



# *Conservation Studies on Palawan Biodiversity*

A COMPILATION OF RESEARCHES CONDUCTED  
IN COOPERATION WITH OR INITIATED BY



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## **CONSERVATION STUDIES ON PALAWAN BIODIVERSITY**

A compilation of researches conducted in cooperation with  
or initiated by Katala Foundation, Inc.

Published on the occasion of the 10th Anniversary of the  
Philippine Cockatoo Conservation Program

Editors

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## PREFACE

The Katala Foundation Inc. (KFI) implements the Philippine Cockatoo Conservation Programme (PCCP) since 1998 with target sites in Palawan. KFI's niche developed over the years of researches, advocacy and capacity building in order to protect and conserve the biological diversity of Palawan. Its vision is to effect conservation of biological resources through active community involvement, thus, conserving with people. To attain this vision, Katala Foundation employs participatory and ecosystemic approaches to all its programs and activities. Its name Katala is derived from the local name of the Philippine cockatoo.

As we celebrate the 10th anniversary of the PCCP, we wish to share with you valuable information on biodiversity conservation topics in Palawan. It is the intent of this publication to make available the findings of these researches to a wider audience to create awareness for and, if possible, to inspire more conservation projects for Palawan's rich flora and fauna.

The first part of this publication describes the results of KFI's Katala Quest expedition in Northern Palawan, Philippines. The quest bagged the Silver Award from the British Petroleum (BP) Conservation Programme in 2003 along with 32 other winning projects among 360 applicants all over the world!

Flagship species of the expedition was the critically endangered Philippine cockatoo *Cacatua haematuropygia*, an endemic to the island nation. The expedition was designed to provide a better understanding of the rich fauna of Pagdanan Range where information on this species and associated fauna is scanty and outdated. Because of increased security problems on mainland Dumaran in those years, we have decided to include Dumaran Island in the expedition considering the encouraging records of cockatoos and other threatened vertebrates on the island. The expedition was conducted in a very high spirit of cooperation among team members from different fields of expertise and institutional affiliations.

The expedition aimed to facilitate conservation of the critically endangered Philippine cockatoo, including its actual and potential habitats and associated vertebrate fauna. As a result, we have engaged local communities and decision makers to secure a long-term conservation project in one of the target sites. Needless to say, the proper management of these areas will benefit not only the scientific world but most importantly will and should benefit the local people living within and around these unique habitats.

We are indebted to BP Conservation Programme and its sponsors - the British Petroleum, Fauna and Flora International, BirdLife International, Conservation International and Wildlife Conservation Society for this opportunity.

The second part of this volume is a compilation of conservation studies and researches on Palawan biodiversity which were conducted in cooperation with or initiated by the KFI. Most of these studies had been published earlier in journals but are not readily accessible for everyone's use.

On this occasion, we are particularly proud that in 2008 the cockatoo population on Rasa Island, Narra, Palawan, Philippines for the first time since the project started passed the 200 individual mark. The area has become, not only the core habitat of the Philippine cockatoo, but also of other globally threatened or near-threatened bird species. Rasa Island by now is the only place where Philippine cockatoos can reliably be observed in the wild!

We are equally grateful to our local partners, our wildlife wardens and volunteers, collaborating institutions and organizations that believed in partnership and cooperation. Most especially we thank our principal sponsor, the Loro Parque Fundacion (LPF) and its funding partners: Conservation des Espèces et des Populations Animales (CEPA), Zoologische Gesellschaft für Arten- und Populationsschutz (ZGAP; incl. Fonds für Bedrohte Papageien and Strunden-Papageien-Stiftung), North of England Zoological Society (Chester Zoological Gardens) and Zoo de Beauval.

This volume is dedicated to the Katala and to all of you on the occasion of the 10th anniversary of the Philippine Cockatoo Conservation Programme.

Matamang salamat!



## FOREWORD

**Conservation Studies on Palawan Biodiversity** is a compendium of 21 papers on land vertebrates found on Palawan Island and associated smaller islands, the Philippines. Four papers highlight the results of the Katala Quest expedition. Most of these 17 papers had been published earlier in journals. While these papers are already known to research specialists, they may not be readily accessible to the public. Gathering them together in this single volume will make them more useful to the public, including leaders of the conservation movement in the Philippines and elsewhere as well as government officials responsible for the conservation of the unique biodiversity on Palawan.

Palawan occupies a strategic position in the evolution of Philippine fauna and flora, being a "bridge" island between the Sunda Islands of the Indonesian Archipelago and the Philippines proper, and has engaged the attention of biographers and naturalists from the past to the present time. The forthcoming volume is therefore of interest to the general public and the scientific community.

This volume, which is composed of 21 papers, four on mammals, six on birds, six on amphibians and reptiles, two on conservation education, two on wildlife trade and hunting and one on biodiversity utilization, shows how a conservation organization such as the Katala Foundation, Inc. can move beyond the usual practice of academic institutions and other organizations in producing publications almost solely for academic purposes. The Katala Foundation, Inc. should be commended for taking the step, through this volume, to inform the public of the results of its research program, its supporters and its research collaborators.

Noteworthy among the admirable achievements of the Foundation is the ten-fold increase of the cockatoo population on Rasa Island as the result of its conservation program. This is an example that other conservation foundations that spend large amounts of money in the Philippines should follow. I distinctly remember a comment of an Asian Development Bank executive some years ago bewailing the fact that despite many millions of US dollars spent on marine conservation during the last two decades, the marine environment has remained degraded and depleted! Our current analysis of the present situation of Philippine coral reefs has confirmed this statement.

With the publication of this volume and adding the several papers on the land vertebrates published in the past by other authors, including scientists from Silliman University, Field Museum in Chicago, University of Kansas, California Academy of Sciences, etc., Palawan Island probably ranks second to Negros Island in terms of the number of papers published on land vertebrates.

I congratulate the Katala Foundation, Inc. for publishing this volume on the natural history and conservation of Palawan terrestrial biodiversity.

### A.C. ALCALA

Emeritus Professor of Biology  
Silliman University  
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The island-province of Palawan is bestowed with unique wildlife being a landbridge island to Borneo. Despite the relative small land area of Palawan, the archipelago holds a high diversity of marine, freshwater and terrestrial ecosystems. Lowland tropical rainforests are the terrestrial ecosystems in Palawan which are richest in species.

For the past 10 years, the Katala Foundation Inc. endeavored to study the ecology and biology of the critically endangered Philippine cockatoo and other wildlife sharing its equally threatened habitats. Founded on a visible commitment to protect and conserve Palawan biodiversity, we are proud to have achieved most of our objectives and to have carved out a niche within the Palawan community and outside for intellectual and scientific discourse. From 23 birds on Rasa in 1998, we have increased the cockatoo population on the island nearly tenfold! Two other project sites in Palawan and one in Polillo, Luzon were established. These achievements have not been easy and the challenges along the way strengthened that determination and passion amongst all staff and local partners. The Philippine Cockatoo Conservation Programme (PCCP) has indeed moved forward in leaps and bounds and we owe a great deal of the support from you, our generous supporters and donors, who have shared our vision and have the means to turn our ideas into realities.

It is just but the opportune time to share these information to all of you whom we shared the same interest and with whom we work to champion our right for a sustainable life! With this publication, we hope we achieve informed management decisions and eventually improve the quality of life and conditions of both human and wildlife population in this unique island province called the last frontier of the Philippines!

Congratulations to all of us and Mabuhay!



**JUAN MIGUEL F. ZUBIRI**  
President, KFI



Republic of the Philippines  
**Department of Environment and Natural Resources**  
**PROTECTED AREAS AND WILDLIFE BUREAU**  
Quezon Avenue, Diliman, Quezon City



### MESSAGE

The Philippine is a megadiverse country. It supports more indigenous or endemic species per unit area than any other country in the world, it is where isolated mountain tops or small islands have their own unique species. Our geological history and the archipelagic nature of our country created a diversity of habitats giving rise to a great diversity of species.

Palawan, though historically connected to and sharing many species with Borneo has its own unique species such as the Palawan Peacock Pheasant, the Palawan Hornbill and many others. The critically endangered Philippine Cockatoo might not be restricted to the Island of Palawan but it has found a haven there.

While there has been an increased research interest in biodiversity in the last few decades, still there is a lot to be learned. The development of conservation programs, whether at the species or ecosystem levels, depends on the quality and quantity of available information. The encroachment of development on what remains of the wildlife habitats and its impacts on the species within, adding to the growing specter of climate change and related influences makes it more imperative to allocate more time and resources for biodiversity research.

The publication of this “Conservation Studies on Palawan Biodiversity” is a step in the right direction. It provides a guide in conservation action including the formulation of policies that would guide management decisions. We hope that the other workers in conservation would emulate your example not only by vigorously pursuing research but also by disseminating results. Unpublished research results are worthless.

We hope the stakeholders will put this research compilation into good use. I know, at PAWB we will.

MABUHAY AND MORE POWER TO YOU !

  
**THERESA MUNDITA S. LIM**  
Director



## MESSAGE

The Provincial Government of Palawan warmly extends our congratulations and heartfelt felicitations to the Philippine Cockatoo Conservation Programme (PCCP) in the municipality of Narra for a decade of exemplary commitment that you have bestowed and succeeded towards effective and efficient biodiversity conservation in the province of Palawan, hand in hand with the Katala Foundation, Inc. (KFI).

We recommend your community – based style of KFI's program management and mobilization, wherein a share of ownership of the vision, mission and resources of the programme are translated into accountability, responsibility, transparency and easier governance. It is on this niche that PCCP makes it easier and more cost – effective for the stakeholders, including us in the Provincial Government, to attain cooperatively our common vision. Let us continuously leverage on the community's strength and active participation, among others, which also deserve our grateful appreciation.

Your active and indispensable role is to support the conservation of our endangered species and biodiversity, which is a difficult task. However, you work and stand beyond the challenges towards your goals. Thus, the province of Palawan has always been inspired by your endeavors. As partners, sustainable development is always achievable, thus leading us towards global progress thru our primary industry – our eco – tourism through your help and support. Let us altogether conserve the cockatoo and biodiversity in the once and only last frontier, our province of Palawan.

*Kapag sama – sama, kayang – kaya. Mabuhay po kayong lahat sa PCCP at KFI.*

More power and God bless you all!

A handwritten signature in black ink, appearing to read "Reyes".  
Joel T. Reyes  
Governor / Chairman  
Province of Palawan/ Palawan Council for Sustainable Development.



Palawan as one of the most biodiverse islands in the region needs effective and strong guardians to protect the natural jewels found only there in the world. The Conservation Leadership Programme with our partner organisations (BirdLife International, Fauna & Flora International, Conservation International and the Wildlife Conservation Society) has been proud to support the Katala Foundation as such guardians since 2003. We warmly congratulate them on this landmark ten year anniversary and thank them for all their untiring and really essential efforts in conservation research and action to protect the Philippine Cockatoo and other endemic wildlife on Palawan over this time. The world would truly be a poorer place without their energy and enthusiasm for this important task. We wish them all the best for the future, and hope we'll have opportunities to continue to collaborate with our network!



*Marianne Carter*

**Marianne Carter**

Executive Manager, Conservation Leadership Programme.

[www.ConservationLeadershipProgramme.org](http://www.ConservationLeadershipProgramme.org)

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- BP Conservation Leadership Programme through its sponsors, British Petroleum, Conservation International, Fauna and Flora International, BirdLife International and Wildlife Conservation Society.
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- Local governments of Narra, Dumaran, Rizal, Taytay, San Vicente and Patnanungan and to all its constituents.
- The Provincial Government of Palawan and the Palawan Council for Sustainable Development (PCSD) and its staff.
- PCCP wildlife wardens, volunteers, staff and affiliates
- Katala Foundation Trustees
- And to everyone from cooperating NGOs, academe and to those who in one way or another assisted and supported in the conservation of the Philippine cockatoo and its habitats.

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**KATALA QUEST NORTHERN PALAWAN**  
308102

Silver Award  
BP Conservation Programme 2003

The flagship species of the expedition is the critically endangered Philippine cockatoo *Cacatua haematuropygia*, an endemic to the island nation. As few as 1,000 individuals may be left in the wild (Widmann 2001). The island of Palawan is the last stronghold of the species. However, information on the species from northern Palawan was incomplete, or by now almost fifteen years old (Lambert 1994). Lowland forest types, which serve as cockatoo habitats in Palawan were systematically studied for their vertebrate communities, some of which are also listed as globally threatened. We conducted in-depth assessment of terrestrial vertebrate communities (small mammals, bats, birds, reptiles and amphibians) particularly in coastal, swamp, and riparian forest.

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Rene Villegas (PCSDS)

# Observations on the Mammals of Lowland Forests in the Pagdanan Range and Dumaran Island, Palawan, Philippines

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## Abstract

We recorded 35 mammal species in five lowland forest sites in the Pagdanan Range and Dumaran Island, Palawan, Philippines during the BP Expedition 'Katala Quest'. Five of the recorded taxa are listed as globally threatened by IUCN (2008).

Lowland forests in the Pagdanan Range and on Dumaran Island harbour diverse mammal communities, equal or even exceeding those of already protected areas in the province. The data gathered are suitable for the identification of areas for biodiversity conservation in the two general locations.

One direct outcome of the 'Katala Quest' was the legal protection of the largest remaining forest patch of Dumaran Island under municipal ordinance.

Keywords: conservation planning, hunting, red list

## Introduction

Despite renewed interest in the mammal fauna of the Palawan faunal region, there are still gaps in the knowledge of status and distribution for many mammalian species within the province (Esselstyn *et al.* 2004). Particularly less accessible parts of the archipelago, which include most areas except coastal ecosystems of the central main island, are insufficiently sampled.

Biodiversity assessments of remaining lowland forests are of high priority in Palawan. These ecosystems are extremely vulnerable to human encroachment (Widmann 1998). Annual human growth rate in Palawan is 3.3%, compared to 2.3% overall in the Philippines, caused by high birth rate and substantial migration from other parts of the nation.

The Palawan Council for Sustainable Development, local government units and other concerned agencies try to cope with this challenge through the Strategic Environmental Plan, a zonation system for land use, specifically designed for Palawan. By default, areas of higher altitudes and steeper relief enjoy stricter protection, compared to lowland ecosystems with lesser inclinations. Whereas this possibly is appropriate in terms of watershed protection, it is unlikely to adequately cover priority areas for biodiversity conservation, which are expected to be situated in forest ecosystems of the lowland (Jakobs 1988).

The surveys conducted in the course of 'Katala Quest' Expedition focussed on two general areas of potentially high conservation priority, which at the same time so far had been very inadequately sampled in respect to mammals. The Pagdanan Range in northern Palawan comprises one of the larger forest blocks of the archipelago. It is listed as Important Bird Area (Mallari *et al.* 2001). Dumaran Island is a landbridge island

which is widely denuded of its original forest cover. Therefore its importance for biodiversity conservation was overlooked until recently when viable populations of critically endangered Philippine cockatoos *Cacatua haematuropygia* and Philippine forest turtle *Siebenrockiella leyteensis* were discovered in the last remaining forest patches (Widmann 2001, Diesmos et al. 2004). Both areas were identified as priority sites for biodiversity conservation (Anda & Tabangay-Baldera 2004).

Members of KATALA Foundation conducted an expedition awarded by the British Petroleum Conservation Programme in 2003 to fill in some of the gaps in knowledge on distribution of mammals, birds, reptiles and amphibians in the lowlands of one of the large forest blocks (Pagdanan Range) and adjacent Dumaran Island in northern Palawan. We present the findings of relevance for conservation-planning for mammals, in this paper.

## Methods

We used mist nets (6x2m; 16 mm mesh) and harp traps (1.80x1.80m, four bank) for capturing bats at the research sites. Nets were usually set in the understorey in natural vegetation gaps or across creeks; in S2 we employed a canopy net consisting of four nets on top of each other in a larger forest gap (Kunz & Kurta 1988). Nets were checked from 18.00 to 22.00 hours and again early in the morning. Nets were left standing for two to three nights and then moved to another location.

The harp trap was employed in the subcanopy in about three to five meters height. It was left in one place for up to five nights and then transferred to a different location. In one case it was used in front of a *Scotophilus* colony situated in an abandoned concrete building.

We used different designs of live traps for non-volant mammals. Circa 20% consisted of large commercial rat traps (ca. 40x15x15 cm), 20% medium-sized collapsible Sherman traps (ca. 23x9x8 cm), the remaining were locally made cage traps (ca. 26x10x10).

Traps were arranged in trap lines consisting of up to 105 traps, but usually split up in two, occasionally three separate lines. Traps were set in distances between five to ten meters in likely runways, in front of holes, close to tree trunks or fallen logs (Gurnell & Flowerdew 1994). About 5% of the traps were placed elevated from the ground, particularly on fallen logs or large lianas.

Traps usually were baited with roast coconut covered with peanut butter. About 3% were baited with live earthworms or with ripe figs respectively. Traps were daily re-baited in the afternoon, or in the morning, if bait was removed. Trap lines were operated for two to three days and then moved to another place.

Sturdy plastic buckets (ca. 50 cm deep, 45 cm diameter) were used as pit-fall traps (Jones et al. 1996). Buckets were placed at a distance of 5 meters from each other. Holes dug were deep enough that bucket rims were level with the forest floor. Each trap line consisted of 10 to 20 buckets. A plastic sheet running across the buckets and supported with wooden stakes was used as guiding fence. Shorter plastic sheets were set in 90 degree angles towards the main fence, but leaving a gap of ca. 10 to 15 cm which allowed animals to follow the main fence. Pit-fall traps were not baited, but a piece of wood was provided in case of flooding and as shelter. Trap lines were checked at least two times a day, in the morning and in the evening. They were left in place from seven to 22 consecutive days.

Small commercial mouse traps baited with coconut and peanut butter were attached to smaller branches and twigs, but did not yield any captures.

Adequacy of sampling effort was assessed by plotting species-catch effort curves separately for nets, traps and pitfall traps for small mammals, mega- and micro-bats.

We used direct observations including spotlighting to collect additional records, particularly of larger mammals. Spotlighting was done in different vegetation types from 18.00 to around 22.00 hours. Indirect signs like faeces, tracks or feeding sites were noted.

Secondary information was collected for selected species using informal interviews with key informants, like hunters or forest product collectors (Martin 1995) and using laminated sheets showing colour illustrations, mostly of secretive or rare species. Reliability of informants was cross-checked through inquiring about species which do not occur in the study area (like deer, tarsier).

## Study area

Pagdanan Range is a geographically distinct forest area in northern Palawan, bordered to the north by the Malampaya Sound, to the east by the Sulu Sea, the south by a gap in the cordillera created by Ginaraton River, and to the west by the South-China Sea.

The range covers altitudes from sea level to a maximum of 661 m a.s.l., with the notable exception of Mt. Copas, an isolated and inactive volcano in the southeast of Malampaya Sound (1,021m).

There are at least three permanent and numerous ephemeral river systems in the area. The only natural lake in Palawan, Lake Mangguao, can also be found here. The area covers five municipalities, namely Taytay, Dumaran, San Vicente, Roxas and Puerto Princesa. Field work was restricted to the former three. Natural vegetation mainly consists of lowland and hill mixed dipterocarp forest. Mangroves occur in often extensive stands, particularly in estuaries. Agricultural land use in the lowlands predominantly consists of rice paddies, coconut, mango and cashew plantations. Encroachment of the slopes is ongoing and agricultural products comprise mainly upland rice, corn and root crops, usually grown in shifting cultivation. Fisheries in the sea, rivers and lake are important sources of income. The fishing grounds of Malampaya Sound are of national importance.

Dumaran Island is a land-bridge island in the Sulu Sea. It is only separated by seven kilometres of shallow sea (max. depth 16 m) from the mainland. The terrain is mostly hilly with the highest elevations just below 200 m a.s.l. in the south-central portion of the island. Along the south coast two fjord-like bays are reaching inland for several kilometres. Dumaran Island covers the two municipalities Araceli and Dumaran. Field work only was conducted in the latter.

The vegetation consists mainly of grassland, shrubs with patches of residual forests. Shifting cultivation and cattle grazing are the most common land use forms. Main cash crops are coconut, cashew, corn and rice. Forest patches of up to two hectares still exist on some steeper slopes. A larger selectively logged forest patch of 117 ha still can be found in the higher portions of Dumaran municipality. Mangrove and natural coastal vegetation is still extensive, particularly along the west coast and in protected bays of the south coast and in smaller patches on the north and east coast. Main livelihood activities along the coasts are fishery and coconut cultivation. Extensive seagrass beds and tidal flats exist along the west and south coasts.

## Survey sites

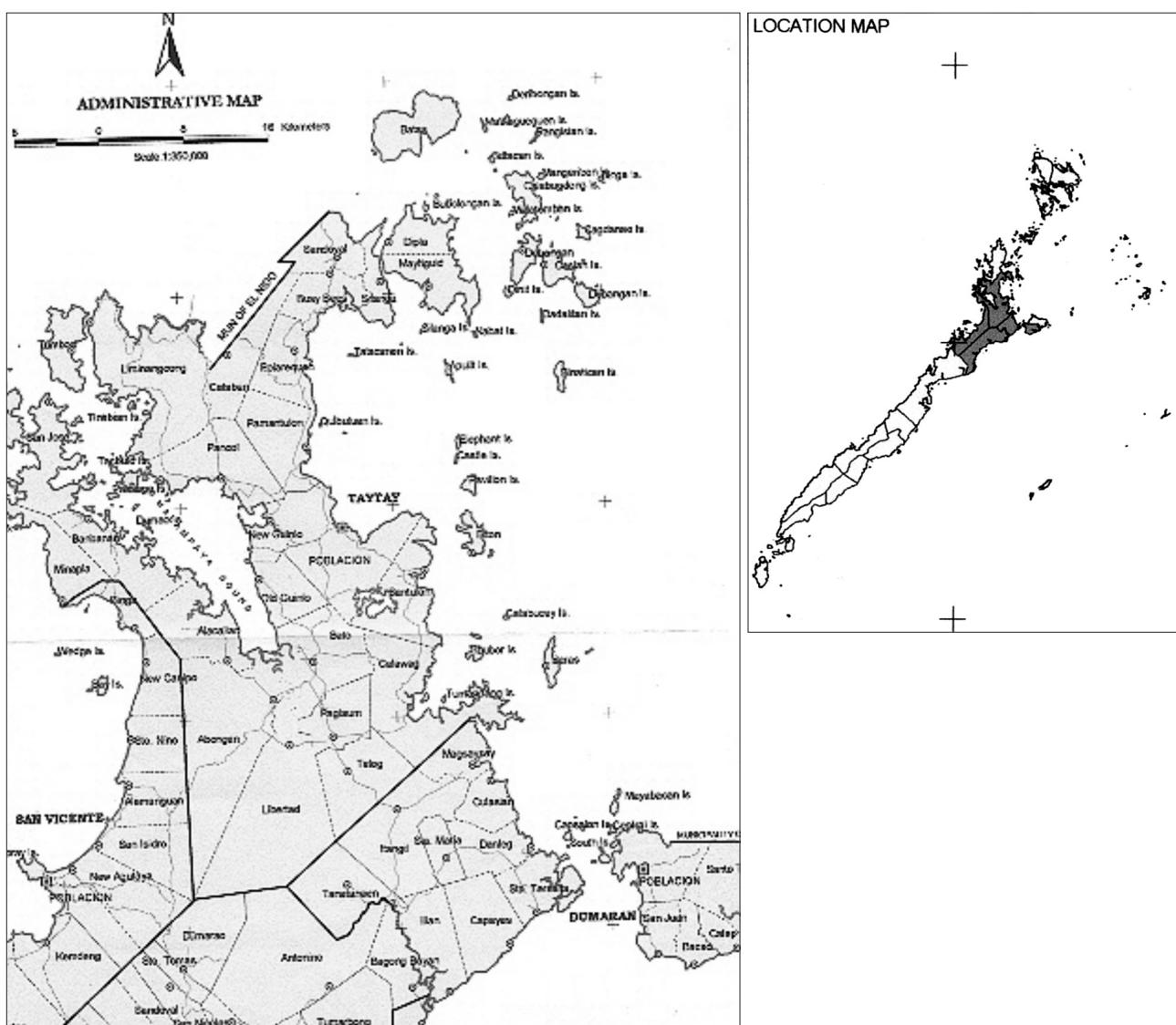
Surveys have been conducted in five sites (S1-S5). Three were situated on mainland Palawan and two on Dumaran Island (Fig.1).

**S1) Sitio Binaluan, Brgy. Liminangcong, Taytay.** Vegetation consisted of a mosaic of overlogged lowland forest, mangrove and cultivated areas (upland rice, coconut).

Elevation ranged between sea level to 60 m a.s.l. Trapping and netting was done in residual forest and across the forest-agricultural ecotone. Most trapping sites were close to a permanent creek. Canopy height was around 28 m with emergents reaching up to 45 m. Some conspicuous tree taxa were *Pometia pinnata*, *Koordersiodendron pinnatum*, *Intsia bijuga*, *Dipterocarpus* spp., many of which were buttressed. Understorey cover was moderate with tree seedlings, ferns, *Selaginella*, *Caryota* and *Costus*. Vines included *Calamus*, and *Araceae*. Epiphytes were moderately common and contained orchids, *Asplenium* and other ferns. Screw palms (*Pandanaceae*) were rare, *Musa* and *Ficus* uncommon.

The soil type was of a sandy loamy type, with superficial humus and almost closed leaf litter. Rock exposure was moderate, fallen logs were common. A rock fall cave in the higher slopes was reported by locals, but not visited by us.

On-site disturbances included low levels of Carabao logging (logging using water buffalos to haul the logs), snaring and collection of rattan. Adjacent cleared land was almost entirely covered with pastoral weeds, like *Lantana camara* and *Chromolaena odorata*, and patches of grasses and shrubs.



**Figure 1.** Survey areas in northern Palawan (circles): 1) Binaluan, Bgy. Liminanco, Taytay, 2) Carabao Breeding Center, Brgy. Kemdeng, San Vicente, 3) Ilian watershed, Brgy. Ilian, Dumaran, 4) Lagan, Brgy. San Juan, Dumaran, 5) Omoi, Brgy. Sto. Tomas, Dumaran. Small map: location of the detail map within Palawan.

We had 84 net nights in the forest and 12 in cultivated areas and seven harp trap nights in the forest canopy. We had 482 trap and 100 pit-fall trap nights in the forest.

**S2) Forest near Carabao Breeding Center, Kemdeng, San Vicente.** The site was situated on the South-China Sea coast of Palawan. Vegetation consisted of overlogged lowland forest and extensive meadows for water buffalos, with interspersed rice paddies, small wetlands and shrub. A perennial river was bordered by disrupted stretches of riparian forest. A smaller, rapidly flowing creek was found in the forested areas.

The elevation ranged from ca. 10 m a.s.l. in the riparian forest, to about 100 m a.s.l. in the forest. The terrain in the cultivated portion was nearly flat, in the forest rolling to very steep, particularly along the river banks. Canopy height in higher elevations was circa 24 m, with single emergents reaching 48 m. Canopy forming taxa included *Dipterocarpus* spp., *Intsia bijuga*, *Dracontomelon dao*, *Palaquium* sp., *Myristica* sp., most of them with buttresses. The subcanopy in the upper forest portion was quite open, understorey dense to very dense, with different species of ferns and tree saplings dominating. Diversity of epiphytes was increasing dramatically with altitude along the creek with orchids and ferns common in ca. 100 m a.s.l. *Pandanus* spp. were rare, *Ficus* and *Musa* were moderately common.

Soil was clayish and light grey in colour, humus cover was not closed. Exposed rocks and fallen logs were rare. Soil was heavily disturbed in the lower forest portions due to the presence of water buffalos. This might partly also explain the for Palawan unusually high density of leeches in the area. Aside from that, sparse logging seemed to occur.

Vegetation in the lower slopes was heavily degraded with dense stands of ferns, *Imperata cylindrica* and pioneering tree species like *Trema orientalis*, *Archiodendron* sp. Small patches were planted with *Acacia mangium*. The meadow areas were dominated by grass vegetation, with patches of dense pastoral weeds, like *Lantana camara* and *Chromolaena odorata*.

Of a total of 62 net nights, 24 were in mature forest and 38 in young secondary forest and open areas. We had two harp trap nights in front of a *Scotophilus* colony situated in a shed, and two in a canopy gap in the forest.

We set one pit-fall trap line in the forest with 140 trap nights. We set two trap lines in the forest with a total of 630 trap nights.

**S3) Ilian watershed, Dumaran.** Ilian River is one of the larger river systems in northern Palawan. Its banks were bordered by mangrove vegetation (mainly *Rhizophora* spp. and *Nypa fruticans* with scattered *Sonneratia alba* and *Xylocarpus granatum*) reaching far upriver. The valley floor was mainly under cultivation (fruit plantations, upland and irrigated rice). The slopes were still mainly forested, but encroachment through shifting cultivators and illegal logging were rampant.

In this site we mainly conducted visual observations, including spotlighting in a variety of vegetation types. We covered an altitudinal range from sea level to 100 m a.s.l. We had two net nights and 12 trap employing live traps set inside and directly outside a house within Ilian village.

**S4) Mangrove and coconut area in Sitio Lagan on Dumaran Island.** The site contained one of the largest mangrove areas on Dumaran Island with partly very distinct zonation. Other natural vegetation forms were beach forests and small patches of coastal forest.

Our study site was within an old coconut plantation (ca. 80 years old). Single palms reached heights up to 45 m. Trees typical for coastal forest could be found within the plantation, in dense clusters in places, like *Diospyros* cf. *discolor*, *Terminalia catappa*, *Pongamia pinnata*. Sewards the plantation was bordered by beach forest containing for example *Erythrina orientalis*, *Barringtonia asiatica* and *Albizia acle*. The mangrove was dominated by *Rhizophora* spp.

Soil in the dry portion was sandy with superficial and open humus layer. Leaf litter was patchy.

We had 12 net nights in the area and conducted spotlighting and roost counts for flying foxes.

**S5) Omoi forest patch on western Dumaran Island.** The study site was situated in a 117 ha large overlogged lowland forest patch, surrounded by shifting cultivation and large areas of secondary bamboo growth. According to the older local population, the surrounding area was already deforested while they were young. Large-scale logging apparently occurred already almost 300 years ago, with the arrival of the Spanish on the island.

Altitude from a dry river bed to the ridge ranged from 35 to 70 a.s.l. Canopy height was about 25 m. Trees were of low diameter classes, virtually all larger individuals, particularly *Intsia bijuga*, were cut, with stumps still present. The subcanopy and understorey was dense to very dense with mostly saplings and Areca palms.

It was very dry during the trapping period and leaf litter was completely closed. Fallen logs in larger diameter classes which retained some humidity were common. Adjacent to the forest patch were old slash-and-burn fields, with very dense understorey, and an eight meter high canopy formed by clumps of bamboo. Small-scale logging was still ongoing.

We had 18 net nights and 112 trap nights in the forest. We had three pit-fall trap lines from the ridge to the dry creek, and one line in an overgrown slash-and-burn farm, with a total of 660 trap nights.

## Results

In the five sites we recorded 35 mammal species and two additional species have been reported by local hunters (Tab.1). Six taxa are currently globally threatened, four species near threatened and one is data deficient (IUCN 2008).

### ***Crocidura cf. batakorum* – White-toothed shrew**

Two species of shrew, *Crocidura palawanensis* and the recently described *C. batakorum* are currently recorded from Palawan (Heaney *et al.* 1998, Esselstyn *et al.* 2004, Hutterer 2007).

We recorded small-sized *Crocidura* sp. in pit-fall traps in S5. In the four pit-fall trap lines, we caught two individuals on top of the ridge, two in the middle slope, three close to an ephemeral creek, and three in young secondary forest close to the residual forest ecotone. One specimen was obtained from a pit-fall trap in Binaluan, Taytay (S1) on the mainland Palawan. External measurements are smaller than those given in Sanborn (1952) for *C. palawanensis*, and match those given by Hutterer (2007). We therefore preliminarily ascribe our specimens to *C. batakorum*.

We never caught shrews with methods other than pit-fall traps, which might partly explain the scarcity of records from Palawan until now, since this technique was not yet employed over extended periods of times in the archipelago.

### ***Suncus murinus* – Asian house shrew**

Introduced to the Philippines, including Palawan (Heaney *et al.* 1998, Esselstyn *et al.* 2004).

We observed the species in a house in S3, but not in any site or settlement on Dumaran Island.

### ***Tupaia palawanensis* – Palawan tree-shrew**

Endemic to Palawan faunal region, where it occurs in all kind of forests, including agricultural plantations (Heaney *et al.* 1998, Esselstyn *et al.* 2004).

We commonly observed and trapped the species in all mainland sites. We recorded it in a variety of vegetation types ranging from tree plantations, secondary growth to mature forest on Palawan, however not from Dumaran Island.

### ***Cynopterus brachyotis* – Common short-nosed fruit bat**

Abundant and in a wide range of vegetation types in the Philippines and in Palawan, including cultivated areas (Heaney *et al.* 1998, Esselstyn *et al.* 2004).

We commonly netted the species in all sites. In S2 it was the only bat species caught in mist nets.

### ***Eonycteris spelaea* – Common nectar bat**

Common in agricultural areas in the Philippines, including in Palawan, however reliant on caves (Heaney *et al.* 1998, Esselstyn *et al.* 2004).

We netted this species only in S1 in an agricultural area and residual forest. We also observed medium-sized fruit bats in adjacent mangrove (*Rhizophora* and *Sonneratia*), however failed to record any flower visits. Locals reported that bats were observed, but not persecuted in a rock fall cave close to the study site.

### ***Macroglossus minimus* – Dagger-toothed flower bat**

Abundant in the Philippines and common in Palawan in a wide variety of habitats (Heaney *et al.* 1998, Esselstyn *et al.* 2004).

We caught the species in residual and secondary forest, meadows and coconut plantations in all sites, except S2.

### ***Pteropus vampyrus* – Large flying fox NEAR THREATENED**

Widespread, but declining in lowland forest and agricultural areas in the Philippines, including Palawan (Heaney *et al.* 1998, Esselstyn *et al.* 2004).

**Table 1:** Mammal species recorded from the survey sites

Species	Binaluan, Taytay (S1)	Kemdeng, Sn. Vicente (S2)	Ilian, Dumaran (S3)	Lagan, Dum. (S4)	Omoi Forest Patch Dum. (S5)
<i>Crocidura cf. batakorum</i>	C				C
<i>Suncus murinus</i>			O		
<i>Tupaia palawanensis</i>	C	C	O		
<i>Cynopterus brachyotis</i>	C	C	C	C	C
<i>Eonycteris spelaea</i>	C				
<i>Macroglossus minimus</i>	C		C	C	C
<i>Pteropus cf. vampyrus</i>	O	O	O	O	O
<i>Rousettus amplexicaudatus</i>			O		
<i>Megaderma spasma</i>	C				
<i>Hipposideros diadema</i>	C	C		C	C
<i>Rhinolophus acuminatus</i>	C				
<i>Rhinolophus arcuatus s</i>	C				
<i>Rhinolophus virgo</i>	C				
<i>Kerivoula hardwickii.</i>	C			C	C
<i>Murina cyclotis</i>					C
<i>Scotophilus kuhlii</i>		C			
<i>cf. Scotophilus kuhlii</i>	O	O	O	O	
<i>Macaca fascicularis</i>	O	O	O		O
<i>Manis culionensis</i>	S		S		
<i>Hylopetes nigripes</i>	O	O			
<i>Sundasciurus juvencus</i>	C	O	O	O	O
<i>Chiropodomys calamianensis</i>					C
<i>Haeromys pusillus</i>		C			
<i>Maxomys panglima</i>	C	C			C
<i>Mus musculus</i>			C		
<i>Rattus exulans</i>		C			C
<i>Rattus tanezumi</i>	C		O	O	C
<i>Rattus tiomanicus</i>		C			
<i>Hystrix pumila</i>	S	O	S	S	S
<i>Prionailurus bengalensis</i>	S	S			
<i>Amblyonyx cinereus</i>	S	O		S	
<i>Mydaus marchei</i>	S	O	O		
<i>Arctictis binturong</i>	O	O	S		
<i>Paradoxurus hermaphroditus</i>	C*	S	S	S	S
<i>Sus ahoenobarbus</i>	O	O	O		O
<i>Dugong dugon</i>				O	

**C:** caught, **O:** observed, **S:** secondary information.

\* One individual was brought to us by locals. It was caught in a wire snare. Because it was left there for a long time the entangled leg got infected. It died some hours after we received it.

We counted 70 individuals at a roost in *Rhizophora* sp. in mangrove in S4. We assume that most large flying foxes we observed foraging in all other sites belong to this species.

The species is hunted for food in Dumaran Island (S4, S5) and in Binaluan (S1).

***Rousettus amplexicaudatus* – Common rousette**

Widespread, mostly in lowland agricultural areas and less so in disturbed and primary forest. All roosts known in the Philippines so far are from caves (Heaney *et al.* 1998, Esselstyn *et al.* 2004).

We found one roost in a solitary palm *Corypha elata* in S3. At least 40 individuals were roosting in between the dead and drooping leaves. In the meantime Widmann (unpubl. data) found a similar roost in Puerto Princesa town proper in the same palm species, containing at least 20 bats. The species was mainly identified by its size and the clicking sounds produced while roosting or foraging.

***Megaderma spasma* – Common Asian ghost bat**

Common in primary and secondary forest in the Philippines, including Palawan (Heaney *et al.* 1998, Esselstyn *et al.* 2004).

We only netted this species in S1 in residual forest.

***Hipposideros diadema* – Diadem roundleaf bat**

Common in secondary growth and primary forest in the Philippines, including Palawan (Heaney *et al.* 1998, Esselstyn *et al.* 2004).

We caught the species in residual and secondary forest, in pasture and coconut plantation in all sites, except S3. In S1 an individual was caught in the harp trap in 6 m height.

***Rhinolophus acuminatus* – Acuminate horseshoe bat**

Within the Philippines only known from the Palawan faunal region (Heaney *et al.* 1998), in Palawan recorded in bamboo thickets and primary forest (Esselstyn *et al.* 2004). In Borneo recorded in lowland dipterocarp forest (Payne *et al.* 1985).

We caught the species in secondary forest and adjacent pasture land in S1. It occurred syntopic with the two other *Rhinolophus* species recorded during this survey.

***Rhinolophus arcuatus s* – Arcuate horseshoe bat**

Widespread throughout oceanic Philippines and locally common where a smaller lowland morph is associated with caves in agricultural areas (Heaney *et al.* 1998). Recently recorded from the Palawan faunal region from mature, but disturbed forest (Esselstyn *et al.* 2004).

We caught the species in S1 in residual forest and pasture land.

***Rhinolophus virgo* – Yellow-faced horseshoe bat**

Endemic to the Philippines, including Palawan, where it was recorded in secondary and primary forest (Heaney *et al.* 1998, Esselstyn *et al.* 2004).

We caught the species in residual forest in S1.

***Kerivoula hardwickii* – Common woolly bat**

In oceanic Philippines in forests higher than 500 m a.s.l. (Heaney *et al.* 1998), in Palawan also recorded from the lowland in bamboo thickets and higher elevation (650 m a.s.l.; Esselstyn *et al.* 2004).

We caught the species in S1 in a residual forest, in S4 in a coconut plantation, and in S5 in a dry riverbed in overlogged forest.

***Murina cyclotis* – Round-eared tube-nosed bat**

In oceanic Philippines moderately common in primary and slightly disturbed lowland and lower montane forest (Heaney *et al.* 1998).

Two individuals were caught in mist nets in S5 in a dry riverbed in overlogged forest. This is the first record of this species from the Palawan faunal region.

***Scotophilus kuhlii* – Lesser Asian house bat**

Abundant in urban and agricultural areas in the Philippines, including Palawan (Heaney *et al.* 1998, Esselstyn *et al.* 2004).

We caught the species with a harp trap in an abandoned house in a pasture in S2, during emergence at dusk. We assume that high flying large-bodied microchiropterans foraging in the open sky in S1-4 belonged to this species as well.

***Macaca fascicularis* – Long-tailed macaque NEAR THREATENED**

Widespread in the Philippines (Heaney *et al.* 1998) and common in secondary and primary forests up to 1,000 m in Palawan (Esselstyn *et al.* 2004).

We recorded the species in all sites, except S4. Observations in Dumaran were fewer compared to sites in the mainland. The species is hunted and trapped in all sites where it is recorded. In Dumaran skulls are sold to a middleman and apparently destined for Japan.

***Manis culionensis* – Palawan anteater NEAR THREATENED**

Endemic to Palawan faunal region and possibly fairly common in forests and also degraded areas (Esselstyn *et al.* 2004).

We did not encounter this species in our surveys. However, hunters claimed its presence in S1 and S2, where it is caught for subsistence purposes. The species is said not to occur on Dumaran Island.

***Hylopetes nigripes* – Palawan flying squirrel NEAR THREATENED**

Endemic to Palawan faunal region where it is found in primary and secondary lowland forest (Heaney *et al.* 1998, Esselstyn *et al.* 2004).

We frequently heard the species in S1 and S2 during night time and spotlighted one individual climbing up a tree in S2.

***Sundasciurus juvencus* – Northern Palawan tree squirrel**

Endemic and common in a variety of tree-dominated vegetation types in the Palawan faunal region (Heaney *et al.* 1998, Esselstyn *et al.* 2004).

We recorded this species in all study sites, including agricultural areas with tree cover and coconut plantations. One freshly killed specimen was brought to us by locals from a mangrove area near S1. Its external measurements are slightly larger and the coloration (grey upper side, white underside) differs from other individuals of this species.

***Chiropodomys calamianensis* – Palawan pencil-tailed tree mouse DATA DEFICIENT**

Poorly-known tree-dwelling murid endemic to the Palawan faunal region (Heaney *et al.* 1998, Esselstyn *et al.* 2004).

We caught only one individual of this species by hand in a nipa hut close to S5. Our efforts to trap more individuals with small snap traps in the surrounding vegetation and the hut were unsuccessful.

***Haeromys pusillus* – Lesser ranee mouse VULNERABLE**

This small arboreal murid is endemic to Borneo and the Palawan faunal region (Esselstyn *et al.* 2004).

One individual was caught in a pit-fall trap in an overlogged evergreen lowland forest near Kemdeng, San Vicente (S2). We tentatively identified it as belonging to this species based on external measurements and toe structure of the hind feet.

***Maxomys panglima* – Palawan spiny rat**

Endemic to the Palawan faunal region where it is commonly recorded in secondary and primary forests (Heaney *et al.* 1998, Esselstyn *et al.* 2004).

We frequently caught the species in old secondary forest and old-growth forest in S1 and S2 on Palawan and in S5 on Dumaran Island. We only captured it in traps set on the ground, never in elevated ones (e.g. fallen logs, tree stumps, liana tangle).

***Mus musculus* – House mouse**

Commensal in and near settlements in Palawan (Heaney *et al.* 1998, Esselstyn *et al.* 2004).

We caught one in a house in Ilian, Dumaran (mainland) near S3. According to secondary information, this species is not known from Dumaran Island.

***Rattus exulans* – Polynesian rat**

Introduced and found in agricultural areas and secondary forest in Palawan (Heaney *et al.* 1998, Esselstyn *et al.* 2004).

We only recorded the species from a forest patch in S5. It was caught in large numbers in rice paddies by employees of the Carabao Breeding Centre close to S2.

***Rattus tanezumi* – Oriental house rat**

Common and introduced species in residential and agricultural areas and in disturbed forests (Heaney *et al.* 1998, Esselstyn *et al.* 2004).

We caught the species in forest in S1 and S5. Rats observed in houses close to S3 and S4 likely also belonged to this species.

***Rattus tiomanicus* – Malaysian field rat**

This indigenous rat is recorded in Palawan in a variety of habitats, from secondary forest, scrub, cultivated areas, grassland-forest mosaic and in the transition zone between montane and cloud forest (Esselstyn *et al.* 2004).

We caught it in old-growth forest in S2.

***Hystrix pumila* – Palawan porcupine VULNERABLE**

Endemic to the Palawan faunal region and recorded from forest-grassland mosaics, secondary and primary lowland forests (Heaney *et al.* 1998, Esselstyn *et al.* 2004).

We spotlighted one individual in secondary forest in S2. Credible secondary information for its presence is available from all sites. Aside from *Sus ahoenobarbus*, this is possibly the most popular mammal for hunting and trapping in the area. Populations might decrease rapidly, and population surveys therefore are urgently needed.

***Prionailurus bengalensis* – Leopard cat**

Recorded in agricultural areas and forests up to about 1500 m a.s.l. (Heaney *et al.* 1998, Esselstyn *et al.* 2004).

We did not observe this wild cat, but secondary records indicate its presence in S1 and S2. The species seems not to be known from Dumaran Island.

***Amblyonyx cinereus* – Oriental small-clawed otter VULNERABLE**

Recorded from coastal areas and rivers (Heaney *et al.* 1998, Esselstyn *et al.* 2004).

We found pug marks on the river banks of Kemdeng River (S2) and received secondary information from sightings in mangrove in S1 and S4. According to interview respondents the species is sometimes hunted for food.

***Mydaus marchei* – Palawan stink badger**

The species is still widely distributed over Palawan Island (Esselstyn *et al.* 2004) and tolerates considerable habitat modification (Widmann & Widmann 2004).

One juvenile was spotlighted within the settlement of Ilian, Dumaran (S3) while foraging in a dump site. Another adult individual was observed during herping in pasture land of the Carabao Breeding Center, Kemdeng, San Vicente (S2).

***Arctictis binturong whitei* – Palawan bearcat VULNERABLE**

This endemic subspecies is restricted to primary and secondary lowland forests of the Palawan faunal region (Heaney *et al.* 1998, Esselstyn *et al.* 2004).

Tracks of one individual were found in mud of a riverbank in Binaluan, Taytay (S1). Larger scats, containing several seeds and remnants of fruits presumably belonging to this species were found in Kemdeng, San Vicente (S2). The species is apparently not known from Dumaran Island.

***Paradoxurus hermaphroditus* – Common palm civet**

Recorded from agricultural areas and forest (Heaney *et al.* 1998, Esselstyn *et al.* 2004).

We caught and released one individual in a cage trap in secondary forest in S2, another snared animal with severely infected leg was brought to us by locals from S1. We received secondary information of the species from all sites. *P. hermaphroditus* is subject to moderate hunting pressure for food and due to its reputation of preying on domestic chickens

***Sus ahoenobarbus* – Palawan bearded pig VULNERABLE**

This species is endemic to Palawan and is recorded in forest ecosystems in all altitudes (Heaney *et al.* 1998, Esselstyn *et al.* 2004).

Tracks and rutting sites of this species were found in all study areas. We received a dentale of a subadult individual from hunters in S2. Despite the fact that the species is under hunting pressure, it still seems to be common on the mainland sites, but less so on Dumaran Island. In the latter, meat is sold to a trader and possibly resold in the central Visayas.

***Dugong dugon* – Dugong VULNERABLE**

In shallow waters with seagrass beds (Heaney *et al.* 1998).

One individual was caught in a fish-trap in a mangrove channel near Lagan, Dumaran Island (S4) and was slaughtered by local fisherfolks.

## Discussion

Capture-effort curves levelled out for understorey fruit bats captured in mist nets and for small mammals captured in live and snap traps. For pitfall traps it levelled out in Dumaran Island, but not on Palawan Island. Micro-bats are very likely not well represented through mist-netting and harp-trapping alone, and more species are to be expected from the area using other capturing methods (e.g. tunnel traps).

Larger mammals which we did not observe and which were not reported to us during this survey comprise Palawan flying fox *Acerodon leucotis*, short-tailed mongoose *Herpestes brachyurus* and Malay civet *Viverra tangalunga*. We cannot rule out that these species persist in the area and even are hunted, but cannot be discriminated by hunters from other more common species.

Despite these possible gaps in the records, the lowland forests of the Pagdanan Range and Dumaran Island turn out to be rich in mammalian species, including heavily hunted ones. Noteworthy is the apparent absence of some taxa from Dumaran Island, like *Manis culionensis* or *Arctictis binturong*. Given the ongoing forest destruction and fragmentation since Spanish times in this area, these species might have become locally extinct. Nevertheless yielded the last larger forest patch on Dumaran specimens of otherwise rarely or unrecorded mammal species, like *Crocidura* sp., *Murina cyclotis* or *Chiropodomys calamianensis*, highlighting the conservation value of this small area within this landbridge island. In the meantime the residual forest where some of our records came from was declared as 'Omoi Cockatoo Reserve' under municipal ordinance of Dumaran.

Recent conservation planning, covering the entire Palawan faunal region, resulted in the identification of the four largest remaining forest blocks, including the Pagdanan Range, as conservation priority areas (Ong *et al.* 2002, Anda & Tabangay-Baldera 2004).

Land use planning in Palawan so far is heavily based on both altitude and slope. Areas of higher altitudes and steeper relief tend to have a stricter protection, than such in lower altitudes or which are less steep. This strategy primarily aims at watershed protection, particularly nutrient retention and erosion control. At the same time, population pressure tends to be lower in these remote areas, than in those closer to the coast.

Following the paradigm that lowland tropical forests are richer in species than submontane or montane forests in the tropics (Jacobs 1988), the current zoning practice seems not to be adequate to facilitate maximum biodiversity conservation in Palawan.

Workshops conducted through the Critical Ecosystems Partnership Fund from 2003 onwards in Palawan aimed to identify areas for conservation priorities, through using existing information on distribution of species (Anda & Tabangay-Baldera, 2004).

It turned out, that available data on distribution on most taxa are too scanty to come up with fine-tuned recommendations for zonation, particularly for the four large forest blocks. The data on diverse mammal communities in the Pagdanan Range highlights the conservation priority of these lowland areas in Palawan. Only one of the sites (S1) is within an existing protected area of the Malampaya Sound. We suggest that the forested portions of the Pagdanan Range should be declared as protected area, particularly including the fragmented and degraded lowland forests.

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# **The Birds of Pagdanan Range, Lake Manguao and Malampaya Sound, Northern Palawan, Philippines**

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## **Abstract**

Northern mainland Palawan holds one of the largest continuous blocks of lowland rainforest in the Philippines. Two important bird areas (IBA) are situated in the area, namely El Nido Taytay Managed Resource Protected Area and San-Vicente-Taytay-Roxas forests. The latter comprises the Pagdanan Range and connects with the Malampaya Sound Protected Landscape and Seascape. At least three Key Biodiversity Areas are recognized within the area, including the former two IBAs mentioned, plus Lake Manguao, which lies in the periphery of Pagdanan Range. Despite the importance of northern Palawan for conservation, information on biodiversity, including birds was scanty until recently. We report on the results of an ornithological survey in four sites of the area. We recorded a total of 141 bird species, with nine species currently considered globally threatened and eight species 'near threatened'. Aggregations of waterbirds in Lake Manguao suggest that the area may deserve to be included as a Ramsar site. The avifauna of the area is threatened mainly by habitat destruction and by direct persecution, either for the live bird trade or as bushmeat. Because of its diverse bird communities and importance as link between two existing protected areas in Palawan, we recommend that the area is awarded a stricter conservation status, as is currently the case.

Keywords: bushmeat, conservation, pet trade, Ramsar, red list, lowland rainforest, wetlands.

## **Introduction**

The avifauna of large portions of northern Palawan has been poorly studied in the past, thus only incomplete data are available. Pagdanan Range was included in the Philippine Important Bird Areas (IBA; Mallari *et al.* 2001). It was also identified as one of the priority conservation areas for terrestrial biodiversity in the province (Anda and Tabangay-Baldera 2004). Recently, it was included as one of the Key Biodiversity Areas of the Philippines, together with Malampaya Sound Protected Landscape and Seascape, and Lake Manguao and its watershed (CI and DENR 2004).

Pagdanan Range is comprised of a large block of old growth forest between the boundaries of the municipalities of Roxas, San Vicente and Taytay. Much of the area is low-lying and the hills have a maximum altitude of 701m, so that the entire area is potentially covered by lowland and submontane forest. Most of it is not officially protected at present; however an integrated management plan has been prepared for the Palawan Biosphere Reserve under the Environmentally Critical Areas Network (ECAN), which aims to zone the island according to different intensities of human activities. From 1975-1993, the forests in San Vicente, Taytay and Roxas were commercially logged by Pagdanan Timber Products, which mainly targeted dipterocarps. This has significantly reduced the forest area and quality of Pagdanan Range. Roxas and Taytay were considered as among the

illegal logging hotspots of Palawan (Anda and Tabangay-Baldera 2004). Presence of single globally threatened bird species was known for the area (hence the listing of IBA's), but comprehensive ornithological surveys were so far not carried out.



**Figure 1.** Survey areas in Northern Palawan (encircled): 1) Binaluan, Bgy. Liminangcong, Taytay, 2) Carabao Breeding Center, Brgy. Kemdeng, San Vicente, 3) Ilian watershed, Brgy. Ilian, Dumaran, and 4) Lake Manguao, Taytay. **Small map:** location of the detail map within Palawan.

reaching far upriver. The valley floor is mainly under cultivation (fruit plantations, upland and irrigated rice, and coconut grooves). The slopes are still forested, but encroachment through shifting cultivation and illegal logging are rampant.

4) **Lake Manguao, Taytay, Palawan (S4).** The only freshwater lake in mainland Palawan, Lake Manguao is a Philippine Key Biodiversity Area (KBA) due to its unique aquatic and terrestrial vertebrate fauna. It has a catchment area of more than 4,000 ha and a water surface area of at least 640 ha. It is considered to be a young lake which formed after volcanic eruptions. Within the catchment area of the lake high quality lowland forest could be found, bordered by several streams acting as the lake's inflows. The lake has no surface outflow; instead the water diffuses underground past a lava field and reappears to form a peat marsh area near Bantolan Bay. Along the fringes of the lake are numerous marsh and swamp habitats.

This paper aims to contribute to the knowledge of the birds of San Vicente-Taytay-Roxas forest particularly Pagdanan Range, Lake Manguao, and Malampaya Sound in Northern Palawan and discuss conservation issues regarding the avifauna in this area. We give recommendations for protection measures of the areas surveyed. We discuss possible changes in global conservation status of several species based on the results of the surveys.

## Study Area

Pagdanan Range is located at  $10^{\circ} 46'N$  and  $119^{\circ} 20'E$ . Maximum altitude in the area reaches only 701 m. The area is characterized by excessively-logged lowland forest with large patches of agricultural lands and human settlements. However, there are still large tracts of old growth forest left in the interior. Organized commercial illegal logging activities are still ongoing, particularly within the forests between Roxas and San Vicente, as well as in peripheral areas of Taytay.

In the following, each study site is briefly described.

1) **Sitio Binaluan, Bgy. Liminangcong, Taytay (S1).** The area is peripherally connected to the Pagdanan Range. Vegetation consists of over-logged lowland forest, mangrove areas and patches of agricultural lands.

2) **Forest near Carabao Breeding Center, Kemdeng, San Vicente (S2).** The site is located in the northwest coast of Palawan. Vegetation consists of over-logged lowland forest and extensive meadows for water buffalos, with scattered rice fields, small wetlands and shrub. A perennial river is bordered by disrupted stretches of riparian vegetation.

3) **Ilian watershed, Dumaran (S3).** Ilian River is one of the larger river systems in northern Palawan. Its banks are bordered by mangrove vegetation

## Material and Methods

Field surveys were conducted from April 2003 to January 2004 in Kemdeng, San Vicente, Binaluan, Taytay, and Ilian Dumaran, while field surveys for Lake Manguao were carried out from August 2005 to May 2007. However, we have also considered bird species that we have recorded within the area during reconnaissance surveys and visits outside of regular surveys in Pagdanan Range and surrounding areas. Birds were recorded mostly using Mackinnon Lists (Bibby *et al.*, 1992, and Bibby *et al.* 1998). Surveys were conducted early morning and late afternoon when bird activity was usually at its peak. The study covered forested habitats, agricultural lands (including rice paddies and coconut plantations), wetland areas, and coastlines. Mist netting was conducted to record cryptic birds. Birds caught in mist nets were released immediately after taking measurements and photos. Conservation status of the birds follows IUCN (2008).

## Results

A total of 141 bird species were recorded for the area (Table 1). Of these, nine were globally threatened while eight were 'near threatened' (IUCN 2008). Of the four study sites, Lake Manguao (S4) got the highest species record of 120 species, followed by Kemdeng (S2) with 102, Ilian (S3) with 92 species and Binaluan (S1) with 79 species respectively (Tab. 1). Grey imperial pigeon *Ducula pickeringii* was for the first time recorded from Palawan mainland in the Lake Manguao catchment.

### Threatened Species

#### ***Polyplectron napoleonis* – Palawan peacock-pheasant VULNERABLE**

The only previous record of this species from Pagdanan Range is from local accounts from Danlig in San Vicente (Lambert 1993) and in Port Barton (Mc Gowan *et al.* 1989). Since then, it has not been recorded from this area. We recorded Palawan peacock-pheasants from a degraded riparian forest near Kemdeng, San Vicente at an elevation of lower than 50 m asl. Tail feathers could be obtained from trappers in Binaluan, Taytay. In Lake Manguao, a lone individual was heard calling in degraded lowland forest bordered by bamboo groves. The species seems to be under moderate hunting pressure in the Pagdanan Range, as is the case all over Palawan (Mallari *et al.* 2001); however the extent of hunting of this species is not known to date. The presence of this bird even in a degraded riparian forest in San Vicente suggests that the species might still be moderately common in this portion of Pagdanan Range which connects to the forests within the boundaries of Puerto Princesa Subterranean River National Park, where a stable population of the species exists.

#### ***Anas luzonica* – Philippine duck VULNERABLE**

A roosting and feeding group with total number of at least 325 individuals was encountered in deeply indented bays of Lake Manguao, particularly in the western uninhabited coasts of the lake.

In this study, the species was only recorded from Lake Manguao and in ricefield areas in Bgy. Abongan in Taytay and in Dumarao, Roxas, particularly along Barbacan River. It was previously recorded in Palawan from the Mantalingahan mountain range only. Results of present study indicate that the Philippine duck is more common in Palawan than previously thought. The bird is under moderate hunting pressure within the lake, however, there are existing local efforts regulating hunting activities for several game birds, including the Philippine duck. The species seems to congregate in the lake during the dry season and disperse to other areas in Palawan upon onset of the rainy season. The highest number of ducks was recorded in the lake in April during the peak of the dry season but the lake has a year round population of the species. The number of birds recorded in the lake exceeded the minimum population threshold set by Mallari *et al.* (2001) making the lake a potential Ramsar site.

#### ***Anthracoceros marchei* – Palawan hornbill VULNERABLE**

This endemic hornbill species was commonly encountered in all survey sites, particularly in Kemdeng, San Vicente and in Lake Manguao. In the latter, a flock of seven birds was a common sight. We usually recorded the species in pairs and at times in groups of up to four individuals in other sites. In a privately owned farmland with adjoining residual old growth forest near the town proper of Taytay, the species was fairly common, and flocks of 6-12 birds were encountered. The fact that the bird is common and tame in this area may suggest lower hunting pressure than elsewhere. Locals informed us that the species was sometimes hunted for the pet trade and as bushmeat. Based on local perceptions, we assume that the species is moderately threatened by hunting.

***Cacatua haematuropygia* – Philippine cockatoo CRITICALLY ENDANGERED**

This critically endangered species was encountered in elevations less than 50 m asl. in all sites except Lake Manguao, where apparently the species had become locally extinct due to excessive hunting in the 1980s to 1990s. Most of the encounters involved single birds or pairs. Neither roosting sites nor flocks were observed in any of the sites.

Once common all over the province and even considered in the 1960s as pest in rice and corn fields, its population is now severely depleted. It is estimated that not more than 800 birds are surviving in Palawan (Widmann *et al.* 2005), which is considered as its last stronghold in the Philippines. Information from locals indicates ongoing persecution, mainly for the pet trade.

***Prioniturus platenae* – Blue-headed racquet-tail VULNERABLE**

This parrot species was commonly recorded from forest and cultivated areas in Kemdeng, San Vicente and moderately common from all other surveyed forested sites. A flock of ten individuals was seen roosting in taller trees in the brush land along the eastern coast of Lake Manguao.

In S1 and S2, it is considered a pest in banana plantations where it feeds mainly on ripening fruits. Information from locals suggests that this species is not hunted specifically for wildlife trade due to poor survival in captivity, and it is less appealing to pet keepers since it is difficult to maintain.

***Ducula pickeringii* - Grey imperial pigeon VULNERABLE**

A flock containing 25-30 birds was observed near the coast of Binaluan, Taytay and two individuals were seen in the catchment area of Lake Manguao.

This is so far the first record of this species in mainland Palawan. Kennedy *et al.* (2001) state that this species was only recorded from small, wooded islands off the coast of Palawan and Sulu. In northern Palawan it was previously recorded only in the islands of Cadlao and Lagen in El Nido, (Gonzales *et al.* 1997).

***Egretta eulophotes* – Chinese egret VULNERABLE**

One individual was observed in mangrove near Binaluan, Taytay. The species was likely overlooked, since many individuals could not be separated from reef egrets, because they were too far away, or under unfavourable light conditions. According to Mallari *et al.* (2001), Palawan could be one of the major wintering areas of the species. Its presence in Binaluan warrants future studies to assess the importance of this site as staging area of this species.

***Ficedula platenae* – Palawan flycatcher VULNERABLE**

The species was encountered only once in Lake Manguao in a residual forest with bamboo groves. This record is so far the first for the species in northern Palawan. We have never encountered the species in other survey areas, but we assume that it might be due to its secretive nature that it has evaded detection in the three other sites.

***Ptilocichla falcata* – Falcated ground-babbler VULNERABLE**

This species was only rarely recorded from over-logged lowland forests in Binaluan and Kemdeng. However, in Lake Manguao, it was consistently recorded in remnant gallery forest near human settlements. However it was more frequently encountered in primary forests or residual old growth during reconnaissance surveys and subsequent visits to Pagdanan Range. The species is likely a primary forest specialist.

## **Near Threatened Species**

***Tanygnathus lucionensis* - Blue-naped parrot**

This species still was moderately common in all four sites. The species was widely poached for the pet market and taken in large numbers, nevertheless it seemed to compensate this population drain better than other popular cage birds, like the Philippine cockatoo or the Hill myna *Gracula religiosa*.

***Otus fuliginosus* - Palawan scops-owl**

This species was recorded in all four sites. As with earlier studies, the species seemed to have no range overlap

with Mantanani scops-owl *Otus mantananensis*, which is restricted to islands off the coast of Palawan.

We commonly observed and netted the species in secondary and primary lowland forest areas.

#### ***Caloenas nicobarica* - Nicobar pigeon**

In Palawan this species is most often encountered in smaller satellite islands. Within this survey we recorded it infrequently in tall evergreen forest in the Lake Manguao area.

#### ***Oriolus xanthornotus* - Dark-throated oriole**

This species was generally a rare bird in the Pagdanan Range, recorded only once in overlogged forest in S2. However, in S4, it was a common site but restricted in areas where high quality lowland forest existed. The species seemed to show site fidelity since we recorded it for four consecutive months on the same general vicinity during field surveys in Lake Manguao.

#### ***Tersiphone cyanescens* - Blue paradise-flycatcher**

This bird endemic to Palawan was commonly observed in almost all vegetation types surveyed in all sites. The species seemed to be well-represented in areas near human habitation. In Lake Manguao, the species has been regularly netted during all sampling events and was one of the most frequently netted birds. In April 2003, an adult bird was seen with a juvenile in Ilan, Dumaran, near a riverine mangrove forest. However, a nest was recorded in Lake Manguao last June 10, 2006, suggesting varying seasonality of breeding.

Findings of this survey indicate that the species was common throughout northern Palawan. We therefore suggest downlisting of this species to 'least concern' by IUCN.

#### ***Cyornis lemprieri* - Palawan blue flycatcher**

One individual was caught in a mist net in Binaluan, Taytay. The species seemed to be common in all study sites, particularly after it gave off a loud call upon release, which aided in identification of the species in later surveys. In Lake Manguao, the species was recorded in riparian forest of Manguao Stream. All encounters in Lake Manguao were inside residual and primary forest habitat.

It was usually recorded in lowland forest with dense understorey. We never encountered this bird in open brush lands, suggesting preference for forested areas. Listing as near-threatened in IUCN (2008) seems appropriate, since its lowland forest habitat in Palawan is under threat of destruction.

#### ***Parus amabilis* - Palawan tit**

This species was relatively common in all surveyed sites, particularly in forested habitats. In Lake Manguao, the species was only recorded in heavily forested areas and never in severely degraded areas.

#### ***Malacopteron palawanense* - Melodious babbler**

We recorded this babbler in all study sites except in Lake Manguao. We suggest that listing of this species as 'near threatened' is appropriate since its lowland forest habitat are continuously being degraded in all study sites where the species was recorded .

## **Discussion and Recommendation**

Habitat degradation and hunting, the latter practiced both for consumption and trade, were the two most common human-caused threats in all survey sites. We observed that hunting for consumption threatened only the larger species, which were valued as food by the locals. Generally, smaller species like flycatchers, bulbuls and sunbirds were not hunted for consumption. Though these small bird species were regularly hunted by children using sling shots, we consider this hunting activity as a minor threat. This seemed especially true for smaller globally threatened species, which are usually rarely sighted and inhabit the interior parts of the forest. Species that are usually hunted as bushmeat include members of the family Columbidae, Phasianidae, and Rallidae.

Pet trade-related trapping of birds mainly affects parrot species, particularly Blue-naped parrot and Philippine cockatoo. In S1 for example, cockatoos were said to be very abundant until 1970s, the locals even identified one island as a roosting site. However, during the survey, only two individuals were recorded and the demise

of the population is blamed to trapping for the pet trade. In S2, it seems that destruction of the lowland habitat, combined with ongoing persecution for trade was a major threat. The cockatoo is now locally extinct in certain areas of northern Palawan like in the vicinity of Lake Manguao, where it was historically recorded (Collar et al. 1999).

In San Vicente, people believed that the Philippine cockatoo is a pest in rice farms; hence persecution of the birds was still ongoing to prevent crop damage. Blue-naped parrots were also popular cage birds and were the most sought-after species in all areas surveyed since cockatoos were almost hunted to extinction. Birds caught for pet trade were usually juvenile individuals about to fledge. However, sometimes even younger hatchlings were already taken and hand-reared until they could be sold.

Other species trapped for trade included the Hill myna, occasionally the Palawan hornbill, Palawan peacock-pheasant, and Green imperial pigeons *Ducula aenaeia*. In most survey sites adult individuals, which were predominantly valued for the pet trade were as well hunted for their meat for local consumption.

We observed that in all sites surveyed, deforestation and forest degradation were common threats, mainly because of conversion of forest into slash-and burn fields (locally called 'kaingin') and other forms of agricultural lands. Kaingin farming is prohibited in Palawan but was continuously practiced in all our survey areas.

A commercial logging ban is implemented in the whole province of Palawan but we observed that organized small-scale timber extraction was still ongoing in all municipalities we covered. Information from locals also suggested that these logging activities were ongoing even in remote primary forest areas of Pagdanan.

The species composition of birds in Pagdanan Range was similar to that of Puerto Princesa Subterranean River National Park (PPSRNP). Except for one species (Nordmann's Greenshank *Tringa guttifer*), all restricted range and threatened species found in PPSRNP were recorded in the Pagdanan Range. All endemic lowland species were recorded during the survey, plus a possibly resident population of Philippine duck emphasize the value for bird conservation of this largest lowland forest area in Palawan.

Due to its diverse bird communities with a high proportion of globally threatened and near threatened species, we recommend that Pagdanan Range be afforded a comparable level of protection as PPSRNP. The legal protection of this area may further safeguard the corridor function between PPSRNP and the Malampaya Sound Protected Landscape and Seascapes. In addition, the presence of eight globally threatened bird species in Lake Manguao and its population of Philippine duck strongly support the declaration of the lake as a separate protected area, and eventually it should be included in the Ramsar list of wetlands of international significance.

We strongly recommend additional studies on the birds of Pagdanan Range, particularly in the inner portions of the old growth forest. Study in this area may reveal additional records of threatened and restricted range species of birds. Monitoring of illegal logging activities and the opening of new kaingin (shifting cultivation) farms in all study sites, needs to be strengthened. Presently, it is only in Lake Manguao that kaingin is highly regulated, however, in the other study sites; no similar restriction on kaingin activities is being implemented.

Seasonal monitoring of migrating birds in Lake Manguao should be done annually to further determine the importance of this site as a staging area for migrating waterbirds.

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**Table 1.** Birds recorded from four sites in northern Palawan, Philippines

Species	IUCN Status	Binaluan	Ilian	Kemdeng	Lake Manguao
PHILIPPINE SCRUBFOWL <i>Megapodius cumingii</i>					1
RED JUNGLEFOWL <i>Gallus gallus</i>		1		1	1
PALAWAN PEACOCK PHEASANT <i>Polyplectron napoleonis</i>	VULNERABLE			1	1
WANDERING WHISTLING-DUCK <i>Dendrocygna arcuata</i>		1			1
PHILIPPINE DUCK <i>Anas luzonica</i>	VULNERABLE				1
BARRED BUTTONQUAIL <i>Turnix suscitator</i>		1	1	1	1
WHITE-BELLIED WOODPECKER <i>Dyocopus javensis</i>			1	1	1
COMMON FLAMEBACK <i>Dinopium javanense</i>				1	1
GREATER FLAMEBACK <i>Chrysocolaptes lucidus</i>		1	1	1	1
GREAT SLATY WOODPECKER <i>Mulleripicus pulverulentus</i>		1	1	1	1
PALAWAN HORNBILL <i>Anthracoceros marchei</i>	VULNERABLE	1	1	1	1
DOLLARBIRD <i>Eurystomus orientalis</i>			1	1	1
COMMON KINGFISHER <i>Alcedo atthis</i>				1	1
BLUE-EARED KINGFISHER <i>Alcedo meninting</i>			1	1	1
ORIENTAL DWARF KINGFISHER <i>Ceyx erithacus</i>		1	1	1	1
STORK-BILLED KINGFISHER <i>Halcyon capensis</i>		1	1	1	1
COLLARED KINGFISHER <i>Todiramphus chloris</i>		1	1	1	1
BLUE-THROATED BEE-EATER <i>Merops viridis</i>			1	1	1

Species	IUCN Status	Binaluan	Ilian	Kemdeng	Lake Manguao
ORIENTAL CUCKOO <i>Cuculus saturatus</i>		1			
BANDED BAY CUCKOO <i>Cacomantis sonneratii</i>		1	1	1	
PLAINTIVE CUCKOO <i>Cacomantis merulinus</i>		1	1	1	
BRUSH CUCKOO <i>Cacomantis variolosus</i>		1	1	1	
VIOLET CUCKOO <i>Chrysococcyx xanthorhynchus</i>				1	
DRONGO CUCKOO <i>Surniculus lugubris</i>		1	1	1	1
ASIAN KOEL <i>Eudynamys scolopacea</i>			1	1	1
CHESTNUT-BREASTED MALKOHA <i>Phaenicophaeus curvirostris</i>		1	1	1	1
GREATER COUCAL <i>Centropus sinensis</i>		1	1	1	1
LESSER COUCAL <i>Centropus bengalensis</i>		1	1	1	1
PHILIPPINE COCKATOO <i>Cacatua haematuropygia</i>	CRITICALLY ENDANGERED	1	1	1	
BLUE-HEADED RACQUET-TAIL <i>Prioniturus platenae</i>	VULNERABLE	1	1	1	1
BLUE-NAPED PARROT <i>Tanygnathus lucionensis</i>	NEAR THREATENED	1	1	1	1
GLOSSY SWIFTLET <i>Collocalia esculenta</i>		1	1	1	1
PYGMY SWIFTLET <i>Collocalia troglodytes</i>		1	1		1
UNIFORM SWIFTLET <i>Collocalia vanikorensis</i>		1	1	1	1
EDIBLE-NEST SWIFTLET <i>Collocalia fuciphaga</i>					1
BROWN-BACKED NEEDLETAIL <i>Hirundapus giganteus</i>			1		1
PALAWAN SCOPS OWL <i>Otus fuliginosus</i>	NEAR THREATENED	1	1	1	1
SPOTTED WOOD OWL <i>Strix seloputo</i>			1	1	1
BROWN HAWK OWL <i>Ninox scutulata</i>					1
JAVAN FROGMOUTH <i>Batrachostomus javensis</i>			1	1	1
LARGE-TAILED NIGHTJAR <i>Caprimulgus macrurus</i>			1	1	1
SPOTTED DOVE <i>Streptopelia chinensis</i>		1	1	1	1
ZEBRA DOVE <i>Geopelia striata</i>		1	1	1	1
REDDISH CUCKOO DOVE <i>Macropygia phasianella</i>			1		1
EMERALD DOVE <i>Chalcophaps indica</i>		1	1	1	1
NICOBAR PIGEON <i>Caloenas nicobarica</i>	NEAR THREATENED				1
PINK-NECKED GREEN PIGEON <i>Treron vernans</i>			1	1	1
THICK-BILLED GREEN PIGEON <i>Treron curvirostra</i>			1	1	1
BLACK-CHINNED FRUIT DOVE <i>Ptilinopus leclancheri</i>					1
GREEN IMPERIAL PIGEON <i>Ducula aenea</i>		1	1	1	1
GREY IMPERIAL PIGEON <i>Ducula pickeringii</i>	VULNERABLE	1			1
PIED IMPERIAL PIGEON <i>Ducula bicolor</i>					1
WHITE-BREASTED WATERHEN <i>Amaurornis phoenicurus</i>			1	1	1
WHITE-BROWED CRAKE <i>Porzana cinerea</i>				1	1
GREATER PAINTED-SNIPE <i>Rostratula benghalensis</i>				1	
ASIAN GOLDEN PLOVER <i>Pluvialis fulva</i>				1	
WHIMBREL <i>Numenius phaeopus</i>		1			
GREEN SANDPIPER <i>Tringa ochropus</i>				1	
WOOD SANDPIPER <i>Tringa glareola</i>				1	
COMMON SANDPIPER <i>Actitis hypoleucus</i>		1	1	1	
GREY-TAILED TATTLER <i>Heteroscelus breviceps</i>		1			
OSPREY <i>Pandion haliaetus</i>		1			1
ORIENTAL HONEY-BUZZARD <i>Pernis ptilorhynchus</i>		1			
WHITE-BELLIED SEA EAGLE <i>Haliaeetus leucogaster</i>			1		1
CRESTED SERPENT EAGLE <i>Spilornis cheela</i>		1	1	1	1

Species	IUCN Status	Binaluan	Ilian	Kemdeng	Lake Manguao
Crested Goshawk <i>Accipiter trivirgatus</i>		1	1		1
CHINESE SPARROWHAWK <i>Accipiter soloensis</i>					
JAPANESE SPARROWHAWK <i>Accipiter gularis</i>					1
CHANGEABLE HAWK EAGLE <i>Spizaetus cirrhatus</i>		1	1	1	1
ORIENTAL HOBBY <i>Falco severus</i>		1	1		
LITTLE GREBE <i>Tachybaptus ruficollis</i>					1
CHINESE EGRET <i>Egretta eulophotes</i>	VULNERABLE	1			1
PACIFIC REEF EGRET <i>Egretta sacra</i>		1			
LITTLE EGRET <i>Egretta garzetta</i>		1	1	1	1
GREY HERON <i>Ardea cinerea</i>		1			1
PURPLE HERON <i>Ardea purpurea</i>					1
GREAT EGRET <i>Casmerodius albus</i>					1
INTERMEDIATE EGRET <i>Mesophoyx intermedia</i>		1	1	1	1
CATTLE EGRET <i>Bubulcus ibis</i>		1	1	1	1
LITTLE HERON <i>Butorides striatus</i>					1
RUFOUS NIGHT HERON <i>Nycticorax caledonicus</i>			1	1	1
CINNAMON BITTERN <i>Ixobrychus cinnamomeus</i>			1		1
HOODED PITTA <i>Pitta sordida</i>		1	1	1	1
RED-BELLIED PITTA <i>Pitta erythrogaster</i>		1			1
ASIAN FAIRY BLUEBIRD <i>Irena puella</i>		1	1	1	1
YELLOW-THROATED LEAFBIRD <i>Chloropsis palawanensis</i>		1	1	1	1
BROWN SHRIKE <i>Lanius cristatus</i>		1		1	1
MANGROVE WHISTLER <i>Pachycephala grisola</i>			1		1
SLENDER-BILLED CROW <i>Corvus enca</i>		1	1	1	1
LARGE-BILLED CROW <i>Corvus macrorhynchos</i>			1		
WHITE-BREASTED WOODSWALLOW <i>Artamus leucorynchus</i>		1		1	1
DARK-THROATED ORIOLE <i>Oriolus xanthornotus</i>	NEAR THREATENED			1	1
BLACK-NAPED ORIOLE <i>Oriolus chinensis</i>		1	1	1	1
BAR-BELLIED CUCKOOSHRIKE <i>Coracina striata</i>		1	1	1	1
PIED TRILLER <i>Lalage nigra</i>			1		1
SMALL MINIVET <i>Pericrocotus cinnamomeus</i>			1	1	1
PIED FANTAIL <i>Rhipidura javanica</i>		1	1	1	1
ASHY DRONGO <i>Dicrurus leucophaeus</i>		1	1	1	1
SPANGLED DRONGO <i>Dicrurus hottentottus</i>		1	1	1	1
BLACK-NAPED MONARCH <i>Hypothymis azurea</i>			1	1	1
BLUE PARADISE-FLYCATCHER <i>Terpsiphone cyanescens</i>	NEAR THREATENED	1	1	1	1
COMMON IORA <i>Aegithina tiphia</i>		1	1	1	1
GREY-STREAKED FLYCATCHER <i>Muscicapa griseisticta</i>				1	
DARK-SIDED FLYCATCHER <i>Muscicapa sibirica</i>		1	1		
PALAWAN FLYCATCHER <i>Ficedula platenae</i>	VULNERABLE				1
PALAWAN BLUE FLYCATCHER <i>Cyornis lemprieri</i>	NEAR THREATENED	1	1	1	1
WHITE-VENTED SHAMA <i>Copsychus niger</i>		1	1	1	1
ASIAN GLOSSY STARLING <i>Aplonis panayensis</i>		1	1	1	1
HILL MYNA <i>Gracula religiosa</i>		1	1	1	1
VELVET-FRONTED NUTHATCH <i>Sitta frontalis</i>			1		1
PALAWAN TIT <i>Parus amabilis</i>	NEAR THREATENED	1	1	1	1
PACIFIC SWALLOW <i>Hirundo tahitica</i>		1	1	1	1

Species	IUCN Status	Binaluan	Ilian	Kemdeng	Lake Manguao
BARN SWALLOW <i>Hirundo rustica</i>		1		1	1
BLACK-HEADED BULBUL <i>Pycnonotus atriceps</i>		1	1	1	1
OLIVE-WINGED BULBUL <i>Pycnonotus plumosus</i>		1	1	1	1
GREY-CHEEKED BULBUL <i>Alophoixus bres</i>		1	1	1	1
SULPHUR-BELLIED BULBUL <i>Ixos palawanensis</i>		1	1	1	1
ZITTING CISTICOLA <i>Cisticola juncidis</i>				1	1
RUFOUS-TAILED TAILORBIRD <i>Orthotomus sericeus</i>		1	1	1	1
ARCTIC WARBLER <i>Phylloscopus borealis</i>				1	
STRIATED GRASSBIRD <i>Megalurus palustris</i>				1	
ASHY-HEADED BABBLER <i>Malacocincla cinereiceps</i>		1	1	1	1
MELODIOUS BABBLER <i>Malacopteron palawanense</i>	NEAR THREATENED	1	1	1	1
FALCATED WREN BABBLER <i>Ptilocichla falcata</i>	VULNERABLE	1		1	1
STRIPED TIT BABBLER <i>Macronous gularis</i>		1	1	1	1
PALAWAN FLOWERPECKER <i>Prionochilus plateni</i>		1	1	1	1
STRIPED FLOWERPECKER <i>Dicaeum aeruginosum</i>					1
PYGMY FLOWERPECKER <i>Dicaeum pygmaeum</i>		1	1	1	1
PURPLE-THROATED SUNBIRD <i>Nectarinia sperata</i>			1	1	1
COPPER-THROATED SUNBIRD <i>Nectarinia calcostetha</i>		1		1	1
OLIVE-BACKED SUNBIRD <i>Nectarinia jugularis</i>		1	1	1	1
LOVELY SUNBIRD <i>Aethopyga shelleyi</i>		1	1	1	1
LITTLE SPIDERHUNTER <i>Arachnothera longirostra</i>		1	1	1	1
EURASIAN TREE SPARROW <i>Passer montanus</i>			1	1	1
FOREST WAGTAIL <i>Dendronanthus indicus</i>					1
YELLOW WAGTAIL <i>Motacilla flava</i>				1	1
GREY WAGTAIL <i>Motacilla cinerea</i>		1	1	1	
PADDYFIELD PIPIT <i>Anthus rufulus</i>				1	
SCALY BREASTED MUNIA <i>Lonchura punctulata</i>				1	1
WHITE BELLIED MUNIA <i>Lonchura leucogastra</i>		1	1	1	1
CHESTNUT MUNIA <i>Lonchura malacca</i>			1	1	1

**Amphibians and Reptiles recorded on Pagdanan Range and Dumaran Island  
(after Widmann and Widmann, 2004 and Schoppe and Cervancia, in press)**

Species	Binaluan, Taytay	Kemdeng, San Vicente	Ilian, Dumaran mainland	Sto. Tomas, Dumaran Is.	Lagan, Dumaran Is.
<b>Amphibians</b>					
<i>Barbourula busuangensis</i>	C	C			
<i>Bufo philippinus</i>	C	C	O	C	C
<i>Chaperina fusca</i>	C			C	
<i>Leptobrachium cf. hasseltii</i>		C			
<i>Limnonectes acanthi</i>	C	C			
<i>Megophrys ligayaee</i>	C			C	
<i>Occidozyga laevis</i>		C		C	
<i>Polypedates macrotis</i>	C				
<i>Rana moellendorffii</i>	C	C			
<i>Rana sanguinea</i>	C	C	O	C	
<i>Staurois natator</i>	C	C	O		
<b>Reptiles</b>					
<b>Snakes</b>					
<i>Ahaetulla prasina</i>	O				
<i>Boiga dendrophila multicincta</i>	O	O		O	O
<i>Boiga schultzei</i>	C	C			
<i>Chrysopelea paradisi</i>			O		
<i>Dendrelaphis spp.</i>	O	O			O
<i>Gonyosoma oxycephalum</i>				O	
<i>Lycodon subcinctus sealei</i>		C			
<i>Opisthotropis typicus</i>		C			
<i>Python reticulatus</i>					
<i>Rhabdophis chrysargos</i>		C	O		
<i>Sibynophis bivittatus</i>				C	
<i>Trimeresurus schultzei</i>		C			
<i>Typhlops braminus</i>		C			
<b>Lizards</b>					
<i>Bronchocela cristatella</i>	C			C	
<i>Draco palawanensis</i>	O	O	O		
<i>Emoia atrocostata</i>	O		O		O
<i>Eutropis indeprena</i>	C				

**Amphibians and Reptiles recorded on Pagdanan Range and Dumaran Island  
(after Widmann and Widmann, 2004 and Schoppe and Cervancia, in press)**

Species	Binaluan, Taytay	Kemdeng, San Vicente	Ilian, Dumaran mainland	Sto. Tomas, Dumaran Is.	Lagan, Dumaran Is.
<i>Eutropis multifasciata</i>	C	C	O	C	O
<i>Gehyra mutilata</i>		O	O		
<i>Gekko athymus</i>		C			
<i>Gekko gecko</i>	O	O	O	O	O
<i>Gekko palawanensis</i>			O		
<i>Hemidactylus frenatus</i>	O	O	O		O
<i>Varanus salvator marmoratus</i>	O	O	O	C	O
<i>Unid. gekkonid sp. 1</i>		O			
<i>Unid. scincid sp. 1</i>		O			
<b>Crocodiles</b>					
<i>Crocodylus porosus</i>					S
<b>Turtles</b>					
<i>Cyclemys dentata</i>	C	C	C	C	
<i>Cuora amboinensis</i>	C	C		C	
<i>Siebenrockiella leyteensis</i>		C		C	

**C:** caught, **O:** observed, **S:** secondary information.

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# Key Conservation Amphibian Species Along Pagdanan Range, Northern Palawan, Philippines

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## Abstract

The present study provides evidence that the Pagdanan Mountain Range which is known to hold globally threatened plant, reptile, bird and mammal species is also of importance for key amphibian species. For *Barbourula busuangensis* and *Megophrys ligaya* the area constitutes an important stronghold. Habitat conservation measures are recommended. Findings also lead to recommendations for IUCN status assessments of the species.

Keywords: amphibian, key conservation species, Palawan, Philippines

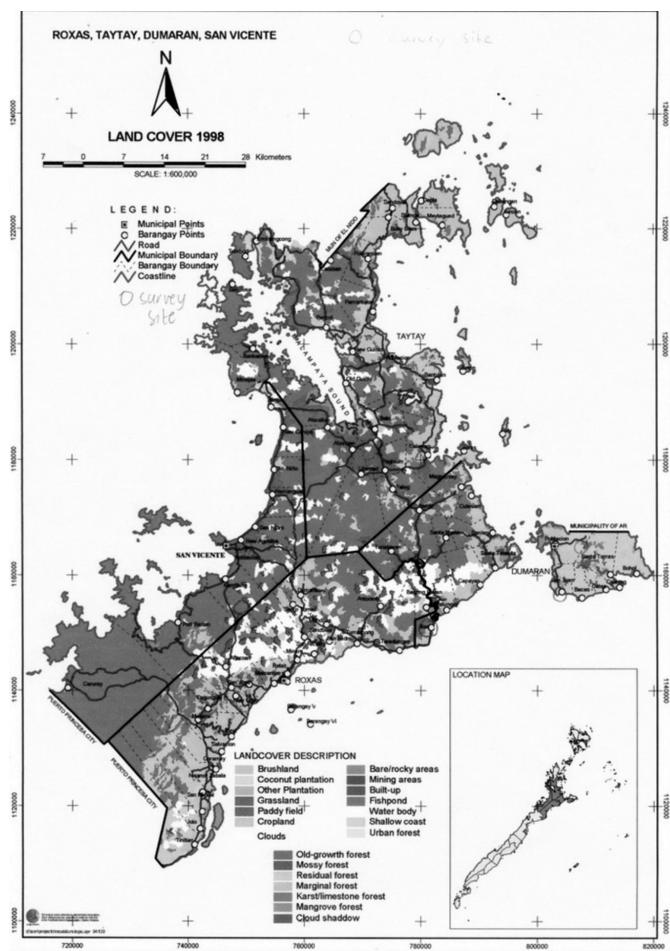
## Introduction

The Pagdanan Mountain Range extends through two of Palawan's Key Biodiversity Areas: the El Nido-Taytay Managed Resource Protected Area (ENTMRPA) and the San Vicente-Taytay-Roxas Forest, the latter comprising the terrestrial area of the Malampaya Sound Protected Landscape and Seascapes (Anda and Tabangay-Baldera 2004). Criteria for the classification as Key Biodiversity Areas were the presence of globally threatened and/or restricted-range species. In the case of the San Vicente-Taytay-Roxas Forest these were four threatened bird species incl. the "Critically Endangered" Philippine Cockatoo, and one threatened mammal and plant species, respectively. The ENTMRPA classified because of the presence of two threatened and six restricted-range bird species, one threatened reptile species, and six threatened plant species. Until 2004, both areas were never covered by extensive amphibian surveys, hence it was not known whether these important areas also provide habitat to key amphibian species.

The present is part of a larger study intended to provide first data on the herpetofauna of the Pagdanan Mountain Range (Schoppe and Cervancia, in print), and to determine the importance of the area for the conservation of potential key species. Here only key amphibian species are tackled.

## Study Area

Pagdanan Range is located at 10°46' N and 119°20' E in the northern part of Palawan between the municipalities of Roxas, San Vicente and Taytay (Figure 1). Maximum altitude is 701m. Deforestation and illegal logging are main threats in the area; others are slash-and-burn farming practices, treasure hunting, gold-panning, quarrying, land conversion, erosion, pesticide run-off and high net in-migration (Anda and Tabangay-Baldera, 2004). Surveys were conducted in two sites along the Pagdanan Range: Sitio Binaluan, Barangay Liminangcong, Taytay and Barangay Kemdeng, San Vicente (Figure 1).



**Figure 1:** Map of Northern Palawan (Roxas, Taytay, Dumaran and San Vicente) wherein the study sites are encircled.

## Methodology

Visual encounter surveys were conducted daily between 6:00 and 10:00am and 5:30 and 10:00pm. Frogs were collected through hand captures, scope netting, and pit fall trapping. All frogs were identified but special attention was given to key biodiversity species. Key biodiversity amphibians are defined as those classified “threatened” under IUCN (Anda and Tabangay-Baldera, 2004). IUCN status as of 2008 was used (IUCN, 2008). Measurements of all herpetofaunal elements taken during the survey are provided in Schoppe and Cervancia (2008).

Surveys were part of the Katala Quest Project that assessed the threatened vertebrate fauna of habitats of the “Critically Endangered” Philippine Cockatoo in Northern Palawan (Widmann et al., 2004). Surveys in Binaluan were carried out in November 2003, and those in Kemdeng were done in January 2004.

## Results and Discussion

A total of eleven frog species were recorded (Table 1), three of which are threatened and hence classified as key biodiversity species. These are the “Endangered” Palawan Horned Frog *Megophrys ligayae* (Taylor, 1920), the “Vulnerable” Philippine Flat Headed Frog *Barbourula busuangensis* Taylor and Noble, 1924, and the “Vulnerable” Busuanga Wart Frog *Limnonectes acanthi* (Taylor, 1923). The remaining eight species are either “Near Threatened” or of “Least Concern” (IUCN, 2008). In addition to frogs, nine snake species, 12 lizard species and three freshwater turtle species were caught. Details about these are currently being published (Schoppe and Cervancia, in print).

**Table 1:** Amphibian species encountered in two sites along Pagdanan Range.

Species	IUCN Status (2008)	Binaluan, Taytay	Kemdeng, San Vicente
<i>Megophrys ligayae</i>	EN	✓	
<i>Barbourula busuangensis</i>	VU	✓	✓
<i>Limnonectes acanthi</i>	VU	✓	✓
<i>Rana moellendorffi</i>	NT	✓	✓
<i>Bufo philippinicus</i>	LC	✓	✓
<i>Chaperina fusca</i>	LC	✓	
<i>Leptobrachium cf. hasseltii</i>	LC		✓
<i>Occidozyga laevis</i>	LC		✓
<i>Polypedates macrotis</i>	LC	✓	
<i>Rana sanguinea</i>	LC	✓	✓
<i>Staurois natator</i>	LC	✓	✓

### ***Megophrys ligayae* (Taylor, 1920) - Palawan Horned Frog**

*Megophrys ligayae* is a Palawan endemic that has been recorded from Balabac and Palawan Islands only (IUCN, 2008). The species is listed 'Endangered' because of its limited distribution range, fragmented distribution, and continuing decline in the extent and quality of its habitat in Palawan (IUCN, 2008).

From Palawan location records exist for Barangay Irawan, Puerto Princesa City (Peneyra, 2004); Brgy. Ransang, Rizal (CI-Phi, in prep.); Culasian, Rizal (Schoppe and Acosta, 2008); Brgy. Dumara, Roxas and Brgy. Santo Tomas, Dumaran Island (Schoppe and Cervancia, in print). The current survey found the species in Binaluan but not in Kemdeng. In Binaluan, the species was common to abundant. The present constitutes the first record for the species for the Pagdanan Mountain Range in Northern Palawan.

The main threats to the species along its range in Balabac and Palawan Islands are habitat loss and degradation caused by slash and burn farming practices and the pollution of streams due to agricultural effluents and mine-tailings (IUCN, 2008). This is also true for the site in Binaluan where vegetation consists of over-logged lowland forest and patches of agricultural lands. In Kemdeng, where the species was absent, over-logged lowland forest also predominated, but in addition extensive meadows for water buffalos, with scattered rice fields, small wetlands and shrubs characterized the area. It is expected that the higher degree of habitat alteration is responsible for the absence of *M. ligayae* in Kemdeng.

### **Philippine Flat Headed Frog - *Barbourula busuangensis* Taylor and Noble 1924**

*Barbourula busuangensis* is another endemic that is restricted to the Palawan group of islands, such as Busuanga, Culion and Palawan (Inger and Voris, 2001; IUNC, 2008). The species is considered 'Vulnerable' because its extent of occurrence is less than 20,000 km<sup>2</sup>, and its distribution is severely fragmented (IUCN, 2008). Furthermore, assessors of the species justified its status due to the continuing decline in the extent and quality of its forest habitat in the Palawan group of islands.

The species was described from a single preserved specimens from Busuanga in the Calamianes group of islands by Taylor and Noble (1924). Taylor and Noble (1924) remarked that it might be nearing extinction because they found it to be extremely rare. After this the species has rarely been documented but discoveries from Palawan Island extended its range considerable to the south (Myers, 1943; Inger, 1954; Brown and Alcala, 1970; Alcala and Brown, 1987). On Palawan islands the species was confirmed for Narra (Infante *et al.*, 2002), and Irawan, Puerto Princesa City (Peneyra, 2004). The current findings constitute the first record for the species from Binaluan, Malampaya Sound, and Kemdeng, San Vicente (see also Schoppe and Cervancia, in print).

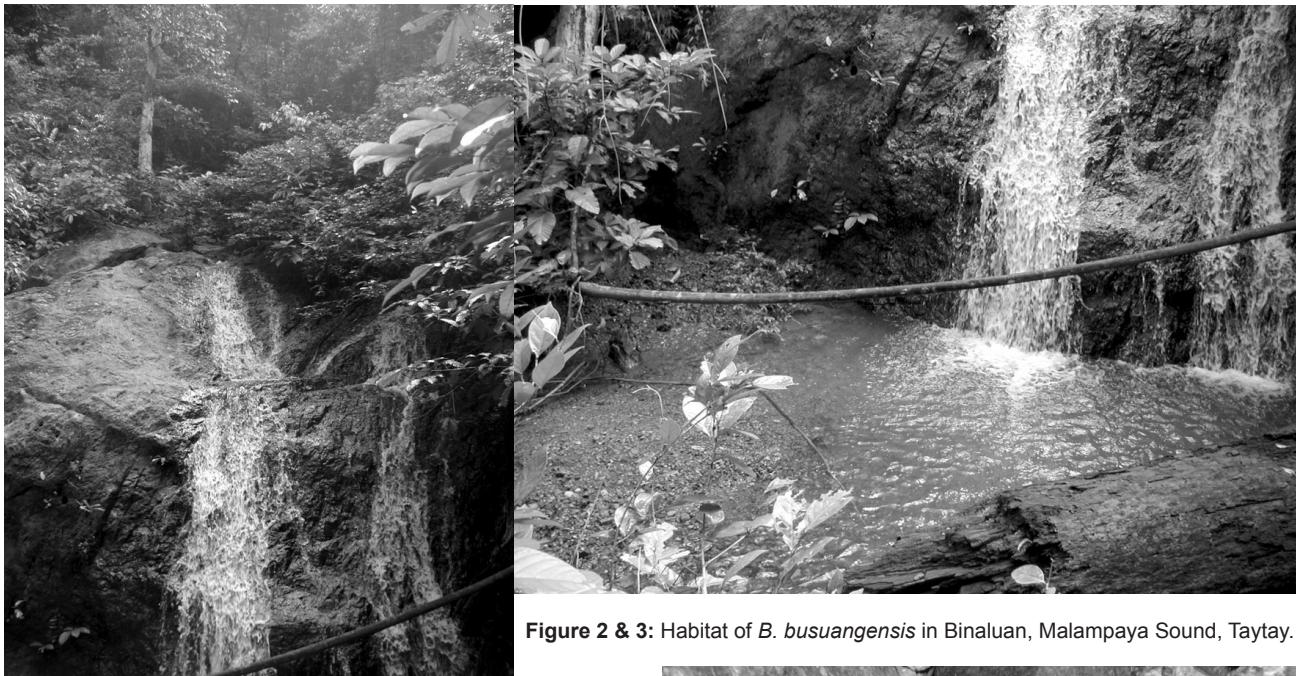
In each of the two study sites the species was only found in one small and clear stream in areas well within the forest. Adults were found within the stream bed hiding under boulders and in crevices as well as in clefts under a waterfall (Figure 2 and 3). Small juveniles on the other hand were exclusively found in waterfall areas. Most small juveniles were found on steep walls just beside the main waterfall. They used to cling to the mossy substrate which gave them perfect camouflage. Some were also found in the pool under the waterfall (Figure 4).

The Philippine Flat-headed Frog is a highly aquatic species known to inhabit only undisturbed, clear, unpolluted mountain streams of lower elevations of up to about 300 m a.s.l. (IUCN, 2008). Its strict habitat requirements and sensitivity to disturbance was proven for a small stream in Puerto Princesa City, where it decreased in abundance from 30 individuals (Peneyra, 2004) to 19 individuals (Pastrana, 2006) in only two years. Habitat alteration and an increasing number of tourists visiting the waterfall area were held responsible for the decrease in abundance (Pastrana, 2006).

The populations in Pagdanan Range are one of the remaining strongholds of the species in Palawan. Habitat conservation is considered a priority in the management of the species. Based on the findings, IUCN status assessment is recommended since the species might classify endangered.

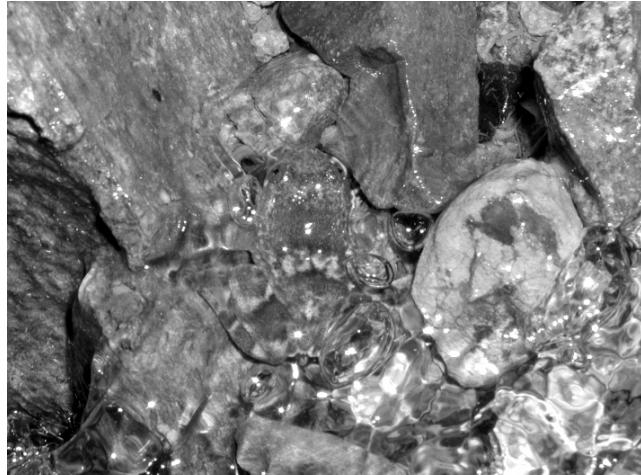
### **Busuanga Wart Frog - *Limnonectes acanthi* (Taylor, 1923)**

Until recently the species was still considered endemic to Palawan, but now populations on Mindoro are also attributed to the species (IUCN, 2008). The known range of this species is now Balabac, Busuanga, Culion, Palawan, and Mindoro (IUCN, 2008).



**Figure 2 & 3:** Habitat of *B. busuangensis* in Binaluan, Malampaya Sound, Taytay.

On Palawan the species seems to be widely distributed with records in northern, southern and central Palawan (e.g. Alcala, 1986; Alcala and Brown, 1998; Penevra, 2004; Schoppe and Acosta, 2008; Schoppe and Cervancia, in print; Ci-Phi, in prep.). Among the frog species encountered in the two sites in Pagdanan Range, *L. acanthi* was the most abundant species. As of now the species is still classified as 'Vulnerable' which is justified by its described extent of occurrence which is less than 20,000 km<sup>2</sup>, its severely fragmented distribution, and the continuing decline in the extent and quality of its forest habitat on the Philippines. Present findings and those from other areas in northern (Schoppe and Cervancia, in print) and southern Palawan (Schoppe and Acosta, 2008) lead to recommending the species for IUCN status assessment which might result to down-grading.



**Figure 4:** Juvenile *B. busuangensis* in a pool area under the waterfall in Binaluan.

## Conclusions and Recommendations

The Pagdanan Mountain Range constitutes an important strong hold for at least two globally threatened frog species, the "Vulnerable" *B. busuangensis* and the endangered *M. ligaya*. Conservation measures such as the declaration of protected areas should be considered. In support a follow up study at the two sites is recommended. The latter is needed to confirm the presence of the species since more than four years have passed since the last survey. A follow up study could reveal trends in the abundance of threatened species and therewith contribute to an eventual IUCN status assessment.

## Acknowledgment

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# From Species Lists to Cockatoo Reserves – The Example of the Community-based Protected Areas on Dumaran Island, Palawan, Philippines

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## Abstract

Assessment of vertebrates is a frequently used tool for identification of priority conservation areas in the Philippines and elsewhere. Considerable effort is usually invested for such inventories. However, frequently the process stops just there and does not further contribute to improved conservation action. We describe how information on presence of threatened species was used for the creation of protected areas on Dumaran Island, Palawan, Philippines, under involvement of local stakeholders. In the course of the BP conservation expedition "Katala Quest" in 2003, we conducted zoological and ethnozoological surveys in lowland forests in northern Palawan. On Dumaran Island we recorded a number of globally threatened species in two small forest patches, among these were the 'critically endangered' Philippine cockatoo *Cacatua haematuropygia* and the first recent record of the Philippine forest turtle *Siebenrockiella leytensis* in the wild. Survey results were publicized through conservation education employing social marketing strategies. Locals living adjacent to protected areas were trained and employed as wildlife wardens. After declaration of two cockatoo reserves through municipal ordinances, KATALA Foundation assisted in the creation of a Local Protected Areas Management Board for the long-term management of the two sites.

Keywords: conservation education, Philippine cockatoo, protected area, PRIDE campaign

## Introduction

The "Katala Quest Northern Palawan" expedition was designed to provide a better understanding of the rich fauna of the area. It was conducted at the three municipalities of Dumaran, Taytay and San Vicente encompassing the vast area of the Pagdanan Range from April 2003 – June 2005. The surveys focussed on two general areas of potentially high conservation priority, which at the same time so far had been very inadequately sampled in respect to vertebrates. The Pagdanan Range in northern Palawan comprises one of the larger forest blocks of the archipelago. It is listed as Important Bird Area (Mallari *et al.*, 2001). Dumaran Island is a landbridge island which is widely denuded of its original forest cover. Therefore its importance for biodiversity conservation was overlooked until recently when viable populations of 'critically endangered' Philippine cockatoos *Cacatua haematuropygia* and Philippine forest turtle *Siebenrockiella leytensis* were discovered in the last remaining forest patches (Widmann, 2001; Diesmos *et al.*, 2004). Both areas were identified as priority sites for biodiversity conservation (Anda & Tabangay-Baldera, 2004).

In the Philippines and anywhere else in the world, scientific surveys and assessments focus on delivering species lists to assist in developing conservation actions. In many cases, after biodiversity assessments are conducted, results are published, often in technical journals. Oftentimes this hard-won information does not contribute to better informed local citizenry and therefore not achieving tangible conservation outcomes.

This paper describes how we used the scientific results of the Katala Quest expedition in order to safeguard priority areas on Dumaran Island for the protection and conservation of the 'critically endangered' Philippine cockatoo *Cacatua haematuropygia* and other threatened wildlife sharing its habitat.

## **Vertebrate Assessments**

In-depth assessments of terrestrial vertebrate communities have been conducted in five sites where reconnaissance surveys yielded cockatoo records. Three sites were situated on the mainland, two sites on Dumaran Island.

We recorded 35 mammal (Widmann *et al.*, 2008), 157 bird (Matillano *et al.*, 2008), 31 reptile and 12 amphibian species in the five sites (Schoppe and Cervancia, in press). Seven mammals, 13 bird species and five herps species respectively are listed as globally threatened respectively (IUCN, 2008).

All cockatoo records were made in altitudes below 50 m a.s.l. Highest density of cockatoos were found on Dumaran Island, where also the only known roosting site in northern Palawan is situated. We were neither able to observe cockatoos in the widely intact higher altitude forest of Pagdanan Range, nor in two historical sites for the species (Collar *et al.*, 1999). Apart from the 'critically endangered' Philippine cockatoo, other threatened species of global conservation concern occur on the two forest patches on Dumaran Island (Table 1).

**Table 1.** Threatened species of global concern recorded from Dumaran Island (from Widmann *et al.*, 2008; Schoppe and Cervancia, in press; Matillano *et al.*, 2008)

Species	Conservation status
<i>Arctictis binturong</i>	VU
<i>Aonyx cinerea</i>	VU
<i>Sus ahoenobarbus</i>	VU
<i>Dugong dugon</i>	VU
<i>Anas luzonica</i>	VU
<i>Egretta eulophotes</i>	VU
<i>Hystrix pumila</i>	VU
<i>Anthracoceros marchei</i>	VU
<i>Cacatua haematuropygia</i>	CR
<i>Prioniturus platenae</i>	VU
<i>Megophrys ligayae</i>	EN
<i>Cuora amboinensis</i>	VU
<i>Siebenrockiella leytensis</i>	CR
<i>Chelonia mydas</i>	EN
<i>Eretmochyles imbricata</i>	CR

These findings suggested that Pagdanan Range and Dumaran Island are of similar conservation priority as the already protected World Heritage Site Puerto Princesa Subterranean River National Park' and the Malampaya Protected Land-and Seascape.

## **Ethnozoological surveys**

Ethnozoological interviews (Martin, 1995) were randomly conducted in all survey sites. Most of the interviews were conducted in close proximity to these areas. Priority species asked were according those listed as globally threatened by IUCN (2008) and those endemic to the island province and in particular the Philippine cockatoo. During the interviews, laminated pictures or priority species were shown and local names were also verified and compared. A more comprehensive survey questionnaire was conducted in Dumaran not only on respondent's sightings of cockatoos and other target species but also of respondent's uses of forest resources and perceived threats to forest ecosystem.

Sighting of Philippine cockatoos were very infrequent and rare in San Vicente and Taytay but common on Dumaran Island. However, in both municipalities some Palawan endemics were frequently sighted including Blue-headed racquet-tail *Prioniturus platenae*, and Palawan hornbill *Anthracoceros marchei*.

Particular to Dumaran Island, respondents were greatly dependent on forest resources. Hunting, poaching, logging and collection of non-timber forest products were common activities. The Philippine cockatoo along with the Hill myna *Gracula religiosa* and Blue-naped parrot *Tanygnathus lucionensis* were the top three bird species that were poached for the pet trade. Philippine cockatoos were also persecuted because they were considered pests on ricefields. Several methods of poaching were known. Some endemic mammal species e.g. Palawan bearded pig *Sus ahoenobarbus* and Palawan pangolin *Manis culionensis* were poached in surveyed sites (Villafuerte, 2005; Widmann, 2005).

### **Conservation education**

The Philippine cockatoo and other enigmatic vertebrate species which can be used as flagship species are seen as appropriate vehicles for a broader environmental awareness scheme, particularly among schoolchildren, farmers and forest users.

Prior to the full implementation of the PRIDE campaign in 2004 in Dumaran, education efforts e.g. school and community visits in all survey sites (San Vicente, Taytay and Dumaran) focused on conservation of wildlife and forest ecosystems. We used laminated print outs of photos taken during the expedition and interactive environmental games as strategies of instruction. About 480 students and ca. 200 community members in the proximity of the survey areas were reached.

### **Stakeholders Meeting**

Two separate consultative meetings and planning workshops were held in Dumaran; one in the mainland and one on Dumaran Island prior to the full blown stakeholders' meeting. Results of the expedition and questionnaires were presented during these meetings. The stakeholders' meeting was instrumental in developing the concept model in order to protect the remaining forests and wildlife of Dumaran Municipality. The initial concept model was evaluated and revised by the same key stakeholders during the 2nd stakeholders meeting in Dumaran after a pre-project survey was completed and analyzed.

The revised concept model (Annex 1) reflected the various threats to Dumaran's forests and wildlife species. Direct threats were streamlined to five: sand and gravel quarrying, logging, hunting / trapping, kaingin farming practice and forest fire (Widmann, 2005).

Expedition results and focus group discussions also showed that the lack of protected area results in increasing and unregulated hunting and trapping. The hunting threat is aggravated by lack of (or inaccurate knowledge on) wildlife and forest laws and poor law enforcement. Stakeholders ranked these direct threats using Margoluis & Salafsky (1998) three out of seven criteria: area, intensity and urgency. These criteria have equal weights while the highest score that any threat can get for each criterion is equal to the total number of threats identified.

Kaingin farming practice ranked first among all threats according to area, intensity and urgency of the threat. This was followed by logging. Forest fire and hunting/trapping share the 3rd rank while sand and gravel quarrying played last (Table 2). This ranking was very similar according to community perceived importance except that logging was seen by the community as the top threat followed by kaingin. If criteria were taken individually, based on area and intensity kaingin practice ranked first and had the strongest impact on the target condition. Meanwhile, on the basis of urgency, hunting and trapping topped the ranking. Key stakeholders contended that immediate action must be taken to deal and combat this threat; otherwise, wildlife species will be gravely affected and endangered.

### **PRIDE Campaign**

The PRIDE campaign, introduced by RARE Conservation, uses a flagship species and social marketing vehicles such as mascots, festivals, billboards, posters, leaflets, puppet shows, to rally local support for biodiversity conservation. The flagship species chosen by the stakeholders for this campaign was the Philippine cockatoo,

**Table 2.** Direct ranking of threats in Dumaran, Palawan, Philippines

THREATS	CRITERIA			Total score	Rank
	Area	Intensity	Urgency		
Sand and Gravel Quarrying	1	1	1	3	D
Forest Fire	4	3	2	9	C
Logging	3	4	4	11	B
Kaingin Practice	5	5	3	13	A
Hunting/Trapping	2	2	5	9	C

the priority species surveyed for the Katala Quest. Apart from its charismatic nature, the restriction of the species to extreme lowland habitats makes it more vulnerable to all kinds of human activities with whom it often shares the same general areas (Widmann, 2005). Since the species is endemic to the Philippines and its last stronghold is in Palawan, we thought to instill pride among Dumareños for hosting one of the few remaining wild populations in the world.

Human activities in most cases if not all, greatly affect the environment. As conflicts over natural resources utilization increase, there is also a growing need for education efforts to be creative and entertaining in order to attract the public's attention and hopefully influence attitudes and changes behaviours towards biodiversity conservation (Jacobson *et al.*, 2006).

While it is difficult to "sell" conservation especially in developing countries like the Philippines where many perceive conservation as an impediment to development (Butler, 1995), the PRIDE campaign drew attention and created the momentum for people to take actions. As McKenzie-Mohr & Smith (1999) writes "All persuasion begins with capturing attention. Without attention, persuasion is impossible".

Focal messages "drawn out" from series of consultations and meetings were:

- Cockatoo conservation directly benefits the human population through increased ecosystem services.
- The cockatoo population is an indicator for human life quality. Therefore, it is a must to share the place for both species to live!
- Cockatoo conservation benefits the complete lowland forest ecosystems, including all associated biodiversity.

Therefore, the key conservation message agreed by all stakeholders to carry out the pride campaign's ideals and objectives was "SHARE A PLACE TO LIVE".

Activities included school visits; conduct of festivals, cockatoo mascot appearances, puppet shows and many more that makes learning fun and entertaining. In total 2640 students were reached in the school visits and post project survey suggested 37% points (up from 39.5% to 76.5%) say they believed that Philippine cockatoo and other wildlife could live in harmony with people. The festival was an effective medium to further diffuse key messages of the campaign. The conservation messages were omni-present and consistent in almost all festival activities. Key messages were connected to very popular affairs, like sport activities, beauty pageants, municipal clean-ups, tree planting, drawing contest, youth field exposures, puppet shows, the use of the Philippine cockatoo mascot, environmental skits and short plays, and even parlour/fun games. These were repeated everywhere and the general public were saturated with visual and auditory aids (McKenzie-Mohr & Smith, 1999) to remind them again and again of the key messages.

### **Wildlife Wardens Recruitment**

Six key forest users residing near the two forest patches surveyed on Dumaran Island were deputized as wildlife enforcement wardens. They were trained on basic wildlife identification skills, forest inventory skills, date recording and use of equipment like global positioning system (GPS), hypsometer, diameter at breast height (DBH) meter, etc. A separate paralegal training was conducted along with other key stakeholders.

Deputation was granted by the Regional Executive Director of the Department of Environment and Natural Resources (DENR) - MIMAROPA Region to which Palawan belongs. Deputation grants the wildlife warden volunteers the powers and authorities usually given to enforcement officers from the DENR.

### **Paralegal trainings**

Two separate paralegal trainings were conducted with wildlife wardens, teachers, priests, local police, and local government officials as participants. This training aimed to heighten the understanding of key stakeholders on existing environmental laws and capacitate them to implement these laws effectively. The first training was tailored for law enforcement agencies and concerned authorities in the area with 27 participants while the second training reached 129 parishioners as we had engaged the participation of the local church.

### **Protected Area Establishment and Management**

This was possibly the most significant output from the surveys conducted through the Katala Quest project. Simultaneous to the conduct of the PRIDE campaign and other capacity-building measures, we lobbied for the legal protection of the two forest patches on Dumaran Island. In late 2003, Municipal Resolution No. 070, a resolution declaring the forest patch in Sitio Omoi, Brgy. Sto. Tomas as an environmentally and ecologically protected area was approved by the Municipal Mayor. Albeit declared as a PA, this does not ensure further disturbance. Hence, we mobilized a multi-sectoral team to demarcate the boundaries of the two forest patches encompassing three barangays in Dumaran: Sto. Tomas, Poblacion and San Juan. Along with representatives from the Municipal's Assessor's Office, Department of Agriculture, wildlife wardens, farmers near the area and Katala Foundation, the demarcation was completed in a week. Following this, we proposed for a strengthened legal basis for protection through a municipal ordinance. The draft of the said ordinance went through several committee readings at the municipal council and public consultations prior to its approval and enactment. On October 19, 2004, Municipal Ordinance No. 2004-092 entitled "An ordinance enforcing total protection and conservation of Philippine cockatoo / Katala and other endemic and endangered wildlife within the environmentally and ecologically protected area covering or encompassing the barangays of Sto. Tomas, Poblacion and San Juan, Municipality of Dumaran and imposing penalties in violations thereof and providing funds therefore" was approved by the Municipal Council and signed by the Mayor on November 2, 2004. Meanwhile, the 2nd forest patch in Sitio Manambaling, Bgy. San Juan was secured through a Barangay Resolution which was then approved by the Municipal Council on February 15, 2005.

### **LPAMC creation through Executive Order**

Lobbying was pursued even after the declaration of the protected areas because the real work starts only then. We proposed the creation of a Local Protected Area Management Council (LPAMC). We had patterned this from our initiatives in Narra, the pilot site of the Philippine Cockatoo Conservation Program. This management council acts as the governing body for the protected area that shall oversee and ensure the protection and conservation of the PA in the future.

After series of deliberations and presentations done in the last quarter of 2005, Municipal Ordinance No. 2006-139 was approved in January 3, 2006 creating the Local Protected Area Management Committee (LPAMC) for Dumaran, Palawan. The overall goal of the LPAMC is to efficiently and effectively protect, conserve and rehabilitate protected areas in Dumaran and its flora and fauna therein. Composition of the LPAMC comprised mainly of local stakeholders particularly the Mayor as Chairman, Vice Mayor as Vice Chairman and members are offices of DENR-CENRO-Roxas, deputized wildlife wardens, Chairman of the Committees on Environment, Tourism and Agriculture of the Municipal Council, Municipal Environment and Natural Resources Officer, Phil. National Police-Dumaran, Municipal Agriculture Office, Principal of the Dumaran National High School, and heads of elementary schools in Bgys. San Juan, Sto. Tomas and Poblacion, Municipal Task Force and representative of farmers surrounding the PA. The Katala Foundation serves as the host organization and secretariat of the Committee.

### **Other uses of information gathered**

Environmental action plans which were agreed during the Planning Workshops and Stakeholders Meeting were incorporated in the municipality's Medium Term Development Plan in August 2005. These plans mainly support the conservation of the PA thereby ensuring the survival of the cockatoo species and all other wildlife that shares its habitat.

Three members of the Katala Quest team participated in the first Philippine Bird Fest held in Quezon City, Philippines on November, 2005 through a presentation of the results of the Katala Quest in northern Palawan. The team leader gave a short presentation about the Philippine cockatoo conservation program before kids, bird enthusiasts and guests during the festival.

Further, results were presented in poster form during the 15th Annual Conference of the Wildlife Conservation Society of the Philippines in April 2006.

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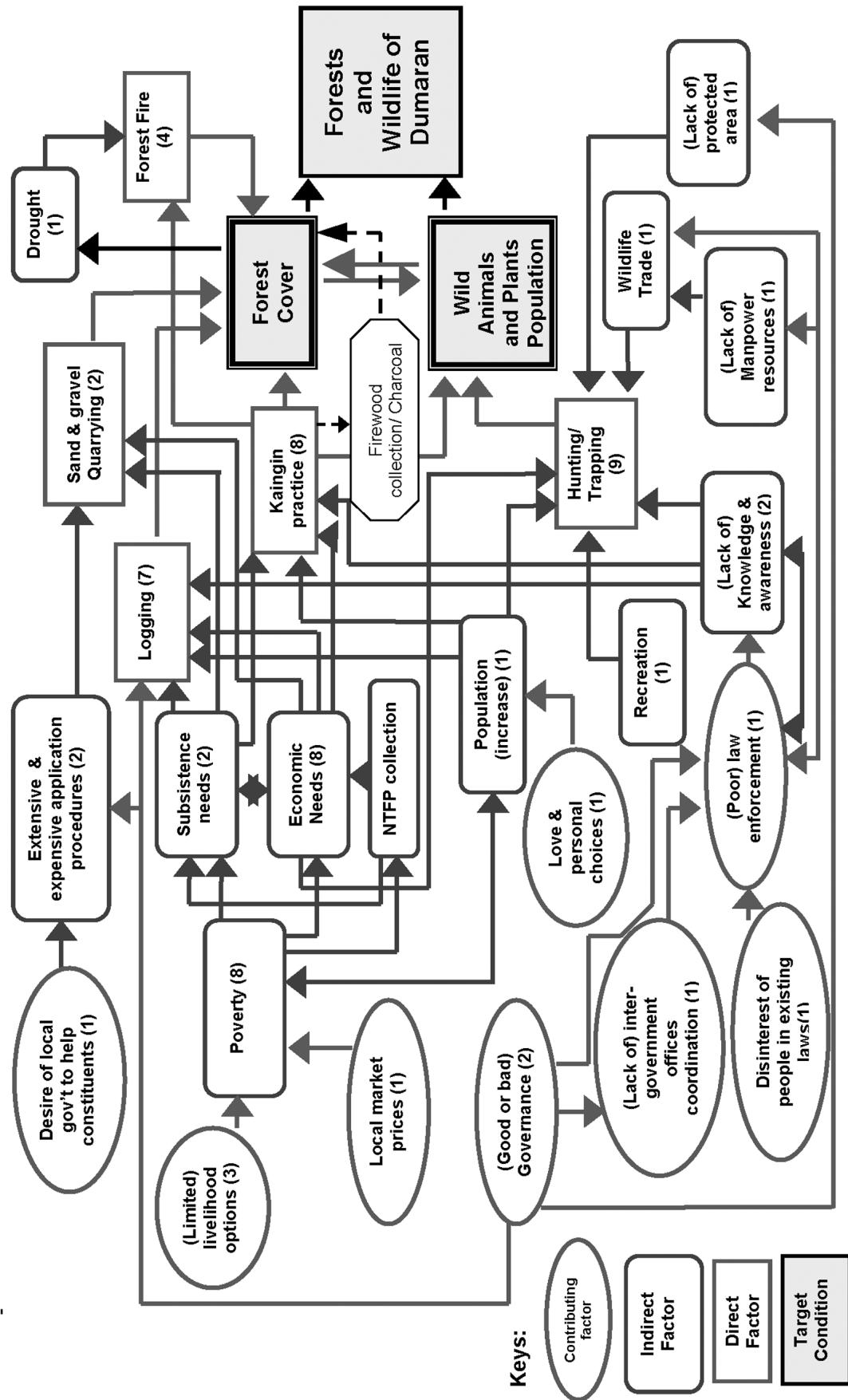
Thanks to the Rare Conservation through the Critical Ecosystems Partnership Fund (CEPF) for granting the PRIDE campaign on Dumaran.

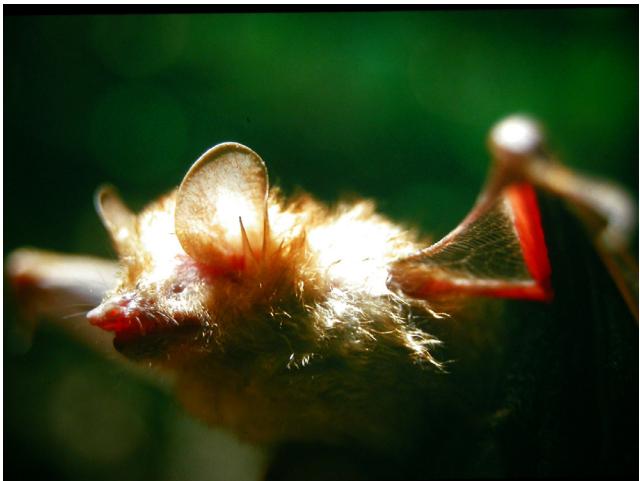
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**Revised concept model for the protection of the forests and wildlife of Dumaran, Palawan, Philippines December 2003**





*Murina cyclotis* © pwidmann



*Sundasciurus juvencus* © pwidmann



*Haeromys pusillus* © pwidmann



*Otus fuliginosus* © pwidmann



*Hypsipetes palawanensis* © pwidmann



*Trichastoma cinereiceps* © pwidmann



*Trimeresurus schultzei* © sschoppe



*Cuora amboinensis* © sschoppe



*Siebenrockiella leytensis* © pwidmann



*Barbourula busuangensis* © pwidmann



*Limnonectes acanthi* © sschoppe

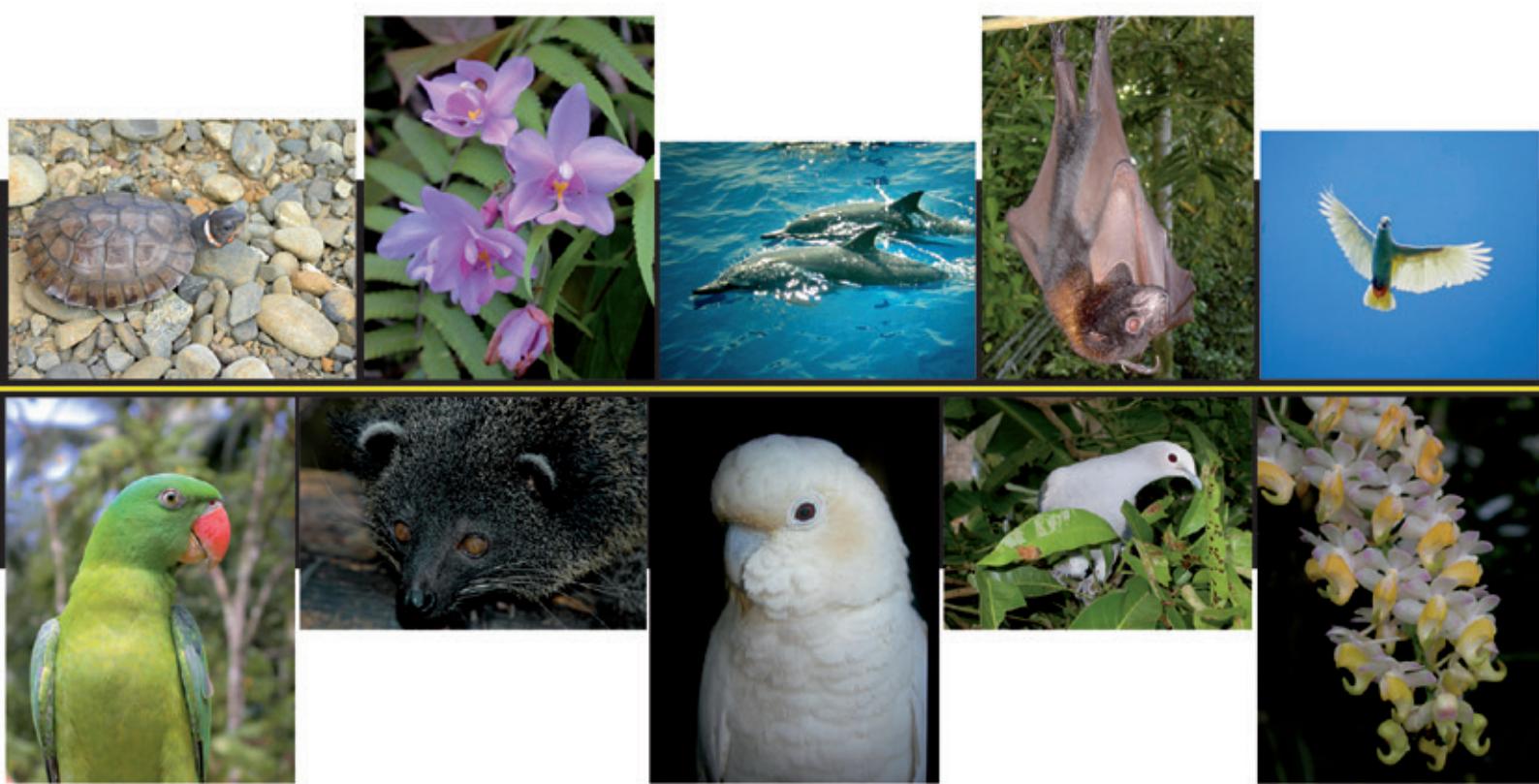


*Megophrys ligayaе* © sschoppe

**KATALA FOUNDATION, INC. (KFI)**, a non-stock, non-governmental organization, is active in protecting and conserving wildlife, particularly the Philippine cockatoo from which its name is derived and other threatened wildlife in the Philippines. Its niche developed over the years of research, advocacy, community development and practical conservation to achieve its vision that is, to effect conservation of biological diversity through active community involvement.

The first part of this publication describes the results of KFI's Katala Quest expedition in Northern Palawan, Philippines. The quest won Silver Award from the British Petroleum (BP) Conservation Programme in 2003. The second part is a compilation of conservation studies and researches conducted in Palawan by KFI or in cooperation with KFI and local partners.

It is the intent of this publication to make available the findings of these researches to a wider audience to create awareness for and, if possible, to inspire more conservation projects for Palawan's rich flora and fauna.



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