reported that Tamaraws occur more as solitary animals (some with young); but wouldn't this also imply that much of their original population has been so greatly reduced that older territorial individuals made up the bulk of their remaining numbers. Disease or disturbance has also affected their fecundity, just like the captive stock in the gene pool. Territorial behavior among large grazing mammals often protect a family herd from other males or from competitors for forage. This indicates that only a definite population of Tamaraws can actually co-exist in a small isolated island like Mindoro. Furthermore, their adaptation to grazing rather than browsing (like deer) also restricts its distribution to western grassy highlands. After nearly 30 years of active conservation programs developed for the tamaraw, it now appears clear, that unless a massive shift in conservation awareness occurs in Mindoro, this unique species will not survive through another millennium.

8. The endangered Philippine crocodile is slowly becoming a species that can be regarded as "conservation-dependent," just like the California condor and Pere David's deer. This species may no longer exist in the wild unless a more positive scenario ensures that re-introductions would survive. Very few wild populations remain in the Philippines, and with the increasing insurgency problems and rapid development of Mindanao and Northern Palawan, these few satellite populations will soon cease to exist. It is a shame that a once widespread species had been greatly reduced in such a short period of time, that now the only assurance for survival is in captivity. It is more saddening that *Crocodylus mindorensis* would disappear from its original place of discovery, Lake Naujan, and its name-sake, Mindoro Island. Island-wide surveys failed to confirm its presence in the wild, although several reports indicate that only a few stragglers still remain in isolated rivers deep into the island's interior, possibly along the relatively upper tributaries of Mag-asawang-tubig which feeds into Lake Naujan, or possibly along remote secluded river valley such as Victoria's gorge or Busuangan river. The rapidly expanding coastal communities surrounding the lake have taken over much of the crocodiles' original habitat, and increasing boat traffic and fishing activities add more disturbance. Gill nets, metal fish traps, and electric-shock had taken its toll on the few surviving juvenilesan entire generation. Persecution and fear have always placed crocodiles at the losing end. The shaded mud-banks covered with dense reeds necessary for mound-nest building have been mostly cleared and converted to ricefields, and even the wetland birds that serves as a primary food source for the Philippine crocodile have also declined. It would even be possible that the introduction of the toxic South American cane toad may have affected juveniles that feed on amphibians, insects, and fishes during this stage. The few remaining crocodiles finally succumbed to a more serious and invisible threat pollution. According to the local fishermen and boat operators, it had been several years since they had last seen a live crocodile in Naujan lake. Unconfirmed reports of crocodiles possibly surviving in two areas around the lake (Brgy. Balete and along Butas river) were noteworthy. However, two species of crocodiles were recorded to inhabit lake Naujan. The eastern portion where the Butas river empties the lake into Tayabas Bay, is the habitat of the Indo-Pacific or estuarine crocodile, whereas the western portion leading to the smaller tributaries supports Philippine crocodiles. Both species are regarded to be endangered, but the endemic Philippine crocodile is the most threatened in the wild. Proposed lake development would likely seal the fate of this unique species, and unless strict mitigating measures are enforced more wetland species will be lost forever. Increasing the protection over the last few remaining wild areas surrounding the lake affords some solution, if it is true that the species had been completely eradicated or extirpated from the lake. Future deliberations for lake restoration and possible re-introduction programs must be planned ahead in order to prepare the next generation who never experienced sharing the lake with crocodiles. Proper community planning, awareness programs and implementation of laws should encourage the people to avoid causing any more damage to the lake system, wetlands, and adopt eco-friendly methods of fishery. The best initiative that would help convince lake residents from not abusing the lake is simply to take Laguna de Bay as scenario they must avoid.

9. Primeval Mindoro would have probably looked like one of those untouched wilderness areas with large winding rivers traversing thick rainforest blocks like those in the Amazon. Such a

scenario probably was not that far behind in the past. The vast floodplains of the eastern portion of the island now supports extensive rice fields that gave Mindoro the nickname of food-basket of the east. The same expansive flat floodplains that gradually slope from the central spine out into the coasts were also ideal for the rapidly expanding coastal communities. Much of the present lowland landscape is dominated by rice paddies, coconut-banana plantations, and expanding villages. Before the turn of the 20th century, much of these coastal plains were once extensively covered by dense tangles of swamp forests, much like the flooded rainforests of Brazil. Historical accounts of large-scale logging operations in the 1920's to 1940's, led mostly by American lumber companies had stripped much of these rainforests, and the remaining tangles of jungle were eventually cleared for agriculture. Further timber extraction had continued into the 1960's and 1970's, expanding up into hill forests and valleys, as well as the lower slopes of mountains. A small patch of these tall swamp forests remains in the middle of the vast floodplain between Calapan and Naujan, contrasting with the surrounding rice fields. This patch of forest serves as a reminder of how Mindoro was once a majestic dense cover of rainforests that rivaled even the mighty Amazon. No wonder that Whitehead's initial expedition through the Baco River was difficult and was only known accessible way up to Mt. Halcon. Evidences of extremely large indigenous forest trees can still be seen scattered in isolated pockets around Baco, Calapan, Naujan, and even as far down as Roxas and Bongabong. It would be extremely difficult to restore any part of these floodplains to its original rainforest landscape. Forest restoration would take more than just time to naturally grow and evolve since most of the complex inter-linkages that maintain the balance in the system are not longer present. Once a rainforest and its rich biological diversity are lost, it is impossible to recreate all that is lost.

10. Reforestation programs that intend to augment the loss of forest cover, flood control, and increasing demand for alternative timber resources provide immediate solutions. However, improper forest management practices encourage numerous reforestation programs to adopt the same system which eventually cause more problems in the long run. Many reforestation programs have adopted the use of fast-growing exotic tree species adapted produce rapid growth during the wet season in order to best survive the coming dry season in deciduous coastal forests of South America (*Gmelina, Sweitania*), savannas of Africa (*Acacia, Samanea, Albizia*), and Australia (*Eucalyptus*). The same adaptations for water absorption in dry conditions make these exotic trees the worst candidates for watershed management in the tropics. The major reasons for adopting these species as the major tool for reforestation projects throughout the Philippines was their rapid growth rate in areas with limited rainfall, which lessens the labor cost, time, and effort to manage the plots. Others were adopted for their more practical uses rather than as ecological tools, such timber (Large-leaf mahogany), source of pulp and paper (Falcata), and gum source (Eucalyptus). However, the problem lies when identifying the use of these trees whether they are for community watershed management or for private forest/timber plantations. Privately-owned plantations can plant any tree they want as long as they have accomplished the necessary permits. Although, they should be encouraged to plant more indigenous tree species which equally provide the timber value and earlier harvest as do the exotics, an added value to this would be providing alternative habitats for native wildlife. Exotic tree plantations do not provide the needed habitats many forest species require, such that only a few more adaptable species actually survive in exotic forests. It would be difficult for species which had co-evolved with particular trees for food and refuge to readily adapt to a foreign organism. As such, exotic tree

plantations provide little ecological value, and some may even do more damage by producing invasive chemicals that causes surrounding vegetation to become stunted (some Acacia).

11. One problem arising from exotic trees used in watersheds is the use of monoculture, wherein only a single tree species is planted and dominates the landscape. Just like in temperate pine or oak forests in the north, monoculture provides little ecological diversity. In watershed reserves, reforestation and restoration programs should never involve any non-native species but rather comprise a diverse mixture of fast growing indigenous/endemic tree species typical of secondary rainforests or pioneer species dominating *parang* vegetation. Once the earlier trees have become established, slow-growing climax species (like Dipterocarps) may be added. Figs (*Ficus* sp.) and the closely related Jaks (*Artrocarpus* sp.) both of the family Moraceae are noted to be excellent trees for watershed management, and also attract numerous wildlife species that in turn improve diversity through seed dispersal, later becoming self-sustaining with the gradual addition of other species interacting within the system.

12. The extremities in prevailing ecological conditions between the east and west part of Mindoro Island is brought about by the “rain-shadow” effect, a natural phenomenon known to occur on islands or coasts with sufficiently high mountain peaks as barriers. The rugged central mountain spine is composed primarily of two mountain massifs (Halcon & Baco). These peaks trap low clouds formed from the nearby coasts (east side), which condense into mist or rain drenching the peaks and slopes causing the luxuriant growth of rainforests as well as wet cloud forests around the peak. Because of the limited rainfall reaching the other side of the mountain (west side), the vegetation is adapted to dry conditions with seasonal drought, thus less luxuriant growth on the peaks due to fast drainage and greater exposure. The vegetation tends to cluster around the secluded gulley where water then accumulates, forming small riparian habitats that later build up into tall rainforests surrounding rivers. As a result of limited moisture, mostly fire-maintained climax grasslands develope around the peaks and slopes, along with pine trees that require fire to pop open their seeds out of the pinecones. Both these natural Themeda grasslands and pine forests occur only on the west portion of the island, since both are fire-adapted. Although both the east and west sides share a similar geological base volcanic in origin, the extreme southern half portion of the island was replaced by karst limestone substrate, from southeast Bongabong to Bulalacao, and from southern Sablayan toward Magsasay. The remaining northern portions are mainly volcanic rock, granite, and quartz, as well as limestone formations more evident in the Mt. Malasimbo and Talipanan ranges. The western dry climatic condition also extends southward to cover most of the island and cross even beyond the relatively low end of the mountain spine, which no longer causes a rain-shadow on Mansalay and Bulalalcao. As a result, these two townships actually experience the same climatic conditions as the rest of Occidental Mindoro.

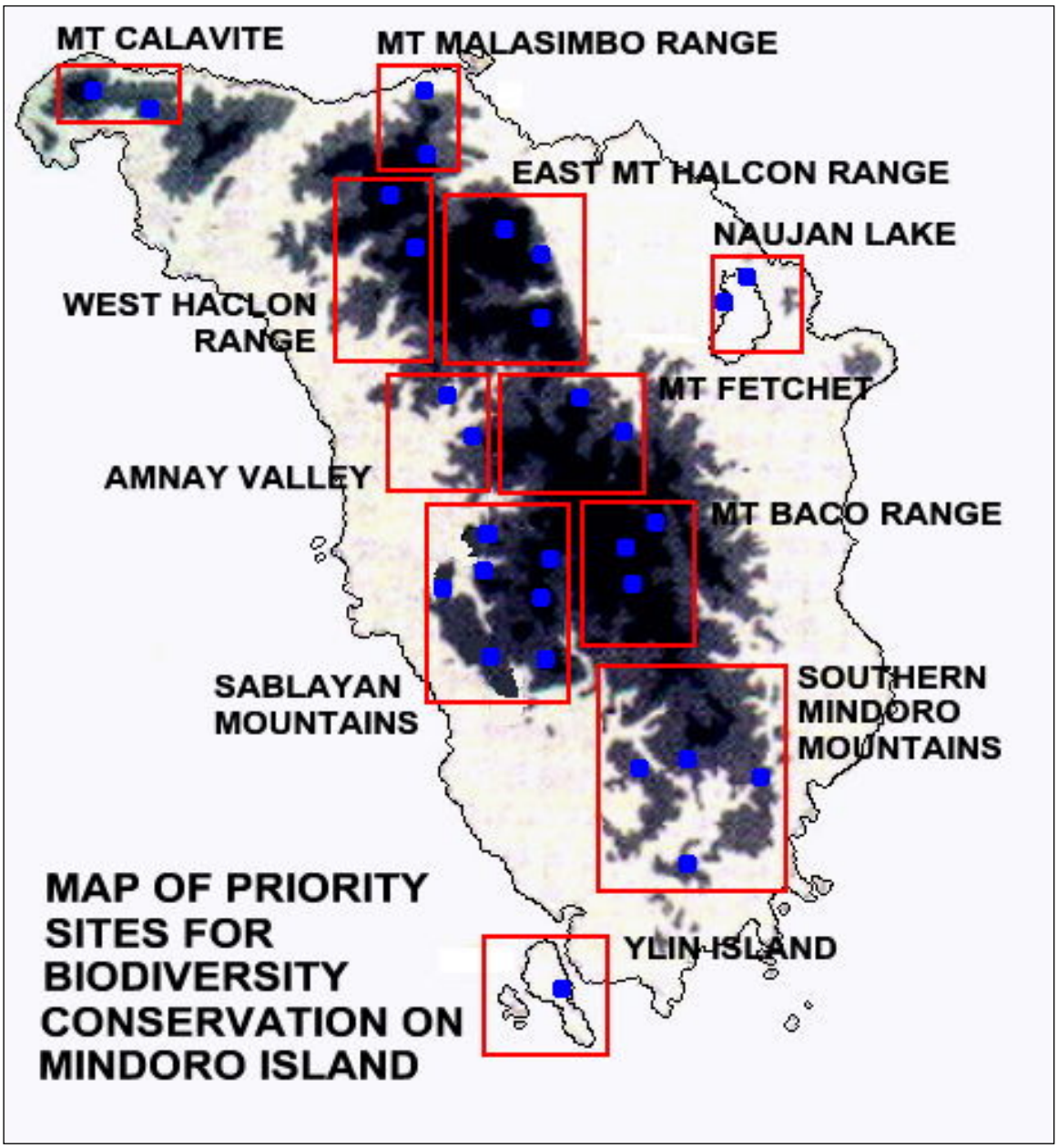
13. Given the distinct dry and wet climatic zones between west and east, two different management plans need to be developed for each, since these extreme differences in temperature and moisture provide similarly varied adaptations for growth. However, the southern part of the island varies more because of its geological formation and shares the same dry zone as the west. The more porous limestone rock formation as dominant substrate entails much more adaptive means of water absorption, attachment, and nutrient source. The drier conditions typically do not allow water-loving tree species to survive, but instead employ well adapted species allied to the molave tree (*Vitex*), as well as other deciduous tree

species such as Taluto (*Pterospermum*), Panisoghin (*Canarium*), Dao (*Dracontomeloni*), various figs (*Ficus*), Banaba (*Lagerstomia*), Kalantas (*Toona*), and other trees typical of forests of karst limestone and ultrabasic soil. The same conditions and rock formations extend toward the smaller islands surrounding the southern tip of the province, including Ylin and Ambulong Islands.

14. One the sweetest ironies that can be observed with regard to forest conservation in Mindoro island was the fact that many areas around the island have been designated or proclaimed as protected areas. F.B. Harrison Game Refuge and Bird Sanctuary, Mts. Iglit-Baco National Park (ASEAN Heritage Site), Mt. Calavite Game Reservation, Puerto Galera Man-and-Biosphere Reserve, Apo Reef Marine Natural Park and Lake Naujan National Park. Despite these large areas of land devoted to protecting forests, wildlife, and marine resources many endemic species continue to become endangered due to the lack of implementation and more effective management schemes, and lack of funding support, among other constraints. On the other hand, Mt. Halcon, which is known to harbor most if not all the known island endemic species of Mindoro, (several of which are known to occur only from the mountain). Apparently, Mt. Halcon itself is not a protected area or a part of any major recognized site by the DENR, this is despite the fact that several watershed reserves are supported by Mt. Halcon and therefore qualify as a sort of PA. The southern slopes of Mt. Halcon may in fact form a saddle that connects with the mountain range around FB Harrison GRBS. Actually the proposed Mangyan HeritageNatural Park(MHNP), intends to combine the FB Harrison GRBS and MIBNP into one larger PA that extends northward to cover not only Mt. Halcon but also the Baco saddle. The boundaries of this proposed PA extends to existing forests and avoids established communities; it also combined existing large PA's and turning it into a larger and more effective PA for the conservation of island endemic wildlife particularly the Tamaraw. Unfortunately, MHNP remains to be just a proposal.

15. One of the perceived current threats and issues that may later cause problems in the protection of natural landscapes and wildlife on Mindoro are mining exploration and extraction in existing old growth forests, and similarly important habitats, which would otherwise be more valuable in conserving the rich biological diversity of Mindoro. Mining is an essential component in economic growth and industrial development since raw materials need to be available. However, there are alternative measures that can be resolved, and there is a need to search for alternative sources which would not conflict with conservation or social change. All proposed industrial developments must undergo rigid environmental assessment and should acquire all the necessary permits before any preliminary test or visits can be done, thereby respecting other people's rights. Mitigating measures needs to be strongly enforced by the local DENR or EMB in order to avoid future conflicts, with assurance of regular monitoring, testing, and community workshops. However, in most cases, these simple procedures become complicated and become a source of increased social tension.The proposed splitting of Oriental Province into two separate provincial units poses a problem with regard to political boundaries with known PA's or proposed priority sites. It has been a common notion that political issues in Mindoro are no laughing matter due to the extreme regionalism expressed by both sites. It seems unfair that such an island could be socially separate by the same central mountain spine that divides itself into climatic zones. Unlike Negros Island, which is divided by language and culture, the people have begun to set aside their differences and act as one Negrense. While Mindoro Island speaks one language, the people manage to keep each others' paths closed rather than opening up further. A third party

would tend to cause more confusion, let alone conflicts with wildlife, forests, and the landscape, waiting for their fate. One of the major problems plaguing rapidly developing islands like Mindoro is the increased influx of migrant settlers from other congested adjacent islands, most of whom are landless migrant farmers seeking new lives by doing kaingin farming in the uplands of a national park or watershed reserve. The influx of migrants and the rapid population growth following urbanization in the core areas of commerce like Calapan, San Jose, Pinamalayan, Sablayan, and Bansud spell diminishing returns. The law of supply and demand becomes increasing uneven, particularly for space and water, unless early measures are devised to properly plan ahead before any conflicts become apparent.



Map of Mindoro Island showing the original 11 priority sites for biodiversity conservation grouped into related sections based on results of the MBCP rapid island-wide survey 1998-1999.

A splinter of bamboo with etched Banghayin poems of the Hanunuo-Mangyan trib

CONCLUSION AND RECOMMENDATIONS

LOCAL INITIATIVES AND RELEVANT ISSUES FOR CONSERVATION

Summary of proposed actions and issues/strategies that may aid the development of management plans relevant to biodiversity conservation initiatives for Mindoro Island.

1. Conduct more extensive field research on priority areas suggested, particularly on areas which have not been studied previously due to their relative inaccessibility but contain large areas of old growth forest habitats, that may possibly harbor other undiscovered that would otherwise be possible island-endemic taxa.

2. Designate other new protected areas on selected priority sites which have not been or are in any form protection but contain considerable areas of habitat. There is also a need to review the current management plans for existing PA's and possibly restructure the conservation initiatives that would best cater to the needs of that particular PA.

3. Increase community conservation education in order to widen the awareness among the local Mindorenos, from all levels of society or social status, religion , race, gender and culture. The level of awareness can also affect the amount of direct community involvement regarding wildlife conservation, as well as other related issues. The importance of incorporating and highlighting Indigenous knowledge and local culture in the mainstream of environmental education and conservation awareness.

4. Increase local protection of existing protected areas, watershed reserves, marine sanctuaries or even other forest habitats of considerable size that still remain unprotected can be done community level. Endorsing or encouraging the local community or LGU to take their own initiative in conservation.

5. Importance of conserving variable habitat types, ecosystem diversity for maintaining the fragile ecology of small islands. All the varied forest and vegetation types (including other non-forest habitats) are vital to keeping the ecological balance of small isolated archipelagic islands like Mindoro. Each habitat type and their distinct fauna and flora components regulate and maintain the functional linkages within each type and other adjacent habitats as well.

6. Selection of important indicator species to be considered for use in a standardized island-wide monitoring of the island's remaining fragmented habitats that would be most applicable to each unique locality. Consider species that is in the most threat and regularly evaluate its local conservation status/categories.

7. Initiate conservation measures for the wetland bird fauna, fishes and aquatic flora of Naujan Lake, including the extensive studies of its unique lake biodiversity, and monitor populations of migratory birds as well as other resident fauna that have declined significantly.

8. Control of the illegal trade of both forest and marine resources at the community level, by promoting localized protection schemes for hunting wildlife or even logging constraints to protected valuable watersheds. Control the influx of migrant settlers into uplands to prevent further degradation of remaining forest habitats and the need for more organized planning of

recently established communities that would reduce (if not stop) their impact on surrounding habitats.

9. Protection of all Island endemic species of flora and fauna and their inclusive ecological communities in order to conserve the unique natural heritage that represents Mindoro. Conservation measures need not focus only on those critically endangered species and popular flagship species like the Tamaraw, but must be relayed further to protect other equally unique island taxa which may suffer the same extinction unless given sufficient attention. Already some the less recognized island endemic races of birds have shown significant decline.

10. Limit the extent of expanding exotic tree plantations on areas which contain natural habitats in order to reduce the negative impact of aggressive introduced species on the overall ecology of forest ecosystems. Most endemic wildlife species are unable to adapt to these non-native habitats. Encourage the use of multi-species reforestation as opposed to monoculture, and the use of indigenous or endemic tree species for watershed development and restoration.

11. Increased local involvement (NGO's, schools, indigenous tribes, etc.) in the management and conservation of their remaining habitats in proximity of their community, using flagship species to help promote cultural or aesthetic value towards wildlife as part of their heritage.

12. Identify and monitor the status of smaller satellite islands surrounding mainland Mindoro which harbors other possible unique and threatened species that gain refuge on these small isolated less populated areas. Such as the larger islands of Lubang and Semirara which may harbor other distinct species endemic to the island, as well as other small islands in around the coasts of Calapan, Puerto Galera, Bulalacao, Sablayab and even within Naujan Lake, which provide the sanctuary for some species – like marine turtles, tabon scrubfowl, sea birds and migratory birds.

CORE PRIORITY SITES FOR BIODIVERSITY CONSERVATION

On the basis of organizing the previously selected list of priority sites chosen from numerous study areas derived from the island-wide survey and rapid inventory. Considering the most appropriate clustering of adjacent priority sites which contains the most number of important habitat types and greatest extent of size or area containing natural landscapes. With particular emphasis on dominant vegetation types along elevational, climatic and geological gradients. Inclusion of other smaller priority sites that does not necessarily contain numerous indicator species or varied habitats, but otherwise vital to the survival of one or several critically important species.

1. Northwestern Mindoro Highlands and Mount Calavite - Anduyanan mountain range

   This priority site contains varied vegetation types typical of the western dry climatic zone that contains lowland forests, scattered scrub forest along gulleys and extensive grasslands on the upper elevations. It is greatly affected by the rain-shadow effect and coastal climate.

2. Northern Mindoro Highlands and Mount Halcon massif

This priority site contains more dense vegetation types typical of the eastern wet climatic zone that contains varied forest habitats from the coastal floodplains to the mountains, with a unique alpine heath zone at the peaks.

3. Central Mindoro highlands and Mount Baco mountain massif

   This priority site contains highly variable vegetation types typical for priority sites 2, 3, and 4.

4. Southern Mindoro Highlands and Mount Hinunduang range

   This priority site contains an extension of priority site 1 on the southeastern portion but occurs in a different geological formation – forests on limestone.

5. Species-specific priority sites

   a. Mount Naujan and Lake Naujan

   This priority site contains wetland and lake habitats vital to crocodiles and wetland fauna

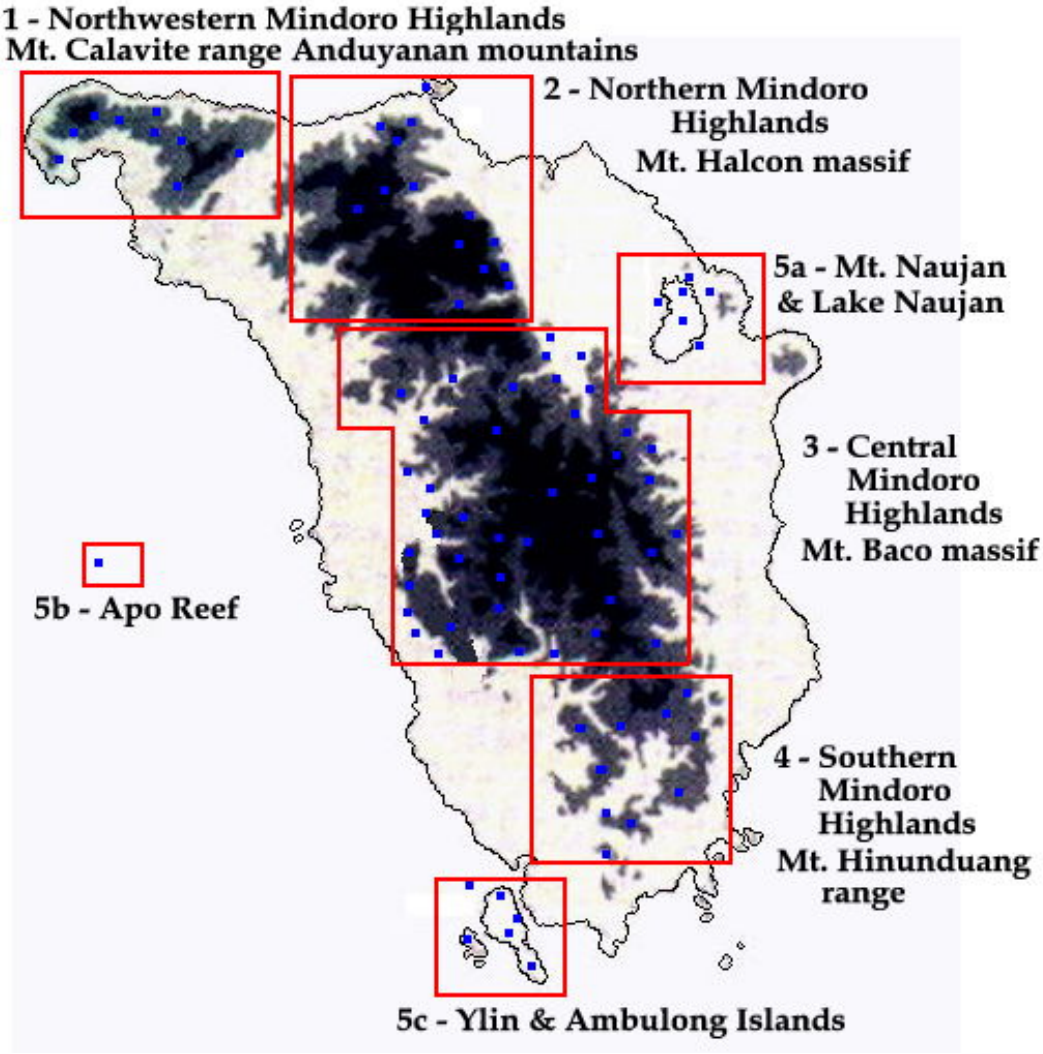
   b. Apo Reef Marine Natural Park

   This priority site contains coralline islands and marine habitats vital for seabirds and turtles

   c. Ylin and Ambulong Islands

   This priority site contains dry island forests vital to the bushy-tailed cloud rat

FIVE CORE PRIORITY SITES SELECTED FOR BIODIVERSITY CONSERVATION ON MINDORO ISLANDS, PHILIPPINES



Conservation status of Mindoro Island-endemic taxa based on the results of the MBCP island-wide surveys.

Common Name	Scientific Name	IUCN Category or Status of endemic taxa
Birds		
Mindoro zone-tailed/ imperial pigeon	*Ducula mindorensis*	Endangered
Mindoro bleeding-heart	*Gallicolumba platenae*	Critical
Black-hooded or Steere's coucal	*Centropus steerii*	Critical
Mindoro mountain or Mindoro scops-owl	*Otus mindorensis*	Vulnerable
Mindoro tarictic or Mindoro hornbill	*Penelopides mindorensis*	Endangered
Scarlet-collared or Mindoro flowerpecker	*Dicaeum retrocinctum*	Critical
Mindoro Blue-crowned Racquet-tail	*Prioniturus discurus mindorensis*	Uncommon
Mindoro colasisi/hanging-parrot	*Loriculus philippensis mindorensis*	Uncommon
Mindoro Hawk-Owl or Boobook Owl	*Ninox philippensis mindorensis*	Uncommon
Mindoro White-bellied Woodpecker	*Dryocopus javensis mindorensis*	
Mindoro Black-bibbed Cicadabird	*Coracina mindanensis elusa*	Vulnerable
Mindoro blue-flytcatcher	*Cyornis rufigastra mindorensis*	Uncommon
Mindoro Green-backed Whistler	*Pachycephala albiventris mindorensis*	Uncommon
Mindoro mountain shrike	*Lanius validirostris tertius*	Uncommon
Mindoro Golden-yellow White-eye	*Zosterops nigrorum mindorensis*	Uncommon
Mindoro lowland scops-owl	*Otus (megalotis group) sp.*	Uncommon
Mindoro Bar-bellied Cuckoo-shrike	*Coracina striata mindorensis*	Uncommon
Mindoro coucal	*Centropus viridis mindorensis*	Common
Mindoro White-browed shortwing	*Brachypteryx montana mindorensis*	Common
Mindoro thrush	*Turdus poliocephalus mindorensis*	Common
Mindoro grassbird	*Megalurus timoriensis mindorensis*	Common
Mindoro mountain white-eye	*Zosterops montanus halconensis*	Common
Lubang lovely sunbird	*Aethopyga shelleyi rubrinota*	Not known
Mammals		
Tamaraw or Mindoro dwarf-buffalo	*Bubalus mindorensis*	Endangered
Mindoro shrew	*Crocidura mindorus*	Vulnerable
Mindoro flying fox	*Pteropus sp.*	Rare
Mindoro climbing rat	*Anonymomys mindorensis*	Indeterminate
Large mindoro forest mouse	*Apomys gracilirostris*	Indeterminate, newly described (Ruedas e al)
Lesser mindoro forest mouse	*Apomys* sp.	Indeterminate, undescribed (Heaney et al)
Mindoro spiny rat	*Maxomys* sp.	Indeterminate, undescribed (Heaney et al)
Ilin hairy-tailed cloud rat or cloud runner	*Crateromys Paulus*	Endangered/ Possibly extinct??
Mindoro warty pig	*Sus philippensis oliveri*	Indeterminate
Mindoro brown deer	*Cervus mariannus barandanus*	Rare
Amphibians and Reptiles		
Mindoro tree frog	*Philautus schmakeri*	Not known
Mindoro forest frog	*Platymantis sp.*	Not know undescribed – may b several new species
Mindoro variable-backed frog	*Rana signata*	Fairly common alor

Common Name	Scientific Name	IUCN Category or Status of endemic taxa
		clean rivers/streams
Mindoro litter toad	*Leptobrachium hasselti ssp.*	Not known, but fair restricted to N Mindoro
Mindoro anglehead or Forest dragon	*Gonocephalus interupttus*	Proposed Indeterminate?
Mindoro burrowing skink	*Brachymeles boulengeri mindorensis*	Not known
Mindoro flying lizard	*Draco sp.*	Not known, possibly new undescribed

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Appendix Table 1. Checklist of Terrestrial Vertebrates of Mindoro Island

SCIENTIFIC NAME	COMMON NAME
MAMMALS	
Order Insectivora	
Family Soricidae	
*Crocidura grayi**	Luzon shrew
*Crocidura mindorus**	Mindoro shrew
Suncus murinus+	Asian house shrew
Order Chiroptera	
Family Pteropodidae	
*Acerodon jubatus**	Golden-crowned flying fox
Cynopterus brachyotis	Common short-nosed fruit bat
Eonycteris spelaea	Common nectar/dawn bat
*Haplonycteris fischeri**	Philippine pygmy fruit bat
*Harpyionycteris whiteheadi**	Harpy fruit bat
Macroglossus minimus	Dagger-toothed flower bat
*Ptenochirus jagori**	Musky fruit bat
*Pteropus pumilus**	Little golden-mantled flying fox
Pteropus vampyrus	Large flying fox
*Pteropus sp.***	Mindoro pallid flying fox
Rousettus amplexicaudatus	Common rousette
Family Megadermatidae	
Megaderma spasma	Lesser false-vampire bat
Family Rhinolophidae	
*Coelops hirsutus**	Philippine tailles roundleaf bat
Hipposideros ater	Dusky roundleaf bat
Hipposideros bicolor	Bicolored roundleaf bat
Hipposideros diadema	Diadem roundleaf bat
Hipposideros lekaguli	Large Asian roundleaf bat
Rhinolophus arcuatus	Arcuate horseshoe bat
*Rhinolophus inops**	Philippine forest horseshoe bat
Rhinolophus philippinensis	Enormous-eared horseshoe bat
*Rhinolophus rufus**	Large rufous horseshoe bat
*Rhinolophus subrufus**	Small rufous horseshoe bat
Family Vespertilionidae	
Miniopterus schreibersi	Common bent-winged bat
Miniopterus tristis	
*Murina cyclotis**	
Pipistrellus javanicus	
Tylonycteris pachypus	Lesser bamboo bat
Order Primates	
Family Cercopithecidae	
Macaca fascicularis	
Order Rodentia	
Family Muridae	
*Anonymomys mindorensis***	Mindoro climbing rat
*Apomys gracilirostris***	Large Mindoro forest mouse
*Apomys musculus**	
*Apomys sp. E***	
*Chrotomys mindorensis**	Lowland striped shrew-rat
*Crateromys paulus***	
Mus musculus+	
Rattus argentiventer+	
*Rattus everetti**	

SCIENTIFIC NAME	COMMON NAME	
*Rattus mindorensis***		
Rattus tanezumi+		
Order Carnivora		
FamilyViverridae		
Paradoxurus hermaphrodites	Common palm civet	
Viverra tangalunga		
Order Artiodactyla		
Family Suidae		
*Sus philippensis**		
Family Cervidae		
*Cervus mariannus**		
Family Bovidae		
*Bubalus mindorensis***	Tamaraw	

Summary

Mindoro endemic = 7 species
Philippine endemic = 24 species
Common = 19 species
Introduced/commensal = 4 species
Total = 47
6 orders, 11 families, 31 genera, 47 species

BIRDS		
Order Podicipediformes		
Family Podicipedidae		
Tachybaptus ruficollis philippensis	Little grebe	Endemic subspecies
Order Pelecaniformes		
Family Anhingidae		
Anhinga melanogaster melanogaster	Oriental darter	Resident
Order Ciconiiformes		
Family Ardeidae		
Ardea sumatrana	Great-billed heron	Resident
Ardea purpurea manilensis	Purple heron	Resident
Egretta garzetta garzetta	Little egret	Migratory
Egretta sacra sacra	Eastern reef-egret	Resident
Egretta eulophotes	Chinese egret	Migratory
Egretta alba modesta	Great egret	Migratory
Bubulcus ibis coromandus	Cattle egret	Resident
Ardeola bacchus	Chinese Pond-heron	Migratory
Butorides striatus carcinophilus	Striated heron	Resident
Butorides striatus amurensis		Migratory
Gorsachius melanolophus kutteri	Malayan night-heron	Endemic subspecies
Nycticorax nyctiorax nycticorax	Black-crowned night-heron	Migratory
Nycticorax caledonicus manillensis	Rufous night-heron	Endemic subspecies
Ixobrychus sinensis	Yellow bittern	Resident
Ixobrychus eurhythmus	Schrenck's bittern	Migratory
Ixobrychus cinnamomeus	Cinnamon bittern	Resident
Dupetor flavicollis flavicollis	Black bittern	Resident
Family Ciconiidae		
Ciconia episcopus episcopus	Woolly-necked stork	Resident
Family Threskiornithidae		

SCIENTIFIC NAME	COMMON NAME	
Threskiornis melanocephalus	Black-headed ibis	Migratory
Order Anseriformes		
Family Anatidae		
Dendrocygna arcuata arcuata	Wandering whistling duck	Resident
Anas crecca crecca	Green-winged teal	Migratory
Anas luzonica	Philippine duck	
Anas clypeata	Northern shoveler	Migratory
Order Falconiformes		
Family Pandionidae		
Pandion haliaetus haliaetus	Osprey	Migratory
Family Accipitridae		
Pernis ptilorhyncus philippensis	Oriental honey-buzzard	Endemic subspecies
P. p. orientalis		Migratory
Pernis celebensis steerei	Barred honey-buzzard	Endemic subspecies
Elanus caeruleus hypoleucus	Black-shouldered kite	Resident
Haliastur indus intermedius	Brahminy kite	Resident
Haliaeetus leucogaster	White-bellied sea-eagle	Resident
Ichthyophaga ichthyaetus	Grey-headed fish-eagle	Resident
Spilornis (cheela) holospilus	Philippine crested serpent-eagle	Endemic
Circus spilonotus spilonotus	Eastern marsh harrier	Migratory
Circus melanoleucos	Pied harrier	Migratory
Accipiter virgatus confusus	Besra sparrowhawk	Endemic subspecies
Accipiter soloensis	Chinese sparrowhawk	Migratory
Butastur indicus	Grey-faced Buzzard	
Hieraaetus kienerii formosus	Rufous-bellied eagle	Resident
Spizaetus cirrhatus limnaetus	Changeable hawk-eagle	Resident
Spizaetus philippensis	Philippine hawk-eagle	Endemic
Family Falconidae		
Microhierax erythrogenys erythrogenys	Philippine falconet	Endemic
Falco severus severus	Oriental hobby	Resident
Falco peregrinus calidus	Peregrine falcon	
Order Galliformes		
Family Megapodidae		
Megapodius cumingii pusillus	Tabon scrubfowl	Endemic subspecies
Family Phasianidae		
Coturnix chinensis lineata	Blue-breasted quail	Endemic subspecies
Gallus gallus philippensis	Red junglefowl	Endemic subspecies
Order Gruiformes		
Family Turnicidae		
Turnix suscitator fasciata	Barred buttonquail	Endemic subspecies
Family Rallidae		
Gallirallus philippensis philippensis	Buuf-banded rail	Endemic subspecies
Gallirallus striatus striatus	Slaty-breasted rail	Resident
Gallirallus torquatus torquatus	Barred rail	Endemic subspecies
Rallina fasciata	Red-legged crake	Resident

SCIENTIFIC NAME	COMMON NAME	
Rallina eurizonoidez eurizonoidez	Slaty-legged crake	Endemic subspecies
Porzana fusca fusca	Ruddy-breasted crake	Resident
Porzana tabuensis tabuensis	Spotless crake	Resident
Porzana cinerea ocularis	White-browed crake	Endemic subspecies
Amaurornis olivacea olivacea	Plain bush-hen	Endemic subspecies
Amaurornis phoenicurus javanica	White-breasted waterhen	Resident
Gallinula chloropus lozanoi	Common moorhen	Endemic subspecies
G.c. indica	?	Migratory
Porphyrio porphyrio pulverulentus	Purple swamphen	Endemic subspecies
Fulica atra atra	Eurasian coot	Migratory
Order Charadriiformes		
Family Jacanidae		
Hydrophasianus chirurgus	Pheasant-tailed jacana	Resident
Family Rostratulidae		
Rostratula benghalensis benghalensis	Greater Painted snipe	Resident
Family Charadriidae		
Pluvialis dominica fulva	Lesser golden plover	Migratory
Charadrius dubius dubius	Little ringed-plover	Resident
Charadrius alexandrinus dealbatus	Kentish plover	Migratory
Charadrius peronei	Malaysian plover	Resident
Charadrius mongolus mongolus	Lesser sand-plover	Migratory
Charadrius leschenaultia	Greater sand-plover	Migratory
Family Scolopacidae		
Numenius arquata orientalis	Eurasian curlew	Migratory
Numenius phaeopus variegatus	Whimbrel	Migratory
Numenius madagascariensis	Far-eastern curlew	Migratory
Limosa limosa melanuroides	Black-tailed godwit	Migratory
Tringa totanus eurhinus	Common redshank	Migratory
Tringa nebularia	Common greenshank	Migratory
Tringa ocrophus	Green sandpiper	Migratory
Tringa glareola	Wood sandpiper	
Actitis hypoleucos	Common sandpiper	Migratory
Heteroscelus brevipes	Grey-tailed tattler	Migratory
Arenaria interpres interpres	Ruddy turnstone	Migratory
Gallinago megala	Swinhoe’s snipe	Migratory
Gallinago gallinago gallinago	Common snipe	Migratory
Calidris canutus canutus	Red knot	Migratory
Calidris alba	Sanderling	Migratory
Calidris ruficollis	Rufous-necked stint	Migratory
Calidris temminckii	Temminck’s stint	Migratory
Calidris subminuta	Long-toed stint	Migratory
Calidris ferruginea	Curlew sandpiper	Migratory
Philomachus pugnax	Ruff	Migratory
Phalaropus lobatus	Red-necked phalarope	Migratory
Family Recurvirostridae		
Himantopus himantopus himantopus	Black-winged stilt	Migratory
Family Burhinidae		
Esacus magnirostris magnirostris	Great thick-knee	Resident
Family Laridae		

SCIENTIFIC NAME	COMMON NAME	
Larus ridibundus	Common black-headed gull	Migratory
Family Sternidae		
Sterna bergii cristata	Greater crested tern	Resident
Sterna albifrons sinensis	Little tern	Migratory; Resident
Sterna anaethetus anaethetus	Bridled tern	Resident
Chlidonias hybridus hybridus	Whiskered tern	Migratory
Chlidonias leucopterus	White-winged tern	Migratory
Order Columbiformes		
Family Columbidae		
Treron curvirostra erimacra	Thick-billed green-pigeon	Resident
Treron pompadora axillaris	Pompadour green-pigeon	Endemic subspecies
Treron vernans vernans	Pink-necked green-pigeon	Endemic subspecies
Phapitreron leucotis leucotis	White-eared brown dove	Endemic
Ptilinopus occipitalis occipitalis	Yellow-breasted fruit dove	Endemic
Ptilinopus leclancheri leclancheri	Black-chinned fruit dove	Endemic subspecies
Ducula poliocephala	Pink-bellied imperial pigeon	Endemic
Ducula mindorensis	Mindoro imperial pigeon	Mindoro endemic
Ducula carola carola	Spotted imperial pigeon	Endemic
Ducula aenea aenea	Green imperial pigeon	Endemic subspecies
Ducula bicolor bicolor	Pied imperial pigeon	Resident
Macropygia phasianella tenuirostris	Reddish cuckoo-dove	Endemic subspecies
Streptopelia bitorquata dusumieri	Island collared-dove	Endemic subspecies
Streptopelia tranquebarica humilis	Red turtle-dove	Resident
Streptopelia chinensis tigrina	Spotted dove	Resident
Geopelia striata striata	Zebra dove	Resident
Chalcophaps indica indica	Common emerald- dove	Resident
Gallicolumba platenae	Mindoro bleeding-heart	Mindoro
Caloenas nicobarica nicobarica	Nicobar pigeon	Resident
Order Psittaciformes		
Family Psittacidae		
Cacatua haematuropygia	Philippine cockatoo	Endemic
Prioniturus discurus mindorensis	Blue-crowned racquet-tail	Endemic
Tanygnathus lucionensis lucionensis	Blue-naped parrot	Endemic subspecies
Loriculus philippensis mindorensis	Philippine hanging-parrot	Endemic
Order Cuculiformes		
Family Cuculidae		
Cuculus sparverioides sparverioides	Large hawk-cuckoo	Migratory
Cuculus fugax pectoralis	Hodgson's hawk-cuckoo	Endemic subspecies
Cuculus saturatus horsfieldi	Oriental cuckoo	Migratory
C. s. saturatus	?	Migratory
Cacomantis merulinus merulinus	Plaintive cuckoo	Resident
Cacomantis variolosus sepulcralis	Brush cuckoo	Resident
Chrysococcyx xanthorhynchus amethystinus	Violet cuckoo	Endemic subspecies

SCIENTIFIC NAME	COMMON NAME	
Surniculus lugubris chalybaeus	Drongo cuckoo	Endemic subspecies
Eudynamys scolopacea mindanensis	Common koel	Endemic subspecies
Centropus steerii	Black-hooded coucal	Mindoro endemic
Centropus viridis mindorensis	Philippine coucal	Endemic
Centropus bengalensis philippinensis	Lesser coucal	Endemic subspecies
Order Strigiformes		
Family Tytonidae		
Tyto capensis amauronota	Grass owl	Endemic subspecies
Family Strigidae		
Otus mindorensis	Mindoro scops-owl	Mindoro endemic
Ninox scutulata randi	Brown hawk-owl	Endemic subspecies
N.s. japonica	?	Migratory
Ninox philippensis mindorensis	Philippine hawk-owl	Endemic
Asio flammeus flammeus	Short-eared owl	Migratory
Order Caprimuligiformes		
Family Caprimulgidae		
Eurostopodus macrotis macrotis	Great eared-nightjar	Endemic subspecies
Caprimulgus indicus jotaka	Grey nightjar	Migratory
Caprimulgus manillensis manillensis	Philippine nightjar	Endemic subspecies
Caprimulgus affinis griseatus	Savanna nightjar	Endemic subspecies
Order Apodiformes		
Family Hemiprocnidae		
Hemiprocne comata major	Lesser tree-swift	Endemic subspecies
Family Apodidae		
Collocalia vanikorensis amelis	Island swiftlet	Resident
Collocalia mearnsi	Philippine swiftlet	Endemic
Collocalia esculenta marginata	Glossy swiftlet	Endemic subspecies
C.e. bagobo	?	Endemic subspecies
Collocalia troglodytes	Pygmy swiftlet	Endemic
Hirundapus celebensis	Purple needletail	Resident
Apus affinis subfurcatus	House swift	
Order Coraciiformes		
Family Alcedinidae		
Alcedo atthis bengalensis	Common kingfisher	Migratory
Alcedo cyanopectus cyanopectus	Indigo-banded kingfisher	Endemic
Ceyx erithacus rufidorsum	Oriental dwarf-kingfisher	resident
Halcyon capensis gouldi	Stork-billed kingfisher	Endemic subspecies
Halcyon coromanda major	Ruddy kingfisher	Migratory
Halcyon smyrnensis gularis	White-throated kingfisher	Resident

SCIENTIFIC NAME	COMMON NAME	
Halcyon chloris collaris	White-collared kingfisher	Resident
Family Meropidae		
Merops viridis americanus	Blue-throated Bee-eater	Endemic subspecies
Merops philippinus philippinus	Blue-tailed Bee-eater	Resident
Family Coraciidae		
Eurystomus orientalis cyanocollis	Dollarbird	Resident
Family Bucerotidae		
Penelopides (panini) mindorensis	Mindoro hornbill	Mindoro endemic
Order Piciformes		
Family Capitonidae		
Megalaima haemacephala haemacephala	Coppersmith barbet	Endemic subspecies
Family Picidae		
Dryocopus javensis mindorensis	White-bellied woodpecker	Endemic subspecies
Dendrocopos maculatus validirostris	Philippine pygmy woodpecker	Endemic
Order Passeriformes		
Family Pittidae		
Pitta erythrogaster erythrogaster	Red-bellied pitta	Endemic subspecies
Pitta sordida sordida	Black-hooded pitta	Endemic subspecies
Family Alaudidae		
Mirafra javanica philippinensis	Singing bush-lark	Endemic subspecies
Family Hirundinidae		
Hirundo rustica gutturalis	Barn swallow	Migratory
Hirundo tahitica javanica	Pacific swallow	
Hirundo daurica striolata	Red-rumped swallow	Resident
Family Camphephagidae		
Coracina striata mindorensis	Bar-bellied cuckoo-shrike	Endemic subspecies
Coracina morio elusa	Black-shouldered cuckoo-shrike	Endemic subspecies
Lalage melanoleuca melanoleuca	Black-and-white triller	Endemic species
Lalage nigra chilensis	Pied triller	Endemic subspecies
Pericrocotus divaricatus divaricatus	Ashy minivet	Migratory
Family Pycnonotidae		
Pycnonotus goiavier goiavier	Yellow-vented bulbul	Endemic subspecies
Hypsipetes philippinus mindorensis	Philippine bulbul	Endemic
Family Dicruridae		
Dicrurus balicassius balicassius	Balicassiao drongo	Endemic
Family Oriolidae		
Oriolus chinensis chinensis	Black-naped oriole	Endemic subspecies
Family Corvidae		
Corvus enca pusillus	Slender-billed crow	Endemic subspecies
Corvus macrorhynchos philippinus	Large-billed crow	Endemic

SCIENTIFIC NAME	COMMON NAME	
		subspecies
Family Paridae		
Parus elegans elegans	Elegant tit	Endemic
Family Turdidae		
Brachypteryx montana mindorensis	White-browed shortwing	Endemic subspecies
Luscinia calliope	Siberian rubythroat	Migratory
Copsychus saularis mindanensis	Oriental magpie robin	Endemic subspecies
Saxicola caprata caprata	Pied chat	Endemic subspecies
Monticola solitarius philippensis	Blue rock-thrush	Endemic subspecies
Zoothera cinerea	Ashy ground-thrush	Endemic
Zoothera andromedae	Sunda ground-thrush	Resident
Zoothera dauma aurea	Scaly ground-thrush	Migratory
Turdus poliocephalus mindorensis	Island thrush	Endemic subspecies
Family Sylviidae		
Gerygone sulphurea simplex	Golden-bellied flyeater	Endemic subspecies
Phylloscopus fuscatus fuscatus	Dusky warbler	Migratory
Phylloscopus borealis borealis	Arctic warbler	Migratory
P.b. kennicotti	?	Migratory
Phylloscopus trivirgatus nigrorum	Mountain leaf-warbler	Endemic subspecies
Acrocephalus stentoreus harterti	Clamorous reed-warbler	Endemic subspecies
Acrocephalus orientalis	Oriental reed-warbler	Migratory
Locustella fasciolata	Gray's warbler	Migratory
Locustella ochotensis	Middendorf's warbler	Migratory
Megalurus timoriensis mindorensis	Tawny grassbird	Endemic subspecies
Megalurus palustris forbesi	Striated grassbird	Endemic subspecies
Cisticola exilis semirufa	Bright-capped cisticola	
Cisticola juncidis tinnabulans	Zitting cisticola	Resident
Cettia diphone canturians	Oriental bush-warbler	Migratory
Family Muscicapidae		
Muscicapa griseisticta	Grey-streaked flycatcher	Migratory
Muscicapa ferruginea	Ferruginous flycatcher	Migratory
Eumyias panayensis nigrimentalis	Mountain verditer-flycatcher	Endemic subspecies
Ficedula narcissina narcissina	Narcissus flycatcher	Migratory
Ficedula hyperythra dulangana	Snowy-browed flycatcher	Endemic subspecies
Ficedula westermanni rabori	Little Pied flycatcher	Endemic subspecies
Cyornis rufigastra mindorensis	Mangrove blue flycatcher	Endemic subspecies
Family Monarchidae		
Rhipidura javanica nigritorquis	Pied fantail	Endemic subspecies
Hypothymis azurea azurea	Black-naped monarch	Endemic

SCIENTIFIC NAME	COMMON NAME	
		subspecies
Terpsiphone atrocaudata periophthalmica	Japanese paradise-flycatcher	Migratory
Terpsiphone cinnamomea unirufa	Rufous paradise-flycatcher	Endemic subspecies
Family Pachycephalidae		
Pachycephala albiventris mindorensis	Green-backed whistler	Endemic
Family Motacillidae		
Motacilla cinerea robusta	Gray wagtail	Migratory
Motacilla flava simillima	Yellow wagtail	Migratory
Anthus hodgsoni hodgsoni	Olive tree pipit	Migratory
Anthus novaeseelandiae lugubris	Richard's pipit	Endemic subspecies
Anthus cervinus	Red-throated pipit	Migratory
Anthus gustavi gustavi	Pechora pipit	Migratory
Family Artamidae		
Artamus leucorhynchus leucorynchus	White-breasted wood-swallow	Resident
Family Laniidae		
Lanius cristatus lucionensis	Brown shrike	Migratory
Lanius validirostris tertius	Mountain shrike	Endemic
Lanius schach nasutus	Long-tailed shrike	Endemic subspecies
Family Sturnidae		
Aplonis panayensis panayensis	Asian glossy starling	Resident
Sturnus philippensis	Chestnut-cheeked starling	Migratory
Sarcops calvus calvus	Bald starling/coleto	Endemic
Family Nectarinidae		
Anthreptes malacensis birgitae	Plain-throated sunbird	Endemic subspecies
Nectarinia sperata trochilus	Purple-throated sunbird	Resident
Nectarinia jugularis jugularis	Olive-backed sunbird	Endemic subspecies
Aethopyga shelleyi minuta	Lovely sunbird	Endemic
Family Dicaeidae		
Dicaeum aeruginosum aeruginosum	Striped flowerpecker	Endemic
Dicaeum bicolor inexpectatum	Bicoloured flowerpecker	Endemic
Dicaeum retrocinctum	Scarlet-collared flowerpecker	Endemic
Dicaeum trigonostigma xanthopygium	Orange-bellied flowerpecker	Endemic subspecies
Family Zosteropidae		
Zosterops nigrorum mindorensis	Golden-yellow white-eye	Endemic
Zosterops montanus halconensis	Mountain white-eye	Endemic subspecies
Family Passeridae		
Passer montanus saturatus	Eurasian tree sparrow	Resident
Family Estrildidae		
Erythrura hyperythra brunneiventris	Tawny-breasted parrotfinch	Endemic subspecies
Lonchura leucogastra everetti	White-bellied munia	Endemic subspecies
Lonchura punctulata cabanisi	Scaly-breasted munia	Endemic subspecies
Lonchura malacca jagori	Chestnut munia	Resident

Summary

SCIENTIFIC NAME	COMMON NAME
Resident and Philippine endemic subspecies = 77	
Resident and Mindoro endemic subspecies = 8	
Philippine endemic species = 35	
Philippine endemic species and Mindoro endemic subspecies = 8	
Mindoro endemic subspecies = 16	
Mindoro endemic species = 6	
Migratory species (excluding satellite islands) = 75	
Migratory species (recorded on satellite islands) = ?	
Total species (Dickinson et al. 1991) = 239	
AMPHIBIANS AND REPTILES	
Amphibia	
Order Anura	
Family Bufonidae	
Bufo marinus+	Giant marine toad
Family Ranidae	
Occidozyga laevis laevis+	Common small-headed Frog
Rana cancrivora cancrivora+	Brackishwater frog
Rana limnocharis+	Common pond frog
*Rana magna acanthi**	Philippine woodland frog
Rana signata	Variable-backed Frog
Family Rhacophoridae	
*Philautus schmackeri**	Schmacker's tree frog
Polypedates leucomystax+	Common tree frog
Rhacophorus pardalis	Gliding tree frog
Family Microhylidae	
*Kaloula conjuncta**	Truncate-toed narrow-mouthed frog
Reptilia	
Order Testudines	
Family Emydidae	
Cuora amboinensis	Malayan fresh-water turtle
Order Crocodilia	
Family Crocodylidae	
Crocodylus porosus	Estuarine crocodile
*Crocodylus mindorensis**	Philippine crocodile
Order Squamata	
Family Gekkonidae	
Cosymbotus platyurus+	Flat-bodied house gecko
*Cyrtodactylus philippinicus**	Philippine bent-toed gecko
Gehyra mutilata+	Tender-skinned house gecko
*Gekko mindorensis**	Mindoro narrow-disked gecko
Gekko gecko+	Tokay narrow-disked gecko
Hemidactylus frenatus+	Common house gecko
Hemidactylus garnoti	Large hemidactylid gecko
*Lepidodactylus planicaudus**	Small broad-tailed smooth-scaled gecko
Family Agamidae	
Calotes cristatellus	Indonesian calotes
*Calotes marmoratus**	Philippine calotes
*Gonyocephalus semperi**	White-spotted anglehead
*Gonyocephalus interruptus**	Mindoro anglehead
*Hydrosaurus pustulatus**	Sailfin water lizard
Family Scincidae	
*Brachymeles bonitae**	Stub-limbed Burrowing Skink

SCIENTIFIC NAME	COMMON NAME
*Brachymeles gracilis mindorensis**	Common burrowing skink
*Dasia grisea**	Northern keel-scaled tree skink
Emoia atrocostata	Gray swamp skink
Lamprolepis smaragdina	Spotted green tree skink
*Lipinia auriculatum**	Bronze slender tree skink
Mabuya multifasciata+	Common mabouya
Mabuya multicarinata+	Two-striped mabouya
*Otosaurus cumingi**	Cuming's eared skink
*Sphenomorphus coxi**	Cox's sphenomorphus
Family Varanidae	
Varanus salvator	Variable malay monitor
Family Typhlopidae	
Typhlops braminae+	Brahminy blind snake
Family Pythonidae	
Python reticulatus	Reticulated python
Family Acrochordidae	
Acrochordus granulatus	Small wart snake
Family Colubridae	
Ahaetulla prasina	Elongate-headed tree snake
*Calamaria gervaisi**	Gervais' worm snake
Chrysopelea paradisi	Paradise snake
Dendralaphis pictus	Common bronze-backed snake
*Dryophiops philippina**	Philippine dryophiops
Elape erythrura erythrura	Common rat snake
*Gonyosoma oxycephala**	Arboreal rat snake
Hurria rynchops	
Lycodon aulicus+	Common wolf snake
*Natrix dendrophiops**	Spotted water snake
*Oligodon ancorus**	Northern short-headed snake
Psammodynastes pulverulentus	Dark-spotted mock-viper
Family Elapidae	
*Calliophis calligaster calligaster**	Striped coral snake
*Naja naja philippinensis**	Philippine common cobra
Ophiophagus hannah	King cobra
Family Viperidae	
*Trimeresurus flavomaculatus flavomaculatus**	Philippine pit-viper
Trimeresurus wagleri	Wagler's pit-viper

Summary

Philippine endemic species = 24
Mindoro endemic subspecies = 3
Non-endemic resident species = 18
Introduced/commensal = 13
Total = 57
4 orders, 16 families, 47 genera, 57 species