# The Vertebrate Biodiversity of the Gigantes and Sicogon Islands, Iloilo Province, Philippines

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The biodiversity of the Gigantes and Sicogon Islands and associated islets are presented and discussed based on a study conducted from December 2009 to May 2010. Pertinent data on the biophysical conditions of caves in the Gigantes are also presented. Observations on the biology of the Critically Endangered Gigante Limestone Frog (***Platymantis insulatus***) and the Endangered Gigante Narrow-disked Gecko (***Gekko gigante***) such as population density, behaviour, and reproductive biology are also presented. Threats to the biodiversity of these islands are discussed with corresponding recommendations. A preliminary discussion on the zoogeography of the two islands is also provided.

**KEYWORDS:** biodiversity, Gigantes Islands, Panay Island, zoogeography

## INTRODUCTION

The Philippines is one of the 17 megadiverse countries in the world, with high species richness and endemism (Heaney & Regalado, 1998; Ong, Afuang, & Rosell-Ambal, 2002; Brown & Diesmos, 2009). In terms of biodiversity priority, Philippines is considered one of the world's top 25 global conservation hotspots with several species threatened by extirpation (Myers et al., 2000).

The herpetofauna of the Gigantes, Sicogon and other nearby offshore islands have been studied by Brown and Alcala (1970, 1978,

1980), Brown and Alcala (2000), Ferner et al. (2000), and Alcala and Alcala (2005). The avifauna on these islands has been studied by Rabor (1938) and Alcala and Sanguila (1969). However, the mammals have not been studied in the past. These vertebrate groups are the subject of the present survey.

## Description of the Study Area

We surveyed the three islands and their associated islets off the municipality of Carles in northeast Iloilo province, namely Gigante Norte, Gigante Sur, and Sicogon (Figure 1).

Gigantes Sur (481 ha; population 6,096) is composed primarily of karst forests (Figure 2) on the east with patches of ipil-ipil (*Leucaena leucocephala*). A thin strip of flat land exists only along the coastline. At the north of the island is an extensive fishpond area converted from mangrove forest. The rest of the island is grassland (*Imperata cylindrica*) interspersed with scrub. A small part of the island (i.e. close to the shoreline) is planted with fruit trees and coconuts. The associated islets of Gigante Sur were also visited on the dates indicated below: Bantigui (2 ha; population 5–10) on 15 January 2010; Cabugao Dako (10 ha; transient population c. 5) and Cabugao Gamay (c. 7–8 ha) on 16 January 2010; and Balabagon (5–6 ha; transient population c. 15) on 15-16 January 2010.

Gigante Norte (599 ha; population 6,919) has similar features as Gigante South being primarily karst formation. It was visited

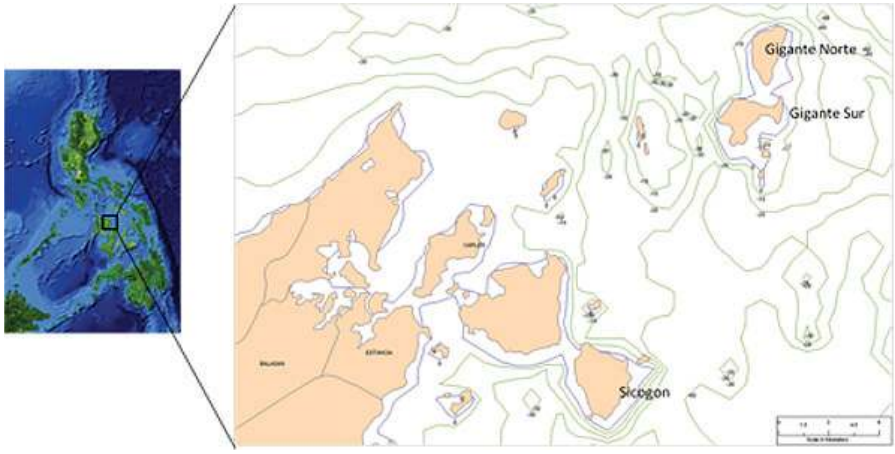


*Figure 1.* A map showing the three islands covered by the study (Gigante Norte, Gigante Sur, and Sicogon).

*Figure 2.* View of a typical karst landscape in Gigante Sur.

*Figure 3.* A non-karst forestland on Sicogon Island (viewed from the eastern side).

on the following dates: 16-21 December 2009; 21-24 February 2010; 1 March 2010; and 13-16 May 2010. The islets of Gigantillo (< 1 ha) and Gigantuna (< 1 ha), located about 0.7 km east of Asluman, North Gigante and north of Bulubadiang islet (c. 1.5 ha; transient population c. 10) and Uay Dahon Islet (2 ha; population c. 5, resort workers) were visited on 17 January 2010.

Sicogon Island is a non-karst island. The soil is predominantly clay (Dela Cruz, Viloria, & Abadilla, 1980). The vegetation on the western part of the island is composed of mixed grassland and is devoted to agriculture, while the eastern part is forested (circa 300 ha). Most of the forest area is classified as timberland (Figure 3) and is presently under the jurisdiction of the Department of Environment and Natural Resources (DENR) and the local government of Carles. Our study on Sicogon Island was limited to only four days due to security reasons.

## MATERIALS AND METHODS

The study was conducted 13-19 December 2009, 13-20 January 2010, 21-28 February 2010, 14 April 2010, and 15 May 2010. Although the sampling months fell within the dry season, intermittent rains were experienced on several occasions.

The primary method used to study birds in the area is through observation. Birds were identified and counted with the aid of binoculars (Bushnell 10×50, Focus 8×23, 10×60) and the field guide *Birds of the Philippines* by Kennedy et al. (2000). Online databases such as those of the Oriental Bird Club (www.orientalbirdimages.org) and the Internet Bird Collection (ibc.lynxeds.com) were referred to by the observers. The bird sightings were supplemented with photographs (using a digital camera) and audio recordings (Sanyo TCM and Sony IC digital recorder). Monofilament mist nets (6m×4m and 6m×12m) were also used to capture birds during our initial survey in December 2009. This was, however, discontinued due to poor results. The nets were difficult to set up on rough limestone and presented risk to the researchers who had to go through sharp-edged rocks and deep crevices.

Bats were sampled using the same mist nets used to capture birds while non-volant mammals were directly observed. Mist nets were placed near fruiting trees and flyways to optimize capture. Species identification was based on available taxonomic references (Heaney et al., 1998; Sedlock & Ingle, 2010).

The herpetofauna (amphibians and reptiles) were surveyed following the methods used by Alcala and Alcala (2005). This was conducted during certain times of the day and during night time with the aid of head-mounted flashlights. Species identification was based on Alcala and Brown (1998) for frogs and Brown and Alcala (1978, 1980) and Alcala (1986) for reptiles.

The study also took temperature and relative humidity readings in the caves using mercury-based field thermometers, sling psychrometer, and digital hygrometer during each visit. It also conducted population counts using the plotting and cruising methods (Alcala & Alcala, 2005). This was undertaken during the months of December 13-21 2009, January 13-21 2010, February 21 -March 01, 2010 and May 15 2010.

We visited 17 caves in the Gigantes and recorded ambient temperature and relative humidity readings. Temperature and relative humidity readings were conducted on the following dates: 13, 14, 15, 18 and 19 December 2009 and 13 January 2010. The rest of the dates already indicated above were allocated to survey the other vertebrate groups such as birds and mammals.

The caves visited can be considered wet, considering the high relative humidity (RH) values (>80%), although on two occasions, RH values fluctuated to about 75% in Pawikan Cave and Longon-longon Cave. None of the caves contain stagnant or running water. The sizes of caves covered in this study ranged from ca. 1.0m to 6.5m wide and 2.0m to 35.0m long. All the caves visited were located in the low land (<150m above sea level). Some of the caves visited were along the shorelines of the islets and main islands of Gigantes Norte and Sur.

The study also employed informal interviews with the locals. This was primarily done to supplement our field sampling efforts and to list species that have not been encountered during our stay in the area. A retrospective account of some species we failed to encounter was also used to supplement our study.

## RESULTS

### Climatic and Biophysical Conditions of the Study Area

The climate in the study area can be categorized as type III, according to the Philippine Atmospheric Geophysical and Astronomical Services (PAGASA) with seasons not very pronounced; relatively dry from November to April and wet during the rest of the year. The

conduct of the survey (December 2009 to June 2010) partly coincided with an El Niño Southern Oscillation (ENSO) event (Yumul et al., 2010). Yumul et al. (2010) showed that the Western Visayas (including the study area) was affected by dry spells during the ENSO Event. Data from PAG-ASA weather station in Dumangas, Iloilo showed reduced amount of precipitation (5.2-33mm) in the Iloilo province from December 2009 through March 2010.

Based on the National Oceanic and Atmospheric Administration (NOAA) virtual station (www.http//coralreefwatch.noaa.gov.satellite/virtual_station/philippines_virtual.stations.html#VisayanSea_philippines) data, the sea surface temperatures (SST) in the Visayan Sea ranged from 26-31°C, with an increasing trend from January to August 2010. SST readings gradually dropped from 31°C to 30°C by September 2010, then 29-30°C as of December 2, 2010. Our data on ambient temperatures in the Gigantes were mainly between 26-30°C between the months of February to June 2010. In one occasion (20 January 2010), the highest temperature reading reached 32°C in an open area in Gabi, Gigante Sur. Alcala and Alcala (2005) recorded air temperatures ranging from 25-31°C in 2004 and 2005.

### Air temperature readings in caves

Air temperature readings in cave entrances (Table 1) ranged from 26-28°C (27.44±0.20 S.E.) while our hygrometer readings (relative humidity) ranged from 75-92% (87.44±1.08 S.E.). The inner cave's ambient temperatures, ranging from 25-28°C (26.5±0.21 S.E.), were slightly lower than the entrance temperature readings.

### Herpetofauna

A total of 44 species in 11 families of herpetofauna are presently known from the study sites, 24 of which were observed during the study (Table 2). These include three species of sea snakes belonging to two genera. Among the three islands, Gigante Sur has the highest number of species (30), followed by Sicogon (26), and Gigante Norte (15).

The study was also able to follow up on two island endemic herpetofauna living in limestone habitats, the Island Forest Frog (*Platymantis insulatus*) and Gigante Narrow-disked Gecko (*Gekko gigante*). We noted that of the 17 caves visited, nine were inhabited by *P. insulatus* while 13 were inhabited by *Gekko gigante*. In addition to

this, we also discovered that both *P. insulatus* and *G. gigante* inhabited the Bulubadiang Islet, Gigante Norte. They were found in limestone fissures and crevices at least one meter below the surface. Although this cave was visited by Silliman University researchers during the early 2000s, the species were only observed during our study.

## Biological observations on the Gigante Endemic Herpetofauna

### *Gigante Limestone Forest-Frog Platymantis insulatus Brown & Alcala* (Figure 4)

We provide a detailed observation on the biology of the Limestone Frog (*Platymantis insulatus*) because it is crucial to determine whether or not it was affected by the recent ENSO Event.

*Figure 4.* The Gigante endemic frog *Platymantis insulatus*.

*Figure 5. Platymantis insulatus* congregating in a hole (left) during an ENSO Event but left the same hole (right) during the onset of *La Niña*.

## Population density vs. physical conditions

During the 2009-2010 ENSO Event, the population density of *P. insulatus* was estimated at 5-6.7 individuals/100m$^2$±0.48-0.67 S.E. (50-67 individuals per hectare) in the vicinity of the caves and sometimes absent in the vicinity of the 13 caves out of the 16 that we visited. In the cave interior, the population density ranges from 1.0-4.30 individuals/100m$^2$± 0.33-1.86 S.E. (100-430 individuals per hectare). These estimates were made during an El Ninõ event. These values are lower than those reported by Alcala and Alcala (2005). They estimated the population of the species at 400-638 individuals per hectare, sometimes reaching 1000 individuals per hectare during the rainy months in 2004-2005.

We also observed that *P. insulatus* was generally found in moist and cooler portions of the caves particularly near the entrance and in moist crevices. Except for the Harpa Cave which showed no frog signs, despite having the lowest temperature and highest humidity readings (Table 1), the rest of the wet caves were observed to be inhabited by the species. We think the species' absence in the cave may be due to the high human disturbance that included diggings for supposed treasure-hunting activities. Conversely, we generally did not observe the species in dry caves with high temperature readings (e.g. Elepante Cave). In addition, one of the authors (AB) visited three caves in the adjacent islet of Cabugao Daku in February 2010 and observed only three *P. insulatus* inhabiting a single dry cave. This suggests that the islet is poorly habitable due to the dry conditions of the caves. A summary of these observations is found in Table 1.

## Observed congregations

We observed at least 18 individuals congregating inside a small hole (Figure 5) measuring ca. 15cm x 10cm on 15 May 2010, when the place was still relatively dry. The mean temperature at that time was between 27–28°C with humidity readings of 70–80%. The hole was devoid of water but had relatively high moisture content. This congregational behavior is the first to be observed within the species. On the other hand, we have observed non-cave species like *Kaloula picta* congregating in pairs and sometimes in groups in ground soil and decomposing material (e.g., coconut shells) during dry season but were in state of stupor, presumably aestivating, on Negros Island. Active congregational behavior is usually associated with group

survival such as to reduce moisture loss during the dry season and may as well be a form of social interaction within the species.

## Observations on reproductive behavior

We observed at least five gravid females in Pawikan Cave in May 2010. One gravid female specimen we dissected contained 22 to 24 eggs on each ovary (circa 46 eggs in both ovaries). About 50% (11–12 eggs) contained yellowish ova with a yolk diameter of about 2.0 mm. The presence of gravid females inside the cave indicate that the species utilize the cave for breeding (and probably egg-laying) and that the reproductive behavior of *P. insulatus* is not affected by the dry spells brought about by the ENSO Event, allowing them to breed under such conditions. The reproductive biology of the *P. insulatus* requires more study and investigation. The species is most likely a direct developer like any other Philippine species of *Platymantis*.

Although no egg of *P. insulatus* was found inside any of the caves we visited, we encountered juveniles near the vegetated cave entrances in Gigante Sur (Danao-danao and Pawikan caves) on 13 December 2009. The following month, we also observed froglets (with snout-vent length of circa. 10mm) outside the caves in moist forest floor. We suspect that the juveniles and froglets were hatched either inside the caves or in deep crevices and only went outside to feed. This appears in consonance with an earlier observation by Alcala and Alcala (2005) with the froglets of another limestone cave species, *P. spelaeus*, on Negros Island. The ability of limestone-associated species to survive during dry season can very well be explained by the fact that they live in cooler and moist microhabitats such as caves and crevices. The presence of juveniles and froglets during an ENSO Event further supports our earlier findings that limestone cave habitats tend to ensure the survival of the species.

## Observed escape response

When handled, the frog often secreted through its cloaca a slimy fluid, which may allow the animal to escape. This escape response behavior has also been observed with another species, *P. paengi*, found on mainland Panay. Although cloacal ejecta is associated with egg-laying (for sticking their eggs to substrates), it has not been reported as a mechanism for evasion from capture (e.g., Alcala, 1962; Alcala & Brown, 1982).

*Figure 6.* The Gigante Narrow-disked Gecko *Gekko gigante*.

***Gigante Narrow-disked Gecko* Gekko gigante *Brown & Alcala (Figure 6)***

The species was observed in most caves that we visited during daytime but can be found also in karst forests and adjacent Ipil-ipil (*L. leucocephala*) plantations. Because they are usually found in cave roofs during the survey and estimation on surface area is difficult and unreliable, we can only present counts of the species.

The highest count of this species is in Wawa Cave with 22 individuals. About 16 individuals were also counted in Gintagoan Cave, a small coastal cave in Gigante Norte on 16 December 2009 (Table 4). In addition, several eggs (about 12—15 per clutch) were observed in this cave. Unlike most of the caves in Gigantes, these caves are less disturbed by humans. The rest of the caves have been destroyed by humans; for example, cooking inside the cave resulted in accumulation of soot on cave walls and roofs.

At night, the species often feed on trees, cliffs, and on a few occasions on the ground close to limestone walls. A juvenile *Gekko gigante* was observed being chased by the snake *Chrysopelea paradisi* at the entrance of Pawikan Cave.

## Avifauna

The total number of bird species observed in the entire study site is 87

species (Table 4). At least 33 species have been observed in Sicogon. The bird study also documented 42 new records for the Gigantes and 12 new records for Sicogon. Our study observed more species (42 species in Gigantes and 12 species in Sicogon) compared to Kennedy et al. (2000) which listed only 35 species for Gigantes Island and 28 species in Sicogon.

However, we were not able to encounter some of the species Kennedy et al. (2000) reported. They are the Blue-breasted Quail (*Coturnix chinensis*), Philippine Pygmy Woodpecker (*Dendrocopus maculatus*), Mangrove Blue Flycatcher (*Cyornis rufigastra*), White-vented Whistler (*Pachycephala homeyeri*), and Grey Wagtail (*Motacilla cinerea*). It is possible that we missed them during the survey or they may have disappeared from the island in recent years. Details on the avifauna of the Gigantes are discussed in a separate paper.

In Sicogon, certain species listed by Kennedy et al. (2000) were not encountered, probably because of the short period (4 days) of observation due to security reasons. Another reason is the contraction of the forest cover in the island as a result of farming expansion and charcoal production. There is reason to believe that the Visayan Hornbill (*Penelopides panini*), which is presently an Endangered species (BirdLife International, 2008), may have disappeared from the island.

## Mammals

A total of 14 species of mammals were observed during the study, of which 11 species were bats (Table 5). Majority of the species captured were *Rousettus amplexicaudatus* (38 individuals mist-netted in the Gigante Norte Island and 21 individuals in the Gigante Sur). In addition, five species of insectivorous bats were observed roosting in some caves but at very low density (ca 1 to 12 individuals per cave).

The only large mammal observed was the Long-tailed Macaque *Macaca fascicularis* on the three major islands (Sicogon, Gigante Norte, and Gigante Sur). In Sicogon and Gigante Sur, most of the sightings were in cliffs with thick vegetation. On one occasion, a group of five individuals was seen gleaning in the intertidal area of Sicogon.

Because of its affinity to the mainland Panay, certain Negros-Panay endemic mammals probably existed on Sicogon in the past, such as the Visayan Spotted Deer *(Rusa alfredi*) and the Visayan Warty Pig (*Sus cebifrons*). These species are presently considered by the World Conservation Union as Critically Endangered and Endangered, respectively (IUCN, 2010).

## DISCUSSION

The Gigantes and Sicogon islands off northeastern Panay in the western Visayan Sea is considered part of the Central Visayan Pleistocene Ice-Age Island (Heaney, 1986). The former are primarily karst islands, which also serve as land-bridge between the Pleistocene Islands of Panay, Cebu, Negros and Masbate in the Visayan Sea (Brown & Alcala, 2000), while the latter was probably once connected to the mainland Panay during the Pleistocene when the sea level was about 120m lower than the current level (Heaney, 1986).

Ferner et al. (2000) listed the herpetofauna of Panay, including the small associated islands like the Gigantes and Sicogon. Their list for the Gigantes did not include *Cosymbotus* (=*Hemidactylus*) *platyurus*, *Cerberus rynchops*, *Rhinella marina* (formerly *Bufo marinus*) and *Kaloula conjuncta*. These four species of herpetofauna were observed during our study. These species are relatively common in houses and in the vicinity of human dwellings.

The restricted range of *G. gigante* and *P. insulatus* in the karst areas of the Gigante Islands indicates the importance of limestone habitats in the evolution of these two island endemics (Alcala & Alcala, 2005). This role is further illustrated by the presence of other limestone endemic frogs such as *P. speleaus* on Negros Island (Brown & Alcala, 1982), *P. bayani* on Samar (Siler et al., 2009), *P. paengi* on northwest Panay (Siler et al. 2007) and *P. biak* on Luzon (Siler et al., 2010) as well as the gekkonids such as *Gekko ernstkelleri* on northwest Panay (Rosler et al., 2006), and *G. carusadensis* on Luzon (Linkem et al., 2010).

Dunson and Minton (1978) reported 13 species of sea snakes from the Gigantes including *Laticauda colubrina* and *L. laticaudata*, which we encountered in the rocky shores of Gigante Sur and the islets of Dyakit-dyakit, Pulupandan, and Uay Dahon. We think that the population of the two *Laticauda* species may have declined over the years to judge from the loss of coral reefs, which are the snakes' feeding grounds (Elfes et al., in manuscript). *Laticauda* species appear to be particularly vulnerable because the eels and catfish (*Plotosus* spp.) they feed on coral reefs are harvested extensively often through the use of chemical poisons such as cyanide. In addition, the Near Threatened species *L. semifasciata* (see Elfes et al., in manuscript), which was reported by Dunson and Minton (1978) in the Gigantes, was not encountered during the survey. There is a need to make an assessment of sea snakes and coral reefs in the Gigantes.

### Threats to the biodiversity of the Gigantes and Sicogon

The caves we visited were generally disturbed with some caves showing signs of drying up. The disturbance was mainly attributed to human activities like treasure hunting, guano collection, and the use of caves for waste disposal. Cave surface disturbance in the form of deforestation is also evident on the islands of the Gigantes. Forest species together with cultivated species like Ipil-ipil (*L. leucocephala*) are indiscriminately harvested for timber and charcoal. The cutting of trees is driven primarily by the demand for fuel wood. This has significantly caused the rapid decline of forest cover particularly on the two Islands of Gigantes. Loss of forest cover has resulted in the exposure of the karst landscape and consequently the drying up of caves in the area making it less habitable for the cave-dwelling animals.

The proposed conversion of the forestland in Sicogon into a plantation of rattan (*Calamus* sp.) may lead to the disappearance of most forest-dwelling species, including the flying foxes (*Pteropus pumilus* and *P. hypomelanus*) that roosted in trees. As observed during the survey, several hardwood species like narra (*Pterocarpus indicus*) were illegally poached from the forestland, presently being managed by the DENR. In addition, slash-and-burn farming (*kaingin*) and production of charcoal have encroached into the forested portion of the island.

Aside from habitat destruction, collection of *Gekko* species by the locals for the supposed "foreign buyers" may be considered as the most recent threat to the endemic gekkonid species. Although *Gekko gecko* appeared as the target for this so-called "buying and selling" of *Gekko*, the minimum weight target of 300g is considered. Apparently, the locals collect any species of the genus *Gekko* (including *Gekko gigante*) and bring them to the mainland (Estancia town) to be weighed, only to be released anywhere as the lizards fall short of the required weight of 300g (L. Cordova, pers. comm.).

## CONCLUSION AND RECOMMENDATIONS

The presence of endemic species on the islands of the Gigantes and Sicogon makes the area significantly important in terms of research

and conservation. The distinct and unique distribution of species among neighbouring islands presents an interesting perspective on island biogeography and isolation. On the other hand, the presence of threats on the island endemics and their habitats is a great challenge to the sustainable management of the area. Some of the more pressing matters that need to be immediately addressed to preserve the species and their habitats are suggested as follows:

- The remaining Sicogon Forest should be preserved and denuded timberland areas replanted with indigenous species to sustain the watershed and local source of water and support local wildlife habitats.
- Information, Education and Communication (IEC) should be intensively undertaken in the Gigantes islands so that protection of caves and sustainable use of resources can be promoted, pursued, and undertaken.
- A strategy to allocate vacant areas for agroforestry production should be developed and implemented so that locals will have source of wood to use for cooking and other household uses.
- The regulatory and monitoring capability should be strengthened by providing regular funds to the Bantay Dagat/Bantay Gubat task force.

Moreover, the study further encourages local academic /research institutions and government line agencies like DENR and DA to cooperate in the monitoring and management of biodiversity in the area.

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*Table 1.*

*Population densities of Platymantis insulatus during an ENSO event in 2009-2010.*

| Site | Date | Cave Entrance | | No. of Plots | Mean Density (ind./100m²±S.E.) | Cave Interior | | No. of Plots | Mean Density (ind./100m²±S.E.) |
|---|---|---|---|---|---|---|---|---|---|
| | | Ambient Temp. (°C) | RH (%) | | | Ambient Temp. (°C) | RH (%) | | |
| Danao-danao Cave 1 | 13-Dec-09 | 28.0 | 87 | 3 | absent | 27.0 | 91.5 | 3 | 2.0±0.58 |
| Danao-danao Cave 2 | 13-Dec-09 | 26.0 | 92 | 3 | 0.67±0.67 | 26.0 | 92 | 3 | 3.67±1.20 |
| Danao-danao Cave 3 | 13-Dec-09 | 28.0 | 87 | 3 | 0.67±0.67 | 27.0 | 91.5 | 2 | 2.0 |
| Wawa Cave | 14-Dec-09 | 28.0 | 87 | 2 | absent | 28.0 | 87 | 3 | 1.67±0.33 |
| Elepante Cave | 16-Jun-10 | 28.0 | 82 | 1 | absent | 28.0 | 82 | 1 | absent |
| Pawikan Cave | 16-Jun-10 | 28.0 | 82 | 4 | 2.75±0.48 | 28.0 | 82 | 10 | 4.30±1.86 |
| Pawikan Cave | 14-Dec-09 | 28.0 | 82 | 2 | absent | 28.0 | 75 | 3 | 1.0±0.57 |
| Bulubadiang Cave | 15-Dec-09 | 26.0 | 92 | 4 | 0.50±0.50 | 26.0 | 92 | 1 | absent |
| Bakwitan Cave 1 | 18-Dec-09 | 28.0 | 87 | 2 | absent | 26.0 | 92 | 3 | 2.38±0.88 |
| Bakwitan Cave 2 | 18-Dec-09 | 27.0 | 91.5 | 2 | absent | 26.0 | 92 | 2 | 1.5±0.5 |
| Lapus-lapus Cave | 18-Dec-09 | 28.0 | 87 | 2 | absent | 27.0 | 92 | 4 | absent |
| Langub Cave | 18-Dec-09 | 28.0 | 87 | 2 | absent | 28.0 | 87 | 2 | absent |
| Gintago-an Cave | 18-Dec-09 | 27.0 | 91.5 | 2 | absent | 27.0 | 91.5 | 1 | absent |
| Harpa Cave | 19-Dec-09 | 26.0 | 92 | 2 | absent | 25.0 | 92 | 4 | absent |
| Longon-longon Cave | 19-Dec-09 | 27.0 | 75 | 2 | absent | 27.0 | 93 | 2 | 3.5±0.50 |
| Cabugao Dako 1 | 13-Jan-10 | 28.0 | 87 | 2 | absent | 27.0 | 93 | 2 | absent |
| Cabugao Dako 2 | 13-Jan-10 | 28.0 | 87 | 2 | absent | 27.0 | 93 | 2 | absent |
| Cabugao Dako 3 | 13-Jan-10 | 28.0 | 87 | 2 | absent | 27.0 | 93 | 1 | 3.0 |

*Table 2.*

*List of amphibians and reptiles known from Gigantes and Sicogon Islands.*

| Family | Species | Site | | |
|---|---|---|---|---|
| | | Gigante Norte | Gigante Sur | Sicogon |
| Ceratobatrachidae | *Platymantis insulatus* | X, F, AA | X, BA1, F | |
| | *Platymantis dorsalis* | | | F |
| | *Platymantis corrugatus* | | | F |
| Ranidae | *Fejervarya cancrivora* | X | X, BA1, F | X, F |
| | *Polypedates leucomystax* | | X, BA1 | F |
| | *Limnonectes visayanus* | | X, F | |
| | *Occidozyga laevis* | | | F |
| Microhylidae | *Kaloula conjuncta* | X | | |
| Bufonidae | *Rhinella marina* | X | X | X |
| Gekkonidae | *Hemidactylus frenatus* | X, BA2, F | X, BA2, F | X, BA2, F |
| | *Hemidactylus platyurus* | X | X | X |
| | *Gehyra mutilata* | X, BA2, F | X, BA2, F | X, BA2, F |
| | *Gekko gigante* | X, BA2, F, A, AA | X, BA2, F, A, AA | |
| | *Gekko mindorensis* | | | X, BA2, F |
| | *Gekko gecko* | X, BA2, F | X, BA2, F | X, BA2, F |
| | *Lepidodactylus lugubris* | X, BA2, F | X, BA2, F | X, BA2, F |
| | *Cyrtodactylus annulatus* | | | F |
| | *Cyrtodactylus philippinicus* | | | F |
| Scincidae | *Emoia atrocostata* | | X, B | |
| | *Brachymeles talinis* | | | F |

*Continued in the next page...*

*Table 2. (Continued...)*

*List of amphibians and reptiles known from Gigantes and Sicogon Islands.*

| Family | Species | Site | | |
|---|---|---|---|---|
| | | Gigante Norte | Gigante Sur | Sicogon |
| | *Lamprolepis smaragdina philippinica* | X, BA3, F | X, BA3, F | X, BA3, F |
| | *Mabuya multicarinata borealis* | X,BA3, F | X,BA3, F | F |
| | *Sphenomorphus jagori grandis* | | X,BA3 | BA3, F |
| | *Sphenomorphus steerei* | X, BA3 | X, BA3, F | BA3 |
| | *Sphenomorphus cumingi* | | | F |
| Elaphidae | *Laticauda colubrina* | | X, DM | |
| | *Laticauda laticaudata* | | X, DM | |
| | *Laticauda semifasciata* | | DM | |
| | *Hydrophis inornatus* | | DM | |
| | *Hydrophis cyanocinctus* | | DM | |
| | *Hydrophis fasciatus* | | DM | |
| | *Hydrophis ornatus* | | DM | |
| | *Hydrophis belcheri* | | DM | |
| | *Lapemis curtus* | | DM | |
| | *Astrotia stokesii* | | DM | |
| | *Pelamis platurus* | | DM | |
| Typhlopidae | *Ramphotyphlops cumingii* | F | | |
| Acrochordidae | *Acrochordus granulatus* | | X, DM | |

*Continued in the next page...*

*Table 2. (Continued...)*

*List of amphibians and reptiles known from Gigantes and Sicogon Islands.*

| Family | Species | Site | | |
|---|---|---|---|---|
| | | Gigante Norte | Gigante Sur | Sicogon |
| Boidae | *Boiga dendrophila* | X, F | X, F | F |
| Colubridae | *Cerberus rynchops* | | X, DM | |
| | *Chrysopelea paradisi* | | X, F | F |
| | *Cyclocorus lineatus alcalai* | | F | |
| | *Dendrelaphis terrificus* | | F | |
| | *Tropidonophis negrosensis* | | | F |
| **Families = 11** | **Number of Species = 44** | **15** | **30** | **26** |

**NOTE:** (X)-This study; (A)-Alcala (1986); (BA1)-Brown & Alcala (1970); (BA2)-Brown & Alcala (1978); (BA3)-Brown & Alcala (1980); (B)-Brown (1992); (F)-Ferner et al. (2000); (DM)-Dunson & Minton (1978); 24 species recorded in this study.

*Table 3.*

*Counts of Gekko gigante in cave habitats of the Gigantes.*

| Site | Counts | Remarks |
|---|---|---|
| *Gigante Sur* | | |
| Danao-danao Cave 1 | 0 | Slightly disturbed; with markings on walls |
| Danao-danao Cave 2 | 0 | Less disturbed; sloping/vertical entrance |
| Danao-danao Cave 3 | 2 | Disturbed by collection of guano and treasure hunting activities |
| Wawa Cave | 22 | Minimal disturbance; *G. gigante* found in loose groups |
| Pawikan Cave | 4 | Disturbed by collection of guano and treasure hunting activities |
| Elepante Cave | 15 | Slightly disturbed |
| Cabugao Dako (cluster of 3 caves) | 7 | Disturbed by treasure hunting activities; one cave with soot on walls and roofs |
| Ipil-ipil plantation (near karst) | 15 | *G. gigante* found foraging at night |
| *Gigante Norte* | | |
| Bakwitan Cave 1 | 6 | Disturbed by collection of guano and treasure hunting activities |
| Bakwitan Cave 2 | 2 | Disturbed by collection of guano and treasure hunting activities |
| Lapus-lapus Cave | 1 | Disturbed by collection of guano and treasure hunting activities |
| Langub Cave | 6 | Walls and ceiling with heavy soot and floor with broken glasses and plastics; frequented by people |
| Gintagoan Cave | 16 | No disturbance; *G. gigante* found in groups of 3-12 individuals |
| Bulubadiang Islet | 2 | *G. gigante* not found in caves but in deep crevices |
| Harpa Cave | 5 | Disturbed by collection of guano and treasure hunting activities |
| Lungon-lungon Cave | 4 | Disturbed by collection of guano and treasure hunting activities |

*Table 4.*

*Checklist of bird species known from the Gigantes and Sicogon Islands.*

| English Name | Species | Status* | Gigantes | | Sicogon | |
|---|---|---|---|---|---|---|
| | | | Kennedy et al. (2000) | This study | Kennedy et al. (2000) | This study |
| Philippine Megapode | *Megapodius cumingii* | R | X | X | X | X |
| Streaked Shearwater | *Calonectris leucomelas* | M | | X, NR | | |
| Yellow Bittern | *Ixobrychus sinensis* | R | | X, NR | | |
| Cinnamon Bittern | *Ixobrychus cinnamomeus* | R | | X, NR | | |
| Rufous Night Heron | *Nycticorax caledonicus* | R | X | X | | |
| Striated HeroN | *Butorides striata* | R | X | X | | X, NR |
| Pond-heron | *Ardeola* sp. | M | | X, NR | | |
| Cattle Egret | *Bubulcus ibis* | R | | X, NR | | |
| Pacific Reef Egret | *Egretta sacra* | M | | X, NR | | X |
| Little Egret | *Egretta garzetta* | M | | X, NR | | |
| Great Frigatebird | *Fregata minor* | R | | X, NR | | |
| Brahminy Kite | *Haliastur indus* | R | | X, NR | | X, NR |
| White-bellied Sea-Eagle | *Haliaeetus leucogaster* | R | X | X | | X, NR |
| Crested Serpent-Eagle | *Spilornis cheela* | R | | | X | X |
| Barred Rail | *Gallirallus torquatus* | R | | X, NR | X | X |
| White-browed Crake | *Porzana cinerea* | R | | X, NR | | |
| Blue-breasted Quail | *Coturnix chinensis* | R | X | | | |
| Barred Buttonquail | *Turnix suscitator* | R | X | X | | |
| Oriental Pratincole | *Glareola maldivarum* | M | | | X | |
| Black-winged Stilt | *Himantopus himantopus* | M | | X, NR | | |
| Pacific Golden Plover | *Pluvialis fulva* | M | | X, NR | | |
| Little Ringed Plover | *Charadrius dubius* | M | | X, NR | | |
| Snipe | *Gallinago* sp. | M | | X, NR | | |
| Whimbrel | *Numenius phaeopus* | M | | X, NR | | |
| Wood Sandpiper | *Tringa glareola* | M | | X, NR | | |
| Common Sandpiper | *Actitis hypoleucos* | M | | X, NR | | X |
| Grey-tailed Tattler | *Heteroscelus brevipes* | M | | X, NR | | |

Continued in the next page...

*Table 4. (Continued...)*

*Checklist of bird species known from the Gigantes and Sicogon Islands.*

| English Name | Species | Status* | Gigantes | | Sicogon | |
|---|---|---|---|---|---|---|
| | | | Kennedy et al. (2000) | This study | Kennedy et al. (2000) | This study |
| Great Crested Tern | *Sterna bergii* | M | | X, NR | | |
| Little Tern | *Sterna albifrons* | M | | | X | |
| Whiskered Tern | *Chlidonias hybrida* | M | | X, NR | | X |
| Island Collared Dove | *Streptopelia bitorquata* | R | X | X, NR | | |
| Spotted Dove | *Streptopelia chinensis* | R | | X, NR | | X, NR |
| Emerald Dove | *Chalcophaps indica* | R | | X, NR | | X, NR |
| Zebra Dove | *Geopelia striata* | R | X | X | | X, NR |
| Pink-necked Green Pigeon | *Treron vernans* | R | X | X | X | X |
| Pied Imperial-Pigeon | *Ducula bicolor* | R | | X, NR | | |
| Hodson's Hawk-Cuckoo | *Hierococcyx fugax* | R | | X, NR | | |
| Asian Koel | *Eudynamys scolopaceus* | M | X | X | X | |
| Philippine Coucal | *Centropus viridis* | PE | X | X | | X, NR |
| Grass Owl | *Tyto capensis* | R | | X, NR | | |
| Philippine Hawk Owl | *Ninox philippensis* | PE | | X, NR | | |
| Philippine Nightjar | *Caprimulgus manillensis* | PE | | X, NR | | |
| Glossy Swiftlet | *Collocalia esculenta* | R | X | X | | X, NR |
| Pygmy Swiftlet | *Collocalia troglodytes* | PE | X | X | | X, NR |
| Uniform Swiftlet | *Collocalia vanikorensis* | R | X | X | | |
| Edible-nest Swiftlet | *Collocalia fuciphaga* | R | | X, NR | | |
| Visayan Hornbill | *Penelopides panini* | PE | | | X | |
| Dollarbird | *Eurystomus orientalis* | R | | X, NR | X | |
| Ruddy Kingfisher | *Halcyon coromanda* | M | | X, NR | | |
| Collared Kingfisher | *Todiramphus chloris* | R | X | X | X | X |
| Common Kingfisher | *Alcedo atthis* | M | | X, NR | | |
| Philippine Pygmy Woodpecker | *Dendrocopos maculatus* | PE | X | | | |
| Hooded Pitta | *Pitta sordida* | R | | | | X, NR |

*Continued in the next page...*

*Table 4. (Continued...)*

*Checklist of bird species known from the Gigantes and Sicogon Islands.*

| English Name | Species | Status* | Gigantes | | Sicogon | |
|---|---|---|---|---|---|---|
| | | | Kennedy et al. (2000) | This study | Kennedy et al. (2000) | This study |
| Golden-bellied Gerygone | *Gerygone sulphurea* | R | | X, NR | | X, NR |
| White-breasted Woodswallow | *Artamus leucorynchus* | R | X | X | X | X |
| Barn Swallow | *Hirundo rustica* | M | | X, NR | | |
| Pacific Swallow | *Hirundo tahitica* | R | X | X | X | X |
| Striated Swallow | *Hirundo striolata* | M | | X, NR | | |
| Pied Triller | *Lalage nigra* | R | X | X | X | X |
| Brown Shrike | *Lanius cristatus* | M | | X, NR | X | |
| Black-naped Oriole | *Oriolus chinensis* | R | X | X | | X, NR |
| Large-billed Crow | *Corvus macrorhynchos* | R | X | X | X | X |
| Grey-streaked Flycatcher | *Muscicapa griseisticta* | M | | | X | |
| Pied Fantail | *Rhipidura javanica* | R | | X, NR | X | X |
| White-vented Whistler | *Pachycephala homeyeri* | R | X | | | |
| Golden-headed Cisticola | *Cisticola exilis* | R | | X, NR | X | |
| Yellow-vented Bulbul | *Pycnonotus goiavier* | R | X | X | X | X |
| Philippine Bulbul | *Ixos philippinus* | PE | X | X | | X |
| Black-naped Monarch | *Hypothymis azurea* | R | | | X | X |
| Tawny Grassbird | *Megalurus timoriensis* | R | X | X | X | X |
| Striated Grassbird | *Megalurus palustris* | R | X | X | | |
| Arctic Warbler | *Phylloscopus borealis* | M | | X, NR | X | |
| Oriental Warbler | *Acrocephalus orientalis* | M | | | X | |
| Asian Glossy Starling | *Aplonis panayensis* | R | X | X | X | X |
| Coleto | *Sarcops calvus* | R | X | X | X | |
| Oriental Magpie Robin | *Copsychus saularis* | R | X | X | X | X |
| Blue Rock-Thrush | *Monticola solitarius* | M | | X, NR | | |
| Mangrove-blue Flycatcher | *Cyornis rufigastra* | R | X | | | |
| Pygmy Flowerpecker | *Dicaeum pygmaeum* | PE | X | X | X | |

*Continued in the next page...*

*Table 4. (Continued...)*

*Checklist of bird species known from the Gigantes and Sicogon Islands.*

| English Name | Species | Status* | Gigantes | | Sicogon | |
|---|---|---|---|---|---|---|
| | | | Kennedy et al. (2000) | This study | Kennedy et al. (2000) | This study |
| Olive-backed Sunbird | *Cinnyris jugularis* | R | X | X | X | X |
| Eurasian Tree Sparrow | *Passer montanus* | R | | X, NR | X | X |
| Black-headed Munia | *Lonchura malacca* | R | X | X | | X |
| Yellow Wagtail | *Motacilla flava* | M | | X, NR | | |
| Grey Wagtail | *Motacilla cinerea* | M | X | | | |
| Richard's Pipit | *Anthus richardi* | M | X | X | | |
| | **Total Number of Species = 87** | | **35** | **72** | **29** | **33** |

**NOTE:** PE-Philippine Endemic; R-resident; M-migrant; NR-new record; (*) based on Kennedy et al. (2000)

*Table 5.*

*A list of mammals observed in the Gigantes and Sicogon during the survey.*

| Family | Species | North Gigante | Gigante Sur | Sicogon |
|---|---|---|---|---|
| ***Volant mammals*** | | | | |
| Eballonuridae | | | | |
| Pteropodidae (Fruit Bats) | *Saccolaimus saccolaimus* | | 12 | |
| | *Pteropus hypomelanus* | (1) | 1(1) | 30 |
| | *Pteropus pumilus* | | | 15 |
| | *Rousettus amplexicaudatus* | (38) | (21) | |
| | *Macroglossus minimus* | (1) | (1) | |
| | *Ptenochirus jagori* | | (1) | |
| | *Cynopterus brachyotis* | (3) | (4) | (3) |
| Rhinolophidae | | | | |
| (Horsehoe and Roundleaf Bats) | *Rhinolophus virgo* | 1 | | |
| | *Hipposideros diadema* | | 1 | |
| Vespertilionidae | | | | |
| (Vesper and Evening Bats) | *Murina cyclotis* | | 3 | |
| | *Pipistrellus tenuis* | | (3) | |
| ***Non-volant mammals*** | | | | |
| Cercopithecidae (Monkies) | *Macaca fascicularis* | 2 | 3 | 10 |
| Muridae (Mice and Rats) | *Rattus tanezumi* | 1(3) | 3 | 4 |
| Soricidae (Shrews) | *Suncus murinus* | 3(2) | 2 | 2 |
| | **Number of Species = 14** | **8** | **14** | **5** |