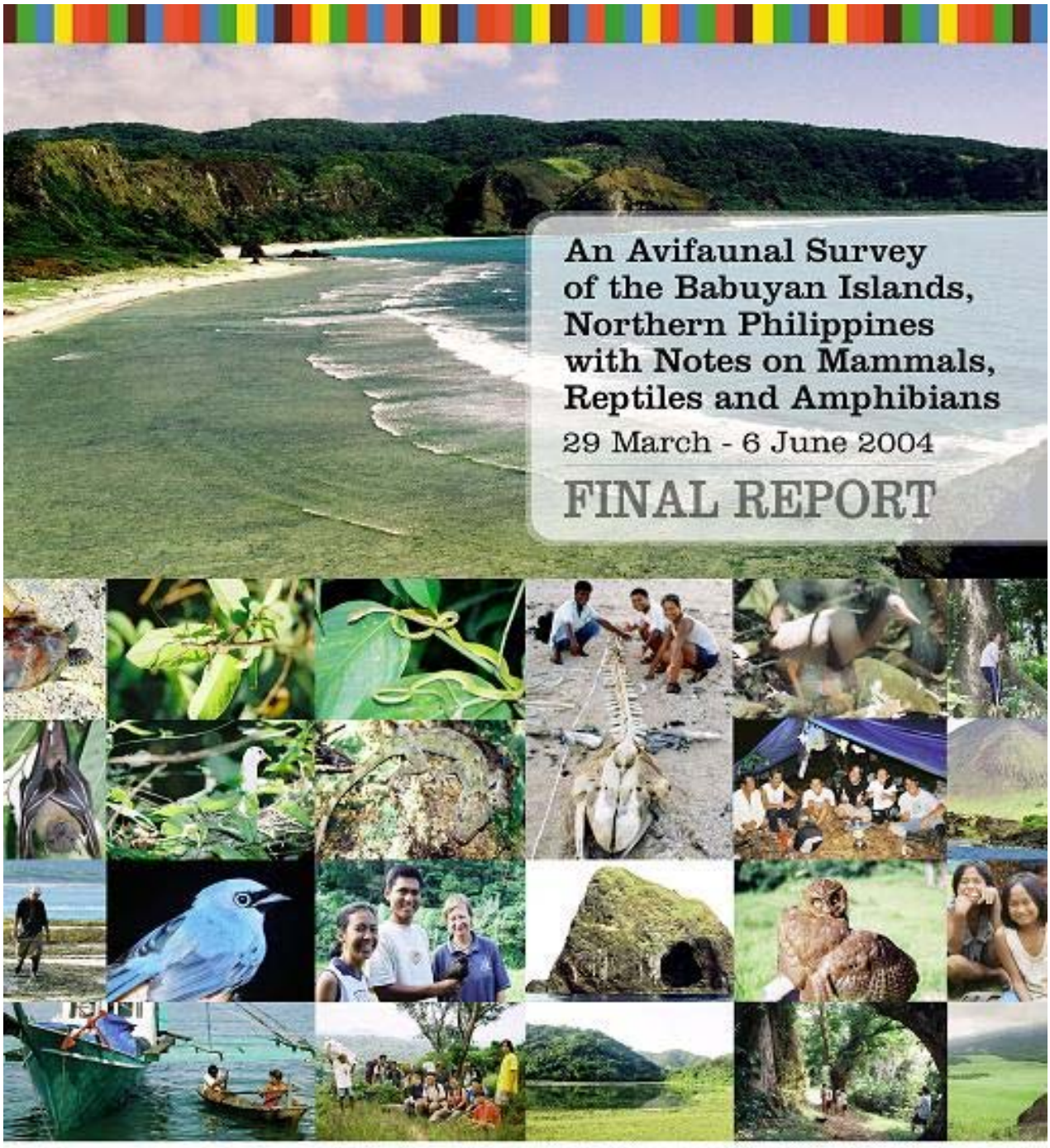

An Avifaunal Survey of the Babuyan Islands, Northern Philippines with Notes on Mammals, Reptiles and Amphibians

29 March - 6 June 2004

FINAL REPORT

by Carl Oliveros, Genevieve Broad, Marisol Pedregosa, Carmela Española, Mark Anthony Reyes, Harvey John Garcia, Juan Carlos Gonzalez, Amado Bajarias Jr.

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by
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September 2004
Manila, Philippines

Preface

This project arose out of a desire to assist the Babuyan group of islands to protect their natural resources and wildlife during a time of development and change. The islands are rich in biological diversity and have rapidly become a focus of international interest and importance following the discovery of a humpback whale breeding ground in their waters during 1999. A planned eco-tourism industry could lead to expanded settlements and improved infrastructure, such as new roads, creating increased disturbance of natural habitats and subsequent loss of wildlife. With WWF-Philippines conducting research and conservation work on the marine ecosystems of the Babuyan Islands, there was an equal need for research and conservation efforts focused on the area's terrestrial habitats. Since the islands have been little studied in the past, the first step towards protecting the stability of their ecosystems was a research study to identify the terrestrial fauna and important habitats present within the island group.

The Philippine government took the necessary initial actions to designate part of the island group as a protected Landscape and Seascape early in June 2003. The aim of the Babuyan Islands Expedition 2004 was to provide basic information about the birds, mammals, reptiles and amphibians of the islands of Camiguin Norte, Calayan, Babuyan Claro and Dalupiri, all of which lie within the municipality of Calayan. This would enable the local people and government to draw up effective management plans for the natural resources and protection of wildlife.

The Babuyan Island group offers special challenges to scientists. It lies only 60 to 70 kilometers from the mainland, but the combination of rough weather throughout most of the year, the lack of major passenger ferries to the islands and the poor infrastructure mean it is logistically hard to travel to, and within, the islands. In spite of this, the fieldwork objectives of the expedition were achieved. Inventories of the birds, mammals, reptiles and amphibians were compiled successfully and we collected data on current threats to the fauna and the environment as well as identifying habitats for priority conservation.

The findings of this survey have highlighted the importance of the Babuyan island group in Philippine bio-diversity. It holds some of the country's remaining habitats that are relatively unscathed where endemic species like the Calayan Rail still survive. Therefore, it is vital that the international community supports the people of the islands, both communities and government, in their efforts to conserve their natural resources and unique wildlife of the area. Conservation measures need to be in place in this time of stirring change in the islands.

This report provides a foundation on which discussions between local and national government, local communities and the international community concerning the future wildlife management of these fascinating and beautiful islands can be based.

Acknowledgements

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Thank you to Calayan Mayor, Joseph Llopis, who inspired us to undertake the project with his enthusiasm for environmental conservation and ensured we received every assistance within the municipality of Calayan.

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Summary

A survey of the terrestrial fauna of the Babuyan Islands was conducted by a small team of volunteer wildlife biologists and experts from 29 March to 6 June, 2004 in the islands of Camiguin Norte, Pamoctan, Babuyan Claro, Calayan, and Dalupiri. A species list was compiled for each island visited and these lists were annotated by measures of relative abundance.

Survey results show an archipelago rich in wildlife and harboring island-endemic species. Totals of 128 bird species, 18 mammal species, 33 reptile species and 7 amphibian species were recorded during the study. These records include a previously undescribed bird species, the endemic Calayan Rail *Gallirallus calayanensis*, and the following threatened species: Philippine Duck *Anas luzonica*, Ryukyu Flying-Fox *Pteropus dasymallus*, Philippine Warty Pig *Sus philippensis* and McGregor's Pit Viper *Trimeresurus mcgregori*. Further investigation is necessary to confirm the presence of the critically endangered Philippine Crocodile *Crocodylus mindorensis* and a fruit-eating monitor lizard that may be threatened. The project recorded twenty-two species endemic to the Philippines.

Threats to the wildlife and habitats of the islands were identified. These include introduced species, unregulated hunting and logging, and slash and burn farming. The project has identified the lowland forests of Camiguin Norte, Babuyan Claro and Calayan as sites of very high conservation priority.

The people of the Babuyan Islands have demonstrated their awareness of conservation issues by passing local legislation in recent years designed to protect threatened species and habitats. In addition, they gave strong support to the project both before, and during, the fieldwork. The initiatives of the local community should be recognized and further encouraged. This should enable future conservation projects within the island group to be built on a sound foundation, supported by the local community.

Copies of this report will be circulated among local and national government officials, non-governmental organizations (NGO's), the scientific community and other stakeholders.

Buod

Isang pagtatala ng iba't ibang uri ng hayop ang isinagawa ng isang maliit na pangkat ng mga volunteer na biologist at dalubhasa. Isinagawa ito noong ika-29 ng Marso hanggang ika-6 ng Hunyo sa mga isla ng Camiguin, Pamoctan, Babuyan Claro, Calayan at Dalupiri na kabilang sa kapuluan ng Babuyan. Inilista ang iba't ibang uri ng hayop sa bawat isla at binigyan ng kaukulang tantsya ng dami.

Ipinapakita ng pag-aaral na ito na mayaman sa iba't ibang uri ng hayop ang kapuluan ng Babuyan kabilang ang ilang uri ng hayop na *endemic*, o dito lamang matatagpuan sa buong mundo. Nakabilang ang pangkat ng 128 uri ng ibon, 18 uri ng mammals, 33 uri ng reptiles at 7 uri ng palaka. Nadiskubre ang isang uri ng ibon, ang Calayan Rail *Gallirallus calayanensis*, na hindi pa nakikilala ng siyensya. Mayroon ditong ilang uri ng hayop ang nangaganib mawala sa mundo: Philippine Duck *Anas luzonica*, Ryukyu Flying-Fox *Pteropus dasymallus*, Philippine Warty Pig *Sus philippensis* at McGregor's Pit Viper *Trimeresurus mcgregori*. Kailangan pa ng karagdagang pag-aaral para masigurado na mayroon ditong Philippine Crocodile *Crocodylus mindorensis*, na lubhang nanganganib mawala sa mundo, at isang uri ng bayawak na kumakain ng bungang kahoy, na maaaring nanganganib din mawala sa mundo. Dalawampu't dalawang uri ng hayop na matatagpuan lamag sa Pilipinas ang naitala.

Napag-alaman na panganib sa mga hayop at kanilang tirahan ang kakulangan ng regulasyon sa pangangaso, pangangahoy at pagkakaingin. Nagbabantang panganib din ang mga dayong uri ng hayop na nadala o idinala sa mga isla. Nangangailangan ng kina-uukulang pansin ang pangangalaga at proteksyon ng mga kagubatan ng Camiguin, Babuyan Claro at Calayan.

Naipamalas ng mga tao sa mga isla ng Babuyan ang kanilang malasakit sa kalikasan sa pamamagitan ng pagpasa ng ilang lokal na batas at ng malawakang suporta sa proyektong ito. Makakabuti kung lalong hihikayatin at bibigyan ng ibayong suporta ang mga lokal na inisyatibong ito. Lalong magtatagumpay ang pangangalaga at pagbibigay proteksyon sa yamang-likas ng mga isla ng Babuyan kapag ito'y may suporta ng mga residente nito.

Ipamamahagi ang ulat na ito sa mga lokal at pambansang opisyal ng pamahalaan, sa mga non-governmental organization (NGO), sa mga siyentipiko at iba pang kinauukulan.

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Definition of terms and abbreviations

Amphibians – cold-blooded animals that belong to class Amphibia. The majority live on land, but they have a larval phase that develops in water (unlike reptiles). The group includes frogs, toads and salamanders.

Avifauna – the bird fauna of an area or period.

Birds – two-legged warm-blooded animals with bodies covered with feathers and with forelimbs modified for flight. Internal fertilization using shelled eggs. Birds characteristically have light-weight bones and long jaws that lack teeth and support a horny bill.

DENR – Department of Environment and Natural Resources

Endemic – native to, and restricted to, a particular geographical region.

Fauna – the animals of a particular region or habitat, or geological period.

Herpetofauna – the reptiles and amphibians of a particular region.

Herpetology – the study of amphibians and reptiles.

IUCN – International Union for the Conservation of Nature and Natural Resources

Mammals – warm-blooded animals that have mammary glands for feeding milk to the young, epidermal hair, and other typical skeletal and physiological characteristics. The class Mammalia includes pigs, cats, rats and bats.

Migrant bird – a bird that breeds outside the Philippines but migrates to the country to winter or for passage to other countries.

Near-endemic – refers to species that mainly occur in the Philippines except for a few other islands outside the country

Near-threatened – refers to species that almost fit one of the threatened IUCN categories or is likely to do so in the near future.

Ornithology – the study of birds.

Red List – The IUCN Red List of Threatened Species. A listing produced by the IUCN intended to be an easily and widely understood system for classifying species at high risk of global extinction.

Reptiles – cold-blooded animals that belong to class Reptilia that are usually covered with scales or bony plates. The group includes turtles, lizards, skinks, snakes and crocodiles.

Resident bird – a bird that breeds or is thought to breed in the Philippines and remains in the country throughout the year.

Restricted-range – refers to bird species that have a total world range size estimated to be less than 50,000 km^2.

Species – the basic unit in the biological classification of plants and animals comprising related organisms that share common characteristics and are capable of interbreeding.

Subspecies – a named subdivision (as a race or variety) of a taxonomic species.

Terrestrial – pertaining to the land or ground surface.

Threatened – refers to species that are classified by the IUCN as Critically Endangered, Endangered, or Vulnerable.

Vagrant – refers to a bird that is recorded outside its usual range.

Volant – adapted for flying or gliding.

WWF – World-wide Fund for Nature

1 Introduction

This project provided an exciting and unique opportunity to study the terrestrial fauna and habitats of the Babuyan Islands. Little scientific exploration had been done in the islands, possibly because of its isolation, but more probably because they have been under the shadow of their better-known neighbors to the north, the Batanes Islands. The Batanes Islands were declared a Protected Landscape and Seascape in 2001 under Republic Act No. 8991. On the other hand, the Babuyan group of islands, which covers three times as much land area and was recognized in the latest iteration of the Philippine National Biodiversity Strategy and Action Plan as a distinct bio-geographic region (Ong *et al*., 2002), has yet to achieve protected area status. The same plan identified the Babuyan Islands as a conservation area of 'very high priority' for birds and 'extremely high priority' for amphibians and reptiles.

1.1 Geography & Climate

The Babuyan group of islands (Figure 1) is a cluster of small islands in the Philippines, each no larger than 200 km², located north of Luzon and south of the Batanes Islands. Table 1.1 shows the location, size and highest elevation of selected islands together with their 2002 population census. The largest of these islands are Calayan, Camiguin Norte [hereafter referred to as Camiguin], Babuyan Claro, Fuga and Dalupiri. Apart from Fuga, which forms part of the municipality of Aparri, the islands of the Babuyan group fall under the municipality of Calayan in the province of Cagayan.

Table 1.1 Profile of selected islands and islets of the Babuyan group

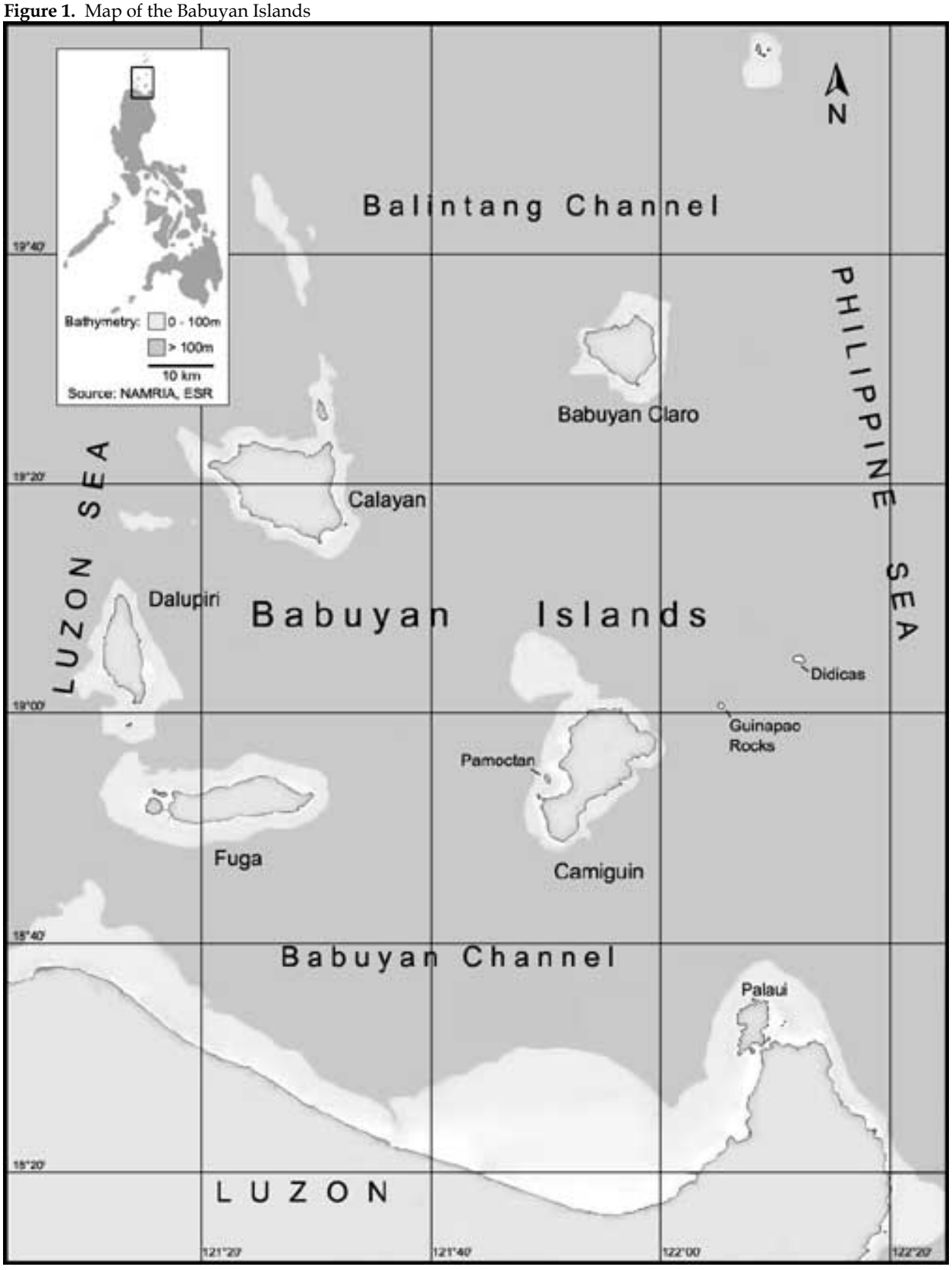
Name	Coordinates	Area	Highest Elevation	2002 Population
Calayan	N 19° 20′ E 121° 27′	196 km²	499 m	8,451
Camiguin	N 18° 55′ E 121° 55′	166 km²	828 m	3,936
Babuyan Claro	N 19° 32′ E 121° 57′	70 km²	1108 m	1,367
Fuga	N 18° 52′ E 121° 22′	100 km²	208 m	1,733
Dalupiri	N 19° 05′ E 121° 13′	50 km²	297 m	555
Pamoctan	N 18° 54' E 121° 50'	0.7 km²	202 m	-
Didicas	N 19° 04' E 122° 12'	0.7 km²	244 m	Uninhabited
Guinapao Rocks	N 18° 58' E 122° 06'	< 0.3 km²	96 m	Uninhabited

Sources: NAMRIA, NSO

The islands of the Babuyan group are volcanic in origin and were formed as early as the Pliocene era. Camiguin, Babuyan Claro and the central part of Calayan, a non-active volcano, are comprised of Pliocene-Quaternary igneous rock, while the margins of Calayan and Dalupiri consist of Pliocene-Pleistocene sedimentary rock (Philippine Bureau of Mines, 1963).

Didicas Island is a very young island that was formed by a volcanic eruption in 1952. Prior to this eruption, Didicas had consisted of three rock masses believed to be volcanic plugs that remained after the erosion of its dome. Guinapao Rocks, locally referred to as Dilayag, are similar volcanic plugs lying 15 kilometers southwest of Didicas (Alcaraz *et al*., 1956). They consist of two adjacent steep sided cones somewhat resembling two sails of a ship, hence the local name of Dilayag, 'with sails'. Pamoctan Island is a young andesitic lava dome (SI, 2004).

Figure 1. Map of the Babuyan Islands



Mount Camiguin on Camiguin Island, Didicas Island and Mounts Pangasun and Smith on Babuyan Claro are active volcanoes. The single known eruption of Mt Camiguin occurred in 1857. Didicas had a phreatic eruption as late as 1978 and a dome-building eruption in 1969. The latest eruptions on Babuyan Claro were ash explosions on Mt Smith in 1924, 1918, 1917 and 1907, and an explosive eruption in 1917 and a phreatic, fumarolic eruption in 1913 on Mt Pangasun (PHIVOLCS, 2004).

The islands of the Babuyan group are separated from Luzon by the Babuyan Channel, a narrow, deep stretch of water that falls to a depth of more than 100m (see Figure 1). Heaney (1986) suggests they were distinct islands during the last ice age in the late Pleistocene era.

The rainy season lasts throughout most of the year in the Babuyan Islands, with maximum rainfall between November and January. There is no dry season, but minimum rainfall is recorded in April. There are frequent tropical cyclones, usually between May and September. The northeast monsoon influences the climate from October until February, after which it weakens as it merges with the trade winds. In May, the southwest monsoon sets in and continues until September (Alcaraz *et al*., 1956).

1.2 Project Aims and Objectives

The overall aim of this project is to provide the community and government with a broad initial assessment of the terrestrial fauna of the Babuyan Islands. A survey of the terrestrial fauna in the islands with a focus on birds was conducted in order to answer the following questions:

- Which species of birds, mammals, reptiles and amphibians are present?
- What is the relative abundance of these species?
- What are the significant threats to wildlife?
- Which species and habitats need conservation priority measures?

The results of this study are intended for use by local stakeholders in:
(1) the development of a resource management plan for the Babuyan Islands
(2) input into the first stages of the legal process to achieve Protected Area status under the government's National Integrated Protected Areas System (Protected Area Site Assessment).

1.3 Personnel

The team was led by Carl Oliveros (Filipino) and Genevieve Broad (British) and comprised the following Filipino wildlife biologists: Carmela Española, Harvey John Garcia, Marisol Pedregosa and Mark Anthony Reyes. Desmond Allen (British) accompanied the expedition as a volunteer consultant on oriental birds. Amado Bajarias, Jr. and ornithologist Juan Carlos Gonzalez each joined the project for two weeks. A student from Cagayan State University at Aparri was offered a place in the team but he declined the offer at a very late stage in the preparation for fieldwork due to personal reasons.

One to three (usually two) local guides were employed in each study site. Guides were trained in basic ecological concepts, mist-netting and animal-handling. A cook/housekeeper accompanied the team during the entire fieldwork period.

1.4 History of Exploration in the Babuyan Islands

The Babuyan Islands have been the subject of little scientific exploration. Much of the scientific knowledge about the fauna of the Babuyan group is gained from records collected during the early 1900's. The first record of a biologist visiting the islands was in May 1895, when John Whitehead, a British naturalist, visited Fuga. Richard McGregor, an ornithologist at the Bureau of Sciences (Manila), explored Fuga in August/September 1903, then continued his expedition on Calayan, remaining there until January 1904. He returned in May/July 1907 to visit Camiguin and, briefly, Babuyan Claro; and in August 1909 to Dalupiri. Edgar Mearns, a US Army surgeon, spent a few days in Fuga in 1907 before exploring Didicas Rocks with Dean Conant Worcester in the same year. The next expedition to the Babuyan group would be in 1980 when Fuga was visited by Filipino collectors working for the Delaware Museum of Natural History (Dickinson *et al.*, 1991).

Researchers and affiliates of the Smithsonian Institution (including Ronald Crombie, Charles A. Ross, and Hidetoshi Ota) collected bird, mammal, reptile and amphibian specimens from Camiguin in 1989. Crombie visited Fuga, Barit (situated west of Fuga), Dalupiri, and briefly, Babuyan Claro and Calayan in March of the following year (H. Ota, R. S. Kennedy, *pers. comm.*).

In 1999, A. A. Yaptinchay of the Worldwide Fund for Nature (WWF)-Philippines visited Fuga and confirmed that Humpback Whales *Megaptera novaeangliae* were using the waters around it as a wintering ground (J.M.V. Acebes, pers. comm.). Subsequently, every year thereafter, WWF-Philippines have conducted cetacean surveys in the waters of the Babuyan.

1.5 Historical records

Birds

There are historical records of 124 bird species from the Babuyan Islands, 59 of which are migratory, 56 are resident, 8 are resident/migratory and 1 vagrant (Kennedy *et al.*, 2000). Most of these records date from the turn of the 20th century. Four near-threatened/restricted-range species are known to occur: the Malaysian Plover *Charadrius peronii*, the Whistling Green-pigeon *Treron formosae*, the Ryukyu Scops-Owl *Otus elegans* and the Short-crested Monarch *Hypothymis helenae*. One threatened species, the Yellow Bunting *Emberiza sulphurata* (Vulnerable-IUCN, 2003), was recorded on Calayan in the early 1900's but was seen more recently in the nearby Batanes Islands in 1991 (Mallari *et al.*, 2001).

A total of 106 species of birds have been recorded historically on Calayan, 42 bird species on Camiguin, and 44 bird species on Fuga. The birds of Dalupiri and Babuyan Claro are very poorly known; only five species have been recorded on each of these islands.

There are 13 known subspecies of birds endemic to the Babuyan Islands. Table 1.2 lists the endemic subspecies and the islands on which they occur.

Table 1.2 List of endemic bird subspecies in the Babuyan Islands

English name	Endemic taxon	Distribution
Green Imperial-pigeon	*Ducula aenea fugaensis*	Calayan, Camiguin, Fuga
Common Koel	*Eudynamys scolopaceus frater*	Calayan, Fuga
Philippine Coucal	*Centropus viridis major*	Calayan, Dalupiri, Fuga
Glossy Swiftlet	*Collocalia esculenta septentrionalis*	Babuyan Claro, Calayan, Camiguin, Fuga
Chestnut-eared Bulbul	*Microscelis amaurotis fugensis*	Calayan, Dalupiri, Fuga
	Microscelis amaurotis camiguinensis	Camiguin
Elegant Tit	*Parus elegans edithae*	Calayan, Camiguin
Snowy-browed Flycatcher	*Ficedula hyperythra calayensis*	Calayan
Short-crested Monarch	*Hypothymis helenae personata*	Camiguin
Yellow-bellied Whistler	*Pachycephala philippinensis fallax*	Calayan
	Pachycephala philippinensis ilex	Camiguin Norte
Pygmy Flowerpecker	*Dicaeum pygmaeum fugaensis*	Calayan, Fuga
Yellowish White-eye	*Zosterops nigrorum meyleri*	Camiguin Norte

Five other subspecies – Whistling Green-pigeon *Treron formosae filipina*, Black-chinned Fruit-dove *Ptilinopus leclancheri longialis*, Philippine Cuckoo-dove *Macropygia tenuirostris phaea*, Ryukyu Scops-owl *Otus elegans calayensis* and Chestnut-eared Bulbul *Microscelis amaurotis batanensis* – occur in the Babuyan Islands and are also distributed in the Batanes island group.

Mammals

A total of 15 mammalian species have been recorded in the Babuyan Islands. Four of these are bats, 11 are marine species. There are no records of non-volant land mammals from the area. Table 1.3 shows the previously known distribution of mammals in the islands. (Data were taken from Heaney *et. al.* (1998) and Acebes & Lesaca (2003)). This list does not include Risso's Dolphin *Grampus griseus* and Pygmy Killer Whale *Feresa attenuata* which were sighted by WWF-Philippines off the coasts of Calayan in 2003 and Camiguin in 2004, respectively (J.M.V. Acebes, pers. comm.).

Table 1.3 Mammalian species previously recorded in the Babuyan Islands

Species	Distribution
Common Short-nosed Fruit Bat *Cynopterus brachyotis*	Dalupiri, Fuga, Barit
Ryukyu Flying-Fox *Pteropus dasymallus*	Dalupiri, Fuga
Common Rousette *Rousettus amplexicaudatus*	Dalupiri, Fuga, Barit
Common Bent-winged Bat *Miniopterus schreibersi*	Dalupiri
Humpback Whale *Megaptera novaeangliae*	Babuyan Island waters
Short-finned Pilot Whale *Globicephala macrorhyncus*	Babuyan Island waters
Fraser's Dolphin *Lagenodelphis hosei*	Babuyan Island waters
Melon-headed Whale *Peponocephala electra*	Babuyan Island waters
False Killer Whale *Pseudorca crassidens*	Babuyan Island waters
Pantropical Spotted Dolphin *Stenella attenuata*	Babuyan Island waters
Spinner Dolphin *Stenella longirostris*	Babuyan Island waters
Rough-toothed Dolphin *Steno bredanensis*	Babuyan Island waters
Bottlenose Dolphin *Tursiops* sp.	Babuyan Island waters
Dwarf Sperm Whale *Kogia simus*	Babuyan Island waters
Sperm Whale *Physeter macrocephalus*	Babuyan Island waters

Reptiles and Amphibians

Very little is known about the reptilian and amphibian fauna of the Babuyan Islands. Table 1.4 lists known reptile distribution records from Ota & Ross (1994), Brown & Alcala (1978, 1980), WCSP (1997) and Leviton (1964, 1970).

Table 1.4 Reptile species previously recorded in the Babuyan Islands

Species	Distribution
Green Turtle *Chelonia mydas*	Camiguin, Calayan
Hawksbill Turtle *Eretmochelys imbricata*	Camiguin, Calayan
McGregor's Flap-legged Gecko *Luperosaurus mcgregori*	Calayan
Gray Swamp Skink *Emoia atrocostata*	"Babuyan Islands"
Lined Slender Tree Snake *Dendrelaphis caudolineatus luzonensis*	Camiguin
Camiguin Island Wolf Snake *Lycodon bibonius*	Camiguin – Endemic
Jareck's Wolf Snake *Lycodon chrysoprateros*	Dalupiri – Endemic
Philippine Pit Viper *Trimeresurus flavomaculatus*	Camiguin

In spite of the limited knowledge of the herpetofauna of the islands, two species of wolf snake endemic to the island group are known, *Lycodon bibonius* and *Lycodon chrysoprateros*. H. Ota is in the process of describing three gecko species endemic to islands in the Babuyan group while a species of flying lizard endemic to Camiguin has yet to be described (Lazell, 1992). *Luperosaurus mcgregori* had previously been known only from Calayan Island but Brown & Alcala (1978) tentatively assigned two specimens from Polillo Island to this species.

A number of specimens collected during previous expeditions to the Babuyan Islands are lodged at the California Academy of Sciences, the U.S. National Museum, and probably other unknown institutions. Crombie (1994) in an unpublished manuscript of herpetofaunal distribution records in the Philippines listed some of them. These records are not included in this report as it is beyond the resources of this project to verify specimens housed in museums overseas.

2 Methods

Surveys were conducted in the following islands and islets of the Babuyan group: Camiguin, Pamoctan, Guinapao Rocks, Didicas, Babuyan Claro, Calayan and Dalupiri. Various habitat types were visited in each island to maximize opportunities for recording species and to increase the scope of the survey. Sections 2.1 to 2.6 describe the field techniques that were employed in the project.

Prior to fieldwork a brief training for team members was conducted, explaining the goals and methodology of the project.

Pilot Study
A pilot study was conducted before the start of the fieldwork proper. This allowed team members to familiarize themselves with the area, the species and their calls. Tasks and responsibilities were also appropriately assigned after obtaining feedback on team members' expertise and preferences. Equipment was tested in field conditions. No significant change to the research design was made.

2.1 Birds

In order to record the maximum number of bird species within a limited time, a variety of search techniques were employed and various habitat types were surveyed in each island following the methodology for site assessment for species richness described by Bibby *et al*. (1998).

Bird Search
Observers were free to search for birds using different techniques to yield the most exhaustive species list for an area. The Bird team was organized into groups of one or two individuals and assigned a search area each day. Searches were carefully planned and coordinated so that at no time was an area surveyed by more than one group at the same time. Observers walked along existing trails and streams and occasionally in a perpendicular or parallel direction several meters from existing paths. The pace of walking was varied in order to detect different species. In areas with an unrestricted view of the canopy, observers watched for canopy species and raptors. Where possible, team members walked across different habitat types and spent time searching in habitat breaks. In small inland lakes, groups stayed in one place and used a spotting scope to count birds. Whenever possible, searches were conducted from dawn until 10:00 and from 16:00 until dusk.

Team members were equipped with binoculars, personal cassette recorders with clip microphones and head phones and still cameras. One team member used a video camera. The following details of observations of birds seen and heard were recorded on a standard data sheet: species name, number of individuals, seen or heard, and other notes (such as physical features observed, sex, behavior and description of call) that would later help in species

identification and support sighting records. Unfamiliar calls were recorded and discussed with other team members. Known bird calls were occasionally played back in the field to attract conspecifics. Audio recording of bird calls were made, photographs and video footage were taken to strengthen distribution records.

Mist netting for birds
The study used 35-mm monofilament mist nets of 12 m length x 2 m wide, 9 m length x 2 m wide and 6 m length x 2 m wide. Mist nets were hoisted along possible flight paths of birds, e.g., in between trees, along streams, just above the ground with clearance of at least 15 cm to 1 m, high and canopy nets with 1.5 to 5.0 m clearance from the ground out of direct sunlight. Net locations were recorded using a handheld GPS unit. Nets were checked for captured birds at intervals of 1 to 2 hours and were closed when it rained.

Descriptions of plumage and soft parts were recorded for each captured individual. Standard biometric measurements of bill length, bill gape length, tail length, wing cord, wing span, tarsus length and weight, were taken using dial calipers and Pesola scales. Captured birds were released immediately unless voucher specimens were needed for further identification, in which case they were euthanased as quickly as possible.

2.2 Mammals

Mist netting of bats
Mist nets used for birds were also employed for catching bats. Nets were operated for a maximum of four consecutive nights. Nets were watched at dusk, at 2 to 4 hours after sunset and checked at intervals of 1 to 2 hours afterwards. When it rained or when nets were catching large numbers of the same bat species in the site, nets were closed.

Trapping of small non-volant mammals
Victor snap traps and pitfall traps were used to trap small non-volant mammals. Roasted coconut meat mixed with peanut butter or fried dried fish were used as bait for Victor snap traps. Victor traps were placed along possible runways, near holes or among root tangles and fallen logs, where small non-volant mammals might be present. Checking and rebaiting were performed early in the morning and in the late afternoon. Cylindrical pitfall traps made from plastic soda bottles (hole 10 cm in diameter, 20 cm high) and plastic containers (hole 16 cm in diameter, 22 cm high) were hidden on the ground with dried leaves in suspected areas of rodent activity. Trapping was limited to sites with forest cover. Trapping in the agricultural areas was avoided due to the possibility of killing non-target species such as waders and quail.

Roosting sites observation
Roosting trees and caves were visited during the study. Volant mammal species in roosting sites were identified using binoculars while nets were used to catch bats and identify species present in caves. Numbers of individuals present in roosting sites were counted or estimated.

Standard biometric parameters of captured mammals were recorded using dial calipers and Pesola scales. These include forearm length, hind foot length, head and body length, total length, tail length, ear length and weight. Photographs of selected captured individuals were taken. Unless there was a need for a voucher specimen, captured animals were released.

Opportunistic sightings of marine mammals during island crossings were noted and, where possible, photographs of the animals were taken.

2.3 Reptiles and amphibians

Amphibians and reptiles were captured by hand. Opportunistic catching was increased by searching a variety of habitats, i.e., forest floor, leaf litter piles, tree trunks and branches, tree holes, root tangles, water tributaries, small ponds and caves. The same pitfall traps used to capture small non-volant mammals were employed to catch reptiles and amphibians. Frog calls were recorded using a personal cassette tape recorder. Photographs of reptiles and amphibians were taken in the wild and/or after capture.

Standard measurements of captured animals were taken using dial calipers and Pesola scales. For amphibians, measurements were recorded for snout-vent length, hind limb length, and weight. For reptiles, snout-vent length, tail length, total length and weight were measured. Specimens were released unless voucher samples were needed for further identification.

2.4 Habitat, vegetation and environmental data

In each study site, habitat data were recorded on standard data sheets. The following details were noted: topography of the area, elevation, the presence of specific vegetation types, forms of human disturbance, and distance to human settlements.

The Point Center Quarter Method was used to describe the vegetation in forested areas. A 50 m transect was laid through representative vegetation and a center point established at each 10 m point along the transect. Four quarters were located around each center point. In each quarter, the following was recorded: the distance to the nearest tree with a circumference of more than 20 cm, its diameter at breast height (DBH), its height, its tree architecture, and the species name, if known.

The following environmental data were taken at the field site each day at 06:00, at 12:00 and at 18:00: air temperature, cloud cover, wind speed, and time since last rainfall.

2.5 Ethnobiology

A standard questionnaire was used to conduct interviews with local people. Supplementary questions were asked as appropriate. Most of the respondents were hunters, others were locals – living adjacent to, or within, the forest and some were local government officials. They were

asked what species they see, where they are sighted, in what numbers they are sighted, what behavior they observe, and the time since their last sighting. Photographs and illustrations of animals were used for confirmation of identification. Local names of animals and information on their local utilization were gathered. Other information was recorded as appropriate. Interviews were conducted in Tagalog and Ilocano.

2.6 Collection of voucher specimens

A collection permit was obtained from the University of the Philippines Los Baños (UPLB) Interdisciplinary Committee which has an Academic Research Agreement (ARA) with the Department of Environment and Natural Resources (DENR).

Voucher specimens were collected only for new island records of apparently common resident species not listed as threatened (IUCN 2003), and for individuals found dead in the field. Study skins of some birds and bats were taken, others directly preserved in 70% ethyl alcohol. Reptile and amphibian specimens as well as bird specimen flesh were set in formalin before being preserved in 70% ethanol. Tree specimens in the form of leaves and fruits were also collected for later identification of tree species present in the study sites. They were soaked in 70% ethyl alcohol before pressing between old newspaper and drying.

Specimens collected during the expedition will be deposited at the Philippine National Museum in Manila and the UPLB Museum of Natural History in Los Baños, Laguna.

2.7 Analysis of data

A species list was assembled for each island (see Appendices 1 to 5). Bird species were identified using Kennedy *et al*. (2000), Taylor (1998), duPont (1971) and Robson (2002). Recorded bird calls were compared with recordings from Scharringa (2001) and other recordings contributed by experienced birdwatchers. The following references were used to identify mammalian species: Ingle & Heaney (1992), Heaney & Ruedi (1994), Jefferson *et al.* (1993), Balete *et al.* (1995). Expert mammalogists also provided assistance in species identification. Reptile and amphibian specimens were identified using Brown & Alcala (1978, 1980), Leviton (1964, 1968, 1970), McGuire & Alcala (2000), Ota & Ross (1994), Ota & Crombie (1989), Taylor (1922), Alcala & Brown (1998), Gonzalez *et al.* (1995) and with the help of expert herpetologists. Where possible, specimens collected were compared with material from the Philippine National Museum. Plant specimens were identified by staff of the UPLB Museum of Natural History.

The species lists were annotated with local names, information on local utilization, and measures of relative abundance based on the encounter rate of each species for birds and net capture rates for volant mammals.

3 Description of Study Sites

Study sites in the islands of Camiguin, Pamoctan, Babuyan Claro, Calayan, and Dalupiri were visited. Each site is described in Table 3.1 and their location shown in Figure 2. In addition to these sites, a boat trip was made around the entire island of Calayan to survey the coast and reef flats for birds, stopping briefly to interview local people and conduct further searches at Dilam, on the north-east coast, and at Dibay, on the north-west coast. A separate trip was made along the south-west coast of Calayan to Katanapan Point. The east coast of Dalupiri was similarly surveyed.

Figure 2. Location of study sites (not drawn to scale).

Camiguin is characterized by steep forested hills overlain with clay, ricefields in small river floodplains and a volcanic cone (Mt Camiguin) in the south. There are three main settlement areas: Balatubat and Naguilian along the island's southwestern cove; and Minabel on the northwestern coast.

Pamoctan is a tiny, privately-owned island situated west of Camiguin Norte at the outer edge of a small bay. A small freshwater lake covers much of the southern tip of the island and a steep-sided hill of 212 m elevation above sea level rises to the north. The beach is fine sand. A small farm is situated near the lake and cattle range freely over the entire island. There are many trails leading to the summit, passing through clearings, secondary forest with undergrowth and some mature lowland forest. Two huts have been built on the island by its owners.

Babuyan Claro is dominated by two volcanic cones, Mt Pangasun and Mt Smith. The former lies near the center of the island and has thickly forested slopes, while the latter is a young symmetrical cone with sparse regenerating vegetation, situated in the northwest corner of the island. The main settlement, Corog, lies in the south of the island. To the north of Corog, cattle graze in open clearings, creating a landscape of short grass scrubland; while to the east, cogon grass 1.5 m high covers approximately 3 ha. Isolated settlements and restricted ricefields dot the lowland areas. Most of the southwest coast is composed of large boulders or black volcanic lava, apart from a black sandy beach at Asked. The lowland forest is comprised of large mature trees and logging for local use takes place in some areas.

Calayan is a low-lying island with extensive grasslands along the eastern coastline and at the northwestern tip. In the north, there are extensive tidal flats protecting sandy beaches between the settlements of Dilam and Dibay. The populated areas of Calayan town and Magsidel are surrounded by extensive ricefields. The central area has primary and regenerating lowland forests, some of which lies on coralline limestone. These forests have intermittent clearings containing patches of cultivated land, often with ricefields and bananas and coconuts at the edges.

Dalupiri is a low-lying island orientated north-south, with coralline limestone under eroded grassland along the central spine. The main settlement, Visita, lies on the SE coast. The influence of ranching can be seen, as cattle, horses, and feral carabao roam freely over the entire island, keeping the vegetation short through grazing. Horses are the main method of transport. Dogs and cats are not allowed on the island, by order of the owners.

The team made brief stops at **Guinapao Rocks** and **Didicas Island** to investigate the presence of sea birds on these small islets. Grass and traces of bird droppings were present on some slopes of Guinapao Rocks. Didicas, on the other hand, is a small cone of volcanic dust and rocks. A very small patch of vegetation was observed near its peak.

Table 3.1 Brief description of sites surveyed

Site/ Dates Surveyed	GPS Location/ Altitude	Habitat types surveyed	Vegetation	Remarks
Camiguin Island				
Balatubat 1, 10-11, 14-16 April and 4 June 2004	N 18° 54.476' E 121° 51.890'/ Sea level	Agricultural, inhabited site, fringes of mangrove area, scrubland	Rice, banana	One of the principal settlements in Camiguin
Limandok 2-10 April 2004	N 18° 55.804' E 121° 53.947'/ 270 m asl	Lowland forest	Mature forest, mean DBH=21cm, mean Ht=8.9m (n = 58), family Euphorbiaceae and Moraceae dominant	Agricultural area 3-km distant, disturbance includes honey & shrimp collection, shell collection and hunting
Magas-asok Lake 13-14 April 2004	N 18° 52.333' E 121° 49.843'/ Sea level	Freshwater site, lowland forest	Lake area approximately 2-3 hectares, surrounded by a narrow margin of short grass, in turn backed by mature forest	Lake margin used to tether carabao (water buffalo), a few fishermen visit the adjoining sandy beach
Kauringan 31 May-4 June 2004	N 18° 54.612' E 121° 54.698'/ 520 m asl	Lowland and sub-montane forest	Disturbed forest, mean DBH=22cm, mean Ht=7.8m (n=16), *Pandanus*, palm, and family Euphorbiaceae dominant	Agricultural area 1-km distant, disturbance includes orchid collection, hunting, logging
Pamoctan Island 11-12, 15 April and 31 May-2 June 2004	N 18° 54.040' E 121° 50.193'/ Sea level	Lowland forest, freshwater site	Secondary forest with undergrowth and some mature lowland forest	Privately-owned island, small farm situated near lake, island grazed by cattle, little hunting by owners
Babuyan Claro Island				
Corog 16-22 April and 30 April-3 May 2004	N 19° 29.327' E 121° 56.894'/ Sea level	Agricultural, inhabited site, grassland, volcanic, sandy beach, rocky shore	Rice, banana, corn	Main settlement on Babuyan Claro Island
Ayumit 21-29 April 2004	N 19° 32.726' E 121° 57.482'/ 360 m asl	Lowland and sub-montane forest	Mature, primary forest, mean DBH=30cm, mean Ht=10.8m (n=20), family Sapindaceae and Meliaceae dominant	Agricultural clearing 750-m distant, disturbance includes hunting, logging
Rakwaranom 26-30 April 2004	N 19° 33.683' E 121° 57.172'/ Sea level	Lowland forest, riverine forest, agricultural area	Rice, corn	Rakwaranom lies at the mouth of the Dakeladanom river
Calayan Island				
Centro 3-8 May and 17-20 May 2004	N 19° 15.769' E 121° 28.355'/ Sea level	Rice fields, scrubland, sandy beaches, rocky shores and coastal cliffs	Rice	Main settlement on Calayan island and administrative capital of the municipality
Longog 8-17 May 2004	N 19° 19.511' E 121° 26.902'/ 300 m asl	Lowland forest, agricultural area	Mature primary & secondary forest, mean DBH=29cm, mean Ht=13.8m (n=18), family Dipterocarpaceae dominant	Agricultural clearings in the middle of forest, hunting by airgun
Dalupiri Island				
Visita 20-22 May and 28-30 May 2004	N 19° 3.726' E 121° 14.702'/ Sea level	Inhabited site, scrubland, rocky & sandy shores, tidal flats, estuary & dry river systems	Guava common	Main settlement on Dalupiri island, pasture and range lands mainly used by horses and cattle
Caucauayan 22-28 May 2004	N 19° 6.540' E 121° 12.280'/ 150 m asl	Riverine gully forest, agricultural area, scrubland	In riverine gully forest, mean DBH=32cm, mean Ht=5.2m (n=18), family Myrtaceae dominant	Part of private ranch

4 Birds

The Babuyan Islands, together with the Batanes group of islands to the north, comprise the Philippines' northernmost Important Bird Area (IBA code PH001) and one of three Secondary Areas for endemic birds (SA 094, Mallari *et al.*, 2001). Owing to their geographical position the islands hold not only a Philippine avian component but also bird species associated with Taiwan and the Ryukyu archipelago of southern Japan. They lie along an extensive bird migration route that stretches from Siberia, Japan, Korea and China through Taiwan to the Philippine archipelago. All migrant species that visit the Philippines likely occur in the islands as passage migrants, and some species that migrate from northeast Asia to Indochina may occur as vagrants.

Table 4.1 shows a summary of bird species recorded in the study and their distribution in the islands visited. Taxonomy and Latin names follow Dickinson (2003) with corrigenda (2004) and English names follow Kennedy *et al.* (2000) with a few exceptions. The English names of the following species were taken from Dickinson (2003) to highlight their recent taxonomic splits: Philippine (Reddish) Cuckoo-Dove *Macropygia tenuirostris*, Striated (Red-rumped) Swallow *Cecropis striolata*, and White's (Scaly Ground) Thrush *Zoothera aurea*. The totals for each island include records made during active search effort and those opportunistically encountered. However, bird species noted only from interviews and those that were not identified to the species level were not included.

A total of 128 bird species were recorded in the study, 46 of which are new records for the Babuyan Island group (marked '++' in Table 4.1) and three new to the Philippines. A previously undescribed bird species was discovered in Calayan. It was subsequently described and named Calayan Rail *Gallirallus calayanensis* (Allen *et al.*, 2004).

Threatened and endemic species
Two threatened bird species were recorded in this survey, the Philippine Duck *Anas luzonica* (Vulnerable-IUCN, 2003) on Dalupiri and the Calayan Rail *Gallirallus calayanensis* on Calayan (proposed category-Vulnerable). In addition, four near-threatened birds occur: Malaysian Plover *Charadrius peronii* on Dalupiri and Calayan; Whistling Green-Pigeon *Treron formosae* on Camiguin, Pamoctan and Calayan; Ryukyu Scops-Owl *Otus elegans* on Calayan, Camiguin and Pamoctan; and Short-crested Monarch *Hypothymis helenae* on Camiguin. These important bird species are further discussed in Section 7.1.

Ten bird species endemic to the Philippines were recorded: Philippine Duck *Anas luzonica*, Bukidnon Woodcock *Scolopax bukidnonensis*, Philippine Coucal *Centropus viridis*, Pygmy Swiftlet *Collocalia troglodytes*, Elegant Tit *Parus elegans*, Short-crested Monarch *Hypothymis helenae*, Yellow-bellied Whistler *Pachycephala philippinensis*, Red-keeled Flowerpecker *Dicaeum australe*, Pygmy Flowerpecker *Dicaeum pygmaeum* and Yellowish White-eye *Zosterops nigrorum*. These are all forest specialists with the exception of the Philippine Duck. Three species are near-endemic, otherwise having only a very restricted range within Taiwan: Black-chinned Fruit-Dove *Ptilinopus leclancheri*, Philippine Cuckoo-Dove *Macropygia tenuirostris* and Lowland White-eye *Zosterops meyeni*.

Table 4.1 Summary of bird species recorded in the study

Species	Camiguin	Pamoctan	Babuyan Claro	Calayan	Dalupiri
Family Procellaridae					
Unidentified *Pterodoma* sp.	-	-	O	-	-
Family Sulidae					
Brown Booby *Sula leucogaster*	X+	-	X+	-	-
Family Ardeidae					
Grey Heron *Ardea cinerea*++	X+	-	X+	X+	-
Great Egret *Ardea alba*++	X+	X+	X+	X+	-
Eastern Reef-Egret *Egretta sacra*	-	X+	-	X	X
Intermediate Egret *Egretta intermedia*	X+	X+	X+	X	-
Little Egret *Egretta garzetta*++	X+	X+	X+	X+	-
Chinese Pond-Heron *Ardeola bacchus*++	-	-	X+	-	-
Cattle Egret *Bubulcus ibis*	X+	-	X+	X	X+
Black-crowned Night-Heron *Nycticorax nycticorax*	X+	-	X*+	X	-
Rufous Night-Heron *Nycticorax caledonicus*	X	-	-	-	X+
Schrenck's Bittern *Ixobrychus eurhythmus*++	X+	-	-	-	X+
Yellow Bittern *Ixobrychus sinensis*	-	-	X+	-	X+
Cinnamon Bittern *Ixobrychus cinnamomeus*++	X+	-	-	-	X+
Unidentified egret sp.	O	-	O	O	O
Family Anatidae					
Philippine Duck *Anas luzonica*++	-	-	-	-	X+
Family Pandionidae					
Osprey *Pandion haliaetus*++	X+	-	-	X+	X+
Family Accipitridae					
White-bellied Sea-Eagle *Haliaeetus leucogaster*	X	X+	X+	X	X+
Japanese Sparrowhawk *Accipiter gularis*	-	X+	-	-	-
Chinese Goshawk *Accipiter soloensis*	-	-	X+	X	-
Grey-faced Buzzard *Butastur indicus*	-	-	X+	X	-
Unidentified raptor sp.	O	-	-	-	O
Unidentified *Accipiter* sp.	O	-	O	-	-
Family Falconidae					
Peregrine Falcon *Falco peregrinus*	-	X+	-	-	-
Family Megapodiidae					
Tabon Scrubfowl *Megapodius cumingii*	-	X+	X+	X	X+
Family Phasianidae					
Red Junglefowl *Gallus gallus*	X	-	-	X	X**+
Blue-breasted Quail *Coturnix chinensis*++	-	-	-	I	X+
Family Rallidae					
Calayan Rail *Gallirallus calayanensis*++	-	-	-	X*+	-
Buff-banded Rail *Gallirallus philippensis*++	-	-	-	X+	-
Barred Rail *Gallirallus torquatus*	X	-	X+	X+	X+
Slaty-legged Crake *Rallina eurizonoides*	X**+	X+	X+	-	-
Baillon's Crake *Porzana pusilla*++	-	-	-	-	X+
White-browed Crake *Porzana cinerea*	X+	-	-	-	-
Plain Bush-hen *Amaurornis olivacea*	X+	-	X**+	X	X+
White-breasted Waterhen *Amaurornis phoenicurus*++	X+	X+	X+	X+	X+
Watercock *Gallicrex cinerea*++	X+	-	-	X+	X+
Common Mooorhen *Gallinula chloropus*	X+	X+	I	X	X+
Unidentified waterfowl sp.	-	-	O	O	-
Family Rostratulidae					
Greater Painted-Snipe *Rostratula benghalensis*++	-	-	-	X+	X+

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Legend: X – recorded, O – observed but not identified to species level, I – present based on interviews, * - voucher specimen collected, ** - record heard only, + - new island record, ++ - record new to the Babuyan group; Name in bold – threatened species, Name underlined – near-threatened species.

Species	Camiguin	Pamoctan	Babuyan Claro	Calayan	Dalupiri
Family Charadriidae					
Grey-headed Lapwing *Vanellus cinereus*++	X+	-	-	-	-
Asian Golden-Plover *Pluvialis fulva*	-	-	X+	-	X+
Little Ringed-Plover *Charadrius dubius*	X+	-	-	-	-
Kentish Plover *Charadrius alexandrinus*	-	-	X+	X	-
Malaysian Plover *Charadrius peronii*	-	-	-	X	X+
Lesser Sand Plover *Charadrius mongolus*	-	-	X+	X	-
Greater Sand Plover *Charadrius leschenaultii*++	-	-	X+	X+	X+
Family Scolopacidae					
Whimbrel *Numenius phaeopus*++	-	-	-	X+	-
Black-tailed Godwit *Limosa limosa*++	-	-	X+	-	-
Common Redshank *Tringa totanus*++	X+	-	-	-	-
Common Greenshank *Tringa nebularia*++	-	-	X+	X+	-
Green Sandpiper *Tringa ochropus*++	-	-	X+	-	-
Wood Sandpiper *Tringa glareola*	X+	-	X+	-	-
Marsh Sandpiper *Tringa stagnatilis*++	-	-	X+	-	-
Common Sandpiper *Actitis hypoleucos*	X+	-	X+	X	X+
Terek Sandpiper *Xenus cinereus*++	-	-	X+	-	-
Grey-tailed Tattler *Heteroscelus brevipes*	-	-	-	X	X+
Ruddy Turnstone *Arenaria interpres*++	-	-	X+	X+	X+
Pintail Snipe *Gallinago stenura*	-	-	X+	-	-
Bukidnon Woodcock *Scolopax bukidnonensis*++	-	-	X*+	-	-
Sanderling *Calidris alba*++	-	-	-	-	X+
Rufous-necked Stint *Calidris ruficollis*	-	-	X+	-	-
Long-toed Stint *Calidris subminuta*++	-	-	X+	-	-
Sharp-tailed Sandpiper *Calidris acuminata*++	X+	-	X+	-	-
Curlew Sandpiper *Calidris ferruginea*++	-	-	X+	-	-
Unidentified *Tringa* sp.	O	-	-	-	-
Unidentified *Scolopax* sp.	-	-	O	I	-
Unidentified *Calidris* sp.	-	-	O	-	-
Unidentified wader sp.	-	-	O	O	O
Family Glareolidae					
Oriental Pratincole *Glareola maldivarum*	X+	-	X+	X	X+
Family Recurvirostridae					
Black-winged Stilt *Himantopus himantopus*++	-	-	-	-	X+
Family Laridae					
Black-tailed Gull *Larus crassirostris*++	-	-	-	X+	-
Family Sternidae					
Common Tern *Sterna hirundo*	-	-	X+	-	-
Bridled Tern *Sterna anaethetus*	X+	-	X+	-	-
Sooty Tern *Sterna fuscata*++	X+	-	-	-	-
Whiskered Tern *Chlidonias hybridus*++	-	-	-	-	X+
Family Columbidae					
Whistling Green-Pigeon *Treron formosae*	X**	X+	I	X	I
Black-chinned Fruit-Dove *Ptilinopus leclancheri*	X	X+	X**+	X	-
Green Imperial-pigeon *Ducula aenea*	X	-	X+	X	-
Metallic Pigeon *Columba vitiensis*	X	X+	-	I	-
Philippine Cuckoo-Dove *Macropygia tenuirostris*	-	-	X**+	I	-
Island Collared-Dove *Streptopelia bitorquata*	-	-	-	X	X+
Spotted Dove *Streptopelia chinensis*++	X+	-	X+	X+	X+
Zebra Dove *Geopelia striata*++	X+	-	-	-	-

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Legend: X – recorded, O – observed but not identified to species level, I – present based on interviews, * - voucher specimen collected, ** - record heard only, + - new island record, ++ - record new to the Babuyan group; Name in bold – threatened species, Name underlined – near-threatened species.

Species	Camiguin	Pamoctan	Babuyan Claro	Calayan	Dalupiri
Common Emerald Dove *Chalcophaps indica*	X	X+	X+	X	X+
Unidentified dove sp.	-	-	-	O	O
Unidentified pigeon sp.	O	O	-	O	-
Family Cuculidae					
Jacobin Cuckoo *Clamator jacobinus*++	-	-	-	-	X+
Common Koel *Eudynamys scolopaceus*	X	X+	X**+	X	X+
Lesser Coucal *Centropus bengalensis*++	X+	-	-	-	X+
Philippine Coucal *Centropus viridis*	X+	X**+	X+	X	X
Unidentified cuckoo sp.	-	-	O	-	-
Family Tytonidae					
Grass Owl *Tyto capensis*	-	-	-	-	I
Family Strigidae					
Ryukyu Scops-Owl *Otus elegans*	X**+	X**+	I	X	-
Brown Hawk-Owl *Ninox scutulata*	X	-	I	X	-
Unidentified owl sp.	O	-	-	O	-
Family Caprimulgidae					
Unidentified nightjar sp.	-	-	I	I	I
Family Apodidae					
Island Swiftlet *Collocalia vanikorensis*++	X+	-	-	-	X+
Glossy Swiftlet *Collocalia esculenta*	X	X+	X	X	X*+
Pygmy Swiftlet *Collocalia troglodytes*++	-	X+	-	X+	-
Fork-tailed Swift *Apus pacificus*	-	X+	-	X+	X+
House Swift *Apus nipalensis*	X	-	-	X+	X+
Unidentified *Collocalia* sp.	O	O	O	O	O
Family Coraciidae					
Dollarbird *Eurystomus orientalis*	I	-	I	X	-
Family Alcedinidae					
Common Kingfisher *Alcedo atthis*	X+	X+	X+	X	-
Ruddy Kingfisher *Halycon coromanda*	X	-	X+	X	-
White-collared Kingfisher *Todirhamphus chloris*	X*	X+	X+	X+	-
Family Upupidae					
Hoopoe *Upupa epops*	-	-	I	I	-
Family Pittidae					
Red-bellied Pitta *Pitta erythrogaster*	X	-	-	-	-
Family Hirundinidae					
Sand Martin *Riparia riparia*	-	-	-	X	X+
Barn Swallow *Hirundo rustica*	X+	X+	X+	X	X+
Pacific Swallow *Hirundo tahitica*	X	X+	X	X+	X+
Striated Swallow *Cecropis striolata*	X	X+	X+	X	X+
Unidentified swallow sp.	O	-	O	-	O
Family Alaudidae					
Oriental Skylark *Alauda gulgula*++	-	-	-	-	X+
Family Campephagidae					
Pied Triller *Lalage nigra*++	X+	X+	-	-	-
Family Pycnonotidae					
Chestnut-eared Bulbul *Microscelis amaurotis*	X	X+	X	X	X
Family Oriolidae					
Black-naped Oriole *Oriolus chinenis*	X	X+	I	X	I
Family Corvidae					
Large-billed Crow *Corvus macrorhynchos*	-	-	X	X	X

Continued on next page

Legend: X – recorded, O – observed but not identified to species level, I – present based on interviews, * - voucher specimen collected, ** - record heard only, + - new island record, ++ - record new to the Babuyan group; Name in bold – threatened species, Name underlined – near-threatened species.

Species	Camiguin	Pamoctan	Babuyan Claro	Calayan	Dalupiri
Family Paridae					
Elegant Tit *Parus elegans*	X	-	-	X	-
Family Turdidae					
Orange-flanked Bush Robin *Luscinia cyanura*++	-	-	-	X+	-
Blue Rock-Thrush *Monticola solitarius*	X+	-	X+	-	-
White's Thrush *Zoothera aurea*	I	-	I	I	-
Brown-headed Thrush *Turdus chrysolaus*	X	X+	I	I	-
Family Sylviidae					
Arctic Warbler *Phylloscopus borealis*	-	-	X+	-	-
Lanceolated Warbler *Locustella lanceolata*	-	-	-	X	X+
Middendorf's Grasshopper-warbler *Locustella ochotensis*	-	-	-	-	X+
Zitting Cisticola *Cisticola juncidis*	X	-	-	X	X+
Unidentified *Megalurus* sp.	O	-	-	-	-
Family Muscicapidae					
Grey-streaked Flycatcher *Muscicapa griseisticta*	-	-	X+	X	X+
Snowy-browed Flycatcher *Ficedula hyperythra*	-	-	-	X*	-
Mangrove Blue Flycatcher *Cyornis rufigastra*++	X+	X*+	-	-	-
Short-crested Monarch *Hypothymis helenae*	X	-	-	-	-
Family Pachycephalidae					
Yellow-bellied Whistler *Pachycephala philippinensis*	X	X+	-	X*	-
Family Motacillidae					
Grey Wagtail *Motacilla cinerea*	-	-	X+	X	X+
Yellow Wagtail *Motacilla flava*	X	-	X+	X	X+
Richard's Pipit *Anthus richardi*	-	-	X+	X	X+
Red-throated Pipit *Anthus cervinus*	X+	-	-	X	-
Unidentified *Motacilla* sp.	-	-	O	O	O
Unidentified *Anthus* sp.	-	-	-	-	O
Family Laniidae					
Brown Shrike *Lanius cristatus*	X+	X+	X+	X	X+
Family Sturnidae					
Asian Glossy Starling *Aplonis panayensis*	X	X+	X+	X+	X+
Crested Myna *Acridotheres cristatellus*++	X+	X+	X+	X+	X+
Family Nectariniidae					
Purple-throated Sunbird *Leptocoma sperata*	X	-	X	X	-
Family Dicaeidae					
Red-keeled Flowerpecker *Dicaeum australe*	X	-	-	-	-
Pygmy Flowerpecker *Dicaeum pygmaeum*	-	-	-	X	-
Family Zosteropidae					
Lowland White-Eye *Zosterops meyeni*	-	-	-	X	-
Yellowish White-Eye *Zosterops nigrorum*	X	X+	-	-	-
Family Ploceidae					
Eurasian Tree Sparrow *Passer montanus*++	X+	-	X+	X+	X+
Family Estrildidae					
White-bellied Munia *Lonchura leucogastra*	X	-	-	X	-
Chestnut Munia *Lonchura malacca*	-	-	-	X	X+
Unidentified bird sp.	O	O	O	O	-
Total number of species recorded	71	36	65	77	59
Total number of new island records	40	36	60	25	55
Total number of search hours	52.8	15.3	57.3	52.9	23.0

Legend: X – recorded, O – observed but not identified to species level, I – present based on interviews, * - voucher specimen collected, ** - record heard only, + - new island record, ++ - record new to the Babuyan group; Name in bold – threatened species, Name underlined – near-threatened species.

The islands of Calayan and Camiguin support the greatest number of bird species endemic or near-endemic to the Philippines. Each holds 7 endemic or near-endemic species. They are followed by Pamoctan (5), Babuyan Claro (4) and lastly, Dalupiri (2). Figure 3 shows the number of endemics and near-endemics recorded in each island.

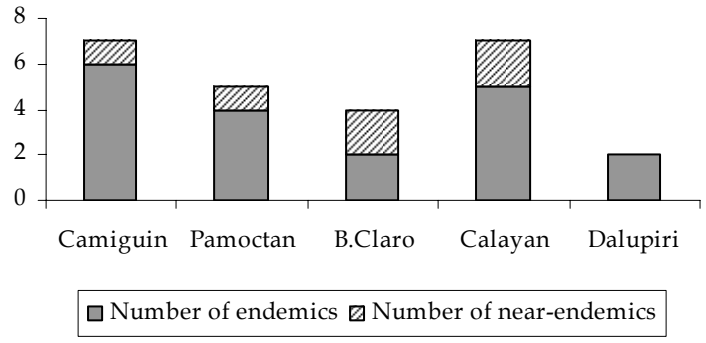

Figure 3. Endemic and near-endemic species in the Babuyan Islands

The 128 bird species recorded in the study fall into a total of 42 bird families. The most common families recorded by this survey in the Babuyan island group were: Scolopacidae – Curlews, Godwits, Sandpipers, Snipes (18 species); Ardeidae – Bitterns, Egrets, Herons (12); Rallidae – Coots, Crakes, Rails, Waterhens (10); Columbidae – Doves, Pigeons (9); and Charadriidae – Lapwings, Plovers (7).

In Camiguin the families with the most number of species were Ardeidae (9) and Rallidae (7). In Pamoctan, Ardeidae and Columbidae were the most represented families with 4 species each. The family Scolopacidae, with 14 species, was the most represented in Babuyan Claro followed by Ardeidae (8). Ardeidae and Rallidae were the most common families in both Calayan and Dalupiri. There were 7 records of each family in Calayan and 6 records of each family in Dalupiri. Species that belong to the families Tytonidae – Barn and Grass Owls, Caprimulgidae – Nightjars, and Upupidae – Hoopoe, were not recorded but according to interviews with local residents are present in the islands. Unidentified petrels and shearwaters sighted between the islands represent records of the family Procellaridae.

4.1 Species Lists

Species lists provide a simple measure of diversity for an area. The bird species recorded for each island are shown in the comprehensive species lists presented in Appendices 1-5. Those species reported by local people to be present are included in the species lists, but are excluded from the detailed analyses. Local names provided by residents are shown in the Ilocano language for Camiguin, Calayan and Dalupiri and in the Ivatan language for Babuyan Claro. Local utilization information gathered from interviews is also provided.

In order to distinguish Philippine resident species from passage or wintering migrants, the residency status of each species taken from Kennedy *et al.* (2000) is provided in the species lists. Species classified as "resident/migrant" in this reference were assigned either a "resident" or a "migrant" status based on available information. Resident species that are endemic or near-endemic to the Philippines were specified as such. The Orange-flanked Bush Robin *Luscinia cyanura* and the Jacobin Cuckoo *Clamator jacobinus* were classified as vagrants since they have not been previously recorded in the country.

It should be noted that some Philippine resident species may migrate between islands and conversely that some migrant species may have resident breeding populations in the country. Little breeding information of birds could be collected during a brief survey such as this and so information has been gathered from external sources. Thus, the residency status provided in the species lists may be revised in the light of results from further research.

Of the 128 bird species recorded in this study, 69 are resident species, 57 are migrant species and 2 are vagrant species. Table 4.2 shows the number of species recorded in each island classified according to their residency status.

Table 4.2 Summary of bird residency status

	Camiguin	Pamoctan	Babuyan Claro	Calayan	Dalupiri	Babuyan Group
Number of species	71	36	65	77	59	128
Number of resident species	47	26	29	46	36	69
Number of migrant species	24	10	36	30	22	57
Number of vagrant species	0	0	0	1	1	2

In this study, the greatest number of bird species was recorded on Calayan (77), followed by Camiguin (71), Babuyan Claro (65), and Dalupiri (59); the least number of species was seen in Pamoctan (36). The highest number of resident species was recorded on Camiguin (47) followed closely by Calayan (46), while the highest number of migrant species was recorded on Babuyan Claro where 36 migrants were recorded.

The number of migratory species present in a given study site can vary greatly depending on the time in the migration season a study is conducted. Thus the timing of an avian survey can have a substantial influence on the length of the resulting species list. This is clearly shown in Figure 4, a graphical representation of the composition of the species lists of each island in terms of residency status. It is worth noting that the high number of migrant species recorded on Babuyan Claro resulted in the island having a more extensive list than Dalupiri. However, more resident species were recorded on Dalupiri than on Babuyan Claro.

It is likely that more time spent searching for birds in each island would yield more new island records, especially migrant birds. Nonetheless, given the small size of the islands and the limited time this study was conducted, we believe the list of birds recorded in this survey provides a fair representation of the resident avifauna in each island.

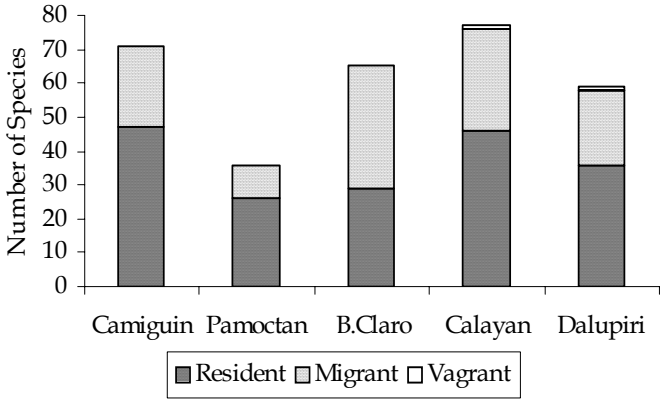

Figure 4. Composition of species lists by residency status

Bird diversity
Based on the number of resident bird species, Camiguin and Calayan hold the highest avian diversity, followed by Dalupiri, Babuyan Claro, and lastly, Pamoctan. According to MacArthur & Wilson (1967, in Kepler & Scott, 1985) under natural conditions higher avian diversity may be expected of islands with a larger area and a higher diversity of habitats. This appears to be generally true in the islands of the Babuyan group. The relatively high diversity of avian fauna on Camiguin and Calayan may be attributed to their larger size compared to the other islands, and the presence of a wide variety of habitats including sandy beaches, rocky shores, coastal reefs, extensive rice field systems, regenerating forests, and lowland evergreen forests. The theory of higher avian diversity in larger, more diverse islands also holds true between the smaller islands of Dalupiri and Pamoctan. Dalupiri holds a higher number of resident species than the much smaller island of Pamoctan.

However, this theory does not hold true for Babuyan Claro. It is surprising that this island, despite the presence of old growth forests and its high maximum elevation, supports a lower number of resident bird species in comparison with Dalupiri, an island half its size. Even more surprisingly, Babuyan Claro has only three more resident species than Pamoctan, an island less than 1% its size.

A number of factors might explain the low number of resident species recorded in Babuyan Claro. First, Babuyan Claro is farthest from Luzon, the nearest major source of avian colonizers. Second, six volcanic eruptions in the last century might have been catastrophic to local bird populations, especially its forest specialists. Thirdly it may be a relatively new island geologically. Lastly, the rampant hunting in the island in recent years has drastically reduced bird numbers, leading to possible extinctions and/or underrecording of species. According to interviews, the 200-300 birds that a hunter might be expected to catch in a day five years ago had dramatically dropped to 30-50 by last year. Residents attribute the recent decline to the introduction of airguns on the island as a hunting tool.

4.2 Completeness of species list

A limited time was spent on each island and so not all habitats on each island were throroughly explored, except on Pamoctan. Thus some resident species may have been overlooked, especially on the larger islands. The surveys were conducted throughout the northern winter and passage periods so the list of migrant species can be expected to be incomplete.

Although this study added several new island records of bird species in the Babuyan group, not all previously recorded species were sighted in this study. Table 4.3 lists the species recorded historically that were not observed in the study (Kennedy *et al*., 2000). The majority of the birds listed in this table are migrant species, not all of which could be expected to be recorded. Some species may start their northward migration as early as February (Dickinson *et al*., 1991).

Some of the birds listed in Table 4.3, however, are resident species which this project would have expected to record as present. Most of these resident species may have escaped detection because they are too rare locally to be spotted in a brief survey such as this or may have been present in areas not surveyed. Such is probably the case for the Tabon Scrubfowl *Megapodius*

cumingii and Dollarbird *Eurystomus orientalis* on Camiguin, and the Metallic Pigeon *Columba vitiensis*, Philippine Cuckoo-dove *Macropygia tenuirostris* and Red Turtle-dove *Streptopelia tranquebarica* on Calayan since these species were also reported in interviews of locals.

Table 4.3 Historical records of bird species that were not recorded in the study

Species	
Camiguin Island	
Wandering Whistling-duck *Dendrocygna arcuata* (R)	Beach Thick-knee *Esacus magnirostris* (R)
Grey-faced Buzzard *Butastur indicus* (M)	Island Collared-dove *Streptopelia bitorquata* (R)
Peregrine Falcon *Falco peregrinus* (M)	Dollarbird *Eurystomus orientalis* (R)
Tabon Scrubfowl *Megapodius cumingii* (R)	
Calayan Island	
Little Grebe *Tachybaptus ruficollis* (R)	Ashy Minivet *Pericrocotus divaricatus* (M)
Great Cormorant *Phalacrocorax carbo* (M)	Siberian Rubythroat *Luscinia calliope* (M)
Brown Booby *Sula leucogaster* (R)	Northern Wheatear *Oenanthe oenanthe* (V)
Little Heron *Butorides striata* (M)	Blue Rock-thrush *Monticola solitarius* (M)
Wooly-necked Stork *Ciconia episcopus* (R)	Brown-headed Thrush *Turdus chrysolaus* (M)
Green-winged Teal *Anas crecca* (M)	Pale Thrush *Turdus pallidus* (M)
Spot-billed Duck *Anas poecilorhyncha* (M)	Eyebrowed Thrush *Turdus obscurus* (M)
Eurasian Wigeon *Anas Penelope* (M)	Arctic Warbler *Phylloscopus borealis* (M)
Garganey *Anas querquedula* (M)	Oriental Reed-warbler *Acrocephalus orientalis* (M)
Northern Shoveler *Anas clypeata* (M)	Gray's Grasshopper-warbler *Locustella fasciolata* (M)
Tufted Duck *Aythya fuligula* (M)	Middendorff's Grasshopper-warbler *Locustella ochotensis* (M)
Peregrine Falcon *Falco peregrinus* (M)	Oriental Bush-warbler *Cettia diphone* (M)
White-browed Crake *Porzana cinerea* (R)	Narcissus Flycatcher *Ficedula narcissina* (M)
Pheasant-tailed Jacana *Hydrophasianus chirurgus* (R)	White Wagtail *Motacilla alba* (M)
Asian Golden-Plover *Pluvialis fulva* (M)	Forest Wagtail *Dendronanthus indicus* (M)
Little Ringed-Plover *Charadrius dubius*	Olive Tree-pipit *Anthus hodgsoni* (M)
Wood Sandpiper *Tringa glareola* (M)	Pechora Pipit *Anthus gustavi* (M)
Beach Thick-knee *Esacus magnirostris* (R)	Silky Starling *Sturnus sericeus* (M)
Metallic Pigeon *Columba vitiensis* (R)	White-shouldered Starling *Sturnus sinensis* (M)
Philippine Cuckoo-dove *Macropygia tenuirostris* (R)	Chestnut-cheeked Starling *Sturnus philippensis* (M)
Red Turtle-dove *Streptopelia tranquebarica* (R)	Brambling *Fringilla montifringilla* (M)
Oriental Cuckoo *Cuculus saturatus* (M)	Eurasian Siskin *Carduelis spinus* (M)
Grey Nightjar *Caprimulgus indicus* (M)	Yellow Bunting *Emberiza sulphurata* (M)
Asian House-martin *Delichon dasypus* (M)	
Dalupiri Island	
Black-naped Oriole *Oriolus chinensis* (R)	
Didicas Island	
Brown Booby *Sula leucogaster* (R)	Bridled Tern *Sterna anaethetus* (R)

Legend: R – Resident, M- Migrant, V – Vagrant

Some residents such as the Little Grebe *Tachybaptus ruficollis* (Camiguin), Wandering Whistling-duck *Dendrocygna arcuata* (Calayan), and Pheasant-tailed Jacana *Hydrophasianus chirurgus* (Calayan) are known to migrate locally depending on the availability of suitable habitat. However, residents did not mention these species in interviews and they may have become locally extinct about a century after they were first recorded in the islands. These species are dependent on freshwater marshes and lakes which were presumably present in the islands before they were converted to ricefields or fishponds. The Beach Thick-knee *Esacus magnirostris* was not reported to be present by residents of Camiguin but its crepuscular and nocturnal habits could make its detection by residents difficult. The Wooly-necked Stork *Ciconia episcopus* (Calayan) is currently extremely rare (Kennedy *et al*., 2000).

It is not clear whether the Brown Booby *Sula leucogaster* and the Bridled Tern *Sterna anaethetus* continue to breed on Didicas after the 1952 eruption that created the island and covered the three rock masses that existed prior to this eruption. However, these two species and other seabirds are possibly roosting at Guinapao Rocks where this study recorded bird droppings marking the rocks and where local fishermen report white birds with webbed feet congregate.

Mist-netting added a marginal contribution to the island species lists. Almost all of the species netted were sighted in bird searches with the exception of the Orange-flanked Bush Robin *Luscinia cyanura* in Calayan and the Brown-headed Thrush *Turdus chrysolaus* in Camiguin. The species and number of individuals captured by mist-netting in each island are summarized in Table 4.4. A total of twenty species of birds were caught. The most number of species were netted in Calayan (11), followed by Camiguin (8), Babuyan Claro (6), Pamoctan (3) and lastly, Dalupiri (1).

Table 4.4 Netting captures of birds

Species	Camiguin	Pamoctan	Babuyan Claro	Calayan	Dalupiri
Pintail Snipe *Gallinago stenura*	-	-	1	-	-
Common Emerald Dove *Chalcophaps indica*	-	-	1	1	-
Ryukyu Scops-Owl *Otus elegans*	-	-	-	2	-
Brown Hawk-Owl *Ninox scutulata*	-	-	-	1	-
Glossy Swiftlet *Collocalia esculenta*	-	-	-	-	2
Pygmy Swiftlet *Collocalia troglodytes*	-	-	-	1	-
Common Kingfisher *Alcedo atthis*	-	-	2	-	-
Ruddy Kingfisher *Halcyon coromanda*	1	-	2	-	-
Chestnut-eared Bulbul *Microscelis amaurotis*	1	1	4	4	-
Elegant Tit *Parus elegans*	1	-	-	1	-
Orange-flanked Bush Robin *Luscinia cyanura*	-	-	-	1	-
Brown-headed Thrush *Turdus chrysolaus*	1	-	-	-	-
Snowy-browed Flycatcher *Ficedula hyperythra*	-	-	-	3	-
Mangrove Blue Flycatcher *Cyornis rufigastra*	-	1	-	-	-
Short-crested Monarch *Hypothymis helenae*	1	-	-	-	-
Yellow-bellied Whistler *Pachycephala philippinensis*	6	-	-	8	-
Brown Shrike *Lanius cristatus*	-	1	-	-	-
Asian Glossy-Starling *Aplonis panayensis*	2	-	1	-	-
Eurasian Tree-Sparrow *Passer montanus*	1	-	-	1	-
White-bellied Munia *Lonchura leucogastra*	-	-	-	1	-
Number of species captured	8	3	6	11	1
Total number of captures	14	3	11	24	2
Total Netting Effort (in meter-net days)*	465	12	591	508	96

* The total netting effort was computed by multiplying the number of nets by their corresponding lengths and by the number of days they were open.

4.3 Bird relative abundance

The relative abundance of bird species was calculated from the rate they were encountered in the study during active search effort. Encounter rates were computed by dividing the total number of individuals recorded for each species in an island by the total number of search hours for that island, and multiplying the quotient by 10, resulting in the number of birds observed for each 10 hours of search effort. The computed encounter rates were translated into

a corresponding nominal scale of relative abundance using the ranges shown in Table 4.5. Only species detected during active search effort were assigned encounter rates and a nominal relative abundance scale. Results are shown with the species lists in Appendices 1-5. No species was assigned the rare abundance category because the short duration of the study resulted in the search effort in each island being insufficient to reasonably say a species is rare.

Table 4.5 Scale of relative abundance for birds

Encounter Rate (Number of individuals per 10 field hours)	Relative abundance scale
< 0.100	Rare
0.100 – 4.999	Uncommon
5.000 – 9.999	Common
10.000 +	Abundant

In Camiguin, the birds most frequently encountered were the Chestnut-eared Bulbul, the Purple-throated Sunbird, the Yellow-bellied Whistler, and the Philippine Coucal. The species most often counted in Pamoctan were the Chestnut-eared Bulbul, the Whistling Green Pigeon, the Crested Myna, and the Asian Glossy Starling. In Babuyan Claro the Chestnut-eared Bulbul, the Yellow Wagtail, and the Purple-throated Sunbird were most often seen or heard. In Calayan, the largest island in the group, the Eurasian Tree Sparrow, Purple-throated Sunbird, Chestnut-eared Bulbul, and the Glossy Swiftlet were most frequently detected. The birds most often seen in Dalupiri were the Oriental Pratincole, the Glossy Swiftlet, the Crested Myna, and the Yellow Wagtail. In the widely-forested islands of Camiguin, Pamoctan, Calayan and Babuyan Claro, the Chestnut-eared Bulbul was the species most commonly seen.

Caution should be taken in interpreting the measures of relative abundance presented in the appendices. They are not estimates of bird density in the islands, which can only be assessed using other survey methods. In this study, where the primary objective was to record a comprehensive list of species present in each island, measures of relative abundance provide a rough idea of which species were more frequently recorded than others within the time of active search effort in each island.

It should be noted that encounter rates were biased by the amount of search effort spent in each habitat type in each island. Most search effort in the islands (except in Dalupiri) was made in lowland forests thus a forest species would have a higher encounter rate than a species of similar density in other habitats, say, cultivated areas. Encounter rates could not be calculated in each habitat type separately because search hours were sometimes spent across different habitat types to maximize the number of species recorded. Since the amount of search effort in each habitat type in each island was not standardized across islands, a comparison of encounter rates of the same species between islands can not be made.

Another source of bias in counting birds in this study is the natural conspicuousness or inconspicuousness of species. The noisy Chestnut-eared Bulbul and Purple-throated Sunbird are easier to detect than the shy Slaty-legged Crake *Rallina eurizonoides* and the tiny Snowy-browed Flycatcher *Ficedula hyperythra*. The more conspicuous birds would be expected to be recorded more frequently than less conspicuous species of the same abundance.

4.4 New island records and notable records

Twenty six (58%) of the 46 new records for the Babuyan island group are migrants while 20 (42%) are residents. Several of these new records of migrants were species of egrets, bitterns and waders. The new records of residents include introduced species such as the Crested Myna *Acridotheres cristatellus* and the Eurasian Tree Sparrow *Passer montanus*. The threatened Philippine Duck *Anas luzonica* has not been recorded previously in the region. Other new records include: rails such as the Calayan Rail *Gallirallus calayanensis*, Buff-banded Rail *Gallirallus philippensis*, White-breasted Waterhen *Amaurornis phoenicurus*, Watercock *Gallicrex cinerea*; swiftlets like the Island Swiftlet *Collocalia vanikorensis* and Pygmy Swiftlet *Collocalia troglodytes*; and doves such as Spotted Dove *Streptopelia chinensis* and Zebra Dove *Geopelia striata*.

The greatest number of new island records was made in the islands of Babuyan Claro (60) and Dalupiri (55). Historically, these two islands have been the least explored in the Babuyan group, with only five species recorded in each island, thus it is not surprising this study provided a high number of new island records. All 36 records from the small island of Pamoctan are new since no bird records have been published from this island. Of the 40 new island records from Camiguin, half are residents and half are migrants. On the other hand, the 25 new island records from Calayan are composed of 15 residents and 10 migrants.

Breeding records
As explained earlier, not all species that are called "resident" in this report have confirmed breeding records in the islands on which they were recorded. The following birds, however, were observed breeding:

On Camiguin, young Barred Rail *Gallirallus torquatus,* White-breasted Waterhen *Amaurornis phoenicurus* and Asian Glossy-Starling *Aplonis panayensis* were sighted. On the same island, Black-chinned Fruit-Dove *Ptilinopus leclancheri*, Short-crested Monarch *Hypothymis helenae*, and Purple-throated Sunbird *Leptocoma sperata* were observed on their nests. On Calayan, nests of Striated Swallow *Cecropis striolata*, eggs of Tabon Scrubfowl *Megapodius cumingii* and juvenile Asian Glossy-Starling *Aplonis panayensis* were noted. Immature Rufous Night-heron *Nycticorax caledonicus* and Crested Myna *Acridotheres cristatellus* were observed still on their nests on Dalupiri. On Babuyan Claro, young Chestnut-eared Bulbul *Microscelis amaurotis* and Tabon Scrubfowl *Megapodius cumingii* eggs were seen, and according to hunters, Bukidnon Woodcock *Scolopax bukidnonensis* breed in April and May on the island.

The Bukidnon Woodcock *Scolopax bukidnonensis* is known from central and northern Luzon and from four mountains on Mindanao (Kennedy *et al*., 2001). Its discovery in Babuyan Claro represents its northernmost range and the first record on a small island. This species was reported to be present in Calayan by residents but these reports need to be verified. Slight differences between the specimen from Babuyan Claro and one from Mindanao suggest that they belong to different subspecies but further taxonomic studies are required to confirm this.

Vagrants and rare migrants

Sightings of a number of vagrant and rare migrant birds were made during the study. An Orange-flanked Bush Robin *Luscinia cyanura* was caught by a ground net at Longog, Calayan on May 10 while a Jacobin Cuckoo *Clamator jacobinus* was seen in Visita, Dalupiri on May 21. It is the first time these two species have been recorded in the Philippines. They are believed to be vagrants. A Chinese Pond-heron *Ardeola bacchus*, a rare migrant, was sighted in the ricefields of Babuyan Claro on April 17 and 18. This is only the fourth record of the species in the Philippines; the last record was made in Dumaguete City in 1948 (Kennedy *et al*., 2000). The Schrenck's Bittern *Ixobrychus eurhythmus*, another rare migrant, was seen in the ricefields in Caucauayan, Dalupiri and Balatubat, Camiguin. A Grey-headed Lapwing *Vanellus cinereus* was sighted in Camiguin on April 12 – only the fourth record of this species in the country after being recorded twice in Batan in 1981 and once in Malabon, Metro Manila in 1906 (Kennedy *et al*., 2000). A Black-tailed Godwit *Limosa limosa* (still in breeding plumage) was observed in the ricefields of Babuyan Claro on April 18 and 19. Recorded only once before in March 1991 in Olango, two Black-tailed Gulls *Larus ridibundus* were found by the study being kept as pets in a household in Calayan. According to the birds' owners, they bought them in January 2003 from fishermen who caught the birds off Calayan. Two individuals were also spotted and photographed off Calayan in March 2003 by a team of WWF-Philippines researchers.

Other notable records

More than 100 Fork-tailed Swifts *Apus pacificus* were sighted flying around Guinapao Rocks on 1 April. They may possibly nest inside a large cave carved on one of the rock masses but our boat could not get close enough to see nests or moor on the island. Extensive markings of bird droppings suggest these rocks may also be a roosting site for other seabirds. No bird species were found during a brief mid-day stop at Didicas on 16 April.

Thirteen species of birds were recorded in all of the islands visited. They are the White-bellied Sea-Eagle *Haliaeetus leucogaster*, White-breasted Waterhen *Amaurornis phoenicurus*, Common Emerald Dove *Chalcophaps indica*, Common Koel *Eudynamys scolopaceus*, Philippine Coucal *Centropus viridis*, Glossy Swiftlet *Collocalia esculenta*, Barn Swallow *Hirundo rustica*, Pacific Swallow *Hirundo tahitica*, Striated Swallow *Cecropis striolata*, Chestnut-eared Bulbul *Microscelis amaurotis*, Brown Shrike *Lanius cristatus*, Asian Glossy-Starling *Aplonis panayensis*, and Crested Myna *Acridotheres cristatellus*. All are resident species with the exception of the Barn Swallow and Brown Shrike.

5 Mammals

A total of 18 mammalian species were recorded from the Babuyan Islands and their surrounding waters during this survey. Table 5.1 shows a summary of these records.

Table 5.1 Summary of mammalian species recorded in the study

Species	Camiguin	Pamoctan	Babuyan Claro	Calayan	Dalupiri
Family Soricidae					
Indochinese Shrew *Crocidura attenuata*++	-	-	-	X*+	-
Asian House Shrew *Suncus murinus*++	-	-	-	-	X+
Family Pteropodidae					
Common Short-nosed Fruit Bat *Cynopterus brachyotis*	X*+	-	X*+	X*+	-
Dagger-toothed Flower Bat *Macroglossus minimus*++	-	-	-	X*+	-
Ryukyu Flying Fox *Pteropus dasymallus*	-	-	X*+	-	-
Large Flying Fox *Pteropus vampyrus*++	-	-	-	X+	-
Unidentified flying fox *Pteropus* sp.	X	X	-	-	X
Common Rousette *Rousettus amplexicaudatus*	X+	X*+	-	X*+	X
Family Rhinolophidae					
Diadem Roundleaf Bat *Hipposideros* cf. *diadema*++	-	-	-	X*+	-
Yellow-faced Horseshoe Bat *Rhinolophus virgo*++	-	-	X*+	X*+	-
Family Vespertilionidae					
Common Bent-winged Bat *Miniopterus schreibersi*	-	-	-	-	X*
Family Muridae					
Common Philippine Forest Rat *Rattus everetti*++	-	-	X*+	-	-
Polynesian Rat *Rattus exulans*++	X*+	-	-	-	-
Oriental House Rat *Rattus tanezumi*++	X*+	-	-	-	-
Unidentified rat *Rattus* sp.	-	I	I	I	I
Family Viverridae					
Unidentified civet cat sp.++	I	-	I	X+	-
Family Suidae					
Philippine Warty Pig *Sus* cf. *philippensis*++	X*+	-	X*+	X*+	-
Family Balaenopteridae					
Humpback Whale *Megaptera novaeangliae*	X	-	-	-	-
Family Delphinidae					
Short-finned Pilot Whale *Globicephala macrorhyncus*	-	-	-	-	X*
Rough-toothed Dolphin *Steno bredanensis*	X	-	-	-	-
Total number of species	8	2	5	9	5
Total number of new island records	5	1	5	9	1

Legend: X – recorded, I – present based on interviews, * - voucher specimen collected, + - new island record, ++ - record new to the Babuyan group; Name in bold – threatened species, Name underlined – near-threatened species.

Out of the total 18 species recorded, there were eight volant mammals, five small non-volant mammals, two large mammals and three marine mammals. Eleven of these species have not been recorded previously in the area. Three threatened species were recorded during the study: the Ryukyu Flying Fox *Pteropus dasymallus* (Endangered-IUCN, 2003), Philippine Warty Pig *Sus philippensis* (Vulnerable-IUCN, 2003) and the Humpback Whale *Megaptera novaeangliae* (Vulnerable-IUCN, 2003). Two species recorded in the study are near-threatened: the Yellow-faced Horseshoe Bat *Rhinolophus virgo* and the Common Bent-winged Bat *Miniopterus schreibersi*. The Yellow-faced Horseshoe Bat *R. virgo* and the Common Philippine Forest Rat *Rattus everetti* are endemic to the Philippines; none is known to be endemic to the Babuyan group.

Twenty-five specimens of 12 species of mammals were collected. The skin specimen of the endangered Ryukyu Flying Fox *P. dasymallus* was taken from an animal shot and badly wounded by a local hunter.

5.1 Volant mammals

Six species of bat were caught by mist-netting. These are listed in Table 5.2 with the corresponding number of individuals captured in each island. The total netting effort in all study sites in each island is also given. The Common Short-nosed Fruit Bat *Cynopterus brachyotis* and the Common Rousette *Rousettus amplexicaudatus* are the most widespread in the islands. The Dagger-toothed Flower Bat *Macroglossus minimus*, the Diadem Roundleaf Bat *Hipposideros diadema*, and the Large Flying Fox *Pteropus vampyrus* were captured only on Calayan – the first time they have been recorded in the Babuyan group. Large bats with dark thick wings that may have been the Large Flying Fox *P. vampyrus* were also seen flying over Camiguin, Pamoctan and Dalupiri.

Table 5.2 Netting captures of bats

Species	Camiguin	Pamoctan	Babuyan Claro	Calayan	Dalupiri
Common Short-nosed Fruit Bat *Cynopterus brachyotis*	31	-	89	21	-
Dagger-toothed Flower Bat *Macroglossus minimus*	-	-	-	34	-
Ryukyu Flying Fox *Pteropus dasymallus*	-	-	3	-	-
Large Flying Fox *Pteropus vampyrus*	-	-	-	2	-
Common Rousette *Rousettus amplexicaudatus*	9	1	-	31	5
Diadem Roundleaf Bat *Hipposideros* cf. *diadema*	-	-	-	1	-
Total Netting Effort (in meter-net nights)	285	24	588	405	30

* The total netting effort was computed by multiplying the number of nets by their corresponding lengths and by the number of nights they were open.

In addition to mist-netting, caves were visited to search for roosting bats and yielded records of the Yellow-faced Horseshoe Bat *R. virgo*, the Common Bent-winged Bat *M. schreibersi*, and the Diadem Roundleaf Bat *H. diadema*. The highest number of bat species was recorded in Calayan (6 species). Only two or three species were recorded in all the other islands visited. Bats from the family Rhinolophidae were not recorded on Camiguin and Pamoctan. However, this may be a reflection of the fact that no caves were visited in these islands rather than that the species is not present.

Records of the Common Short-nosed Fruit Bat *C. brachyotis*, Ryukyu Flying Fox *P. dasymallus*, Common Rousette *R. amplexicaudatus,* Yellow-faced Horseshoe Bat *R. virgo* and Common Bent-winged Bat *M. schreibersi* were to be expected as these species have been collected previously from islands of the Batanes and Babuyan group. The endangered Ryukyu Flying Fox *P. dasymallus* was neither captured nor sighted in Dalupiri, where it has been previously recorded, and in Camiguin and Calayan, where it was expected to be present. This species was caught only in Rakwaranom, Babuyan Claro. *C. brachyotis* was not recorded on Dalupiri during this study, probably because the netting effort was limited on this island.

The rate of capture of bats provide a measure of relative abundance. The capture rate for each species was calculated by dividing the total number of individuals of the species captured in an

Table 5.3 Scales of relative abundance for bats

Net Capture Rate (Number of individuals per 100m-net night)	Relative abundance scale
< 0.100	Rare
0.100 – 4.999	Uncommon
5.000 – 9.999	Common
10.000 +	Abundant

island by the total netting effort for the island and multiplying this figure by 100. The result is the number of individuals of a species captured by 100 meters of net open in one night. The capture rates were assigned a nominal relative abundance scale based on Table 5.3. The calculated capture rates and relative abundance scales are shown in Appendices 1 to 5.

Netting results show that the Common Short-nosed Fruit Bat *C. brachyotis* and the Common Rousette *R. amplexicaudatus* are the most common species in the Babuyan Group. The Dagger-toothed Flower Bat *M. minimus* is common on Calayan. These three species are common and widespread throughout their range. The Ryukyu Flying Fox *P. dasymallus* and the Large Flying Fox *P. vampyrus* were found to be uncommon on Babuyan Claro and Calayan, respectively. However, a more detailed survey of the populations of the Ryukyu Flying Fox *P. dasymallus* is necessary to assess the current status of this endangered species.

The Yellow-faced Horseshoe Bat *R. virgo* was observed in small groups of two or three individuals in shallow caves and rock crevices in Babuyan Claro and Calayan. In a large cave about 200-m long in Longog, Calayan a roost with approximately 3,000 Yellow-faced Horseshoe Bat *R. virgo* and 3,000 Diadem Roundleaf Bat *H. diadema* was found. A roost of approximately 30 Large Flying Fox *P. vampyrus* was seen in a tree on a trail near Barangay Magsidel in Calayan. In Dalupiri, the Common Rousette *R. amplexicaudatus* and the Common Bent-winged Bat *M. schreibersi* were observed roosting in caves.

Lactating and pregnant females and mothers carrying young of the Common Short-nosed Fruit Bat *C. brachyotis* were captured in Camiguin, Babuyan Claro and Calayan. A pregnant Dagger-toothed Flower Bat *M. minimus* and a female Large Flying Fox *P. vampyrus* with large mammae were netted in Calayan. A cluster of approximately 200 young Common Bent-winged Bat *M. schreibersi* was photographed in a cave in Dalupiri.

5.2 Small non-volant mammals

Table 5.4 presents the results of small non-volant mammal trapping. Trapping yielded three species: the Polynesian Rat *Rattus exulans*, Oriental House Rat *Rattus tanezumi* and Indochinese Shrew *Crocidura attenuata*. The Polynesian Rat *R. exulans* and Oriental House Rat *R. tanezumi* are widespread rat species. The Indochinese Shrew *C. attenuata* was captured in lowland forest in Calayan. This species is widely-distributed throughout mainland Asia and Taiwan but previously found in the Philippines only on Batan Island. Assuming the species was not introduced by humans to Calayan, this record provides evidence of colonization from Taiwan that extends closer to Luzon than previously known (Heaney & Ruedi, 1994).

No rodents were trapped in Ayumit, Babuyan Claro and Caucauayan, Dalupiri. However, a dead *Rattus everetti*, a Philippine-endemic species, was found and collected along a trail at high elevation (700-800m) in Babuyan Claro. A dead *Suncus murinus* was sighted in the settlement area of Visita on Dalupiri.

Table 5.4 Trapping captures of small non-volant mammals

Location	Trapping effort	Species	Number of captures
Limandok, Camiguin	54 Victor trap-nights	*Rattus exulans*	2
		Rattus tanezumi	4
Ayumit, Babuyan Claro	45 Victor trap-nights	-	0
Longong, Calayan	69 Victor trap-nights	-	0
	8 pitfall trap-nights	*Crocidura attenuata*	2
Caucauayan, Dalupiri	12 pitfall trap-nights	-	0

Interviews with local residents revealed the presence of other rodent species in the islands. However, the trapping effort for small non-volant mammals in this study was low. This survey has recorded only a small number of the species present in the Babuyan island group. It was not appropriate to calculate measures of relative abundance due to the low number of hours of trapping effort.

5.3 Large Mammals

Old jaws of wild pigs were donated to the study by local hunters in Camiguin, Babuyan Claro and Calayan. It is not possible to confirm the identity of the pig species from the jaw bones (W.Oliver, pers. comm.) but based on known distribution of wild pigs in the country, these are probably from the threatened Philippine Warty Pig *Sus philippensis*, a species endemic to the Philippines. According to interviews, wild pig populations in these islands have declined due to hunting but they still occur in limited areas such as May-muh-muh in Babuyan Claro and Cabudaddan in Calayan.

Local hunters in Camiguin, Babuyan Claro and Calayan also reported the presence of a civet cat. A member of the expedition team saw a civet cat at Longog, Calayan but it was too far away and moved too fast to identify the species.

5.4 Marine Mammals

The waters around the islands of the Babuyan group have the highest species richness of marine mammals in the Philippines. Thirteen species of marine mammals have been documented by WWF-Philippines (see Section 1.5). Although this project did not conduct a formal marine survey, a few opportunistic sightings were made.

The following marine mammals were sighted off Camiguin: Humpback Whale *Megaptera novaeangliae* and Rough-toothed Dolphin *Steno bredanensis*. A photograph of a *S. bredanensis* was taken, showing it to be a distinctive individual with a discolored beak. The skeleton of a stranded Short-finned Pilot Whale *Globicephala macrorhyncus* was collected on Dalupiri. It had been dead for more than two weeks when the skeleton was found by the Expedition Team, according to reports from local people. The skeleton was donated to the Cagayan State University at Aparri, Cagayan.

6 Reptiles and Amphibians

6.1 Reptiles

This project recorded a total of 33 reptile species during the study, including 30 species that are new to the Babuyan island group. Table 6.1 summarizes these records. The following threatened species were observed: Green Turtle *Chelonia mydas* (Endangered-IUCN, 2003), McGregor's Pit Viper *Trimeresurus mcgregori*, and an unidentified crocodile (see Section 7.1). According to interviews with local residents, the Hawksbill Turtle *Eretmochelys imbricata* (Critically Endangered-IUCN, 2003) is present in the waters around Babuyan Claro, Calayan and Dalupiri. Section 7.1 discusses the threatened terrestrial species in more detail.

Table 6.1 Summary of reptile species recorded in the study

Species	Camiguin	Pamoctan	Babuyan Claro	Calayan	Dalupiri
Family Emydidae					
Unidentified freshwater turtle sp.	I	-	-	-	-
Family Chelonidae					
Green Turtle *Chelonia mydas*	-	-	I	I	X*
Hawksbill Turtle *Eretmochelys imbricata*	-	-	I	I	I
Family Crocodylidae					
Unidentified crocodile *Crocodylus* sp.++	-	-	-	-	X+
Family Gekkonidae					
Philippine Bent-toed Gecko *Cyrtodactylus philippinicus*++	X*+	-	X*+	-	-
Tender-skinned House Gecko *Gehyra mutilata*++	-	-	-	X*+	-
Unidentified gecko *Gekko* sp. 1++	X*+	X*+	-	-	-
Unidentified gecko *Gekko* sp. 2++	-	-	X*+	-	-
Unidentified gecko *Gekko* sp. 3++	-	-	-	X*+	X*+
Common House Gecko *Hemidactylus frenatus*++	X*+	X*+	X*+	-	X+
Smooth-scaled Gecko *Lepidodactylus* sp.++	-	-	X*+	-	X*+
Family Agamidae					
Unidentified flying lizard *Draco* sp. ++	X*+	-	X*+	-	-
Family Scincidae					
Gray Swamp Skink *Emoia atrocostata*	-	-	X*+	-	X+
Spotted Green Tree Skink *Lamprolepis smaragdina*++	-	-	X*+	-	-
Northern Two-striped Mabouya *Mabuya multicarinata borealis*++	X*+	X+	-	-	-
Unidentified mabouya *Mabuya* sp. 1++	-	-	X*+	-	X*+
Unidentified mabouya *Mabuya* sp. 2++	-	-	-	X*+	-
Sphenomorphus *Sphenomorphus* cf. *abdictus aquilonius*++	-	-	X*+	X*+	X*+
Jagor's Sphenomorphus *Sphenomorphus* cf. *jagori jagori*++	-	-	X*+	-	-
Family Varanidae					
Water Monitor Lizard *Varanus salvator*++	X+	X+	X*+	X+	-
Unidentified monitor lizard *Varanus* sp.	I	-	-	-	-
Family Boidae					
Reticulated Python *Python reticulatus*++	I	I	I	I	X+

Continued on next page

Species	Camiguin	Pamoctan	Babuyan Claro	Calayan	Dalupiri
Family Colubridae					
Philippine Vine Snake *Ahaetulla prasina preocularis*++	X*+	-	I	-	-
Mangrove Blunt-headed Tree Snake					
Boiga dendrophila divergens++	-	-	-	X*+	-
Philippine Blunt-headed Tree Snake					
Boiga philippina++	-	-	X*+	-	X*+
Northern Triangle-spotted Snake					
Cyclocorus lineatus++	X+	-	-	-	-
Lined Slender Tree Snake					
Dendrelaphis caudolineatus caudolineatus++	-	-	-	-	X*+
Lined Slender Tree Snake					
Dendrelaphis caudolineatus terrificus++	-	-	-	X*+	-
Alcala's Wolf Snake *Lycodon alcalai*++	X*+	-	-	X*+	-
Banded Burrowing Snake					
Oxyrhabdium leporinum leporinum++	-	-	-	X*+	-
Northern Water Snake *Rhabdophis spilogaster*++	X*+	-	-	-	-
Family Elapidae					
Unidentified cobra *Naja* sp.++	I	-	I	I	I
Family Hydrophidae					
Yellow-lipped Sea Snake *Laticauda colubrina*++	-	-	X*+	X*+	-
Black-lipped Sea Snake *Laticauda laticaudata*++	-	-	-	X*+	-
Half-banded Sea Snake *Laticauda semifasciata*++	-	-	X*+	-	-
Family Viperidae					
Philippine Pit Viper					
Trimeresurus flavomaculatus flavomaculatus	X*	-	X*+	-	-
McGregor's Pit Viper *Trimeresurus mcgregori*++	X+	-	I	X+	-
Total number of species	12	4	15	12	11
Total number of new island records	11	4	15	12	10

Legend: X – recorded, I – present based on interviews, * - voucher specimen collected, + - new island record, ++ - record new to the Babuyan group; Name in bold – threatened species.

The greatest number of reptile species was recorded in Babuyan Claro (15), followed by Camiguin (12) and Calayan (12), Dalupiri (11) and lastly Pamoctan (4). With the exception of two species, all are new island records. These numbers don't represent the true diversity of reptilian fauna in each island because the collection effort was merely opportunistic. Rare, uncommon, and possibly some common species in each island are very likely to have been missed. Thus measures of relative abundance were not assigned. The number of species recorded in each island is reflective of the team's search effort. Nonetheless, the data collected offers insights into the reptilian fauna in the islands.

Endemic species

Eight species endemic to the Philippines were found: Philippine Bent-toed Gecko *Cyrtodactylus philippinicus*, *Sphenomorphus abdictus*, Philippine Blunt-headed Tree Snake *Boiga philippina*, Alcala's Wolf Snake *Lycodon alcalai*, Banded Burrowing Snake *Oxyrhabdium leporinum*, Northern Water Snake *Rhabdophis spilogaster*, Philippine Pit Viper *Trimeresurus flavomaculatus*, and McGregor's Pit Viper *Trimeresurus mcgregori*. *L. alcalai* and *T. mcgregori* were previously known to be endemic to the Batanes group.

The two reptile species known to be endemic to the Babuyan group, the wolf snakes *Lycodon bibonius* and *Lycodon chrysoprateros* were not recorded. However, a number of the reptile species recorded in this study are yet to be described and likely to be endemic to the islands in the

Babuyan group. The geckos collected on Dalupiri and Camiguin are possibly two of the three geckos Ota is in the process of describing. The geckos of Babuyan Claro appear to be different from those of Dalupiri and Camiguin and may represent yet another undescribed species. Camiguin holds an undescribed species of flying lizard (Lazell, 1992) and the specimens taken from Babuyan Claro may similarly be unknown to science thus far. Specimens of the genus *Mabuya* (skink) and *Lepidodactylus* (gecko) obtained from Babuyan Claro, Calayan and Dalupiri are possibly undescribed as well. Further investigation on these possibly new species of reptiles endemic to the Babuyan Islands is necessary.

The apparently high endemism of reptile species in the Babuyan Islands is not unexpected. Lazell (1992) predicted that a full species of flying lizard endemic to each of the islands of Camiguin, Calayan and Babuyan Claro will be found; one endemic species will be shared by Fuga and Dalupiri, according to him. Our results appear to prove his predictions true for Camiguin and Babuyan Claro. A high rate of endemism is similarly consistent with the project's discovery of an endemic bird species. Heaney (2002) notes that in places where endemic species are found, the rate of endemism in its herpetofauna is higher than that of its birds and bats.

Species reported in interviews

Most species of reptiles described in interviews with local residents were recorded in the field. A few were not encountered in the field but are probably present. A species of freshwater turtle, likely to be the Malayan Freshwater Turtle *Cuora amboinensis*, was reported in Camiguin. Interviews indicate the presence of the threatened Green Turtle and Hawksbill Turtle in the waters around Babuyan Claro, Calayan and Dalupiri, where they are caught for food and trade. A Green Turtle shell was indeed collected on a beach on the eastern coast of Dalupiri. Respondents, however, are unaware of any sea turtle nesting sites on these islands.

The Reticulated Python and a species of cobra were reported to be present in all islands but only the former was recorded in Dalupiri. Residents of Babuyan Claro describe a species of vine snake which is most likely to be the Philippine Vine Snake and a yellow pit viper which is possibly the threatened McGregor's Pit Viper.

Fruit-eating monitor lizard on Camiguin Island

There are only two species of fruit-eating monitor lizards in the world and both occur only in the Philippines. They are the threatened *V. olivaceus* (Vulnerable-IUCN 2003) and the recently described *Varanus mabitang* (Gaulke & Curio 2001). The former is distributed in Polillo Island, Southern Luzon and Catanduanes, while the latter occurs on Panay Island.

Evidence of the presence of a frugivorous monitor lizard, possibly an undescribed species, was found in Camiguin. In Limandok a clump of about 20 *Pandanus* seeds was found uphill of any adult *Pandanus* tree. A member of the team with experience in surveying Gray's Monitor Lizard *Varanus olivaceus* in Polillo Island east of Luzon recognized that this could be fecal matter from a fruit-eating monitor lizard. A similar clump of seeds was found in Kauringan. In these sites, *Pandanus* trees were also observed to cluster on hilltops and ridges, as they do on Polillo Island because they are dispersed by *V. olivaceus*.

These clues that point to the presence of a frugivorous monitor lizard were supported by information provided by local residents. Some people recognize and distinguish these lizards, locally known as "*lupi*", from their carnivorous relatives *V. salvator*, known as "*banyas*." According to them, the former feeds on fruits of *Pandanus* trees and other fruits while the latter preys on domesticated chicks and other small birds. Local people report that they have seen the *lupi* during the course of their orchid collections in the forest. According to local residents, they do not hunt the animal but on one occasion our guide had caught an animal in a snare trap he set to catch Junglefowl *Gallus gallus*. While all these data strongly indicate the presence of a fruit-eating monitor lizard on Camiguin, a documented sighting has still to be made. An expedition is being planned by the team to confirm the presence and identity of the *lupi*.

Unidentified Crocodile on Dalupiri Island

A crocodile was sighted in one of the pools of a fresh-water river at Caucauayan, Dalupiri on 22 May. The animal was estimated to be 1.9-2.3 meters in length. Four scutes were observed on the back of its neck, raising the possibility of the animal being the critically endangered Philippine Crocodile *Crocodylus mindorensis*. An animal was sighted in the same pond during the following six days, usually surfacing to breathe for a few seconds before submerging itself under water for up to 50 minutes. On one occasion, the crocodile stayed on the surface for about 40 minutes. Photographs of the animal were taken when it surfaced but there was no opportunity to take shots of the crocodile with the head and neck out of the water. Observations taken at the time and inspection of the photographs indicate there may have been two individuals present. An empty nest was seen along the same river, which suggests that there is a breeding population in the island.

The crocodiles at Caucauayan are known to local residents as '*bukarot*.' According to them the *bukarot* is a fresh-water crocodile and it is different from the much larger crocodile seen near the sea which they call '*buwaya*.' The island's owner and residents claim that these crocodiles have been in the island for as long as they can remember and they have no information that suggests that these animals might have been introduced to the island. They recall that there were a greater number of crocodiles before skin traders hunted them some decades ago. The river at Caucauayan has no direct links to the sea but it is less than a kilometer away from the Manolong river which flows to the sea.

Crombie (1994) reported seeing a crocodile on Dalupiri island in his 1989 visit. He did not make a positive species identification but guessed that it was probably the Salt-water Crocodile *Crocodylus porosus*. The identity of the crocodiles on Dalupiri remains to be solved.

6.2 Amphibians

Seven species of amphibians were recorded in this survey. These records are summarized in Table 6.2. All are new island records. Three species are endemic to the Philippines: Giant Philippine Frog *Limnonectes macrocephalus*, Woodworth's Frog *Limnonectes woodworthi*, and Slender-digit Chorus Frog *Kaloula picta*. Two unidentified species of *Platymantis* which belong to the *dorsalis* group are likely to be endemic as well.

Table 6.2 Summary of amphibian species recorded in the study

Species	Camiguin	Pamoctan	Babuyan Claro	Calayan	Dalupiri
Family Bufonidae					
Giant Marine Toad *Bufo marinus*++	X*+	-	X+	X+	X+
Family Ranidae					
Giant Philippine Frog *Limnonectes macrocephalus*++	X+	X+	-	-	-
Woodworth's Frog *Limnonectes woodworthi*++	X*+	-	-	-	-
Unidentified forest frog *Platymantis* sp. 1++	X*+	-	-	-	-
Unidentified forest frog *Platymantis* sp. 2++	X*+	-	-	-	-
Family Rhacophoridae					
Common Tree Frog *Polypedates leucomystax*++	X*+	-	-	-	-
Family Microhylidae					
Slender-digit Chorus Frog *Kaloula picta*++	-	-	-	X*+	X*+
Total number of species	6	1	1	2	2
Total number of new island records	6	1	1	2	2

Legend: X – recorded, * - voucher specimen collected, + - new island record, ++ - record new to the Babuyan group.

Among the islands visited, Camiguin harbors the highest diversity of amphibian fauna with six species present. Only one or two species were found in the other islands. Pamoctan may hold the same lowland forest frog species as Camiguin but little time was spent in surveying frogs in this islet. In the islands of Babuyan Claro, Calayan and Dalupiri, however, there were no forest species of frog detected despite a considerable amount of search effort.

Records of the Common Tree Frog *Polypedates leucomystax* and *L. macrocephalus* were expected since they have been recorded as far north in the Philippines as the Batanes group (Ota & Ross, 1994, BPLS-PIU, 2001). Ota & Ross however presumed *P. leucomystax* to be introduced in Batan.

The most widespread amphibian species in the island group is the Giant Marine Toad *Bufo marinus* which local people call the "bullfrog." This species was introduced in the islands to control agricultural pests such as insects and snakes. While the presence of *B. marinus* might have positive benefits in agriculture, it is an alien species and has been known to cause local ecological strains. With its excellent adaptation skills, *B. marinus* survives in a wide range of open-area habitats from near human habitation to forest clearings where they compete with local frogs for resources (Alcala & Brown, 1998).

7 Conservation

This initial survey has revealed that the Babuyan Islands group is a site of outstanding biological importance, with each island possessing unique fauna and habitats. Some of the species identified during this project are important on an international scale because of their threatened or near-threatened conservation status, as described by the 2003 IUCN Red List. These species, and the habitats in which they were observed, require further study and the implementation of conservation measures as a matter of priority as described in Section 7.1.

7.1 Threatened and Near-threatened Species

Within the island group, this project has identified thirteen important terrestrial species of globally threatened or near-threatened status. The identified species, their habitats (based on records and information from interviews), together with known or observed local threats, are shown in Table 7.1 and subsequently described in detail.

Table 7.1 Important species, their habitats and local threats to these species.

Important species	Habitats	Local Threats
1. Calayan Rail *Gallirallus calayanensis* (T)	Primary & secondary lowland forest on coralline limestone in Calayan	Introduced species, accidental capture, habitat loss.
2. Philippine Duck *Anas luzonica* (T)	Ricefields in Dalupiri	Possibly hunted.
3. Whistling Green-Pigeon *Treron formosae* (NT)	Lowland forest in Camiguin, Babuyan Claro, Pamoctan, Calayan, Dalupiri	Babuyan Claro, Camiguin & Calayan: heavy hunting pressure -preferred species of hunters, habitat loss. Pamoctan: hunting pressure low.
4. Ryukyu Scops-Owl *Otus elegans* (NT)	Lowland forest in Camiguin, Pamoctan, Calayan, and Babuyan Claro	Habitat loss.
5. Short-crested Monarch *Hypothymis helenae* (NT)	Lowland, sub-montane forest in Camiguin	Habitat loss. Not hunted.
6. Malaysian Plover *Charadrius peronii* (NT)	Isolated sandy beaches in Calayan, Dalupiri	Human encroachment on habitat.
7. Ryukyu Flying Fox *Pteropus dasymallus* (T)	Primary lowland forest in Babuyan Claro	Heavy hunting pressure.
8. Philippine Warty Pig *Sus philippensis* (T)	Lowland forest in Camiguin, Babuyan Claro, Calayan	Hunted in Camiguin, Babuyan Claro and Calayan, hybridization.
9. Common Bent-winged Bat *Miniopterus schreibersi* (NT)	Lowland forest in Dalupiri	Possible habitat loss due to disturbance of roosting sites.
10. Yellow-faced Horseshoe Bat *Rhinolophus virgo* (NT)	Primary lowland forest in Calayan, Babuyan Claro	Possible habitat loss due to disturbance of roosting sites.
11. Unidentified Monitor Lizard *Varanus* sp. (T)	Lowland, sub-montane forest in Camiguin	Not hunted.
12. Unidentified Crocodile *Crocodylus* sp. (T)	Gully forest in Dalupiri	Not hunted.
13. McGregor's Pit Viper *Trimeresurus mcgregori* (T)	Lowland forest in Camiguin, Babuyan Claro & Calayan	Habitat loss, human attacks

Legend: T: Threatened, NT: Near-threatened

The conservation status for each species is taken from the 2003 IUCN Red List Database unless otherwise specified. Where sufficient data is available for an assessment of threat status, the

IUCN uses the following classifications – Critically Endangered, Endangered, Vulnerable, Near-threatened and Least Concern – in descending order of threat level. Species that fall under the first three categories are called "Threatened" species. "Near-threatened" species are those that almost fit one of the threatened categories or are likely to be threatened in the near future.

1. Calayan Rail *Gallirallus calayanensis* (Allen *et al.*, 2004)
Range: Calayan Island, Philippines - Endemic
Conservation status: Threatened (Vulnerable-Allen *et al.*, 2004) – restricted-range

A group of unfamiliar rails with dark-colored bodies and red-orange bill and legs was spotted in Longog, Calayan on 11 May. A specimen of the bird was taken along with video footage, photographs and recordings of its calls. After comparison of the specimen with known rail species and discussion with experts, it was determined to be an undescribed bird species.

Description
The body and head of the Calayan Rail are generally dark olive or blackish; the chin is white; the tail is short and blackish-brown. There are four, irregular, cream-colored narrow bars and some spots on the blackish-brown underwing coverts. The feet and legs are orange-red; the bill is scarlet grading to orange. The eye has an orange iris.

Behavior
Single individuals were recorded most frequently, but occasionally small groups of four to five individuals were observed. Some birds tolerated observers within 1 meter without alarm. However, others appeared to be shy, giving alarm calls before quickly running into the undergrowth. The rails foraged by pecking at the ground, sometimes turning leaves over with a sideways motion of the bill and head. Since none of the individuals were seen flying, and examination of the holotype showed a reduced sternum and pectoral muscles, the rails are believed to be flightless, or nearly so.

Diet
Fragments of snails, beetles and millipedes were identified during examination of the stomach contents of a sub-adult female, indicating that the rail feeds on various small invertebrates.

Habitat and Distribution
Calayan Rails were found in both primary and secondary forest on coralline limestone characterized by caves, sink-holes and small streams. The species was also seen in recent secondary forest with low undergrowth, close to cultivated clearings. Sightings were often made near streams, but it is not known to what extent the streams are a significant feature of the rails' habitat.

Very little is known about the distribution of the Calayan Rail outside the study area of Longog, Calayan. Individuals were recorded on, or close to, two main trails from the camp, encompassing an area of approximately 2 km^2. Extrapolating the frequency of sightings indicates there may be one pair to every 1-2 hectares, resulting in a total of approximately 100-200 pairs in the survey area. Interviews with local people revealed that the rail is unknown on any of the three other islands visited during the project.

The Calayan Rail is not hunted by local residents. However, they are occasionally caught in snare traps set for other species, in which instance they are eaten. Introduced species to the island such as cats, dogs and rats may pose a threat to the species.

2. Philippine Duck *Anas luzonica*
Range: Found throughout the Philippines, vagrants have been recorded in Taiwan and Japan - Endemic
Conservation status: Threatened (Vulnerable)

Philippine Ducks were observed in the ricefields of Caucauayan in Dalupiri, the northernmost island in the Philippines where it has been recorded. At most four individuals were seen at any one time. It is not clear whether these ducks are breeding in suitable ricefields in Dalupiri. They are possibly hunted by local residents.

3. Whistling Green-Pigeon *Treron formosae*
Range: Ryukyu islands in Japan, Lan Yu and mainland Taiwan, Batanes and Babuyan Islands in the Philippines
Conservation status: Near-threatened/restricted-range

The Whistling Green Pigeon has been recorded as uncommon and local in the Batanes Islands and rare in Taiwan, and, although common in the Nansei Shoto islands of Japan (Dickinson *et al.*, 1991), it is listed in the 2003 IUCN Red List as being 'near-threatened'. The Philippines holds the endemic subspecies *T. f. filipina*. It was found to be uncommon on both Camiguin and Calayan during the study. Although not previously recorded on Babuyan Claro and Dalupiri, they are present in these islands from October to February during the northeast monsoon season, according to local residents. The Whistling Green-Pigeon was found to be abundant on the tiny island of Pamoctan with as many as 31 individuals recorded on this island in one morning in April. Large numbers of the pigeons were again recorded when the island was re-visited at the end of May. Based on the frequency of sightings, there could be 400-500 individuals on the 50 hectares of forested hills of Pamoctan. An abundance of fruiting fig trees could account for the high numbers of these pigeons on the island. There were not as many fruiting fig trees at Limandok and Kauringan in Camiguin during the same time. The large numbers of Whistling Green-Pigeons recorded on Pamoctan during this expedition indicate that the island may hold a significant proportion of the Philippine population.

Whistling Green-Pigeons have been reported to breed from March until June (Kennedy *et al.*, 2000). Records of the species on Camiguin, Pamoctan and Calayan during April and May thus indicate the presence of breeding populations on these islands. These populations together with those from Batan may visit Babuyan Claro and Dalupiri when trees are fruiting.

Hunting exerts the highest pressure on this species. The Whistling Green-Pigeon consistently ranked among the top three birds hunted by local residents in Camiguin, Babuyan Claro and Calayan. It is preferred for its good taste, according to respondents. On the privately-owned island of Pamoctan, hunting pressure is low. The species is also threatened by habitat loss due to slash and burn farming on Camiguin, Calayan, and Babuyan Claro.

4. Ryukyu Scops-Owl *Otus elegans*
Range: Ryukyu islands in Japan, Borodino, Lan Yu in Taiwan, Batanes and Babuyan Islands in the Philippines
Conservation status: Near-threatened/restricted-range

The Ryukyu Scops-Owl is fairly common in the Ryukyus and Lan Yu. The subspecies *O. e. calayensis* is endemic to the islands of Calayan and Batan in the Philippines. In this study it was recorded on Calayan, Camiguin and Pamoctan but interviews indicate that this species is present in Babuyan Claro. They seemed fairly common in the study site at Longog, where their calls were commonly heard at night-time and two individuals were netted. Since this species relies on trees with large enough cavities to nest in (Severinghaus & Rothery, 2001), habitat loss due to logging and slash and burn farming is a threat to this species.

5. Short-crested Monarch *Hypothymis helenae*
Range: Found throughout eastern Philippines in Camiguin, Luzon, Polillo, Catanduanes, Samar, Dinagat, Siargao and eastern Mindanao – Endemic
Conservation status: Near-threatened

While believed to be rare in large islands such as Luzon, the Short-crested Monarch is more common in small islands such as Camiguin. The endemic subspecies *H. h. personata* was recorded in Camiguin in lowland and sub-montane forest. In this study, observations of this species were under-reported because one of its call variations was not recognized by the team. Thus, the estimate of relative abundance showing the species to be uncommon may under-represent their true status. This species is threatened by habitat loss due to illegal logging and slash and burn farming.

On April 8, a cup-shaped nest about 4 cm in diameter and 4 cm high was found on a fork of a small tree just over 1 meter above the ground near the Limandok site. The nest was made of fine roots sewn together with cobwebs. A female bird was seen sitting on the nest pushing its body against the nest's inner wall while a male was perched beside it. The male was observed wiping its beak on the edge of the nest. The birds appeared to be building the nest.

6. Malaysian Plover *Charadrius peronii*
Range: Malay Peninsula, Indonesia and the Philippines
Conservation status: Near-threatened

The Malaysian Plover was recorded on Calayan and Dalupiri on isolated sandy beaches – the typical habitat of these birds. The species may also be present in Camiguin where there are undisturbed sandy beaches. The introduction of predators such as dogs and cats in their natural habitat are possibly the biggest threat to the survival of these birds in the islands. Pairs appear to be common on suitable beaches on the island of Dalupiri, where cats and dogs are banned.

7. Ryukyu Flying Fox *Pteropus dasymallus*
Range: Ryukyu islands in Japan, Taiwan, Batanes and Babuyan Islands in the Philippines
Conservation status: Threatened (Endangered)

The Ryukyu Flying Fox was reported to be common on Batan in the Batanes group and Fuga and Dalupiri in the Babuyan group more than a decade ago. The Philippine population is believed to be the largest of the species (Heaney *et al.*, 1998). This study established the presence of the Ryukyu Flying Fox in Babuyan Claro but failed to record it in Dalupiri although we believe it to be present on the island based on historical records and interviews with locals. This species faces a substantial threat from hunting on Babuyan Claro, where it is a favored delicacy among locals. However, it does not appear to be hunted in Dalupiri because of the lack of airguns in the community. Given the apparently small remaining local population and the high level of threat, urgent conservation measures are required to ensure the survival of this species.

8. Philippine Warty Pig *Sus philippensis*
Range: Found throughout the Philippines – Endemic
Conservation status: Threatened (Vulnerable)

The Philippine Warty Pig has been heavily hunted in recent years, so that it is now common only in remote forests. The lower jaws of wild pigs collected from hunters from Camiguin, Babuyan Claro and Calayan are likely to be from this species. According to local hunters, pig populations in these islands have declined due to hunting but they still occur in limited areas such as May-muh-muh in Babuyan Claro and Cabudaddan in Calayan. Its reported hybridization with domesticated pigs is also a threat.

9. Common Bent-winged Bat *Miniopterus schreibersi*
Range: Europe to the Solomon Islands, throughout the Philippines
Conservation status: Near-threatened

The Common Bent-winged Bat has only been recorded on the island of Dalupiri in the Babuyan region. In this project, a colony of approximately 600 adults and 200 young was found roosting in a cave in Dalupiri. The habitat of these insect-eating bats may be disturbed when residents collect bat droppings from their cave dwellings to use as fertilizer.

10. Yellow-faced Horseshoe Bat *Rhinolophus virgo*
Range: Found throughout the Philippines – Endemic
Conservation status: Near-threatened

The endemic Yellow-faced Horseshoe Bat was found in an abandoned gold mine in Babuyan Claro and in a cave in Calayan. Disturbance of the roosting area in caves is a threat to the species. Some residents collect stalactites and stalagmites from these caves.

11. Monitor Lizard *Varanus* sp.
Range: Camiguin Island, Philippines – Endemic
Conservation status: Threatened

The project found evidence of the presence of a fruit-eating monitor lizard in lowland and sub-montane forests of Camiguin (see Section 6.1). Although the species identity has not been confirmed, this is an important finding since fruit-eating monitor lizards occur only in the Philippines and the species is likely to be threatened. One of the two known species, *Varanus olivaceus*, is listed as "Vulnerable" in the 2003 IUCN Red List. Although apparently not hunted

in Camiguin, frugivorous monitor lizards are very sensitive to forest degradation and fragmentation (Bennett & Hampson, 2003).

12. Crocodile *Crocodylus* sp.
Range: Philippines
Conservation status: Possibly Threatened

An unidentified crocodile was sighted in the north-western area of Dalupiri, covered mainly by pastureland with a network of streams and rivers surrounded by gully, or riverine, forest (see Sectin 6.1). These patches of unusual riverine forest are vital to the survival of this small population of crocodiles. Although the species identity has not been confirmed, it is believed the crocodile sighted was the critically- endangered Philippine Crocodile *Crocodylus mindorensis*, yet it is possible it may be the Salt-water Crocodile *C. porosus*. This species was removed from the IUCN Red List of threatened species in 1996 since populations of this species have recovered in Australia. However, the Philippine populations in the wild presumably remain rare and continue to decline.

According to residents, crocodiles were hunted by skin traders decades ago but this stopped after crocodile numbers were drastically reduced. Presently, local people do not hunt the crocodiles and there seems to be no pressure from human encroachment of crocodile habitat since the building of settlements is strictly controlled by owners of the island. The apparently small local population of crocodiles in the island may make it vulnerable to other threats, such as disease. Further studies are required to confirm the identity of the crocodiles in Dalupiri and assess the viability of the population for survival on the island.

13. McGregor's Pit Viper *Trimeresurus mcgregori*
Range: Batan Island, Philippines – Endemic
Conservation status: Threatened

Previously, McGregor's Pit Viper has only been recorded on Batan Island in the Batanes region. It has recently been recognized as a distinct species from the Philippine Pit Viper *Trimeresurus flavomaculatus.* In this report, the species is considered 'threatened' as a precautionary measure because of its limited range. One individual was seen on Camiguin and a further individual was captured on Calayan. The snake was released after biometric details had been collected. Threats to this species include habitat loss and mortality from human attacks.

7.2 Habitats for priority conservation

Some species and habitats are more threatened than others and there is limited people, money and time to implement conservation measures to preserve them all simultaneously. Thus there is a need to prioritize habitats and species for conservation action.

Some of the habitats that hold the globally-threatened species discussed in the preceding section require conservation measures to be implemented urgently. In order to indicate the scale of urgency, a matrix has been designed based on the importance of the species present and the level of local threat, as explained below.

An evaluation of the importance of each habitat type on each island (Table 7.3) has been made based on: (1) the number of globally important species present, and (2) the level of local threat to these species and their habitats.

For each habitat type the following scales of global importance have been assigned: Low – habitats with no threatened species, High – habitats with one or two threatened species, and Very high – habitats with 3 or more threatened species. Local threats to the species and habitats listed in Section 7.1 were assessed and levels of Low, Moderate or High assigned. Based on these two variables, we have assigned conservation priority levels according to Table 7.2. We have aimed to strike a balance between the level of local threat and the global perspective as recommended by Sutherland (2000) and in this case, have assumed that the level of local threat is the most significant factor. Priority habitats and the corresponding scale of global importance, scale of local threat and conservation priority are shown in Table 7.3.

Table 7.2 Evaluation of conservation priority for habitats

Scale of Local threats	Scale of habitat global importance		
	Low	*High*	*Very high*
Low	Low	Low	Low
Moderate	High	High	Very high
High	High	Very high	Very high

Table 7.3 Habitats and their level of conservation priority

Habitat	Scale of habitat global importance	Scale of local threats	Conservation Priority
Camiguin			
Lowland forest	Very High (3 T, 3 NT)	Moderate	Very high
Sub-montane forest	High (1 T, 1 NT)	Moderate	High
Pamoctan			
Lowland forest	Low (2 NT)	Low	Low
Babuyan Claro			
Lowland forest	Very High (3 T, 3 NT)	High	Very high
Calayan			
Lowland forest	Very High (3 T, 3 NT)	Moderate	Very high
Sandy beach	Low (1 NT)	Low	Low
Dalupiri			
Ricefields	High (1 T)	Low	Low
Riverine gully forest	High (1 T)	Moderate	High
Sandy beach	Low (1 NT)	Low	Low
Lowland forest	Low (2 NT)	Low	Low

Legend: T: Threatened, NT: Near-threatened

The analysis shows three habitats of very high priority for conservation. They are the lowland forests in Camiguin, Babuyan Claro and Calayan. The threatened species on Camiguin are the Philippine Warty Pig, McGregor's Pit Viper and the unidentified frugivorous monitor lizard. On Babuyan Claro, the Ryukyu Flying Fox, Philippine Warty Pig and McGregor's Pit Viper are of interest for conservation. On Calayan, conservation measures need to address threats to the endemic Calayan Rail, Philippine Warty Pig, and McGregor's Pit Viper. In particular, we would urge that the coralline limestone forest area around Longog, Calayan is given immediate protection to safeguard the habitat of the recently discovered Calayan Rail.

Lowland forests are very important habitats because they usually hold the most number of wildlife, including plants and invertebrates. Protecting them in Camiguin, Babuyan Claro and Calayan could also protect other less-studied forms of life.

The evaluation above was based on available scientific information on the species and their habitats. Priorities need to be re-evaluated as more knowledge of the species is gained or new threats arise. It is advisable for the local government, in consultation with other stakeholders in the area, to formulate management plans and make decisions as to the preferred conservation measures, their implementation and the areas to be protected.

7.3 Current threats

As discussed in previous sections, immediate threats to the wildlife and habitats in the Babuyan Islands include habitat loss and direct hunting of animals in selected locations. These threats are further discussed below.

Illegal logging remains a severe problem throughout the Philippines in spite of legislation to control the practice. In the Babuyan Islands, problems arise through people from the mainland trading in logs taken from the islands, in particular, from Camiguin. Intervention at a national level is required to enable local government authorities to enforce regulation of this trade. Small scale timber felling for local use is necessary on Camiguin, Babuyan Claro and Calayan and is sustainable over the long term at present population levels. However, it is necessary to control the areas in which this can take place and to facilitate enforcement of current legislation by local authorities.

Slash and burn farming (*kaingin*) is practiced in the islands of Camiguin, Babuyan Claro, and Calayan. In spite of local government concern and legislation controlling *kaingin*, this type of farming is practiced illegally in many areas, regularly destroying forest habitats and putting species at risk. There is a need to find sustainable ways of agriculture that do not destroy the ability of the land to renew itself.

Hunting pressure is heavy in many areas, particularly since the introduction of airguns about three years ago. Interviews with local residents in Babuyan Claro revealed that most male members of a household hunt, both to gather food and as a sport. In Calayan, where airguns are more widely owned by residents, hunting of wildlife is commonly practiced. Hunting is rampant in Camiguin but the majority of locals use indigenous methods of hunting such as the use of snares. In Dalupiri, only 2-3 people own airguns but indigenous methods of hunting are employed as well. The establishment of conservation guidelines to control hunting of threatened species in priority habitat areas is crucial to safeguarding the future of wildlife in the islands.

The local government is rapidly improving **road networks** in Calayan. This will facilitate movement around the island, but care must be taken to protect the environment at the same time. Aside from possibly cutting across important natural habitats, the building of new roads facilitates the spread of settlements with their associated dogs, cats and rats, which may threaten species such as the Calayan Rail.

Illegal dynamite fishing is regularly practiced in the Babuyan Islands, according to local residents. This highly destructive type of fishing was witnessed by members of the WWF-Philippines team off the island of Fuga during marine surveys in 2003 and was reported to be

practiced in Camiguin during this survey. Although this project focused on the terrestrial fauna, we recognize that illegal fishing is a severe and persistent problem that must be addressed. As the marine habitat is destroyed and food from the sea is depleted, more pressure will be brought to bear on terrestrial habitats as forest is felled to create agricultural land.

7.4 Conservation activities

Local perceptions of conservation
There is a strong awareness of the necessity for conservation by many people in the Babuyan Islands, particularly within local government. For example, ordinances have been passed controlling slash and burn agriculture, illegal fishing practices and preventing the killing of sea turtles. However, local officials need assistance to enforce these ordinances and to initiate education programs explaining the necessity for them.

Some communities have initiated sustainable conservation practices. For instance, residents of Babuyan Claro no longer collect Tabon Scrubfowl *Megapodius cumingii* eggs for food during the months of June and July so that some birds will survive and produce eggs in the future and they no longer hunt the adult birds. They have done this because they perceive numbers to be declining.

Teachers at local schools in Calayan and in Babuyan Claro showed a keen willingness to incorporate conservation activities and awareness of environmental issues in the curriculum. Again, technical assistance would facilitate the process of education.

Educational activities
On each island, the project employed guides to work with the team on a day-to-day basis. They were highly competent and enabled the team to survey sites and habitats efficiently and successfully. They also enabled us to understand local communities and the influences upon them better than would otherwise have been possible. In the limited time available, it was not possible to train the guides to survey wildlife or monitor trends in the environment without assistance and supervision. However, these individuals could potentially form a core group of interested people in any environmental initiative.

As an educational activity, posters on various aspects of conservation donated to the project by Fauna & Flora International, were distributed to barangay officials and local schools in Camiguin Norte, Babuyan Claro, Calayan and Dalupiri.

National involvement
A bill was filed on June 2003 in the Lower House of the Philippine Congress seeking protected area status of the islands of the municipality of Calayan and its surrounding waters under the National Integrated Protected Areas System (NIPAS) Act. Although the proposed protected area does not cover the island of Fuga, it includes most of the islands of the Babuyan group. The Department of Environment and Natural Resources has been involved in surveys as part of the Protected Area Survey Assessment, one of the initial steps in the process of declaration of a protected area under the NIPAS Act. These steps are very positive and they demonstrate the Philippine government's recognition of the region's importance to the nation's biodiversity.

8 Conclusions and Recommendations

The Babuyan Islands – a site of globally important species and habitats
This survey has shown that the Babuyan Islands, despite their small size, are rich in species of wildlife and hold globally important species of birds, mammals, reptiles and amphibians. The islands harbor seven globally threatened and six near-threatened species of terrestrial animals. Ten bird species, two mammal species, eight reptile species and three amphibian species are endemic to the Philippines. In addition, this expedition discovered the previously undescribed Calayan Rail, the first bird species known to be endemic to the island group. Two reptile species are known to be endemic to the Babuyan Islands, and further studies are likely to reveal more such species.

The study demonstrates that each island in the Babuyan group is a small center of endemism where species of wildlife exist that are found nowhere else in the world. These species continue to survive in these islands at present because of the continued presence of their natural habitat. While the Philippines has lost 93% of its forests since 1900 (Ong *et al.*, 2002), islands such as Calayan, Camiguin and Babuyan Claro have retained more than half of their forest cover.

The Babuyan Islands are not only important for the endemic and resident species. The high percentage of migrant birds recorded in this study also highlights the region's importance in providing a suitable and safe passage for transient migratory birds.

Establishment of protected areas
It is in areas where endemic species occur and their natural habitats remain, like the Babuyan Islands, that protected areas or preserves should be situated (Heaney, 1986, 2002). This course of action is highly recommended so that endemic and threatened species will continue to have a secure home in the future. The establishment of such protected areas has international and national importance. Thus current actions by the Philippine government to declare part of the island group a protected area are encouraging. The list of habitats for priority conservation identified in Section 7.2 is recommended as a guide in determining possible locations of protected areas.

Conservation measures
In addition to the designation of protected areas, conservation measures that address specific threats to important species and habitats (see Sections 7.1 and 7.3) will need to be taken. The formulation and implementation of measures to control threats such as illegal logging, slash and burn farming, excessive hunting and illegal fishing, will require human and financial resources as well as an understanding of their possible ecological, social and economic implications. We feel that local conservation initiatives and the clear interest in protecting the environment already demonstrated by people in the Babuyan Islands can be harnessed to produce successful conservation programs. The combination of local knowledge and external resources can be a powerful force in the protection of the wildlife and habitats.

Educational campaigns
The project highly recommends the development of activities that raise awareness of the value of conserving the natural resources of the islands and promoting their sustainable use among

the communities in the Babuyan Islands. In particular, educational programs with schools provide significant returns in wildlife conservation, utilizing the energy and enthusiasm of young people who can influence their family and friends to care for the environment and later a wider circle of people as they enter the adult community.

Further research

Sound conservation measures are based on thorough scientific research. Therefore, this project recommends that research is focused on the following specific areas in the short term as a matter of priority:

- Investigate the status of the population of the Calayan Rail and determine its habitat requirements.
- Conduct more intensive surveys of mammals, reptiles and amphibians in the Babuyan Islands.
- Verify the identity of the small population of crocodiles on Dalupiri and evaluate the species' chances for survival on the island.
- Verify the presence and identity of a fruit-eating monitor lizard on Camiguin Island.

The islands are likely to be an important area for plants and invertebrates as well. We may never know about the other important life forms in the area because of limited resources for research. However, protecting the "flagship species" already identified together with their natural habitats in the islands will protect all the species present, providing them with a safe environment and the possibility to investigate their ecology through further studies.

Multi-stakeholder involvement

Successful conservation work relies on the cooperation of various stakeholders in the community. The involvement of all such stakeholders in the Babuyan Islands is desirable: the municipal government of Calayan, the barangay officials in the islands, the Department of Environment and Natural Resources, the Department of Tourism, the Department of Education, the Philippine National Police, the Philippine Navy, local people's organizations and local individuals working in conservation initiatives.

Support from the international community and non-government organizations (NGO's) will also be crucial. It is envisaged that any conservation program would include WWF-Philippines, who have been working in the Babuyan Islands on the Humpback Whale Research and Conservation Project (HWRCP) since 1999. The conservation of terrestrial resources in the Babuyan Islands complements WWF's work in the area.

Resource Management Plan

It is desirable for the local government to develop a framework for a management plan together with the stakeholders. Without adequate planning, it is unlikely that natural resources will be identified and used sustainably or that the environment can be protected. The management plan should include information such as a listing of the species and habitats, threats to the environment, the requirements of the stakeholders and an action plan for the future.

Summary

This study demonstrated clearly that the Babuyan Islands group is a site of global biological importance and identified species of birds, mammals, reptiles and amphibians of international interest. We recommend the following actions:

1. Establishment of protected areas in important habitats.
2. Development of conservation measures to address threats to species and habitats.
3. Development of community education campaigns.
4. Identification of stakeholders to be involved in planning.
5. Development of a resource management plan.

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Appendix 1. Species list – Camiguin Island

Family	Species	Ilocano Name	Residency Status	Local Utilization	Number of Individuals	Encounter/ Capture Rate	Relative Abundance
BIRDS							
Sulidae	Brown Booby *Sula leucogaster*	-	Resident	-	Recorded	N/A	N/A
Ardeidae	Grey Heron *Ardea cinerea*	*Rat*	Migrant	-	2	0.379	Uncommon
Ardeidae	Great Egret *Ardea alba*	*Lagwak*	Migrant	-	2	0.379	Uncommon
Ardeidae	Intermediate Egret *Egretta intermedia*	*Lagwak*	Migrant	-	10	1.895	Uncommon
Ardeidae	Little Egret *Egretta garzetta*	*Lagwak*	Migrant	-	15	2.843	Uncommon
Ardeidae	Cattle Egret *Bubulcus ibis*	-	Migrant	-	70	13.266	Abundant
Ardeidae	Black-crowned Night-Heron *Nycticorax nycticorax*	-	Resident	-	Recorded	N/A	N/A
Ardeidae	Rufous Night-Heron *Nycticorax caledonicus*	-	Resident	-	Recorded	N/A	N/A
Ardeidae	Schrenck's Bittern *Ixobrychus eurhythmus*	-	Migrant	-	Recorded	N/A	N/A
Ardeidae	Cinnamon Bittern *Ixobrychus cinnamomeus*	-	Resident	-	4	0.758	Uncommon
Pandionidae	Osprey *Pandion haliaetus*	-	Migrant	-	Recorded	N/A	N/A
Accipitridae	White-bellied Sea-Eagle *Haliaeetus leucogaster*	*Kangkang*	Resident	-	3	0.569	Uncommon
Phasianidae	Red Junglefowl *Gallus gallus*	*Abuyo*	Resident	Food	3	0.569	Uncommon
Rallidae	Barred Rail *Gallirallus torquatus*	*Tukling*	Resident	Food	3	0.569	Uncommon
Rallidae	Slaty-legged Crake *Rallina eurizonoides*	*Banatiran*	Resident	-	2	0.379	Uncommon
Rallidae	White-browed Crake *Porzana cinerea*	-	Resident	-	2	0.379	Uncommon
Rallidae	Plain Bush-hen *Amaurornis olivacea*	*Piding*	Resident	-	6	1.137	Uncommon
Rallidae	White-breasted Waterhen *Amaurornis phoenicurus*	*Mangobog*	Resident	-	4	0.758	Uncommon
Rallidae	Watercock *Gallicrex cinerea*	*Tebteb*	Resident	-	Recorded	N/A	N/A
Rallidae	Common Mooorhen *Gallinula chloropus*	*Papa*	Migrant	Food	4	0.758	Uncommon
Charadriidae	Grey-headed Lapwing *Vanellus cinereus*	-	Migrant	-	Recorded	N/A	N/A
Charadriidae	Little Ringed-Plover *Charadrius dubius*	-	Migrant	-	Recorded	N/A	N/A
Scolopacidae	Common Redshank *Tringa tetanus*	-	Migrant	-	1	0.190	Uncommon

Continued on next page

Family	Species	Ilocano Name	Residency Status	Local Utilization	Number of Individuals	Encounter/ Capture Rate	Relative Abundance
Scolopacidae	Wood Sandpiper *Tringa glareola*	-	Migrant	-	1	0.190	Uncommon
Scolopacidae	Common Sandpiper *Actitis hypoleucos*	-	Migrant	-	7	1.327	Uncommon
Scolopacidae	Sharp-tailed Sandpiper *Calidris acuminata*	-	Migrant	-	Recorded	N/A	N/A
Glareolidae	Oriental Pratincole *Glareola maldivarum*	*Kirit*	Migrant	-	Recorded	N/A	N/A
Sternidae	Bridled Tern *Sterna anaethetus*	-	Resident	-	Recorded	N/A	N/A
Sternidae	Sooty Tern *Sterna fuscata*	-	Resident	-	Recorded	N/A	N/A
Columbidae	Whistling Green-Pigeon *Treron formosae*	*Punay*	Resident	Food	7	1.327	Uncommon
Columbidae	Black-chinned Fruit-Dove *Ptilinopus leclancheri*	*Punay/Bwit*	Near-endemic	Food	77	14.593	Abundant
Columbidae	Green Imperial-pigeon *Ducula aenea*	*Bal-og*	Resident	Food	23	4.359	Uncommon
Columbidae	Metallic Pigeon *Columba vitiensis*	-	Resident	Food	10	1.895	Uncommon
Columbidae	Spotted Dove *Streptopelia chinensis*	*Paggaw*	Resident	Food	2	0.379	Uncommon
Columbidae	Zebra Dove *Geopelia striata*	-	Resident	Food	2	0.379	Uncommon
Columbidae	Common Emerald Dove *Chalcophaps indica*	*Alimuken*	Resident	Food	3	0.569	Uncommon
Cuculidae	Common Koel *Eudynamys scolopaceus*	*Tuwaw*	Resident	-	2	0.379	Uncommon
Cuculidae	Lesser Coucal *Centropus bengalensis*	-	Resident	-	Recorded	N/A	N/A
Cuculidae	Philippine Coucal *Centropus viridis*	*Sigakok*	Endemic	-	111	21.036	Abundant
Strigidae	Ryukyu Scops-Owl *Otus elegans*	*Kukuk*	Resident	-	Recorded	N/A	N/A
Strigidae	Brown Hawk-Owl *Ninox scutulata*	*Kukuk*	Migrant	-	2	0.379	Uncommon
Apodidae	Island Swiftlet *Collocalia vanikorensis*	*Salampingaw*	Resident	-	17	3.222	Uncommon
Apodidae	Glossy Swiftlet *Collocalia esculenta*	*Salampingaw*	Resident	-	105	19.899	Abundant
Apodidae	House Swift *Apus nipalensis*	*Salampingaw*	Resident	-	1	0.190	Uncommon
Coraciidae	Dollarbird *Eurystomus orientalis*	*Tagatag*	Resident	Food	Interview	N/A	N/A
Alcedinidae	Common Kingfisher *Alcedo atthis*	-	Migrant	-	2	0.379	Uncommon
Alcedinidae	Ruddy Kingfisher *Halycon coromanda*	-	Migrant	-	1	0.190	Uncommon
Alcedinidae	White-collared Kingfisher *Todirhamphus chloris*	*Tugareng*	Resident	-	6	1.137	Uncommon
Pittidae	Red-bellied Pitta *Pitta erythrogaster*	-	Resident	-	2	0.379	Uncommon
Hirundinidae	Barn Swallow *Hirundo rustica*	*Salampingaw*	Migrant	-	29	5.496	Common
Hirundinidae	Pacific Swallow *Hirundo tahitica*	*Salampingaw*	Resident	-	11	2.085	Uncommon
Hirundinidae	Striated Swallow *Cecropis striolata*	*Salampingaw*	Resident	-	33	6.254	Common

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Family	Species	Ilocano Name	Residency Status	Local Utilization	Number of Individuals	Encounter/ Capture Rate	Relative Abundance
Campephagidae	Pied Triller *Lalage nigra*	-	Resident	-	4	0.758	Uncommon
Pycnonotidae	Chestnut-eared Bulbul *Microscelis amaurotis*	*Samot*	Resident	Food	211	39.987	Abundant
Oriolidae	Black-naped Oriole *Oriolus chinenis*	*Kiaw*	Resident	Food	19	3.601	Uncommon
Paridae	Elegant Tit *Parus elegans*	*Tiktikrobo*	Endemic	-	6	1.137	Uncommon
Turdidae	Blue Rock-Thrush *Monticola solitarius*	-	Migrant	-	Recorded	N/A	N/A
Turdidae	White's Thrush *Zoothera aurea*	*Boklang*	Migrant	Food	Interview	N/A	N/A
Turdidae	Brown-headed Thrush *Turdus chrysolaus*	*Parekpek*	Migrant	Food	Recorded	N/A	N/A
Sylviidae	Zitting Cisticola *Cisticola juncidis*	*Pipiit*	Resident	-	2	0.379	Uncommon
Muscicapidae	Mangrove Blue Flycatcher *Cyornis rufigastra*	-	Resident	-	1	0.190	Uncommon
Muscicapidae	Short-crested Monarch *Hypothymis helenae*	-	Endemic	-	17	3.222	Uncommon
Pachycephalidae	Yellow-bellied Whistler *Pachycephala philippinensis*	-	Endemic	-	120	22.742	Abundant
Motacillidae	Yellow Wagtail *Motacilla flava*	*Kin-kin-od*	Migrant	-	Recorded	N/A	N/A
Motacillidae	Red-throated Pipit *Anthus cervinus*	-	Migrant	-	Recorded	N/A	N/A
Laniidae	Brown Shrike *Lanius cristatus*	*Talal*	Migrant	-	13	2.464	Uncommon
Sturnidae	Asian Glossy Starling *Aplonis panayensis*	*Piyus*	Resident	Pet	44	8.339	Common
Sturnidae	Crested Myna *Acridotheres cristatellus*	*Martines*	Resident	-	106	20.088	Abundant
Nectariniidae	Purple-throated Sunbird *Leptocoma sperata*	*Sawsaw-it*	Resident	-	140	26.532	Abundant
Dicaeidae	Red-keeled Flowerpecker *Dicaeum australe*	-	Endemic	-	4	0.758	Uncommon
Zosteropidae	Yellowish White-Eye *Zosterops nigrorum*	*Titit*	Endemic	-	11	2.085	Uncommon
Ploceidae	Eurasian Tree Sparrow *Passer montanus*	*Bilituleng*	Resident	-	22	4.169	Uncommon
Estrildidae	White-bellied Munia *Lonchura leucogastra*	*Bilituleng*	Resident	-	Recorded	N/A	N/A
MAMMALS							
Pteropodidae	Common Short-nosed Fruit Bat *Cynopterus brachyotis*	*Kurarapnit*	Resident	-	31	10.877	Abundant
Pteropodidae	Unidentified flying fox *Pteropus* sp.	*Paniki*	Resident	Food	Recorded	N/A	N/A
Pteropodidae	Common Rousette *Rousettus amplexicaudatus*	*Kurarapnit*	Resident	-	9	3.158	Uncommon
Muridae	Polynesian Rat *Rattus exulans*	*Ba-o*	Resident	-	Recorded	N/A	N/A
Muridae	Oriental House Rat *Rattus tanezumi*	*Ba-o*	Resident	-	Recorded	N/A	N/A
Viverridae	Unidentified civet cat sp.	*Mutit*	Resident	Food	Interview	N/A	N/A

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Family	Species	Ilocano Name	Residency Status	Local Utilization	Number of Individuals	Encounter/ Capture Rate	Relative Abundance
Suidae	**Philippine Warty Pig** *Sus* cf. *philippensis*	*Alingo*	Endemic	Food	Recorded	N/A	N/A
Balaenopteridae	**Humpback Whale** *Megaptera novaeangliae*	*Balyena*	Migrant	-	Recorded	N/A	N/A
Delphinidae	Rough-toothed Dolphin *Steno bredanensis*	*Lumba-lumba*	-	-	Recorded	N/A	N/A
REPTILES							
Emydidae	Unidentified freshwater turtle sp.	-	Resident	-	Interview	N/A	N/A
Gekkonidae	Philippine Bent-toed Gecko *Cyrtodactylus philippinicus*	-	Endemic	-	Recorded	N/A	N/A
Gekkonidae	Unidentified gecko *Gekko* sp. 1	*Tikka*	Resident	-	Recorded	N/A	N/A
Gekkonidae	Common House Gecko *Hemidactylus frenatus*	*Alibut*	Resident	-	Recorded	N/A	N/A
Agamidae	Unidentified flying lizard *Draco* sp.	*Banagaw*	Resident	-	Recorded	N/A	N/A
Scincidae	Northern Two-striped Mabouya *Mabuya multicarinata borealis*	*Alibut*	Resident	-	Recorded	N/A	N/A
Varanidae	Water Monitor Lizard *Varanus salvator*	*Banyas*	Resident	Food	Recorded	N/A	N/A
Varanidae	Unidentified monitor lizard *Varanus* sp.	*Lupi*	Resident	-	Interview	N/A	N/A
Boidae	Reticulated Python *Python reticulatus*	*Beklat*	Resident	-	Interview	N/A	N/A
Colubridae	Philippine Vine Snake *Ahaetulla prasina preocularis*	*Maraubot*	Resident	-	Recorded	N/A	N/A
Colubridae	Northern Triangle-spotted Snake *Cyclocorus lineatus*	-	Resident	-	Recorded	N/A	N/A
Colubridae	Alcala's Wolf Snake *Lycodon alcalai*	-	Endemic	-	Recorded	N/A	N/A
Colubridae	Northern Water Snake *Rhabdophis spilogaster*	-	Endemic	-	Recorded	N/A	N/A
Elapidae	Unidentified cobra *Naja* sp.	*Karasaen*	Resident	-	Interview	N/A	N/A
Viperidae	Philippine Pit Viper *Trimeresurus flavomaculatus flavomaculatus*	*Ipel/Barten*	Endemic	-	Recorded	N/A	N/A
Viperidae	**McGregor's Pit Viper** *Trimeresurus mcgregori*	*Tumukak*	Endemic	-	Recorded	N/A	N/A
AMPHIBIANS							
Bufonidae	Giant Marine Toad *Bufo marinus*	*Bullfrog*	Introduced	-	Recorded	N/A	N/A
Ranidae	Giant Philippine Frog *Limnonectes macrocephalus*	*Tukak*	Endemic	Food	Recorded	N/A	N/A
Ranidae	Woodworth's Frog *Limnonectes woodworthi*	*Tukak*	Endemic	Food	Recorded	N/A	N/A
Ranidae	Forest Frog *Platymantis* sp. 1	*Tukak*	Resident	-	Recorded	N/A	N/A
Ranidae	Forest Frog *Platymantis* sp. 2	*Tukak*	Resident	-	Recorded	N/A	N/A
Rhacophoridae	Common Tree Frog *Polypedates leucomystax*	*Tukak*	Resident	-	Recorded	N/A	N/A

Appendix 2. Species list – Pamoctan Island

Family	Species	Ilocano Name	Residency Status	Local Utilization	Number of Individuals	Encounter/ Capture Rate	Relative Abundance
BIRDS							
Ardeidae	Great Egret *Ardea alba*	*Lagwak*	Migrant	-	2	1.304	Uncommon
Ardeidae	Eastern Reef-Egret *Egretta sacra*	*Kanaway*	Resident	-	1	0.652	Uncommon
Ardeidae	Intermediate Egret *Egretta intermedia*	*Lagwak*	Migrant	-	1	0.652	Uncommon
Ardeidae	Little Egret *Egretta garzetta*	*Lagwak*	Migrant	-	2	1.304	Uncommon
Accipitridae	White-bellied Sea-Eagle *Haliaeetus leucogaster*	*Kangkang*	Resident	-	3	1.957	Uncommon
Accipitridae	Japanese Sparrowhawk *Accipiter gularis*	-	Migrant	-	1	0.652	Uncommon
Falconidae	Peregrine Falcon *Falco peregrinus*	-	Migrant	-	1	0.652	Uncommon
Megapodiidae	Tabon Scrubfowl *Megapodius cumingii*	*Ukong*	Resident	Food	3	1.957	Uncommon
Rallidae	Slaty-legged Crake *Rallina eurizonoides*	*Banatiran*	Resident	-	1	0.652	Uncommon
Rallidae	White-breasted Waterhen *Amaurornis phoenicurus*	*Mangobog*	Resident	-	2	1.304	Uncommon
Rallidae	Common Mooorhen *Gallinula chloropus*	*Papa*	Migrant	-	2	1.304	Uncommon
Columbidae	Whistling Green-Pigeon *Treron formosae*	*Punay*	Resident	Food	90	58.696	Abundant
Columbidae	Black-chinned Fruit-Dove *Ptilinopus leclancheri*	*Punay/Bwit*	Near-endemic	Food	22	14.348	Abundant
Columbidae	Metallic Pigeon *Columba vitiensis*	-	Resident	Food	21	13.696	Abundant
Columbidae	Common Emerald Dove *Chalcophaps indica*	*Alimuken*	Resident	Food	7	4.565	Uncommon
Cuculidae	Common Koel *Eudynamys scolopaceus*	*Tuwaw*	Resident	-	1	0.652	Uncommon
Cuculidae	Philippine Coucal *Centropus viridis*	*Sigakok*	Endemic	-	16	10.435	Abundant
Strigidae	Ryukyu Scops-Owl *Otus elegans*	*Kukuk*	Resident	-	Recorded	N/A	N/A
Apodidae	Glossy Swiftlet *Collocalia esculenta*	*Salampingaw*	Resident	-	2	1.304	Uncommon
Apodidae	Pygmy Swiftlet *Collocalia troglodytes*	*Salampingaw*	Endemic	-	20	13.043	Abundant
Apodidae	Fork-tailed Swift *Apus pacificus*	*Salampingaw*	Resident	-	3	1.957	Uncommon
Alcedinidae	Common Kingfisher *Alcedo atthis*	-	Migrant	-	2	1.304	Uncommon
Alcedinidae	White-collared Kingfisher *Todirhamphus chloris*	*Tugareng*	Resident	-	17	11.087	Abundant
Hirundinidae	Barn Swallow *Hirundo rustica*	*Salampingaw*	Migrant	-	17	11.087	Abundant

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Family	Species	Ilocano Name	Residency Status	Local Utilization	Number of Individuals	Encounter/ Capture Rate	Relative Abundance
Hirundinidae	Pacific Swallow *Hirundo tahitica*	*Salampingaw*	Resident	-	6	3.913	Uncommon
Hirundinidae	Striated Swallow *Cecropis striolata*	*Salampingaw*	Resident	-	32	20.870	Abundant
Campephagidae	Pied Triller *Lalage nigra*	-	Resident	-	13	8.478	Common
Pycnonotidae	Chestnut-eared Bulbul *Microscelis amaurotis*	*Samot*	Resident	-	96	62.609	Abundant
Oriolidae	Black-naped Oriole *Oriolus chinenis*	*Kiaw*	Resident	-	31	20.217	Abundant
Turdidae	Brown-headed Thrush *Turdus chrysolaus*	*Parekpek*	Migrant	-	2	1.304	Uncommon
Muscicapidae	Mangrove Blue Flycatcher *Cyornis rufigastra*	-	Resident	-	10	6.522	Common
Pachycephalidae	Yellow-bellied Whistler *Pachycephala philippinensis*	-	Endemic	-	7	4.565	Uncommon
Laniidae	Brown Shrike *Lanius cristatus*	*Talal*	Migrant	-	12	7.826	Common
Sturnidae	Asian Glossy Starling *Aplonis panayensis*	*Piyus*	Resident	-	48	31.304	Abundant
Sturnidae	Crested Myna *Acridotheres cristatellus*	*Martines*	Resident	-	59	38.478	Abundant
Zosteropidae	Yellowish White-Eye *Zosterops nigrorum*	*Titit*	Endemic	-	18	11.739	Abundant
MAMMALS							
Pteropodidae	Unidentified flying fox *Pteropus* sp.	*Paniki*	Resident	Food	Recorded	N/A	N/A
Pteropodidae	Common Rousette *Rousettus amplexicaudatus*	*Kurarapnit*	Resident	-	1	4.167	Uncommon
Muridae	Unidentified rat *Rattus* sp.	*Ba-o*	Resident	-	Interview	N/A	N/A
REPTILES							
Gekkonidae	Unidentified gecko *Gekko* sp. 1	*Tikka*	Resident	-	Recorded	N/A	N/A
Gekkonidae	Common House Gecko *Hemidactylus frenatus*	*Alibut*	Resident	-	Recorded	N/A	N/A
Scincidae	Northern Two-striped Mabouya *Mabuya multicarinata borealis*	*Alibut*	Resident	-	Recorded	N/A	N/A
Varanidae	Water Monitor Lizard *Varanus salvator*	*Banyas*	Resident	Food	Recorded	N/A	N/A
Boidae	Reticulated Python *Python reticulatus*	*Beklat*	Resident	-	Interview	N/A	N/A
AMPHIBIAN							
Ranidae	Giant Philippine Frog *Limnonectes macrocephalus*	*Tukak*	Endemic	-	Recorded	N/A	N/A

Appendix 3. Species list – Babuyan Claro Island

Family	Species	Ivatan Name	Status	Local Utilization	Number of Individuals	Encounter/ Capture Rate	Relative Abundance
BIRDS							
Procellariidae	Unidentified petrel sp.	-	Migrant	-	Recorded	N/A	N/A
Sulidae	Brown Booby *Sula leucogaster*	-	Resident	-	Recorded	N/A	N/A
Ardeidae	Grey Heron *Ardea cinerea*	*Bahugo*	Migrant	Food	Recorded	N/A	N/A
Ardeidae	Great Egret *Ardea alba*	*Lagwak*	Migrant	Food	2	0.349	Uncommon
Ardeidae	Intermediate Egret *Egretta intermedia*	*Lagwak*	Migrant	Food	6	1.048	Uncommon
Ardeidae	Little Egret *Egretta garzetta*	*Lagwak*	Migrant	Food	14	2.445	Uncommon
Ardeidae	Chinese Pond-Heron *Ardeola bacchus*	-	Migrant	Food	2	0.349	Uncommon
Ardeidae	Cattle Egret *Bubulcus ibis*	-	Migrant	Food	39	6.810	Common
Ardeidae	Black-crowned Night-Heron *Nycticorax nycticorax*	-	Resident	Food	2	0.349	Uncommon
Ardeidae	Yellow Bittern *Ixobrychus sinensis*	*Ananaw*	Resident	Food	1	0.175	Uncommon
Accipitridae	White-bellied Sea-Eagle *Haliaeetus leucogaster*	*Kangkang*	Resident	Pet	2	0.349	Uncommon
Accipitridae	Chinese Goshawk *Accipiter soloensis*	*Nyipas*	Migrant	-	Recorded	N/A	N/A
Accipitridae	Grey-faced Buzzard *Butastur indicus*	*Tigwik*	Migrant	-	Recorded	N/A	N/A
Megapodiidae	Tabon Scrubfowl *Megapodius cumingii*	*Ukong*	Resident	Food	4	0.698	Uncommon
Rallidae	Barred Rail *Gallirallus torquatus*	*Rukdi*	Resident	Food	4	0.698	Uncommon
Rallidae	Slaty-legged Crake *Rallina eurizonoides*	*Mabakes*	Resident	Food	1	0.175	Uncommon
Rallidae	Plain Bush-hen *Amaurornis olivacea*	*Allan*	Resident	Food	1	0.175	Uncommon
Rallidae	White-breasted Waterhen *Amaurornis phoenicurus*	*Dayanak*	Resident	Food	1	0.175	Uncommon
Rallidae	Common Mooorhen *Gallinula chloropus*	*Lachit*	Migrant	Food	Interview	N/A	N/A
Charadriidae	Asian Golden-Plover *Pluvialis fulva*	*Taddang*	Migrant	-	8	1.397	Uncommon
Charadriidae	Kentish Plover *Charadrius alexandrinus*	*Taddang*	Migrant	-	1	0.175	Uncommon
Charadriidae	Lesser Sand Plover *Charadrius mongolus*	*Taddang*	Migrant	-	9	1.572	Uncommon
Charadriidae	Greater Sand Plover *Charadrius leschenaultii*	*Taddang*	Migrant	-	3	0.524	Uncommon
Scolopacidae	Black-tailed Godwit *Limosa limosa*	-	Migrant	-	2	0.349	Uncommon
Scolopacidae	Common Greenshank *Tringa nebularia*	*Taddang*	Migrant	-	2	0.349	Uncommon

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Family	Species	Ivatan Name	Status	Local Utilization	Number of Individuals	Encounter/ Capture Rate	Relative Abundance
Scolopacidae	Green Sandpiper *Tringa ochropus*	*Taddang*	Migrant	-	1	0.175	Uncommon
Scolopacidae	Wood Sandpiper *Tringa glareola*	*Taddang*	Migrant	-	7	1.222	Uncommon
Scolopacidae	Marsh Sandpiper *Tringa stagnatilis*	*Taddang*	Migrant	-	1	0.175	Uncommon
Scolopacidae	Common Sandpiper *Actitis hypoleucos*	*Taddang*	Migrant	-	5	0.873	Uncommon
Scolopacidae	Terek Sandpiper *Xenus cinereus*	*Taddang*	Migrant	-	Recorded	N/A	N/A
Scolopacidae	Ruddy Turnstone *Arenaria interpres*	-	Migrant	-	2	0.349	Uncommon
Scolopacidae	Pintail Snipe *Gallinago stenura*	-	Migrant	-	Recorded	N/A	N/A
Scolopacidae	Bukidnon Woodcock *Scolopax bukidnonensis*	*Tabanatuk*	Endemic	-	Recorded	N/A	N/A
Scolopacidae	Unidentified woodcock *Scolopax* sp.	-	Migrant	-	Recorded	N/A	N/A
Scolopacidae	Rufous-necked Stint *Calidris ruficollis*	*Taddang*	Migrant	-	1	0.175	Uncommon
Scolopacidae	Long-toed Stint *Calidris subminuta*	*Taddang*	Migrant	-	Recorded	N/A	N/A
Scolopacidae	Sharp-tailed Sandpiper *Calidris acuminata*	*Taddang*	Migrant	-	3	0.524	Uncommon
Scolopacidae	Curlew Sandpiper *Calidris ferruginea*	*Taddang*	Migrant	-	2	0.349	Uncommon
Glareolidae	Oriental Pratincole *Glareola maldivarum*	-	Migrant	-	3	0.524	Uncommon
Sternidae	Common Tern *Sterna hirundo*	*Arayo/Sipayot*	Migrant	-	Recorded	N/A	N/A
Sternidae	Bridled Tern *Sterna anaethetus*	*Arayo/Sipayot*	Resident	-	Recorded	N/A	N/A
Columbidae	Whistling Green-Pigeon *Treron formosae*	*Segunda*	Resident	Food	Interview	N/A	N/A
Columbidae	Black-chinned Fruit-Dove *Ptilinopus leclancheri*	*Talumiran*	Near-endemic	Food	2	0.349	Uncommon
Columbidae	Green Imperial-pigeon *Ducula aenea*	*Wag-em*	Resident	Food	8	1.397	Uncommon
Columbidae	Philippine Cuckoo-Dove *Macropygia tenuirostris*	*Ibwaw*	Near-endemic	Food	1	0.175	Uncommon
Columbidae	Spotted Dove *Streptopelia chinensis*	-	Resident	Food	Recorded	N/A	N/A
Columbidae	Common Emerald Dove *Chalcophaps indica*	*Badog*	Resident	Food	5	0.873	Uncommon
Cuculidae	Common Koel *Eudynamys scolopaceus*	*Pahaw*	Resident	Food	22	3.842	Uncommon
Cuculidae	Philippine Coucal *Centropus viridis*	*Sigakok*	Endemic	-	4	0.698	Uncommon
Cuculidae	Unidentified cuckoo sp.	-	-	-	Recorded	N/A	N/A
Strigidae	Ryukyu Scops-Owl *Otus elegans*	*Tutuho*	Resident	-	Interview	N/A	N/A
Strigidae	Brown Hawk-Owl *Ninox scutulata*	*Gukguk*	Migrant	-	Interview	N/A	N/A
Caprimulgidae	Unidentified nightjar sp.	-	-	-	Interview	N/A	N/A
Apodidae	Glossy Swiftlet *Collocalia esculenta*	*Haphapnyit*	Resident	-	7	1.222	Uncommon

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Family	Species	Ivatan Name	Status	Local Utilization	Number of Individuals	Encounter/ Capture Rate	Relative Abundance
Coraciidae	Dollarbird *Eurystomus orientalis*	*Rituk*	Resident	Food	Interview	N/A	N/A
Alcedinidae	Common Kingfisher *Alcedo atthis*	-	Migrant	-	5	0.873	Uncommon
Alcedinidae	Ruddy Kingfisher *Halycon coromanda*	-	Migrant	Food	Recorded	N/A	N/A
Alcedinidae	White-collared Kingfisher *Todirhamphus chloris*	-	Resident	Food	1	0.175	Uncommon
Upupidae	Hoopoe *Upupa epops*	-	Migrant	-	Interview	N/A	N/A
Hirundinidae	Barn Swallow *Hirundo rustica*	*Haphapnyit*	Migrant	-	3	0.524	Uncommon
Hirundinidae	Pacific Swallow *Hirundo tahitica*	*Haphapnyit*	Resident	-	10	1.746	Uncommon
Hirundinidae	Striated Swallow *Cecropis striolata*	*Haphapnyit*	Resident	-	Recorded	N/A	N/A
Pycnonotidae	Chestnut-eared Bulbul *Microscelis amaurotis*	*Pirpiruka*	Resident	Food	193	33.702	Abundant
Oriolidae	Black-naped Oriole *Oriolus chinenis*	*Muray*	Resident	Food	Interview	N/A	N/A
Corvidae	Large-billed Crow *Corvus macrorhynchos*	*Kak*	Resident	Food	6	1.048	Uncommon
Turdidae	Blue Rock-Thrush *Monticola solitarius*	-	Migrant		1	0.175	Uncommon
Turdidae	White's Thrush *Zoothera aurea*	*Belang*	Migrant	Food	Interview	N/A	N/A
Turdidae	Brown-headed Thrush *Turdus chrysolaus*	*Chichit*	Migrant	Food	Interview	N/A	N/A
Sylviidae	Arctic Warbler *Phylloscopus borealis*	-	Migrant	-	Recorded	N/A	N/A
Muscicapidae	Grey-streaked Flycatcher *Muscicapa griseisticta*	-	Migrant	-	4	0.698	Uncommon
Motacillidae	Grey Wagtail *Motacilla cinerea*	*Papilwad*	Migrant	-	Recorded	N/A	N/A
Motacillidae	Yellow Wagtail *Motacilla flava*	*Papilwad*	Migrant	-	87	15.192	Abundant
Motacillidae	Richard's Pipit *Anthus richardi*	*Sibeg*	Resident	-	3	0.524	Uncommon
Laniidae	Brown Shrike *Lanius cristatus*	*Balichit*	Migrant	Food	12	2.095	Uncommon
Sturnidae	Asian Glossy Starling *Aplonis panayensis*	*Loji*	Resident	Pet	8	1.397	Uncommon
Sturnidae	Crested Myna *Acridotheres cristatellus*	*Martines*	Resident	Food	Recorded	N/A	N/A
Nectariniidae	Purple-throated Sunbird *Leptocoma sperata*	*Bayasbudek*	Resident	-	77	13.446	Abundant
Ploceidae	Eurasian Tree Sparrow *Passer montanus*	-	Resident	-	8	1.397	Uncommon
MAMMALS							
Pteropodidae	Common Short-nosed Fruit Bat *Cynopterus brachyotis*	*Pulpulnyit*	Resident	-	89	15.136	Abundant
Pteropodidae	**Ryukyu Flying Fox** *Pteropus dasymallus*	*Panichi*	Resident	Food	3	0.510	Uncommon
Rhinolophidae	Yellow-faced Horseshoe Bat *Rhinolophus virgo*	*Pulpulnyit*	Endemic	-	Recorded	N/A	N/A

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Family	Species	Ivatan Name	Status	Local Utilization	Number of Individuals	Encounter/ Capture Rate	Relative Abundance
Muridae	Common Philippine Forest Rat *Rattus everetti*	*Karam*	Endemic	-	Recorded	N/A	N/A
Muridae	Unidentified rat *Rattus* sp.	*Karam*	Resident	-	Interview	N/A	N/A
Viverridae	Unidentified civet cat sp.	-	Resident	Food	Interview	N/A	N/A
Suidae	**Philippine Warty Pig** *Sus* cf. *philippensis*	*Bulaw*	Endemic	Food	Recorded	N/A	N/A
REPTILES							
Chelonidae	**Green Turtle** *Chelonia mydas*	-	-	Food/Trade	Interview	N/A	N/A
Chelonidae	**Hawksbill Turtle** *Eretmochelys imbricata*	-	-	Food/Trade	Interview	N/A	N/A
Gekkonidae	Philippine Bent-toed Gecko *Cyrtodactylus philippinicus*	-	Endemic	-	Recorded	N/A	N/A
Gekkonidae	Unidentified gecko *Gekko* sp. 2	-	Resident	-	Recorded	N/A	N/A
Gekkonidae	Common House Gecko *Hemidactylus frenatus*	-	Resident	-	Recorded	N/A	N/A
Gekkonidae	Unidentified smooth-scaled gecko *Lepidodactylus* sp.	-	Resident	-	Recorded	N/A	N/A
Agamidae	Unidentified flying lizard *Draco* sp.	*Melay*	Resident	-	Recorded	N/A	N/A
Scincidae	Gray Swamp Skink *Emoia atrocostata*	-	Resident	-	Recorded	N/A	N/A
Scincidae	Spotted Green Tree Skink*Lamprolepis smaragdina*	-	Resident	-	Recorded	N/A	N/A
Scincidae	Unidentified mabouya *Mabuya* sp. 1	-	Resident	-	Recorded	N/A	N/A
Scincidae	Sphenomorphus *Sphenomorphus* cf. *abdictus aquilonius*	-	Endemic	-	Recorded	N/A	N/A
Scincidae	Jagor's Sphenomorphus *Sphenomorphus* cf. *jagori jagori*	-	Resident	-	Recorded	N/A	N/A
Varanidae	Water Monitor Lizard *Varanus salvator*	*Sya*	Resident	Food/Trade	Recorded	N/A	N/A
Boidae	Reticulated Python *Python reticulatus*	*Buday*	Resident	Food	Interview	N/A	N/A
Colubridae	Philippine Vine Snake *Ahaetulla prasina preocularis*	*Sumasapaw*	Resident	-	Interview	N/A	N/A
Colubridae	Philippine Blunt-headed Tree Snake *Boiga philippina*	*Matapi*	Endemic	-	Recorded	N/A	N/A
Elapidae	Unidentified cobra *Naja* sp.	-	Resident	-	Interview	N/A	N/A
Hydrophidae	Yellow-lipped Sea Snake *Laticauda colubrina*	*Danit*	Resident	Food	Recorded	N/A	N/A
Hydrophidae	Half-banded Sea Snake *Laticauda semifasciata*	*Aymang*	Resident	Food	Recorded	N/A	N/A
Viperidae	Philippine Pit Viper *Trimeresurus flavomaculatus flavomaculatus*	*Marem*	Endemic	-	Recorded	N/A	N/A
Viperidae	McGregor's Pit Viper *Trimeresurus mcgregori*	*Lalapaw*	Endemic	-	Interview	N/A	N/A
AMPHIBIAN							
Bufonidae	Giant Marine Toad *Bufo marinus*	*Bullfrog*	Introduced	-	Recorded	N/A	N/A

Appendix 4. Species list – Calayan Island

Family	Species	Ilocano Name	Status	Local Utilization	Number of Individuals	Encounter/ Capture Rate	Relative Abundance
BIRDS							
Ardeidae	Grey Heron *Ardea cinerea*	*Rat*	Migrant	-	3	0.567	Uncommon
Ardeidae	Great Egret *Ardea alba*	*Lagwak*	Migrant	-	7	1.324	Uncommon
Ardeidae	Eastern Reef-Egret *Egretta sacra*	*Kanaway*	Resident	-	7	1.324	Uncommon
Ardeidae	Intermediate Egret *Egretta intermedia*	*Lagwak*	Migrant	-	9	1.702	Uncommon
Ardeidae	Little Egret *Egretta garzetta*	*Lagwak*	Migrant	-	2	0.378	Uncommon
Ardeidae	Cattle Egret *Bubulcus ibis*	-	Migrant	-	22	4.161	Uncommon
Ardeidae	Black-crowned Night-Heron *Nycticorax nycticorax*	-	Resident	-	Recorded	N/A	N/A
Pandionidae	Osprey *Pandion haliaetus*	-	Migrant	-	1	0.189	Uncommon
Accipitridae	White-bellied Sea-Eagle *Haliaeetus leucogaster*	*Kangkang*	Resident	Pet	3	0.567	Uncommon
Accipitridae	Chinese Goshawk *Accipiter soloensis*	-	Migrant	-	Recorded	N/A	N/A
Accipitridae	Grey-faced Buzzard *Butastur indicus*	*Tigwik*	Migrant	-	Recorded	N/A	N/A
Megapodiidae	Tabon Scrubfowl *Megapodius cumingii*	*Ukong*	Resident	Food	Recorded	N/A	N/A
Phasianidae	Red Junglefowl *Gallus gallus*	*Abuyo*	Resident	Food	2	0.378	Uncommon
Phasianidae	Blue-breasted Quail *Coturnix chinensis*	*Pugo*	Resident	Food	Interview	N/A	N/A
Rallidae	**Calayan Rail** *Gallirallus calayanensis*	*Piding*	Resident	Food	4	0.757	Uncommon
Rallidae	Buff-banded Rail *Gallirallus philippensis*	-	Resident	Food	2	0.378	Uncommon
Rallidae	Barred Rail *Gallirallus torquatus*	*Tukling*	Resident	Food	4	0.757	Uncommon
Rallidae	Plain Bush-hen *Amaurornis olivacea*	*Piding*	Resident	Food	4	0.757	Uncommon
Rallidae	White-breasted Waterhen *Amaurornis phoenicurus*	*Mangobog*	Resident	-	10	1.892	Uncommon
Rallidae	Watercock *Gallicrex cinerea*	*Tebteb*	Resident	-	Recorded	N/A	N/A
Rallidae	Common Mooorhen *Gallinula chloropus*	*Papa*	Migrant	Food	2	0.378	Uncommon
Rostratulidae	Greater Painted-Snipe *Rostratula benghalensis*	-	Resident	-	15	2.837	Uncommon
Charadriidae	Kentish Plover *Charadrius alexandrinus*	-	Migrant	-	Recorded	N/A	N/A
Charadriidae	Malaysian Plover *Charadrius peronii*	-	Resident	-	2	0.378	Uncommon

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Family	Species	Ilocano Name	Status	Local Utilization	Number of Individuals	Encounter/ Capture Rate	Relative Abundance
Charadriidae	Lesser Sand Plover *Charadrius mongolus*	-	Migrant	-	2	0.378	Uncommon
Charadriidae	Greater Sand Plover *Charadrius leschenaultii*	-	Migrant	-	2	0.378	Uncommon
Scolopacidae	Whimbrel *Numenius phaeopus*	-	Migrant	-	1	0.189	Uncommon
Scolopacidae	Common Greenshank *Tringa nebularia*	-	Migrant	-	Recorded	N/A	N/A
Scolopacidae	Common Sandpiper *Actitis hypoleucos*	-	Migrant	-	5	0.946	Uncommon
Scolopacidae	Grey-tailed Tattler *Heteroscelus brevipes*	-	Migrant	-	39	7.377	Common
Scolopacidae	Ruddy Turnstone *Arenaria interpres*	-	Migrant	-	2	0.378	Uncommon
Scolopacidae	Unidentified woodcock *Scolopax* sp.	*Kampanilya*	Migrant	-	Interview	N/A	N/A
Glareolidae	Oriental Pratincole *Glareola maldivarum*	*Kirit*	Migrant	-	29	5.485	Common
Laridae	Black-tailed Gull *Larus crassirostris*	-	Migrant	Pet	Recorded	N/A	N/A
Columbidae	Whistling Green-Pigeon *Treron formosae*	*Punay*	Resident	Food	20	3.783	Uncommon
Columbidae	Black-chinned Fruit-Dove *Ptilinopus leclancheri*	*Punay/Bwit*	Near-endemic	Food	28	5.296	Common
Columbidae	Green Imperial-pigeon *Ducula aenea*	*Bal-og*	Resident	Food	9	1.702	Uncommon
Columbidae	Metallic Pigeon *Columba vitiensis*		Resident	Food	Interview	N/A	N/A
Columbidae	Philippine Cuckoo-Dove *Macropygia tenuirostris*	*Alagaddan*	Near-endemic	Food	Interview	N/A	N/A
Columbidae	Island Collared-Dove *Streptopelia bitorquata*	*Paggaw*	Resident	Food	11	2.081	Uncommon
Columbidae	Spotted Dove *Streptopelia chinensis*	*Paggaw*	Resident	Food	8	1.513	Uncommon
Columbidae	Common Emerald Dove *Chalcophaps indica*	*Alimuken*	Resident	Food	11	2.081	Uncommon
Cuculidae	Common Koel *Eudynamys scolopaceus*	*Tuwaw*	Resident	Food	34	6.431	Common
Cuculidae	Philippine Coucal *Centropus viridis*	*Sigakok*	Endemic	-	64	12.106	Abundant
Strigidae	Ryukyu Scops-Owl *Otus elegans*	*Kukuk*	Resident	-	2	0.378	Uncommon
Strigidae	Brown Hawk-Owl *Ninox scutulata*	*Kukuk*	Migrant	-	2	0.378	Uncommon
Caprimulgidae	Unidentified nightjar sp.	*Kuyab-kuyab*	-	-	Interview	N/A	N/A
Apodidae	Glossy Swiftlet *Collocalia esculenta*	*Salampingaw*	Resident	-	116	21.942	Abundant
Apodidae	Pygmy Swiftlet *Collocalia troglodytes*	*Salampingaw*	Endemic	-	39	7.377	Common
Apodidae	Fork-tailed Swift *Apus pacificus*	*Salampingaw*	Resident	-	2	0.378	Uncommon
Apodidae	House Swift *Apus nipalensis*	*Salampingaw*	Resident	-	1	0.189	Uncommon
Coraciidae	Dollarbird *Eurystomus orientalis*	*Tagatag*	Resident	Food	1	0.189	Uncommon
Alcedinidae	Common Kingfisher *Alcedo atthis*	-	Migrant	-	2	0.378	Uncommon

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Family	Species	Ilocano Name	Status	Local Utilization	Number of Individuals	Encounter/ Capture Rate	Relative Abundance
Alcedinidae	Ruddy Kingfisher *Halycon coromanda*	-	Migrant	-	Recorded	N/A	N/A
Alcedinidae	White-collared Kingfisher *Todirhamphus chloris*	*Tugareng*	Resident	-	6	1.135	Uncommon
Upupidae	Hoopoe *Upupa epops*	-	Migrant	-	Interview	N/A	N/A
Hirundinidae	Sand Martin *Riparia riparia*	-	Migrant	-	Recorded	N/A	N/A
Hirundinidae	Barn Swallow *Hirundo rustica*	*Salampingaw*	Migrant	-	3	0.567	Uncommon
Hirundinidae	Pacific Swallow *Hirundo tahitica*	*Salampingaw*	Resident	-	50	9.458	Common
Hirundinidae	Striated Swallow *Cecropis striolata*	*Salampingaw*	Resident	-	43	8.134	Common
Pycnonotidae	Chestnut-eared Bulbul *Microscelis amaurotis*	*Samot*	Resident	Food	124	23.455	Abundant
Oriolidae	Black-naped Oriole *Oriolus chinenis*	*Kiaw*	Resident	Food	25	4.729	Uncommon
Corvidae	Large-billed Crow *Corvus macrorhynchos*	*Uwak*	Resident	Food	27	5.107	Common
Paridae	Elegant Tit *Parus elegans*	*Tiktikrobo*	Endemic	-	9	1.702	Uncommon
Turdidae	Orange-flanked Bush Robin *Luscinia cyanura*	-	Vagrant	-	Recorded	N/A	N/A
Turdidae	White's Thrush *Zoothera aurea*	*Boklang*	Migrant	Food	Interview	N/A	N/A
Turdidae	Brown-headed Thrush *Turdus chrysolaus*	*Parekpek*	Migrant	Food	Interview	N/A	N/A
Sylviidae	Lanceolated Warbler *Locustella lanceolata*	-	Migrant	-	Recorded	N/A	N/A
Sylviidae	Zitting Cisticola *Cisticola juncidis*	*Pipiit*	Resident	-	13	2.459	Uncommon
Muscicapidae	Grey-streaked Flycatcher *Muscicapa griseisticta*	-	Migrant	-	Recorded	N/A	N/A
Muscicapidae	Snowy-browed Flycatcher *Ficedula hyperythra*	-	Resident	-	1	0.189	Uncommon
Pachycephalidae	Yellow-bellied Whistler *Pachycephala philippinensis*	-	Endemic	-	31	5.864	Common
Motacillidae	Grey Wagtail *Motacilla cinerea*	*Kin-kin-od*	Migrant	-	2	0.378	Uncommon
Motacillidae	Yellow Wagtail *Motacilla flava*	*Kin-kin-od*	Migrant	-	96	18.159	Abundant
Motacillidae	Richard's Pipit *Anthus richardi*	-	Resident	-	8	1.513	Uncommon
Motacillidae	Red-throated Pipit *Anthus cervinus*	-	Migrant	-	Recorded	N/A	N/A
Laniidae	Brown Shrike *Lanius cristatus*	*Talal*	Migrant	Food	20	3.783	Uncommon
Sturnidae	Asian Glossy Starling *Aplonis panayensis*	*Piyus*	Resident	Pet	33	6.242	Common
Sturnidae	Crested Myna *Acridotheres cristatellus*	*Martines*	Resident	Food	26	4.918	Uncommon
Nectariniidae	Purple-throated Sunbird *Leptocoma sperata*	*Sawsaw-it*	Resident	-	155	29.319	Abundant
Dicaeidae	Pygmy Flowerpecker *Dicaeum pygmaeum*	-	Endemic	-	Recorded	N/A	N/A

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Family	Species	Ilocano Name	Status	Local Utilization	Number of Individuals	Encounter/ Capture Rate	Relative Abundance
Zosteropidae	Lowland White-Eye *Zosterops meyeni*	*Titit*	Near-endemic	-	26	4.918	Uncommon
Ploceidae	Eurasian Tree Sparrow *Passer montanus*	*Bilituleng*	Resident	-	181	34.237	Abundant
Estrildidae	White-bellied Munia *Lonchura leucogastra*	*Bilituleng*	Resident	-	35	6.620	Common
Estrildidae	Chestnut Munia *Lonchura malacca*	*Bilituleng*	Resident	-	1	0.189	Uncommon
MAMMALS							
Soricidae	Indochinese Shrew *Crocidura attenuata*	*Marabutit*	Resident	-	Recorded	N/A	N/A
Pteropodidae	Common Short-nosed Fruit Bat *Cynopterus brachyotis*	*Kurarapnit*	Resident	-	21	5.185	Common
Pteropodidae	Dagger-toothed Flower Bat *Macroglossus minimus*	*Kurarapnit*	Resident	-	34	8.395	Common
Pteropodidae	Large Flying Fox *Pteropus vampyrus*	*Paniki*	Resident	Food	2	0.494	Uncommon
Pteropodidae	Common Rousette *Rousettus amplexicaudatus*	*Kurarapnit*	Resident	-	31	7.654	Common
Rhinolophidae	Diadem Roundleaf Bat *Hipposideros* cf. *diadema*	*Kurarapnit*	Resident	-	1	0.247	Uncommon
Rhinolophidae	Yellow-faced Horseshoe Bat *Rhinolophus virgo*	*Kurarapnit*	Endemic	-	Recorded	N/A	N/A
Muridae	Unidentified rat *Rattus* sp.	*Ba-o*	Resident	-	Interview	N/A	N/A
Viverridae	Unidentified civet cat sp.	*Mutit*	Resident	Food	Recorded	N/A	N/A
Suidae	**Philippine Warty Pig** *Sus* cf. *philippensis*	*Alingo*	Endemic	Food	Recorded	N/A	N/A
REPTILES							
Chelonidae	**Green Turtle** *Chelonia mydas*	*Bindog*		Food	Interview	N/A	N/A
Chelonidae	**Hawksbill Turtle** *Eretmochelys imbricata*	*Kasikas*		Food	Interview	N/A	N/A
Gekkonidae	Tender-skinned House Gecko *Gehyra mutilata*	-	Resident	-	Recorded	N/A	N/A
Gekkonidae	Unidentified gecko *Gekko* sp. 3	*Tikka*	Resident	-	Recorded	N/A	N/A
Scincidae	Unidentified mabouya *Mabuya* sp. 2	*Alibut*	Resident	-	Recorded	N/A	N/A
Scincidae	Sphenomorphus *Sphenomorphus* cf. *abdictus aquilonius*	*Alibut*	Endemic	-	Recorded	N/A	N/A
Varanidae	Water Monitor Lizard *Varanus salvator*	*Banyas*	Resident	Food	Recorded	N/A	N/A
Boidae	Reticulated Python *Python reticulatus*	*Beklat*	Resident	Food	Interview	N/A	N/A
Colubridae	Mangrove Blunt-headed Tree Snake *Boiga dendrophila divergens*	-	Resident	-	Recorded	N/A	N/A
Colubridae	Lined Slender Tree Snake *Dendrelaphis caudolineatus terrificus*	-	Resident	-	Recorded	N/A	N/A

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Family	Species	Ilocano Name	Status	Local Utilization	Number of Individuals	Encounter/ Capture Rate	Relative Abundance
Colubridae	Alcala's Wolf Snake *Lycodon alcalai*	-	Endemic	-	Recorded	N/A	N/A
Colubridae	Banded Burrowing Snake *Oxyrhabdium leporinum leporinum*	-	Endemic	-	Recorded	N/A	N/A
Elapidae	Unidentified cobra *Naja* sp.	*Karasaen*	Resident	-	Interview	N/A	N/A
Hydrophidae	Yellow-lipped Sea Snake *Laticauda colubrina*	*Uha*	Resident	Food	Recorded	N/A	N/A
Hydrophidae	Black-lipped Sea Snake *Laticauda laticaudata*	*Uha*	Resident	Food	Recorded	N/A	N/A
Viperidae	**McGregor's Pit Viper** *Trimeresurus mcgregori*	*Tumukak*	Endemic	-	Recorded	N/A	N/A
AMPHIBIANS							
Bufonidae	Giant Marine Toad *Bufo marinus*	*Bullfrog*	Introduced	-	Recorded	N/A	N/A
Microhylidae	Slender-digit Chorus Frog *Kaloula picta*	*Bato-batog/ Pilat*	Endemic	-	Recorded	N/A	N/A

Appendix 5. Species list – Dalupiri Island

Family	Species	Ilocano Name	Status	Local Utilization	Number of Individuals	Encounter/ Capture Rate	Relative Abundance
BIRDS							
Ardeidae	Eastern Reef-Egret *Egretta sacra*	*Kanaway*	Resident	-	14	6.083	Common
Ardeidae	Cattle Egret *Bubulcus ibis*	-	Migrant	-	16	6.951	Common
Ardeidae	Rufous Night-Heron *Nycticorax caledonicus*	*Manabukol*	Resident	-	12	5.214	Common
Ardeidae	Schrenck's Bittern *Ixobrychus eurhythmus*	-	Migrant	-	2	0.869	Uncommon
Ardeidae	Yellow Bittern *Ixobrychus sinensis*	-	Resident	-	17	7.386	Common
Ardeidae	Cinnamon Bittern *Ixobrychus cinnamomeus*	-	Resident	-	1	0.434	Uncommon
Anatidae	**Philippine Duck** *Anas luzonica*	*Papa*	Endemic	Food	8	3.476	Uncommon
Pandionidae	Osprey *Pandion haliaetus*	-	Migrant	-	Recorded	N/A	N/A
Accipitridae	White-bellied Sea-Eagle *Haliaeetus leucogaster*	*Kangkang*	Resident	-	Recorded	N/A	N/A
Megapodiidae	Tabon Scrubfowl *Megapodius cumingii*	*Ukong*	Resident	Food	Recorded	N/A	N/A
Phasianidae	Red Junglefowl *Gallus gallus*	*Abuyo*	Resident	Food	Recorded	N/A	N/A
Phasianidae	Blue-breasted Quail *Coturnix chinensis*	*Pugo*	Resident	Food	17	7.386	Common
Rallidae	Barred Rail *Gallirallus torquatus*	*Tukling*	Resident	-	21	9.124	Common
Rallidae	Baillon's Crake *Porzana pusilla*	-	Migrant	-	Recorded	N/A	N/A
Rallidae	Plain Bush-hen *Amaurornis olivacea*	*Piding*	Resident	-	10	4.345	Uncommon
Rallidae	White-breasted Waterhen *Amaurornis phoenicurus*	*Mangobog*	Resident	-	2	0.869	Uncommon
Rallidae	Watercock *Gallicrex cinerea*	*Tebteb*	Resident	-	3	1.303	Uncommon
Rallidae	Common Mooorhen *Gallinula chloropus*	*Papa*	Migrant	-	Recorded	N/A	N/A
Rostratulidae	Greater Painted-Snipe *Rostratula benghalensis*	-	Resident	-	32	13.903	Abundant
Charadriidae	Asian Golden-Plover *Pluvialis fulva*	-	Migrant	-	Recorded	N/A	N/A
Charadriidae	Malaysian Plover *Charadrius peronii*	*Manarukoy*	Resident	-	14	6.083	Common
Charadriidae	Greater Sand Plover *Charadrius leschenaultii*	-	Migrant	-	Recorded	N/A	N/A
Scolopacidae	Common Sandpiper *Actitis hypoleucos*	-	Migrant	-	1	0.434	Uncommon
Scolopacidae	Grey-tailed Tattler *Heteroscelus brevipes*	-	Migrant	-	7	3.041	Uncommon

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Family	Species	Ilocano Name	Status	Local Utilization	Number of Individuals	Encounter/ Capture Rate	Relative Abundance
Scolopacidae	Ruddy Turnstone *Arenaria interpres*	-	Migrant	-	Recorded	N/A	N/A
Scolopacidae	Sanderling *Calidris alba*	-	Migrant	-	6	2.607	Uncommon
Glareolidae	Oriental Pratincole *Glareola maldivarum*	*Kirit*	Migrant	-	98	42.578	Abundant
Recurvirostridae	Black-winged Stilt *Himantopus himantopus*	-	Migrant	-	3	1.303	Uncommon
Sternidae	Whiskered Tern *Chlidonias hybridus*	-	Migrant	-	2	0.869	Uncommon
Columbidae	Whistling Green-Pigeon *Treron formosae*	*Punay*	Resident	Food	Interview	N/A	N/A
Columbidae	Island Collared-Dove *Streptopelia bitorquata*	*Paggaw*	Resident	Food	51	22.158	Abundant
Columbidae	Spotted Dove *Streptopelia chinensis*	*Paggaw*	Resident	Food	Recorded	N/A	N/A
Columbidae	Common Emerald Dove *Chalcophaps indica*	*Alimuken*	Resident	Food	4	1.738	Uncommon
Cuculidae	Jacobin Cuckoo *Clamator jacobinus*	-	Vagrant	-	Recorded	N/A	N/A
Cuculidae	Common Koel *Eudynamys scolopaceus*	*Tuwaw*	Resident	-	16	6.951	Common
Cuculidae	Lesser Coucal *Centropus bengalensis*	-	Resident	-	9	3.910	Uncommon
Cuculidae	Philippine Coucal *Centropus viridis*	*Sigakok*	Endemic	-	21	9.124	Common
Tytonidae	Grass Owl *Tyto capensis*	-	Resident	-	Interview	N/A	N/A
Caprimulgidae	Unidentified nightjar sp.	*Kuyab-kuyab*	-	-	Interview	N/A	N/A
Apodidae	Island Swiftlet *Collocalia vanikorensis*	*Salampingaw*	Resident	-	1	0.434	Uncommon
Apodidae	Glossy Swiftlet *Collocalia esculenta*	*Salampingaw*	Resident	-	66	28.675	Abundant
Apodidae	Fork-tailed Swift *Apus pacificus*	*Salampingaw*	Resident	-	25	10.862	Abundant
Apodidae	House Swift *Apus nipalensis*	*Salampingaw*	Resident	-	3	1.303	Uncommon
Hirundinidae	Sand Martin *Riparia riparia*	-	Migrant	-	Recorded	N/A	N/A
Hirundinidae	Barn Swallow *Hirundo rustica*	*Salampingaw*	Migrant	-	9	3.910	Uncommon
Hirundinidae	Pacific Swallow *Hirundo tahitica*	*Salampingaw*	Resident	-	29	12.600	Abundant
Hirundinidae	Striated Swallow *Cecropis striolata*	*Salampingaw*	Resident	-	12	5.214	Common
Alaudidae	Oriental Skylark *Alauda gulgula*	-	Resident	-	6	2.607	Uncommon
Pycnonotidae	Chestnut-eared Bulbul *Microscelis amaurotis*	*Samot*	Resident	-	14	6.083	Common
Oriolidae	Black-naped Oriole *Oriolus chinenis*	*Kiaw*	Resident	-	Interview	N/A	N/A
Corvidae	Large-billed Crow *Corvus macrorhynchos*	*Uwak*	Resident	-	23	9.993	Common
Sylviidae	Lanceolated Warbler *Locustella lanceolata*	-	Migrant	-	Recorded	N/A	N/A

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Family	Species	Ilocano Name	Status	Local Utilization	Number of Individuals	Encounter/ Capture Rate	Relative Abundance
Sylviidae	Middendorf's Grasshopper-warbler *Locustella ochotensis*	-	Migrant	-	Recorded	N/A	N/A
Sylviidae	Zitting Cisticola *Cisticola juncidis*	*Pipiit*	Resident	-	38	16.510	Abundant
Muscicapidae	Grey-streaked Flycatcher *Muscicapa griseisticta*	-	Migrant	-	3	1.303	Uncommon
Motacillidae	Grey Wagtail *Motacilla cinerea*	*Kin-kin-od*	Migrant	-	1	0.434	Uncommon
Motacillidae	Yellow Wagtail *Motacilla flava*	*Kin-kin-od*	Migrant	-	55	23.896	Abundant
Motacillidae	Richard's Pipit *Anthus richardi*	-	Resident	-	17	7.386	Common
Laniidae	Brown Shrike *Lanius cristatus*	*Talal*	Migrant	-	6	2.607	Uncommon
Sturnidae	Asian Glossy Starling *Aplonis panayensis*	*Piyus*	Resident	-	4	1.738	Uncommon
Sturnidae	Crested Myna *Acridotheres cristatellus*	*Martines*	Resident	-	65	28.240	Abundant
Ploceidae	Eurasian Tree Sparrow *Passer montanus*	*Bilituleng*	Resident	-	2	0.869	Uncommon
Estrildidae	Chestnut Munia *Lonchura malacca*	*Bilituleng*	Resident	-	2	0.869	Uncommon
MAMMALS							
Soricidae	Asian House Shrew *Suncus murinus*	*Marabutit*	Resident	-	Recorded	N/A	N/A
Pteropodidae	Unidentified flying fox *Pteropus* sp.	*Paniki*	Resident	Food	Recorded	N/A	N/A
Pteropodidae	Common Rousette *Rousettus amplexicaudatus*	*Kurarapnit*	Resident	-	5	16.667	Abundant
Vespertilionidae	Common bent-winged Bat *Miniopterus schreibersi*	*Kurarapnit*	Resident	-	Recorded	N/A	N/A
Muridae	Unidentified rat *Rattus* sp.	*Ba-o*	Resident	-	Interview	N/A	N/A
Delphinidae	Short-finned Pilot Whale *Globicephala macrorhyncus*	*Lumba-lumba*	-	-	Recorded	N/A	N/A
REPTILES							
Chelonidae	**Green Turtle** *Chelonia mydas*	*Bindog*	-	Food/Trade	Recorded	N/A	N/A
Chelonidae	**Hawksbill Turtle** *Eretmochelys imbricata*	*Kasikas*	-	Food/Trade	Interview	N/A	N/A
Crocodylidae	Unidentified crocodile *Crocodylus* sp.	*Bukarot*	Resident	-	Recorded	N/A	N/A
Gekkonidae	Unidentified Gecko *Gekko* sp. 3	*Tikka*	Resident	-	Recorded	N/A	N/A
Gekkonidae	Common House Gecko *Hemidactylus frenatus*	*Alibut*	Resident	-	Recorded	N/A	N/A
Gekkonidae	Unidentified smooth-scaled gecko *Lepidodactylus* sp.	*Alibut*	Resident	-	Recorded	N/A	N/A
Scincidae	Gray Swamp Skink *Emoia atrocostata*	-	Resident	-	Recorded	N/A	N/A
Scincidae	Unidentified mabouya *Mabuya* sp. 1	*Alibut*	Resident	-	Recorded	N/A	N/A

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Family	Species	Ilocano Name	Status	Local Utilization	Number of Individuals	Encounter/ Capture Rate	Relative Abundance
Scincidae	Sphenomorphus *Sphenomorphus* cf. *abdictus aquilonius*	*Alibut*	Endemic	-	Recorded	N/A	N/A
Boidae	Reticulated Python *Python reticulatus*	*Beklat*	Resident	Food	Recorded	N/A	N/A
Colubridae	Philippine Blunt-headed Tree Snake *Boiga philippina*	-	Endemic	-	Recorded	N/A	N/A
Colubridae	Lined Slender Tree Snake *Dendrelaphis caudolineatus caudolineatus*	-	Resident	-	Recorded	N/A	N/A
Elapidae	Unidentified cobra *Naja* sp.	*Karasaen*	Resident	-	Interview	N/A	N/A
AMPHIBIANS							
Bufonidae	Giant Marine Toad *Bufo marinus*	*Bullfrog*	Introduced	-	Recorded	N/A	N/A
Microhylidae	Slender-digit Chorus Frog *Kaloula picta*	*Bato-batog/ Pilat*	Endemic	-	Recorded	N/A	N/A

Calayan Rail
Gallirallus calayanensis

Black-tailed Gull
Larus crassirostris

Ruddy Kingfisher
Halcyon coromanda

Short-crested Monarch
Hypothymis helenae

Bukidnon Woodcock
Scolopax bukidnonensis

Brown-headed Thrush
Turdus chrysolaus

Asian Glossy-Starling
Aplonis panayensis

Orange-flanked Bush Robin
Luscinia cyanura

White-bellied Munia
Lonchura leucogastra

Elegant Tit
Parus elegans

Ryukyu Scops Owl
Otus elegans

Tabon Scrubfowl
Megapodius cumingii

Common Kingfisher
Alcedo atthis

Common Emerald Dove
Chalcophaps indica

Mangrove Blue Flycatcher
Cyornis rufigastra

Yellow-bellied Whistler
Pachycephala philippinensis

Brown Hawk-Owl
Ninox scutulata

Yellow-faced Horseshoe Bat
Rhinolophus virgo

Large Flying Fox
Pteropus vampyrus

Ryukyu Flying Fox
Pteropus dasymallus

Common Rousette
Rousettus amplexicaudatus

Diadem Roundleaf Bat
Hipposideros diadema

Dagger-toothed Flower Bat
Macroglossus minimus

Short-finned Pilot Whale
Globicephala macrorhyncus

Indochinese Shrew
Crocidura attenuata

Rough-toothed Dolphin
Steno bredanensis

Yellow-lipped Sea Snake
Laticauda colubrina

McGregor's Pit Viper
Trimeresurus mcgregori

Unidentified flying lizard
Draco sp.

Slender-digit Chorus Frog
Kaloula picta

Unidentified mabouya
Mabuya sp.

Water Monitor Lizard
Varanus salvator

Unidentified crocodile
Crocodylus sp.

Green Turtle
Chelonia mydas