

ekolohiya

Volume 1, Issue 1

1st Semester

AY 2002-2003

environmental issues

Deforestation and Sierra Madre biodiversity conservation



Deforestation and Sierra Madre Biodiversity Conservation

by

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ABSTRACT

In terms of biological wealth the Philippines has been identified as one of the world's richest. The Philippine islands are home to a significantly diverse number of species of flora and fauna. In addition to this, the country has a high level of endemism. The Philippines used to be almost completely covered in rainforest thus a lot of the organisms endemic to this country are forest-dependent. Nowadays, the Philippine forest barely covers an area of 5.5M hectares, which is 18.3% of the total land area. This percentage is expected to be further reduced to 6.6% in the future. This rapid degradation of the forest habitats has resulted in endangerment and extinction of certain species. The largest remaining block of forest is in the Sierra Madre Mountain Range. It harbors a concentration of a diverse array of Philippine endemics and non-endemics. The Northern Sierra Madre National Park was established as a protected area in an effort to conserve a large proportion of the biological resources of the Philippines. However, despite the fact that this area has been set aside and designated as a reserve area, it is still threatened by logging activities, among other things. The NSMNP is perhaps the last frontier in Philippine biodiversity conservation. Unless effective action is soon taken in the protection of their habitats, Philippine biological riches will soon be extinct.

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The Philippines has been identified as one of the world's richest in terms of biological wealth. The Philippine islands are home to a significantly diverse number of species of flora and fauna. In addition to this, the country has a high level of endemism. Endemic organisms are species found only in certain regions. The Philippines is recognized worldwide as a megadiversity country. In fact, taking into account the small size of the country, the Philippines is probably the richest on a per-unit-area basis.

FLORAL DIVERSITY

5% of the world's flora is represented in the Philippines with at least 13,500 species (<http://www.psdn.org.ph>). According to Conservation International (CI), the number of plant species in the country is 7,620, of this 5,832 are endemic to the islands. 25 flowering plant genera are indigenous to the islands. These angiosperm genera belong to the families Rubiaceae, Asclepiadaceae, Orchidaceae, Melastomataceae, Loranthaceae, Zingiberaceae, Sapindaceae, Compositae, Euphorbiaceae, Leguminosae, Rutaceae, and Urticaceae. 33 species of gymnosperms are found in the Philippines, 18 % of which are endemic to the islands. Of the 1,011 species of ferns and fern allies identified in the country, 33% are indigenous. 506



Fig. 1 *Rafflesia manillana* from Mount Makiling in Los Banos, Philippines. (Tan 2001)

species of mosses are known, 23% of these are endemics. Also on record are 518, 700 and 790 species of mosses, fungi and lichens respectively. (<http://www.psdn.org.ph>)

FAUNA

CI also reports the number of terrestrial vertebrate species found in the Philippines to be 1,114, approximately 50% of which are endemic. 179 species of mammals are found in the archipelago, 61% of these organisms occurring only in the country. At least 50 of these mammalian species are under the threatened category. (Heaney, LR et.al. 1998) The most threatened mammals in the country are *Bubalus mindorensis* (tamaraw) and *Acerodon jubatus* (Golden crowned flying fox). A number of bats are endemic to the Philippines and are currently under varying levels of the threatened category such as *Otopteropus cartilagonodus*, *Pteropus vampyrus*, *Pteropus leucopterus*, *Ptenochirus jagori*, *Haplonycteris fischeri*,



Fig. 2 Bats endemic or almost endemic to the Philippines. **A)** *Otopterus cartilagonodus* (Heaney 1998) **B)** *Haplonycteris fischeri* (Heideman 2002) **C)** *Pteropus vampyrus* (Kunz 2002) **D)** *Megaderma spasma* (Heideman 2002) **E)** *Nyctimene rabori* (Heideman 2002)

Megaderma spasma, and *Nyctimene rabori* (fig 2). Unfortunately another bat species, *Dobsonia chapmani* or the Bare-backed fruit bat has been extinct since the 1980's. According to Heaney and Regalado (1998) this was the first mammalian species to be reported extinct in modern times.

Other mammals indigenous to the Philippines include members of the order rodentia, these include *Apomys microdon*, *Phloeomys pallidus* (fig 7), and *Crunomys fallax*. The Philippine brown deer, *Cervus mariannus* (fig 8), is locally common but is heavily hunted and populations are declining. *Macaca fascicularis*, the long-tailed macaque (fig 8), is common in Asia but is also locally heavily hunted.

The number of species of Avians in the islands is 558, showing 31% endemism. An example of an endemic bird is the babbler *Stachyris* (see fig 3). 19 species of babblers can be found in the Philippines, 18 of which cannot be found anywhere else in the world. Under the threatened categories, the status of 86 of these avian species range from vulnerable to extinct. *Ceyx melanurus melanurus*,

otherwise known as the Philippine dwarf kingfisher is an endemic species under the vulnerable category. Despite the fact that *Sarcops calvus* easily tolerates human disturbance on their habitat they are endangered due to a more direct form of human influence, they are heavily hunted and are kept as cage birds. *Pitta erythrogaster*, or the red-bellied pitta are small birds and are rarely seen. *Batrachostomus septimus*, or the Philippine frogmouth, so named because of its perpetually grumpy appearance, is unique to the Philippines. It makes no calls and is active at night, making it also a relatively inconspicuous bird. On the contrary, the writhed-billed hornbill, *Aceros waldeni*, is a very conspicuous bird. Not only is it large, it's also very loud. A hollow structure at the top of its bill, called a casque, serves as a resonating chamber.

At least 16 species of owls are endemic to the Philippines. The Philippine eagle-owl, *Bubo philippensis*, one of the largest owls in the world with a wingspan of 1 meter, is vulnerable to extinction due to habitat destruction.



Fig. 3 Some endemic and near endemic birds of the Philippines. **A)** Flame-Templed Babbler *Stachyris speciosa* (Heideman 2002) **B)** Red-bellied pitta *Pitta erythrogaster* (Gnoske and Willard 2002) **C)** Wreathed-billed hornbill *Aceros waldeni* (Heideman 2002) **D)** Coledo *Sarcops calvus* (Gnoske and Willard 2002) **E)** Philippine Frogmouth *Batrachostomus spetimus* (Heideman 2002) **F)** Bleeding Heart Dove *Gallicolumba luzonica* (Dewev 2002)

33 species of doves are found in the Philippines, 16 of which cannot be found elsewhere. A unique dove found in the region is the Flame-Breasted Fruit Dove, it has a distinct patch of bright orange on its breast, cinnamon colored head, crimson feet and carmine spotted wings. This bird can survive only in old growth forest habitats, and has been greatly affected by logging activities. It is also heavily hunted because it is one of the largest doves in the country. Another similar dove is *Gallicolumba luzonica*, the Bleeding Heart dove (fig 3), so named because of the crimson feathers on their breasts. These are likewise endangered.

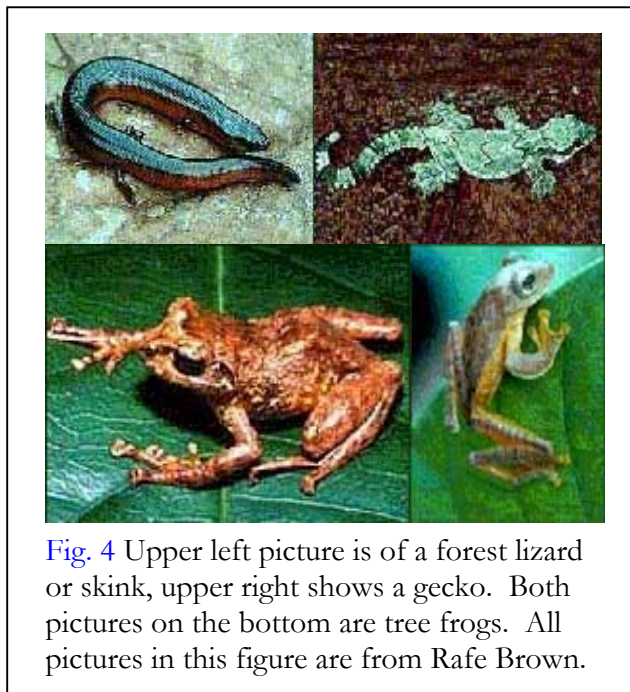
Phaeoniphaeus superciliosus, the red crested malkoha, is restricted to Luzon, Catanduanes, Marinduque and the Polillo islands of the Philippines. The Philippine eagle *Pithecophagi jefferyii* is the second largest eagle in the world. It is well known as the symbol of conservation in this country. Fewer than

50 individuals remain in the wild and it is listed as critically endangered by the IUCN.

63% of the 252 recorded species of reptiles in the country are endemic. The majority require old-growth forests for their survival. About 125 species of lizards have been recorded in the Philippines, 99 of these are endemic. Philippine crocodiles once numbered as much as 10,000 however a 1993 survey showed only 100 left in the wild (Heaney, LR. 1998). Crocodiles in the country are dwarf species, reaching only up to 2m in length. *Crocodylus mindorensis*, like most Philippine crocodile species, have been over hunted. Another potential cause for their extinction includes toxic waste from mines. Despite the fact that the Philippine crocodile is considered as one of the most endangered crocodiles in the world, it is not protected under the law.

Of the 96 known species of amphibians, 53% are indigenous to the Philippines. 20 of the known

species of frogs have been discovered in just the past few years. However, like most fauna, 60-70% of these frogs are vulnerable to extinction due to habitat destruction. In fact, Heaney (1998) states that *Platymanis spelaens* is most probably already extinct. Another possible cause of endangerment to local frogs is the introduction of new species, that compete with the indigenous species for food.



Species of millipedes and centipedes have been numbered at 54 and 44, respectively. For the insects and spiders 20,000 and 341 species have been recorded, respectively. 2,782 species of mollusks have been identified. The percentage of endemism of invertebrates are still undetermined but are estimated to be high.

DEFORESTATION

The forest ecosystem is a diverse system supporting an array of flora and fauna. Only 14% of the earth's land surface is covered by tropical

rainforest (Haribon, 2002), and yet it contains at least two-thirds of the world's species (Brooks, 1997). In the early 1900s the Philippines boasted some of the richest and most biologically diverse tropical rain forests ecosystems of the world. Forest cover in the Philippines back then was approximately 70% of the total land area (21M hectares) (ESSC, 1999). Historically, the Philippines was almost completely covered primarily by lowland tropical moist forest. As a result, most endemic species in the country are forest-dependent, meaning they require forested habitats to some degree.

However, one hundred years later, what's left of the Philippine forest barely covers an area of 5.5M hectares, which is 18.3% of the total land area (Tan, JML. 2000). This percentage is expected to be further reduced to 6.6% by the year 2010 if appropriate conservation measures are not taken (ESSC, 1999). Tropical forests are being cleared at a rate of 1-2% per year, with 40% of their original area already lost (Brooks, 1997).

This dramatically rapid loss of forest cover has adverse effects on the organisms it supports, especially those that are forest-dependent. Most of the endemic vertebrates in the country require primary-forest habitats and fail to survive in highly disturbed and secondary forests. The degradation of the forest habitat leads to the systematic mass extinction of species. The loss of the lowland forests has forced large mammals upland into mountain forests where they now barely survive on the verge of extinction (Dinets, 2001). A large number of endemic species in the Philippine tropical rainforest are now threatened with complete destruction. Already some 52 native vertebrate species are in the critical or

endangered categories, and a great many more are listed as threatened.

That is why the country is considered a “hot spot”, that is, an area where there is a high probability of species extinctions. In fact it has been described as the hottest of the hotspots. The Philippines is considered the most severely endangered among the megadiversity countries.

“Preservation of the primary rain forest is therefore a high priority for the Filipino people”. (Heaney, 1998)

Data on the extent of deforestation in the tropics is still generally lacking despite the development of remote sensing techniques (Brooks, 1997). One of the main reasons behind this is that deforestation in the region is occurring at such a rapid rate that figures obtained from such surveys quickly become outdated soon after publication (Myers, 1994). In the last century alone, 90% of the Philippine forests disappeared. The largest remaining block, located in Luzon, is the Sierra Madre Mountain Range.

SIERRA MADRE

The Sierra Madre Mountain Range has the most extensive forest cover in the Philippines. The Sierra Madre wilderness stretches from the Pacific ocean in the east to the Cagayan Valley to the west.

It contains 25% of the country’s forest resources and 40% of the remaining old growth forest. Because of its relatively pristine state, it has a high level of biodiversity.

In 1997 the Northern Sierra Madre Natural Park (NSMNP) was established as a protected area by

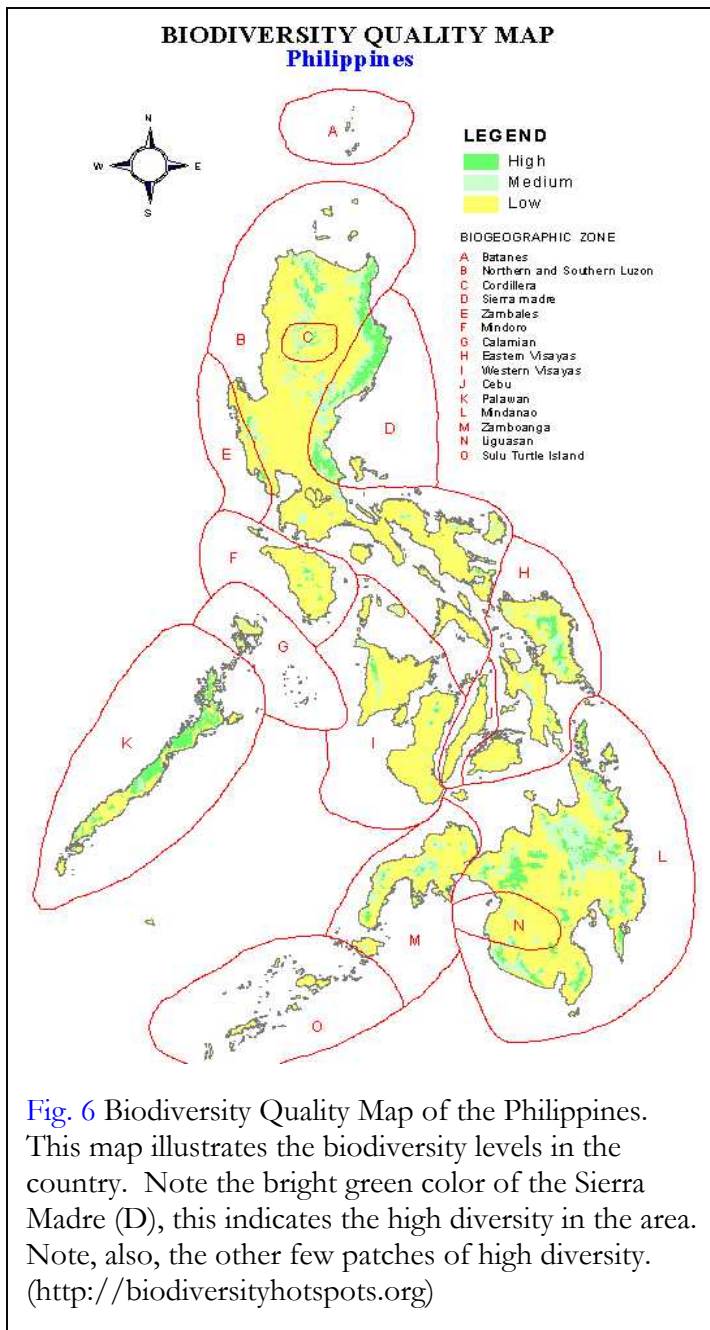


Fig. 5 A view of the vegetation covered Sierra Madre mountains (Thomsen)

virtue of the National Integrated Protected Area System law (NIPAS) and Republic Act 9145. NSMNP, Also known as the Palanan Wilderness is located within the province of Isabela. To the east it is bounded by Dinapigue, Divilacan, Maconacon, Palanan and the Philippine Sea. Its west side is delimited by San Mariano, Ilagan, Tumauni and San Pablo. Its northern boundary the Dikatayan River, and on the South it is bounded by the Disabungan River. The topography within the park ranges from relatively low hills with moderately steep slopes near the coast to higher mountains with very steep slopes, peaks and sharp ridges in the interior of the Sierra Madre Mountain Range. (Haribon)

The park, spanning 359,000, is the last great rainforest of the Philippines. The establishment and management of this natural park contributes to the preservation of a large proportion of the important species and habitats of the region.

The Sierra Madre mountains shelter a diverse array of Philippine flora and fauna. Approximately 416 species of wildlife have been recorded in the NSMNP. This figure includes undescribed species of tree frogs and butterflies, and other faunal species not



previously known to exist in the Philippines (<http://www.nipa.org.ph>).

The park is home to 60% of all plants species in the Philippines. Of the 1,500 vascular plant species in the Philippines 50 are unique to the area. A majority of the diverse floral assemblage of the area is still undocumented. Plants endemic to the area include dipterocarps, orchids, leguminous trees, citrus families. *Shorea sp.* and *Hopea spp* are well known

dipterocarps because they are extensively logged due to their high market value.

Denrobiuma achnia, *Eulophia dentata* and the legume *Milletia longipes* are species unique to the mountain range. Also, *Swinglea glutinosa*, a member of the citrus family can only be found in the Sierra Madre. (<http://www.psdn.org.ph>)

A significant number of fauna is endemic to the area. 60 species of mammals are found in the area, 21 of which are endemic to the Philippines. Included in this are the Golden-crowned flying fox, *Acerodon jubatus*), Small Rufous Horseshoe Bat *Rhinolopus subrufus* and Luzon Pygmy Fruit-bat *Otopteropus cartilagonodus*. With an estimated minimum of 70,000 flying foxes sighted, this is probably the largest roost of flying foxes in the country (Haribon). Golden-crowned Flying Fox is one of the several species using the roost. This is the largest flying mammal in the world. The Palanan Shrew Mouse *Archboldomys musseri*, is found only in the Sierra Madre.



Fig. 7 A) Palanan Shrew Mouse
B) Slender-tailed cloud rat

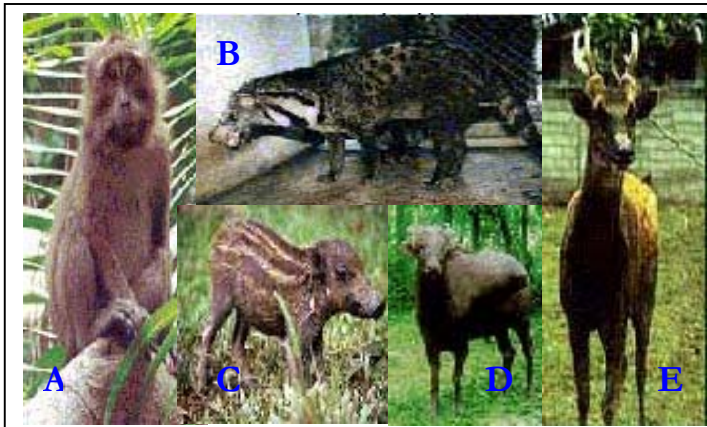


Fig. 8 A) long-tailed macaque B) Malay civet
C) warty pig D) tamaraw E) brown deer

Also, two Northeastern Luzon endemics, the Long-Nosed Luzon Forest Mouse *Apomys sacobianus* and Luzon Shrew *Crocidura grayi*, are believed to inhabit the park. Another member of the order Rodentia found in the park is *Phleomys pallidus* (slender-tailed cloud rat), the largest rat in the world.

Large mammalian inhabitants of the area that are threatened and near threatened include the long-tailed macaque, *Sus philippinensis* (Philippine warty pig), *Cervus marianus* (Philippine brown deer), and *Viverra zibetha* (Malay civet).

84 of the 263 avian species found in the area are endemic to the mountain range. The park has thus been declared an EBA by the Haribon

Foundation.

The national bird of the Philippines, *Pithecophaga jefferyi*, is found in the Sierra Madre ecoregion. These birds perch atop huge epiphytic ferns high in the rainforest canopy (WWF 2001).

Of the 24 species of amphibians found in the Sierra Madre, 16 are endemic. Reptilian species found in this mountain range number up to 67, of which 32 are unique to the area.

Records also include several undescribed species of tree frogs *Platymantis* sp. and other species not previously known to occur in the park and the Philippines. Totals of 51 species of butterflies and 192 species of fish, molluscs and crustaceans were recorded in the area, and 29 of the butterflies were endemic to the Philippines. (Haribon)

The Sierra Madre forest ecosystem, including its rich flora and fauna risk extinction. It supports 70 wildlife species that are either threatened or near-threatened. In Asia, this is the highest concentration of any threatened species in a given area. It is home to 65% of the threatened species in the Luzon Faunal Region. Of the 46 threatened species in the greater Luzon area, 30 are found in the Sierra Madre Mountain Range. The actual status of threatened birds is also changing, almost inevitably for the worse, considering the continuing rates of deforestation in the region

CONTINUED THREATS

Despite this area's designation as a protected area, it is still under serious threat. The biological resources in the area are under pressure from mining, logging, agricultural development, harvesting of non-timber resources, poaching activities, other land



Fig. 9
Pithecophaga jefferyi, the Philippine eagle. This large bird is critically endangered and less than 50 individuals are estimated to be left in the wild.

management practices and establishment of industrial zones.

Aggressive extraction of resources in the area in the form of logging is a major factor in habitat destruction. The methods of extraction being used have no regard for resource depletion.

There are still some illegal logging activities going on within the park. Government units, mainly the DENR and the military, have been monitoring these illegal activities, apprehending loggers and confiscating their timber. Unfortunately, with insufficient manpower, equipment, and will power as constraints, illegal logging activities are still ongoing.

According to Haribon, the NSMNP's river to transport timber to market entry points located in the southern portion. Thus, these areas should be regularly patrolled.

People resort to illegal logging because of the lack of alternative livelihood sources. Unless they find a viable alternative to logging, these timber extraction activities will result in further denuding the forest. The challenge therefore, is to come up with environmentally-sustainable sources of income for local producers and collectors.

Not only is the area under threat from illegal logging, it is also under threat to legal logging. According to FPCN (2000), the government still issues logging licenses under violation of existing law. Existent logging bans on ancient forest areas, of narra and almasiga trees, and logging in national parks are violated by logging companies with logging permits from the DENR.

An indirect effect of logging activities, whether legal or illegal, is that it provides greater accessibility. The network of roads and logging tracts

created by this activity provides ready access to potential hunters, farmers, and other loggers.

According to Dr. Artemio Antolin the implementation of various infrastructure projects in the area by the government has aggravated the situation in the Sierra Madre. The roads built traversed portions of the rainforest which resulted in a large volume of felled trees. This further decreases the capacity of the Sierra Madre forest to support the ecosystem. (Ebreo 2001). The greater accessibility provided by these roads has also made it more susceptible to exploitation. This has brought in communities of subsistence farmers employing the kaingin (slash-and-burn) method which results in more felled trees.

Over 15 million upland people today threaten the survival of the remaining forests (Heaney, 1998). These people want more development. Unfortunately, the roads, infrastructure and related activities associated with development could be detrimental to the environment.

Establishment of parks, in general, results in the exclusion of local people and depriving them of the resources found in the area. In order to preserve the resources in natural parks, exploitation and human occupation of the area is eliminated. The people displaced usually remain uncompensated for their loss.

CONSERVATION PROJECTS

Conservation projects in the area are being undertaken by DENR, CI, Nordic Agency for Development and Ecology (NORDECO), and PLAN-DGIS (NORDECO-DENR 1998).

Conservation International is promoting the development of potential tourist spots in the protected area. Tourism is being tapped as one of the solutions to the problem of conservation in the area because it offers a sustainable means of allowing local people to derive economic benefit from the park and to encourage local support for its maintenance.

Tourism is now the world's largest industry. It is one way of generating money that will go into the management and protection of habitats and species. It also provides the local people with an alternative source of livelihood. If people can gain economic benefits from the protection of the park and tourism of the park, through local employment, they will be less likely to exploit them in non-sustainable ways. Also, it can raise people's awareness of the issues and importance of conservation. (Goodwin 1996)

However, proper management has to be stressed in the implementation of tourism projects. The tourism industry has been known to be a contributor to environmental damage. Tourists destroy vegetation, cause trail erosion and pollute the environment. Furthermore, tourists would require accommodation and transport. This brings us back to the consequences of greater accessibility. One way of reducing the ecological impact of tourism would be the strict regulation of the volume of visitors.

According to Caldecott et.al. (1996) biodiversity management should include site specific interventions, sustainable use of biodiversity and ex-situ action.

Site specific interventions include direct conservation activities, by establishing protected area boundaries and prohibiting extraction of resources within these areas. Sustainable agricultural practices

should also be introduced as alternative means of livelihood. This would provide the locals with an income source so that they would not have to turn to timber extracting related activities. However, these will not stop people from exploiting resources unless laws are enforced and the community is educated on the issues and benefits of conservation.

Ex-situ practices refer to the conservation of organisms and their genetic lineages outside their natural habitat. However, this is not a substitute for in-situ conservation practices. Conserving organisms in, and including their natural habitat is still the best means of conservation. Species conserved in this manner include rare and endangered species, species or relatives of species which are economically important, keystone species, taxonomically isolated species, and species needed in restoring or rehabilitating ecosystems (Caldecott, et.al. 1996).

Surveys and monitoring activities of the flora and fauna in the area have been conducted by DENR, BirdLife International, Conservation International, Leiden University (Netherlands), Isabela State University, and Nordic Agency for Development and Ecology (NORDECO). There is a need for more accurate and more quantitative documentation of the species, their distribution and their habitats in the Philippines. Biodiversity inventories can generate data which can be used in clarifying issues in conservation and making sound management and conservation policies.

CONCLUSION

The Philippine forests are now in such a sorry state and still deteriorating. The projected percentage

of forest cover in the Philippines for the year 2010 is 6.6% according to ESSC Inc. At the rate deforestation is going, this is obviously not an exaggerated estimate. Even protected areas, such as the NSMNP, are not immune to forest degradation. The continuing destruction of forests, leaves many species with only a few places that can sustain them. Forest-dependent organisms are distributed in the forest fragments scattered across the Philippines. These fragments may or may not be adequate in size and quality for the long-term sustainability of the species. The designation of areas as protected is not enough nor is drafting environmental laws, and even community based conservation projects are useless. In order for these measures to have any effect on conservation, strict implementation and enforcement, and education have to be go hand in hand with them. Unless effective action is taken soon to protect the habitats of animals, the diverse biological resources of the Philippines will be lost. Extinction is an irreversible process.

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