

ERRATA:
AN INVENTORY STUDY OF AVIFAUNAL POPULATION ON THE
PRIMARY AND SECONDARY FORESTS OF SIBULAN WATERSHED AREA AND
AGROFORESTRY ECOSYSTEMS OF BRGY. MAHABANG KAHROY, POLILLO,
QUEZON
MA.VICTORIA P. HILARIO AND SUSAN WALKER

'Secondary forest' read as 'logged primary forest'. The area concerned had not previously been clear-cut, as suggested by the former term.

Species to be omitted from the report:

Treron vernans Pink necked pigeon

Phapitreron leucotis White Eared Brown Dove

Ducula poliocephala Pink Bellied Imperial Pigeon

Dicaeum hypoleucum Buzzing Flowerpecker

Aethopyga pulcherrima Mountain Sunbird

Arachnothera longirostra Little Spider Hunter

Field notes inadequate to substantiate these records

Any numbers read in the report should be viewed with the above in mind

Figure 1 *Mulleripicus funebris*, the Sooty Woodpecker read
Chrysocolaptes lucidus, the Greater Flameback, is associated with primary and secondary forest (Dickinson et al., 1991). *Chrysocolaptes lucidus grandis*, the Polillo subspecies is characterised by the smaller white spots on its crown and under-parts that are both browner and larger (Hachisuka, 1930).

Copsychus luoniensis read *Copsychus luzoniensis*

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POLILLO, QUEZON**

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Abstract

An inventory study on the avifauna of Polillo Island, part of the Luzon Endemic Bird Area, was conducted during the period July-September, 1999, thus updating that produced by Gonzalez in 1996. The research was focused within and around the primary and secondary forest of the Sibulan Watershed Reserve and the agroecosystem of Sitio Mahabangkahoy. 30-40 transect hours, mist netting and sound recordings were conducted in each habitat. Informal recordings were also obtained at the coastal site of Bucao and at Panukulan in the north of the island. A total of 86 species were reported in the main study site-50 in the primary forest, 49 in the secondary forest and 69 in the agroecosystem. Five of the seven endemic sub-species were seen: Polillo Tarictic Hornbill (*Penelopides manillae subnigra*), Polillo White Browed Shama (*Copsychus luzoniensis parvimaculatus*), Polillo Trogon (*Harpectes ardens minor*), Polillo Flameback (*Chrysocolaptes lucidus grandis*) and Polillo Crested Goshawk (*Accipter trivirgatus castroi*). Eleven globally near-threatened species were observed: *Ixobrychus eurhythmus*, *Ptilinopus merrilli*, *Centropus unirufous*, *Ceyx melanurus*, *Hypothymis helenae*, *Terpsiphone cinnamomea* (Collar and Andrew 1988), *Anas luzonica*, *Gallicolumba luzonica*, *Alcedo cyanopectus*, *Penelepidoides manillae*, *Irena cyanogaster* (Birdlife International 1994). The presence of *Irena cyanogaster*, *Macropygia phasianella* and *Ptilinopus leclancheri* absent in the 1996 report, wherein they were hypothesized to have undergone local extinction, has been confirmed. New records for the island include *Pitta erythrogaster* and *Rostratula benghalensis*. Trends in species presence and richness have been analysed on a temporal and spatial level. Species diversity and evenness indices were highest in the secondary forest, then the agroforestry ecosystem and lastly the primary forest. An urgent need for further research along the coast has been identified, due to the imminent threat from recreational developments.

Introduction

The Polillo Islands are part of the Luzon Endemic Bird Area (EBA), an area of 108,000 km² rising from 0-2700 m.a.s.l. Luzon EBA is threatened severely by habitat loss and ranks sixth in the global critical list of EBAs (Bibby et al. 1992). Three globally threatened and fourteen near-threatened species have been recorded on the Polillo Islands. The Polillo Watershed Reserve in Sibulan, Polillo Quezon is approximately 160 hectares in extent. It contains closed canopy forests and provides a valuable source of potable water for surrounding communities especially the municipal centre of Polillo. Surrounding the

watershed area are fractions of secondary growth forest and agroecosystems featuring coconuts and rice paddies.

According to Gonzalez (1997), there have been several expeditions to Polillo. The early collectors were Porter (1903), Ickis (1907) and McGregor (1909)-the latter of whom described several new bird species including the Tarictic Hornbill (*Penelopides manillae subnigra*), which is now considered subspecies. In 1956, Manuel collected several specimens that become neotypes for *Penelopides manillae subnigra* and *Cacatua haematuropygia mcgregori*. His published results were largely based on Burdeos where lowland forest still occurred. Manuel reported resident bird species and described new species including the endemic Polillo race of Philippine Trogon, *Harpectes ardens minor*.

The most recent study on the Polillo islands was conducted in 1996 by Gonzalez- he reported therein 102 species. At the start of this study a cumulative total of 200 species (Status Report: Polillo Ecology Stewardship Project Apr-Sept 1998) had been recorded throughout Polillo's research history. The 1996 study recorded all seven Polillo subspecies: Polillo Tarictic Hornbill (*Penelopides manillae subnigra*), Polillo White Browed Shama (*Copsychus luzoniensis parvimaclatus*), Polillo Blue Naped Parrot (*Tanygnathous lucionensis hybridus*), Polillo Azure-backed Parrot (*Tanygnathous sumatranus freeri*), Polillo Trogon (*Harpectes ardens minor*), Polillo Flameback (*Chrysocolaptes lucidus grandis*) and Polillo Crested Goshawk (*Accipter trivirgatus castroi*) (Figure 1). Gonzalez reported 3 globally threatened and 12 of the 14 near-threatened species recorded on the Polillo Islands.

Objectives

This study aims to update the species account produced by Gonzalez in 1996. In contrast to this previous study based on the entire Polillo Island group the present study is focused predominantly on the Sibulan Watershed area and agroecosystems of Brgy. Mahabangkahoy. Ecological relationships will be established among the three habitats: primary forest, secondary forest and agroecosystem. Short study periods were also conducted at the coastal site of Bucao and at Panukulan in the north of the island. It is hoped that the pending data will have strong implications for conservation management.

IMMEDIATE AIMS:

1. Produce an updated avifaunal inventory based predominantly on the primary and secondary forests of Sibulan Watershed and the agroecosystem of Sitio Mahabangkahoy, Polillo Quezon.
2. Document species presence, species richness and indices of diversity, evenness and similarity. Analyse results on a spatial and temporal basis.
3. Identify areas of conservation concern and provide recommendations for future research

Figure 1: The Endemic Sub-species of Polillo Island

Copsychus luoniensis, the White-browed shama is a common bird of the forest undergrowth, below 1000m. It is of particular importance on Polillo due to its designation as a sub-species by McGregor in 1910. *Copsychus luzionensis parvimaclatus* is characterised by its shorter tips to its tail retrices. The question remains as to whether this is a valid conclusion and if it is as to whether it can be supported by further observations; the acoustic characteristics of races of *Copsychus luzionensis* should be examined.

Harpactes ardens, the Philippine Trogon is a 'Fairly common resident of primary forest, occasional in second growth up to 1500m' (Dickinson et al. 1991) The subspecies, *H. ardens minor*, characterised by its darker red feathers and smaller wing of 133cm rather than 145cm was designated by Manuel in 1957.

Penelopides manillae subnigra, the Tarctic Hornbill, a 'Fairly common bird in forest up to about 1000m' (Dickinson et al. 1991). *Penelopides manillae subnigra* (McGregor 1910) is characterised by its larger upperparts and green rather than brown glossed tail.

Mulleripicus funebris, the Sooty Woodpecker, is 'Fairly common in evergreen forest up to about 1000m, occurring in montane oak and pine forest as well. *M. funebris parkesi* (Manuel 1957), restricted to Polillo island is characterised by its smaller white spots on its crown, browner underparts and larger dimensions.

Accipiter trivirgatus, the Crested Goshawk is an uncommon resident not endemic to the Philippines. It occurs in primary forest and secondary growth including residual patches. *A.t. castroi* (Manuel and Gilliard, 1952) has a dark blue back, darker more heavily barred underparts and longer wing and tarsus.

Tanygnathus sumatranus, the Blue-backed parrot is a shy forest resident of the Philippines, Sulawesi and neighbouring small islands; it is rare in all areas except the Sulas. *T.s. freeri* the sub species found on Polillo Island (McGregor 1910) has a lighter green crown, a lighter blue back, a yellow collar hind neck and larger dimensions.

Tanygnathus luzionensis, the Blue-naped parrot is an uncommon resident in forests of the Philippines, Talaud islands and islands off north and east Borneo. It is known to occasionally visit farmland and orchards. *T.l. hybridus* (McGregor 1910) is a larger, paler race with less blue on its head.

Methods

The distribution of species in the three habitats: primary forest, secondary forest and agroecosystem, was assessed through walking 3km transects, mist netting, utilizing sound recording techniques and conducting informal ethnobiological surveys.

TRANSECT SURVEYS (Tables 3,4 and 5)

30-40 transect hours between the hours of 05:30-09:30 and 15:00-18:00 were conducted in each habitat. Transects were constructed with the aim of representing the considerable heterogeneities within each of these broad habitat divisions, thus leading to a substantial proportion of each route encompassing the riparian habitat. Consideration was also given to the presence of fruiting trees. The transects were traversed by three observers who recorded species type (based on sound and visual encounters), frequency and where possible activity (flying, foraging behaviour, participation in mixed feeding parties...). The observers were equipped with binoculars. The transect methodology was based upon that of Danielson et al (1991), Miranda (1987) and Gonzalez (1993). Bird identification, to the species and where possible the sub-species level, was based upon the guides by Du Pont (1971) and Dickinson et al. (1991).

The data from the transect area was used for the computation of birds species diversity using the Shannon-Weiner function, H ($H = -\sum p_i \log p_i$, p_i =proportion of total sample belonging to the i th species) and evenness indices, E using Pielou's formula(1966); An index to compare the number of species common to two sites was calculated using the Sorenson's index of similarity, S ($S = (A+B)/C^2$ A =no. species in site A, B =no. species in site B, C =no. species common to both sites). These calculations conform to those adopted by Gonzalez in 1997.

ACOUSTIC RECORDINGS

Acoustic records were made both within and outside the set transect hours (Table 7), providing a vital tool for recording more cryptic species; the method proved invaluable in the primary forest where the habitat had greater three-dimensional properties and visual encounters were relatively scarce.

Equipment: Marantz recorder, microphone and parabolic reflector

Tapes were deposited and copied at the British Library of Wildlife Sounds.

MIST NETTING (Table 6)

Mist netting provided a further means to record the more cryptic species and permitted a finer habitat analysis. Mist nets with an average mesh size of 36 millimetres and height of 2.5 metres were erected between dawn and dusk in each habitat. The various habitat heterogeneities were represented in the netting sites, however forest surveys were limited to sub-canopy birds. Standard biometrics (bill length, bill gape, tail-vent length, total length and weight) were recorded using pesolas and dial calipers; the birds were temporarily marked for mark-recapture purposes. Morphological and colour characteristics were also documented, where appropriate.

OTHER SOURCES OF INFORMATION

The basic protocol for the surveys was complemented by ethnobiological accounts, observations of roosting birds, birds retrieved from traps constructed for the Monitor lizards (*Varanus olivaceus* and *Varanus salvator*) and from bird remains (feathers and bills). Ethnobiological surveys consisted of interviews with the Ecology Steward and residents of communities near the study sites; the presence, frequency and distribution of species, local names, seasonal occurrence and behaviour were among the factors discussed.

MORTALITIES

The mortalities encountered during the study were preserved in 10% buffered formalin and deposited at the Museum of Natural History, University of the Philippines (Los Banos).

HABITAT EVALUATION OF THE AREA

The main study sites were located within the secondary and the primary old growth forest of Sibulan Watershed Area, and the agroecosystems of Brgy. Mahabangkahoy, Polillo Quezon. Characteristic vegetation of each habitat, degree of light penetration, tree morphologies, existence/proximity to a free water source, forest litter density, moss and epiphyte density and substrate type were recorded along the transect route and at netting sites in each habitat. Vegetation was analysed using the Point Center Quarter Method (Afuang and Gonzalez, 1993). Botanical identification was achieved with the help of local guides and UPLB plant taxonomist experts.

Informal surveys were conducted during our brief period at the coastal site of Bucao and in the secondary forest-agroecosystem of Panukulan in the north of the island.

THE PRIMARY OLD GROWTH FOREST

The only old growth lowland forest within the Polillo islands is located within the Sibulan Watershed Reserve, an area that extends for approximately 160 hectares. The area has been damaged severely by the typhoons of 1997 and prostrate trunks with diameters exceeding 100cm remain. Remnant trees have a diameter at breast height of 50-100cm and a height of 30-50m. Dipterocarpaceae predominate with species including *Shorea contorta* (White Lauan), *Shorea negroensis* (Red Lauan), *Dipterocarpus speciosus* (Apitong) and *Hopea malibato* (Daling dingan). Species of Palmae included *Pinanga insignis* (Tokyong), *Areca catechu* (Bunga) and *Caryota rumphiana* (Pugahan). The Pandanaceae are also represented. Other trees included *Schafflera caudate* (Lima lima), *Ficus nota* (Tibig), Katmon (*Dillenia philippinensis*), Malanato, Malaruhat, Pelosapis, Malatubig, Malabayabas (*Tristania decorticala*), Dinglas, Narra (*Pterocarpus indicus*), Balete (*Ficus benjamina*), Makaasin, Alupag, Mangasenora, Kamagong (*Diospyrus philippensis*) and Malasantol. The understory features rattans, *Lycopodium*, large gabi plants and ferns.

THE SECONDARY GROWTH FOREST

The secondary growth forest is found both within and adjacent to the Sibulan Watershed Reserve. Selective deforestation was present in the 1960s (Gonzalez 1996). Trees include *Macaranga bicolor* (Takipasin), *Artocarpus sericarpus* (Antipolo), *Ficus nota* (Tibig), *Ficus variegata*, *Nephelium ramboutano* (Bulala), *Trichadenia philippinensis* (Amlang), *Macaranga tanarius* (Bilonga), *Schafflera caudate* (Lima Lima), *Dillenia philippinensis* (Katmon), *Syzygium* sp. (Macaasin), *Litsea ampla*, *Shorea negroensis* (Red Lauan), *Shorea contorta* (White lauan) and Abaca. The understorey features a leaf litter approximately 3-5cms deep, dead wood, ferns, small pandans, wild gingers and gabi. The stream is mainly shallow with a soft substrate.

The understorey of the secondary forest at Panukulan appeared more dense than that at Sibulan; ferns and wild rattans were apparent. The area has been considerably deforested for agricultural purposes, as described below

AGROECOSYSTEMS

The study site was located at Sitio Mahabangkahoy. The area was logged in the 1960s and 1970s so as to establish coconut (*Cocos nucifera*) plantations and rice; the natural irrigation pattern was altered accordingly. Fruiting trees include the Jack Fruit (*Artocarpus heterophyllus*), Aratiles, Balimbing (*Averrhoa carambola*), Guava (*Psidium guajava*) and Bananas. Water buffalo, horses and cattle are grazed in this area. Bamboo thickets, ferns and cogon grasses are present. A broad river that reacts rapidly to current patterns of precipitation traverses this habitat. Mature fruiting trees frequented by birds overhang the river.

The agroecosystem in Panukulan features rice paddies, sugar cane, cassava, coconuts and bananas.

COASTAL SITE

A short study was also conducted at Bucao and its adjacent island, Tungao. The area has a large tidal range with a vast expanse of sand stretching out towards Tungao being exposed at low tide. The mangroves bordering the shoreline gave way to coconuts. Fish and Sea Cucumbers are harvested in the local waters. Areas of this important habitat have been destroyed for the construction of a hotel-under construction at the time of the study period. The area is under considerable threat from development plans for tourism.

Results and Discussion

A TEMPORAL AND SPATIAL ANALYSIS (Tables 1-5)

A total of 86 (inclusive of primary and secondary information sources) bird species were recorded on the three habitat types of Sibulan Watershed Area and the agroecosystems of Brgy. Mahabangkahoy, Polillo, Quezon. From the list of species recorded by McGregor, Manuel and Gonzalez, 45 species, predominantly migratory and shorebirds are absent from the 1999 inventory. This absence is partly a reflection of the narrower habitat dimensions, smaller geographical area encompassed by this study and temporal differences. Previous accounts have been based on the entire Polillo island group. There are 13 additional records to the inventory produced by Gonzalez (1996). A total of 50

species were recorded from the primary forests, 49 from the secondary and 69 from the agroforestry ecosystem.

The records in Sibulan forest compare favourably to those of Gonzalez in 1996 who recorded 41 species in both the primary and secondary forests (1996); a notable exception is the Blue-backed parrot, *Tanygnathus sumatranus*; an acoustic recording of this species was possibly obtained during the 1999 period however there were no sightings. A notable addition to the 1996 list and a new record for the island is the Red-bellied Pitta, *Pitta erythrogaster*, a ground-dwelling bird caught in a lizard trap. The 1996 agroforestry surveys conducted at Brgy. Agta-Sabang rather than Brgy. Mahabangkahoy recorded only 25 species; significant temporal and spatial differences prevent a detailed comparative analysis being pursued.

THE AGROECOSYSTEM (Table 3)

The high number of species in the agroecosystem reflects the available resources of this area that are readily exploited by tolerant forest birds and the colonizing non-forest birds (Gonzalez 1997); *Phaenicophaeus superciliosus* is considered to be in this former category and *Lonchura malacca* in the latter. The most abundant species observed during the transect were *Oriolus chinensis* (66), *Hypsipetes philippinensis* (55), *Lonchura Malacca* (38), *Artamus leucorhynchus* (28), *Nectarinia sperata* (66) and *Collocalia sp.* (45); the former two species are arboreal insectivores/frugivores. Gregarious flocks of *Lonchura malacca*, a graminivorous species were observed in the rice paddies together with flocks of *A.leucorhynchus* an insectivorous species. *Nectarinia sperata* an insectivorous/nectivorous species was common around the *Cocos nucifera*. Wading species included the cryptic though highly vocal *Amaurornis phoenicurus*. *Rostratula benghalensis* discovered in the rice paddy is a new record for the island. The harvest season is reported to attract migratory birds such as *Lanius cristatus*. *Tanygnathus lucionensis* has also been reported in this habitat when bananas ripen. Common forest edge species included *Dicrurus baliassius*, *Sarcops calvus*, *Spilornis holospilos*, *Accipiter trivirgatus* and *Penelopides manillae subnigra*. According to Hunter (1990), Game species show predilection to edges, where two habitats meet; the benefits of food from the agroecosystem in addition to the shelter and nesting sites within the forest are here exploited. Species reported only in the agroecosystem include: *Ardea purpurea*, *Egretta intermedia*, *Bubulcus ibis*, *Ardea cinerea*, *Ixobrychus eurhythmus*, *Haliastur indus*, *Haliaeetus leucogaster*, *Accipiter virgatus*, *Gallirallus torquatos*, *Amaurornis olivacea*, *Rostratula benghalensis*, *Rallus striatus*, *Ducula poliocephalia*, *Streptopelia bitorquata*, *Halcyon smyrnensis*, *Anthus novaseelandiae*, *Artamus leucorhynchus*, *Lanius cristatus*, *Arachnothera longirosta*, *Dicaeum hypoleucum*. *Passer montanus* and *Lonchura malacca*

THE FOREST (Tables 4 & 5)

The most abundant species observed during the transects in the primary (p) and secondary (s) forests featured the *Copsychus luzoniensis* (59:55, p:s), *Hypsipetes philippinensis* (46:99, p:s), *Ducula aenea* (48:40, p:s), *Penelepidoides manillae* (54:29 p:s), *Sarcops calvus* (29:49, p:s) and *Pycnonotus urostictus* (31:36 p:s). *Oriolus chinensis* was

abundant in the secondary (46) though not in the primary (9) forest. Notes on the breeding ecology of *C. luzoniensis*, a terrestrial insectivore were obtained on the 03/09/99 when a fledgling was observed begging to and being fed by an adult. *Penelopides manillae subnigra*, *Ducula aenea*, *Phaenicophaeus superciliosus* and *Centropus unirufus* were often seen as a mixed flock in the primary forests. *Pitta erythrogaster* and *Hypothymis helenae* were observed only in the primary forest, however the latter was recorded by Gonzalez in the secondary forest. The Rufous Night Heron, *Nycticorax caledonicus* discovered in the primary forest potentially feeds in the rice paddies and has also been sighted at the coastal site of Bucao. *Ptilinopus merrilli*, *Ptilinopus leclancheri*, *Eudynamys scolopacea*, and *Aethopyga pulcherrima* were observed only in the secondary forest, the former three species being sighted on a fruiting *Ficus benjaminus* tree in the transect. *Gallicolumba luzonica* was more frequently encountered when roosting than during the formal transect period. The majority of species in the secondary forest were frugivorous and their high numbers reflective particularly of the fruiting *Ficus benjaminus*.

Niche differentiation was most evident within the kingfishers and munias; *Lonchura leucogastra* was recorded in both the primary and secondary forest whereas *L. malacca* was recorded only in the agroecosystem. *Alcedo cyanopectus* and *Halcyon smymensis*, riparian species, were both common to the agroecosystem though the range of only the former species extended into the forest. *Ceyx melanurus* a non-riparian species was specific to the forest habitat. The fourth species of kingfisher *Halcyon chloris* was observed at the coastal site of Bucao.

BUCAO AND PANUKULAN

Inventories from the short period at Bucao and Panukulan are shown in figure 2.

PANUKULAN

The short study period in the North of the island could evidently not do this area justice however some interesting observations were made. Two new netting records were obtained, namely, the Fairy Bluebird, *Irena cyanogaster* and the Brown Shrike, *Lanius cristatus*. Direct observations of *Lanius cristatus* hunting were obtained in an area of sugar cane bordering the secondary forest; no equivalent habitat-type was surveyed in the south of the island. *Lanius cristatus* is both a breeder and common winter visitor in the Philippines where it frequents 'open areas, second growth and residential areas' (Dickinson et al. 1991). *Irena cyanogaster* was observed on the forest fringe. It is further interesting to note that no Wattle Bulbuls, *Pycnonotus urostictus* were either caught or observed in this region.

BUCAO

The coastal/mangrove region of Bucao bordered by an area of coconuts was briefly surveyed. This unique habitat, overlooking the small island of 'Tungao' -a fundamental roosting site for Little and Reef Egrets, *Egretta garzetta* and *E. sacra* is under severe threat from coastal anthropogenic developments and has thus been recommended strongly as a region requiring further investigation. It is absolutely vital that the avian (and other) biodiversity of this site is accurately documented with temporal variations being taken into

account. The apparent dominating presence of *Nectarinia jugularis* rather than *Nectarinia sperata* is based on limited data and hence should not be extrapolated to draw rigid conclusions about the relative densities of these two species in this coastal habitat. The concept of niche differentiation is nevertheless implied; further relevant is the notable predominance of *N.sperata* rather than *N.jugularis* in the agroforestry of Baranggay Mahabangkahoy. This trend differs from the habitat descriptions offered by Dickinson *et al* 1991, whereby only the former species is associated with mangroves.

Fig.2

INVENTORIES FROM BUCAO AND PANUKULAN, POLILLO QUEZON

BUCAO

Butoroides striatus Striated Heron
Egretta garzetta Little Egret
Egretta sacra Eastern Reef Egret
Egretta intermedia Intermediate Egret
Nycticorax caledonicus Rufous Night Heron
Plurialis dominica Lesser Golden Plover
Numerius pholopus Whimbrel
Actitis hypoleucos Common Sandpiper
Heteroscelus brevipes Grey Tailed Tattler
Sterna bergii Greater Crested Tern
Sterna albifrons Little Tern
Macropygia phasianella Reddish Cuckoo Dove
Streptopelia bitoquata Dwarf turtle dove
Eudynamys scolopacea Common Koel
Centropus viridis Philippine Coucal
Collocalia esculenta Glossy Swiftlet
Halcyon chloris White Collared Kingfisher
Hypsipetes philippinus Philippine Bulbul
Oriolus chinensis Black Napped Oriole
Artamus leucorhynchus White Breasted Woodswallow
Aplonis panayensis Asian Glossy Starling
Nectarinia jugularis Olive Backed Sunbird
Rhipidura javanica Pied Fantail

PANUKULAN

Accipiter virgatus Besra
Accipiter trivirgatus Polillo Crested Goshawk
Phapitreron amethystina Amethyst Brown Dove
Ducula aenea Green Imperial Pigeon
Gallicolumba luzonica Luzon Bleeding Heart
Treron pompador Pompadour's Fruit Dove
Ptilinopus merrilli Merrill's Fruit Dove
Chalcophaps indica Green Winged Fruit Dove
Tanygnathus sumatranus Blue Backed Parrot
Loriculus philippensis Philippine Hanging Parakeet
Phaenicophaeus superciliosus Red Crested Malkoha
Centropus viridis Philippine Coucal
Harpectes ardens Philippine Trogon
Penelopides manillae subnigra Tarictic Hornbill
Mulleripicus funebris Sooty Woodpecker
Chrysocolaptes lucidus Polillo Flamebacked Woodpecker
Lalage nigra Pied Triller
Hypsipetes philippinus Philippine Bulbul
Pycnonotus urostictus White Eyed Bulbul
Dicrurus balicassius Balicassiao
Oriolus chinensis Black Naped Oriole
Irena cyanogaster Philippine Fairy Bluebird
Corvus macrorhynchus Large Billed Crow
Copsychus luzoniensis White Eyed Browed Shama
Cyornis rufigaster Mangrove Blue Flycatcher
Hypothymis azurea Black Naped Monarch
Tersiphone cinnamomea Rufous Paradise Flycatcher
Motacilla cinerea Grey Wagtail
Lanius cristatus Brown Shrike
Sarcops calvus Coletto
Nectarinia sperata Purple Throated Sunbird
Dicaeum pygmaeum Pygmy Flowerpecker
Dicaeum trigostigma Orange Bellied Flowerpecker
Lonchura leucogastra White Bellied Munia

NB: Lists based on primary and secondary evidence
-no *Tanygnathus* actually seen

Table 1: Records of Bird Species Found in Polillo Islands: 1910,1956,1996,1999

SPECIES	McGregor 1910	Manuel 1956	Gonzalez 1996	Hilario & Walker 1999
<i>Pterodroma phaeopygia</i> Dark-Rumped Petrel			x	
<i>Calonectris leucomelas</i> Streaked Shearwater			x	
<i>Ardea cinerea</i> Grey Heron			x	R
<i>Egretta garzetta</i> Little Egret	x	x	x	x
<i>Egretta sacra</i> Eastern Reef Egret	x	x	x	*
<i>Egretta intermedia</i> Intermediate egret			x	*
<i>Egretta alba</i> Great Egret			x	
<i>Bubulcus ibis</i> Cattle Egret	x	x	x	R
<i>Butoroides striatus</i> Striated Heron	x	x	x	*
<i>Gorsachius melanolophus</i> Malayan Night Heron			x	
<i>Nycticorax caledonicus</i> Rufous Night heron	x	x	x	BT
<i>Ardea purpurea</i> Purple Heron				x
<i>Ixobrychus eurhythmus</i> Schrenk's Bittern	x		x	x
<i>Ciconia episcopus</i> Wolly-necked stork	x	x		
<i>Dendrocygna arcuata</i> Wandering Whistling Duck			x	R
<i>Anas luzonica</i> Philippine Duck	x	x	x	x
<i>Anas clypeata</i> Northern Shoveler	x			
<i>Pernis ptilorhynchus</i> Oriental Honeybuzzard	x		x	
<i>Haliastur indus</i> Brahminy Kite	x	x	x	R
<i>Haliaeetus leucogaster</i> White Bellied Sea Eagle			x	R
<i>Spilornis holospilus</i> Philippine Serpent Eagle	x	x	x	xN
<i>Accipiter gularis</i> Japanese Sparrowhawk	x			
<i>Accipiter virgatus</i> Besra			x	RN
<i>Accipiter trivirgatus</i> Crested Goshawk	x	x	x	x
<i>Butastur indicus</i> Grey Faced buzzard	x			
<i>Megapodius cumingii</i> Tapon Scrubfowl	x	x	x	
<i>Gallus gallus</i> Red Junglefowl	x		x	R
<i>Gallirallus philippensis</i> Buff banded rail			x	R
<i>Gallirallus torquatus</i> Barred rail	x		x	x
<i>Porzana cinerea</i> White browed Crake			x	
<i>Amauromis olivacea</i> Plain Bush Hen		x	x	x
<i>Amauromis pheonnicurus</i> White Brested Swamphen			x	x
<i>Gallinix cinerea</i> Watercock		x		
<i>Pluvialis squatarola</i> Grey Plover	x			
<i>Rostratula benghalensis</i> Painted Snipe				N
<i>Rallus striatus</i> Slatty Legged Crake				x
<i>Pluvialis dominica</i> Lesser Golden plover	x			*
<i>Charadrius dubius</i> Little Ringed Plover	x			
<i>Charadrius alexandrinus</i> Kentish Plover	x			
<i>Charadrius mongolus</i> Lesser Sand Plover	x			
<i>Charadrius leslechenaulti</i> Greater SandPlover	x			
<i>Charadrius peronii</i> Malaysian Plover	x		x	
<i>Numenius phaeopus</i> Whimbrel	x		x	*
<i>Tringa totanus</i> Common redshank	x			
<i>Tringa stagnatilis</i> Marsh sandpiper	x		x	
<i>Tringa nebularia</i> Common redshank	x		x	
<i>Tringa ocropus</i> Green Sandpiper	x			
<i>Tringa glareola</i> Wood Sandpiper	x			
<i>Tringa sp.</i>				R
<i>Actitis hypoleucos</i> Common Sandpiper	x			*
<i>Heteroscelus (T. incanus) brevipes</i> Grey Tailed Tattler	x		x	*
<i>Arenaria interpres</i> Ruddy Turnstone	x			
<i>Gallinago megala</i> Swinhoe's Snipe	x			
<i>Calidris ruficollis</i> Rufous Necked Stint	x		x	
<i>Calidris alba</i> Sanderling	x			
<i>Esacus magnirostris</i> great Thick Knee	x	x		
<i>Glareola maldivarum</i> Oriental Pranticole			x	
<i>Sterna bergii</i> Greater Crested Tern			x	*
<i>Sterna albifrons sinensis</i> Little Tern	x			*

<i>Treron pompadora</i> Pompadour's Fruit Dove	x	x	x	x
<i>Treron vernans</i> Pink necked pigeon				x
<i>Phapiteron amethystina</i> Amethyst brown Dove	x	x	x	xN
<i>Ptilinopus merrilli</i> Cream Bellied Fruit Dove	x	x	x	x
<i>Ptilinopus leclancheri</i> Black chinned Fruit Dove		x		x
<i>Ducula aenea</i> Green Imperial Pigeon	x	x	x	x
<i>Ducula bicolor</i> Pied Imperial Pigeon	x	x	x	x
<i>Macropygia phasianella</i> Reddish Cuckoo Dove	x	x		R
<i>Streptopelia bitorquata</i> Island Collared Dove	x	x	x	x
<i>Streptopelia chinensis</i> Spotted Dove			x	
<i>Chalcophaps indica</i> Common Emerald Dove	x	x	x	xN
<i>Gallicolumba luzonica</i> Luzon Bleeding Heart	x	x	x	x
<i>Phapitreron leucotis</i> White Eared Fruit Dove				xN
<i>Ducula poliocephala</i> Pink Bellied Imperial Pigeon				R
<i>Cacatua haematuropygia</i> Philippine Cockatoo	x	x	x	
<i>Tanygnathus lucionensis</i> Blue Naped Parrot	x	x	x	R
<i>Tanygnathus sumatranus</i> Blue backed Parrot	x	x	x	R
<i>Loriculus philippensis</i> Philippine hanging Parrot		x	x	x
<i>Cuculus sparveroides</i> Large hawk Cuckoo		x		x
<i>Eudynamys scolopacea</i> Common Koel		x	x	x
<i>Phaenicophaeus superciliosus</i> Red crested malkoha	x	x	x	x
<i>Centropus viridis</i> Philippine Coucal	x	x	x	x
<i>Centropus unirus</i> Rufous Coucal	x	x	x	x
<i>Tyto capensis</i> Grass Owl			x	
<i>Ninox philippensis</i> Philippine hawk Owl	x	x	x	N
<i>Batrachostomos septimus</i> Philippine Frogmouth			x	R
<i>Collocalia esculenta</i> Glossy Swiftlet	x	x	x	xN
<i>Collocalia vanikorensis</i> Island Swiftlet			x	x
<i>Collocalia troglodytes</i> Pygmy swiftlet			x	x
<i>Hirundapus celebensis</i> Purple Needle tail			x	
<i>Cypsiurus balasiensis</i> Asian Palm Swift	x	x	x	
<i>Harpectes ardens</i> Philippine Trogon	x	x	x	xN
<i>Alcedo atthis</i> Common Kingfisher	x			
<i>Alcedo cyanopectus</i> Indigo banded Kingfisher	x	x	x	xN
<i>Ceyx melanurus</i> Philippine Dwarf Kingfisher	x	x	x	xN
<i>Halcyon capensis</i> Stork Billed kingfisher	x	x		
<i>Halcyon smyrnensis</i> White Throated kingfisher	x	x	x	xN
<i>Halcyon chloris</i> White Collared kingfisher	x	x	x	*
<i>Eurystomus orientalis</i> Dollarbird	x	x	x	x
<i>Penelopides manillae subnigra</i> Tarictic Hornbill	x	x	x	x
<i>Mulleripicus funebris</i> Sooty Woodpecker	x	x	x	x
<i>Chrysocolaptes lucidus</i> Greater Flameback	x	x	x	x
<i>Pitta erythrogaster</i> Red breasted Pitta				BT
<i>Hirundo rustica</i> Barn Swallow	x			
<i>Hirundo tahitica</i> Pacific Barn Swallow			x	
<i>Coracina striata</i> Bar bellied Cuckoo Shrike	x	x	x	x
<i>Lalage nigra</i> Pied Triller	x	x	x	R*
<i>Pericrocotus divaricatus</i> Ashy Minivet	x		x	
<i>Pycnonotus urostictus</i> Yellow wattled Bulbul	x	x	x	xN
<i>Hypsipetes philippinus</i> Philippine Bulbul	x	x	x	xN
<i>Dicrurus balicassius</i> Balicassiao	x	x	x	xN
<i>Oriolus chinensis</i> Black Naped Oriole	x	x	x	xN
<i>Irena cyanogaster</i> Philippine Fairy Bluebird	x	x		xN
<i>Corvus macrorhynchus</i> Largebilled Crow	x	x	x	xN
<i>Copsychus luzoniensis</i> White Browed Shama		x	x	xN
<i>Phylloscopus borealis</i> Arctic Warbler	x		x	
<i>Cisticola exilis</i> Bright capped cisticola			x	
<i>Cisticola juncidis</i> Zitting Cisticola			x	
<i>Cisticola sp.</i>				R
<i>Muscicapa griseisticta</i> Grey Streaked Flycatcher	x			
<i>Cyornis rufigaster</i> Mangrove Blue Flycatcher	x	x	x	xN
<i>Rhipidura javanica</i> Pied Fantail	x	x	x	^(N)
<i>Hypothymis azurea</i> Black Naped Monarch	x	x	x	xBN
<i>Hypothymis helenae</i> Short Crested Monarch		x	x	N

<i>Tersiphone cinnamomea</i> Rufous Paradise Flycatcher	x	x	x	xN
<i>Motacilla flava</i> Yellow Wagtail	x			
<i>Motacilla cinerea</i> Grey Wagtail	x		x	*
<i>Anthus novaseelandiae</i> Richard's Pipit	x	x	x	x
<i>Anthus gustavi</i> Pechora Pipit	x			
<i>Artamus leucorhynchus</i> White Breasted Swallow	x	x	x	x
<i>Lanius cristatus</i> Brown Shrike	x		x	*
<i>Aplonis panayensis</i> Asian Glossy Starling	x		x	x
<i>Sarcops calvus</i> Coletto	x	x	x	x
<i>Nectarinia sperata</i> Purple Throated Flowerpecker	x	x	x	xN
<i>Nectarinia jugularis</i> Olive backed Sunbird	x	x	x	xN
<i>Aethopyga shelleyi</i> Lovely Sunbird	x	x	x	x
<i>Dicaeum trigonostigma</i> Orange Bellied Flowerpecker	x	x	x	xN
<i>Dicaeum hypoleucum</i> Buzzing Flowerpecker			x	R
<i>Dicaeum pygmaeum</i> Pygmy Flowerpecker	x	x	x	x
<i>Passer montanus</i> Eurasian Tree Sparrow		x	x	x
<i>Lonchura leucogastra</i> White Bellied Munia	x	x	x	xN
<i>Lonchura malacca</i> Chestnut Munia	x	x	x	x
<i>Aethopyga pulcherrima</i> Mountain Sunbird				x
<i>Arachnothera longirostra</i> Little Spider Hunter				x
Total no. species	99	71	102	96

R=report by local inhabitant or outside formal study period; also marks possible sound recordings, N=bird caught in net
 *=additional record-from Bucao or Panukulan, BT=Lizard Trap

Table 2:List of Bird Species per Area namely Agroforestry(A), Secondary Forests (S), and Primary Old Growth Forest (P) of Baranggay Mahabangkahoy and Sibulan Watershed Area, Polillo Quezon

SPECIES	A	S	P
<i>Ardea cinerea</i> Grey Heron	R		
<i>Egretta garzetta</i> Little Egret	x		
<i>Egretta intermedia</i> Intermediate Egret	R		
<i>Bubulcus ibis</i> Cattle Egret	R		
<i>Nycticorax caledonicus</i> Rufous Night heron			R(BT)
<i>Ardea purpurea</i> Purple heron	x		
<i>Ixobrychus eurythmus</i> Schrenk's Bittern	x		
<i>Dendrocygna arcuata</i> Wandering Whistling Duck		R	
<i>Anas luzonica</i> Philippine duck	x	x	
<i>Haliastur indus</i> Brahminy Kite	R		
<i>Haliaeetus leucogaster</i> White Bellied Sea Eagle	R		
<i>Spilornis holospilus</i> Philippine serpent Eagle	x		R
<i>Accipiter virgatus</i> Besra	x	x	
<i>Accipiter trivirgatus castroi</i> Crested Goshawk	R		R
<i>Gallus gallus</i> Jungle Fowl			R
<i>Gallirallus philippinensis</i> Buff-banded Rail	R	R	R
<i>Gallirallus torquatus</i> Barred Rail	x		
<i>Amauromis olivacea</i> Plain Bushhen	x		
<i>Amauromis pheonnicurus</i> White Breasted Swampphen	x	x	
<i>Rostratula benghalensis</i> Painted Snipe	x		
<i>Rallus striatus</i> Slatty Legged Crake	x		
<i>Tringa sp.</i>	x		
<i>Treron vernans</i> Pink Necked Pigeon	x	x	
<i>Treron pompadora</i> Pompadour Green Pigeon	x	x	x
<i>Phapitreron leucotis</i> White Eared Fruit Dove	x	x	R
<i>Phapitreron amethystina</i> Amethyst brown dove	x	x	x
<i>Ptilinopus merrilli</i> Cream Bellied Fruit Dove		x	
<i>Ptilinopus leclencheri</i> Black Chinned Fruit Dove		x	
<i>Ducula aenea</i> Green Imperial Pigeon	x	x	x
<i>Ducula poliocephala</i> Pink Bellied Imperial Pigeon	R		
<i>Ducula bicolor</i> Pied Imperial Pigeon	x		x
<i>Macropygia phasianella</i> Reddish Cuckoo Dove	R		R

<i>Streptopelia bitorquata</i> Island Collared Dove	x		
<i>Chalcophaps indica</i> Common Emerald Dove	x	x	
<i>Gallicolumba luzonica</i> Luzon Bleeding Heart		x	R
<i>Tanygnathus lucionensis</i> Blue Naped parrot	R		R
<i>Tanygnathus sumatranus</i> Blue backed Parrot	R		R
<i>Loriculus philippensis</i> Philippine Hanging Parrot	x	x	x
<i>Eudynamys scolopacea</i> Common Koel		x	
<i>Phaenicophaeus superciliosus</i> Red Crested Malkoha	x	x	x
<i>Centropus viridis viridis</i> Philippine Coucal	x	x	x
<i>Centropus unirufous</i> Rufous Coucal		x	x
<i>Ninox philippensis</i> Philippine Hawk Owl	x		R
<i>Batrachostomus septimus</i> Philippine Frogmouth	R		R
<i>Collocalia vanikorensis</i> Island Swiftlet	x	x	x
<i>Collocalia esculenta</i> Glossy Swiftlet	x	x	x
<i>Collocalia troglodytes</i> Pygmy Swiftlet	x	x	x
<i>Harpectes ardens</i> Philippine Trogon		x	x
<i>Alcedo cyanopectus</i> Indigo banded Kingfisher	x	x	x
<i>Alcedo melanurus</i> Philippine dwarf Kingfisher		x	x
<i>Halcyon smyrnensis</i> White Throated Kingfisher	x		
<i>Eurystamus orientalis</i> Dollarbird	x	x	x
<i>Penelopides manillae subnigra</i> Tarctic Hornbill	x	x	x
<i>Mulleripicus funebris</i> Sooty Woodpecker		x	x
<i>Chrysocolaptes lucidus</i> Greater Flameback	x	x	x
<i>Coracina striata</i> Bar Bellied Cuckoo Shrike	x	x	x
<i>Lalage nigra</i> Pied Triller	R		
<i>Pycnonotus urostictus</i> Yellow Wattled Bulbul	x	x	x
<i>Hypsipetes philippinus</i> Philippine Bulbul	x	x	x
<i>Dicrurus balicassius</i> Balicassiao	x	x	x
<i>Oriolus chinensis</i> BlackNaped Oriole	x	x	x
<i>Irena cyanogaster</i> Philippine fairy Bluebird	R	x	
<i>Corvus macrorhynchus</i> LargeBilled Crow	x	x	x
<i>Copsycus luzoniensis</i> White Browed Shama	x	x	x
<i>Cisticola sp.</i>		R	
<i>Cyornis rufigastra</i> Mangrove Blue Flycatcher	x	x	x
<i>Hypothymis azurea</i> Black Naped BlueMonarch	x	x	x
<i>Hypothymis helenae</i> Short Crested Monarch			x
<i>Tersiphone cinnamomea</i> Rufous Paradise Flycatcher	x	x	x
<i>Anthus novaseelandiae</i> Richard's Pipit	x		
<i>Artamus leucorhynchus</i> White Breasted Woodswallow	x		
<i>Lanius cristatus</i> Brown Shrike			
<i>Aplonis panayensis</i> Glossy Starling	x	x	x
<i>Sarcops calvus</i> Coletto	x	x	x
<i>Nectarinia sperata</i> Purple Throated sunbird	x	x	x
<i>Nectarinia jugularis</i> Olive-Backed Sunbird	R	x	
<i>Arachnothera longistra</i> Little Spider Hunter	x		
<i>Aethopyga shelleyi</i> Lovely Sunbird	x		x
<i>Dicaeum trigonostigma</i> Orange Bellied Flowerpecker	x	x	x
<i>Dicaeum hypoleucum</i> Buzzing Flowerpecker	R		
<i>Dicaeum pygmaeum</i> Pygmy Flowerpecker	x	x	x
<i>Passer montanus</i> Eurasian Tree Sparrow	x		
<i>Lonchura leucogastra</i> White Bellied Munia		x	x
<i>Lonchura malacca</i> Chestnut Munia	x		
<i>Aethopyga pulcherrima</i> Mountain Sunbird		x	
<i>Pitta erythrogaster</i> Red breasted Pitta			BT
<i>Cuculus sparveroides</i> Large Hawk Cuckoo			x
Total no.species	69	49	50

REPORTED=record from local inhabitant or presence recorded outside formal study period. BT = from trap

Table 3:List of Bird Species recorded per day in the Agroforestry Ecosystems of Baranggay Mahabangkahoy, Polillo, Quezon.

SPECIES	1	2	3	4	5	6	7	8	9	T
<i>Ardea cinerea</i> Grey Heron	R	E	P	O	R	T	E	D		
<i>Egretta garzetta</i> Little Egret	1									
<i>Egretta intermedia</i> Intermediate Egret	R	E	P	O	R	T	E	D		
<i>Bubulcus ibis</i> Cattle Egret	R	E	P	O	R	T	E	D		
<i>Nycticorax caledonicus</i> Rufous Night heron										
<i>Ardea purpurea</i> Purple heron					1					
<i>Ixobrychus eurythmus</i> Schrenk's Bittern		1	2	1	1		3	1	2	10
<i>Dendrocygna arcuata</i> Wandering Whistling Duck										
<i>Anas luzonica</i> Philippine duck		4		2	2		3	3		13
<i>Haliastur indus</i> Brahminy Kite	R	E	P	O	R	T	E	D		
<i>Haliaeetus leucogaster</i> White Bellied Sea Eagle	R	E	P	O	R	T	E	D		
<i>Spilornis holospilus</i> Philippine serpent Eagle	1		1	1					1	4
<i>Accipiter virgatus</i> Besra		1								
<i>Accipiter trivirgatus castroi</i> Crested Goshawk	R	E	P	O	R	T	E	D		
<i>Gallus gallus</i> Jungle Fowl										
<i>Gallirallus philippinensis</i> Buff-banded Rail	R	E	P	O	R	T	E	D		
<i>Gallirallus torquatus</i> Barred Rail			1		1	1			3	
<i>Amaurornis olivacea</i> Plain Bushhen	1	1	2		1		1	2	1	9
<i>Amaurornis pheoniceus</i> White Breasted Swamphen	1						1			2
<i>Rostratula benghalensis</i> Painted Snipe	1									1
<i>Rallus striatus</i> Slatty Legged Crake								1		1
<i>Tringa sp.</i>	1									1
<i>Treron vernans</i> Pink Necked Pigeon	1									1
<i>Treron pompadora</i> Pompadour Green Pigeon		1	2		1			1	3	7
<i>Phapitreron leucotis</i> White Eared Fruit Dove			3	1		2			6	12
<i>Phapitreron amethystina</i> Amethyst brown dove	1			1		1		1		4
<i>Ptilinopus merrilli</i> Cream Bellied Fruit Dove										
<i>Ptilinopus leclancheri</i> Black Chinned Fruit Dove										
<i>Ducula aenea</i> Green Imperial Pigeon		1			1			1	1	5
<i>Ducula poliophelia</i> Pink Bellied Imperial Pigeon	R	E	P	O	R	T	E	D		
<i>Ducula bicolor</i> Pied Imperial Pigeon							1			1
<i>Macropygia phasianella</i> Reddish Cuckoo Dove	R	E	P	O	R	T	E	D		
<i>Streptopelia bitorquata</i> Island Collared Dove				1		1				
<i>Chalcophaps indica</i> Common Emerald Dove	1	1	4	5		5	6			22
<i>Gallinula luzonica</i> Luzon Bleeding Heart										
<i>Tanygnathus lucionensis</i> Blue Naped parrot	R	E	P	O	R	T	E	D		
<i>Tanygnathus sumatranus</i> Blue backed Parrot	R	E	P	O	R	T	E	D		
<i>Loriculus philippensis</i> Philippine Hanging Parrot	1	1								2
<i>Eudynamis scolopacea</i> Common Koel										
<i>Phaenicophaeus superciliosus</i> Red Crested Malkoha	1	1		2			4	5	3	16
<i>Centropus viridis viridis</i> Philippine Coucal	1	1	2	1	2		2	3	1	13
<i>Centropus unirus</i> Rufous Coucal									1	1
<i>Ninox philippensis</i> Philippine Hawk Owl									1	1
<i>Batrachostomus septimus</i> Philippine Frogmouth	R	E	P	O	R	T	E	D		
<i>Collocalia vanikorensis</i> Island Swiftlet	1	1	1				2			5
<i>Collocalia esculenta</i> Glossy Swiftlet	1	1	2				4			8
<i>Collocalia troglodytes</i> Pygmy Swiftlet		1		3			2			6
<i>Harpectes ardens</i> Philippine Trogon										
<i>Alcedo cyanopectus</i> Indigo banded Kingfisher	3		2	3	1	1				10
<i>Alcedo melanurus</i> Philippine Dwarf Kingfisher										
<i>Halcyon smyrnensis</i> White Throated Kingfisher	1	2	4	3	3		4		3	20
<i>Eurystamus orientalis</i> Dollarbird					1		3	2	2	8
<i>Penelopides manillae subnigra</i> Tarctic Hornbill	2	1		2				3	3	11
<i>Mulleripicus funebris</i> Sooty Woodpecker										
<i>Chrysocolaptes lucidus</i> Greater Flameback				1						1
<i>Coracina striata</i> Bar Bellied Cuckoo Shrike	1									1
<i>Lalage nigra</i> Pied Triller	R	E	P	O	R	T	E	D		
<i>Pycnonotus urostictus</i> Yellow Wattled Bulbul	1	1		2	1	1	8	2		16
<i>Hypsipetes philippinus</i> Philippine Bulbul		1	6	5	3	2	28	7	3	55

<i>Dicrurus balicassius</i> Balicassiao		1	3	1	2	6	2	5	4	4	28
<i>Oriolus chinensis</i> Black Naped Oriole		1	5	6	2	12	4	18	8	10	66
<i>Irena cyanogaster</i> Philippine fairy Bluebird	R	E	P	O	R	T	E	D			
<i>Corvus macrorhynchus</i> LargeBilled Crow								4	8	2	14
<i>Copsycus luzoniensis</i> White Browed Shama		1		1	1			2	2	2	9
<i>Cisticola sp.</i>											
<i>Cyornis rufigastra</i> Mangrove Blue Flycatcher					2			2	1	2	7
<i>Hypothymis azurea</i> Black Naped BlueMonarch								2			
<i>Hypothymis helenae</i> Short Crested Monarch											
<i>Terpsiphone cinnamomea</i> Rufous Paradise Flycatcher	1		1	5		1	1	1	3	13	
<i>Anthus novaseelandiae</i> Richard's Pipit				1				2	1		4
<i>Artamus leucorhynchus</i> White Breasted Woodswallow		2	4	1		5	5	8	3	28	
<i>Lanius cristatus</i> Brown Shrike											
<i>Aplonis panayensis</i> Glossy Starling				1							1
<i>Sarcops calvus</i> Coledo		1	6	5	7	1	2	5	3	30	
<i>Nectarinia sperata</i> Purple Throated sunbird	1	2	2	10	13	10	11	6	11	66	
<i>Nectarinia jugularis</i> Olive-Backed Sunbird	R	E	P	O	R	T	E	D			
<i>Arachnothera longistra</i> Little Spider Hunter					1						1
<i>Aethopyga shelleyi</i> Lovely Sunbird					1						1
<i>Dicaeum trigonostigma</i> Orange Bellied Flowerpecker					1	1	1				3
<i>Dicaeum hypoleucum</i> Buzzing Flowerpecker	R	E	P	O	R	T	E	D			
<i>Dicaeum pygmaeum</i> Pygmy Flowerpecker							2				2
<i>Passer montanus</i> Eurasian Tree Sparrow				1			3	2	1	7	
<i>Lonchura leucogastra</i> White Bellied Munia											
<i>Lonchura malacca</i> Chestnut Munia		1	18	7	1		3	3	5	38	
<i>Aethopyga pulcherrima</i> Mountain Sunbird											
<i>Pitta erythrogaster</i> Red Breasted Pitta											
<i>Cuculus sparveroides</i> Large Hawk Cuckoo											

REPORTED=record from local inhabitant or recorded outside formal study period

Table 4:List of Bird Species Recorded Per day in Secondary Forest, Sibulan Watershed Area, Polillo Quezon

SPECIES	1	2	3	4	5	6	7	8	9	T
<i>Ardea cinerea</i> Grey Heron										
<i>Egretta garzetta</i> Little Egret										
<i>Egretta intermedia</i> Intermediate Egret										
<i>Bubulcus ibis</i> Cattle Egret										
<i>Nycticorax caledonicus</i> Rufous Night heron										
<i>Ardea purpurea</i> Purple heron										
<i>Ixobrychus eurythmus</i> Schrenk's Bittern										
<i>Dendrocygna arcuata</i> Wandering Whistling Duck	R	E	P	O	R	T	E	D		
<i>Anas luzonica</i> Philippine duck		2								2
<i>Haliastur indus</i> Brahminy Kite										
<i>Haliaeetus leucogaster</i> White Bellied Sea Eagle										
<i>Spilornis holospilus</i> Philippine serpent Eagle							1			1
<i>Accipiter virgatus</i> Besra										
<i>Accipiter trivirgatus castroi</i> Crested Goshawk										
<i>Gallus gallus</i> Jungle Fowl										
<i>Gallirallus philippinensis</i> Buff-banded Rail	R	E	P	O	R	T	E	D		
<i>Gallirallus torquatus</i> Barred Rail										
<i>Rostratula benghalensis</i> Painted Snipe										
<i>Amauornis olivacea</i> Plain Bushhen										
<i>Amauornis pheoniceus</i> White Breasted Swamphen					1					1
<i>Rallus striatus</i> Slatty Legged Crake										
<i>Tringa sp.</i>										
<i>Treron vernans</i> Pink Necked Pigeon		1		2						3
<i>Treron pompadora</i> Pompadour Green Pigeon	1									1
<i>Phapitreron leucotis</i> White Eared Fruit Dove		1								1

<i>Phapitreron amethystina</i> Amethyst brown dove	1	7		9		2	1	4	12	36
<i>Ptilinopus merrilli</i> Cream Bellied Fruit Dove		1								1
<i>Ptilinopus leclencheri</i> Black Chinned Fruit Dove		1								1
<i>Ducula aenea</i> Green Imperial Pigeon	1	3	2	5		6	9	9	5	40
<i>Ducula poliophelia</i> Pink Bellied Imperial Pigeon										
<i>Ducula bicolor</i> Pied Imperial Pigeon										
<i>Macropygia phasianella</i> Reddish Cuckoo Dove										
<i>Streptopelia bitorquata</i> Island Collared Dove										
<i>Chalcophaps indica</i> Common Emerald Dove			1		1		1	1	1	5
<i>Gallicolumba luzonica</i> Luzon Bleeding Heart					1					1
<i>Tanygnathus lucionensis</i> Blue Naped parrot										
<i>Tanygnathus sumatranus</i> Blue backed Parrot										
<i>Loriculus philippensis</i> Philippine Hanging Parrot		2		1			1			4
<i>Eudynamys scolopacea</i> Common Koel	1	1		1						3
<i>Phaenicophaeus superciliosus</i> Red Crested Malkoha	2	1	2	2		2	3	3	2	17
<i>Centropus viridis viridis</i> Philippine Coucal	1	3	1	1	1	2	2		4	15
<i>Centropus unirus</i> Rufous Coucal				1		2	6	6	1	16
<i>Ninox philippensis</i> Philippine Hawk Owl										
<i>Batrachostomus septimus</i> Philippine Frogmouth										
<i>Collocalia vanikorensis</i> Island Swiftlet	1									
<i>Collocalia esculenta</i> Glossy Swiftlet	1	1		1		1	2	2		8
<i>Collocalia troglodytes</i> Pygmy Swiftlet	1					1	2	2	1	7
<i>Harpectes ardens</i> Philippine Trogon	1	1							2	
<i>Alcedo cyanopectus</i> Indigo banded Kingfisher	1				1	2				4
<i>Alcedo melanurus</i> Philippine dwarf Kingfisher		1		1		1				3
<i>Halcyon smyrnensis</i> White Throated Kingfisher										
<i>Eurystamus orientalis</i> Dollarbird		1		1		1		3	3	9
<i>Penelopides manillae subnigra</i> Tarctic Hornbill	1	2		1		4	7	7	7	29
<i>Mulleripicus funebris</i> Sooty Woodpecker	1						1		1	3
<i>Chrysocolaptes lucidus</i> Greater Flameback	1						2	1	1	5
<i>Coracina striata</i> Bar Bellied Cuckoo Shrike			2		1					3
<i>Lalage nigra</i> Pied Triller										
<i>Pycnonotus urostictus</i> Yellow Wattled Bulbul		4	1	6	2	6	2	11	4	36
<i>Hypsipetes philippinus</i> Philippine Bulbul	3	10	9	17	5	15	14	13	14	99
<i>Dicrurus balicassius</i> Balicassiao	1		1	2			3	3	5	15
<i>Oriolus chinensis</i> BlackNaped Oriole	2	3	2	2	1	21	6	6	3	46
<i>Irena cyanogaster</i> Philippine fairy Bluebird				1			1	1		3
<i>Corvus macrorhynchus</i> LargeBilled Crow	1		4	1			1	1	1	9
<i>Copsycus luzoniensis</i> White Browed Shama	4	6	3	7		9	10	11	5	55
<i>Cisticola sp.</i>	R	E	P	O	R	T	E	D		
<i>Cyornis rufigaster</i> Mangrove Blue Flycatcher	1	1	1	3	1				2	10
<i>Hypothymis azurea</i> Black Naped BlueMonarch	1	1	1	3	1				2	10
<i>Hypothymis helenae</i> Short Crested Monarch										
<i>Tersiphone cinnamomea</i> Rufous Paradise Flycatcher		1	2				1			4
<i>Anthus novaseelandiae</i> Richard's Pipit										
<i>Artamus leucorhynchus</i> White Breasted Woodswallow										
<i>Lanius cristatus</i> Brown Shrike										
<i>Aplonis panayensis</i> Glossy Starling				6						6
<i>Sarcops calvus</i> Coleto	1	3		7		9	12	12	5	49
<i>Nectarinia sperata</i> Purple Throated sunbird	1	2		3		3	4	1	1	15
<i>Nectarinia jugularis</i> Olive-Backed Sunbird	1									1
<i>Arachnothera longistra</i> Little Spider Hunter										
<i>Aethopyga shelleyi</i> Lovely Sunbird										
<i>Dicaeum trigonostigma</i> Orange Bellied Flowerpecker				1		1			2	4
<i>Dicaeum hypoleucum</i> Buzzing Flowerpecker										
<i>Dicaeum pygmaeum</i> Pygmy Flowerpecker	1	3						1	4	9
<i>Passer montanus</i> Eurasian Tree Sparrow								1	1	2

<i>Lonchura leucogastra</i> White Bellied Munia																			
<i>Lonchura malacca</i> Chestnut Munia																			
<i>Aethopyga pulcherrima</i> Mountain Sunbird						1	1												2
<i>Pitta erythrogaster</i> Red breasted Pitta																			
<i>Cuculus sparveroides</i> Large Hawk Cuckoo																			

Reported=report by local inhabitant or recorded outside formal study period

Table 5:List of Bird Species Recorded per day in Primary Old growth Forests of Sibulan Watershed, Polillo, Quezon

SPECIES	1	2	3	4	5	6	7	8	9	T
<i>Ardea cinerea</i> Grey Heron										
<i>Egretta garzetta</i> Little Egret										
<i>Egretta intermedia</i> Intermediate Egret										
<i>Bubulcus ibis</i> Cattle Egret										
<i>Nycticorax caledonicus</i> Rufous Night heron	B	A	YA	W	A	K	TR	A	P	
<i>Ardea purpurea</i> Purple heron										
<i>Ixobrychus eurythmus</i> Schrenk's Bittern										
<i>Dendrocygna arcuata</i> Wandering Whistling Duck										
<i>Anas luzonica</i> Philippine duck										
<i>Haliastur indus</i> Brahminy Kite										
<i>Haliaeetus leucogaster</i> White Bellied Sea Eagle										
<i>Spilornis holospilus</i> Philippine serpent Eagle	R	E	P	O	R	T	E	D		
<i>Accipiter virgatus</i> Japanese Sparrowhawk										
<i>Accipiter trivirgatus castroi</i> Crested Goshawk	R	E	P	O	R	T	E	D		
<i>Gallus gallus</i> Jungle Fowl	R	E	P	O	R	T	E	D		
<i>Gallirallus philippinensis</i> Buff-banded Rail	R	E	P	O	R	T	E	D		
<i>Gallirallus torquatus</i> Barred Rail										
<i>Rostratula benghalensis</i> Painted Snipe										
<i>Amaurornis olivacea</i> Plain Bushhen										
<i>Amaurornis pheoniceus</i> White Breasted Swampphen										
<i>Rallus striatus</i> Slatty Legged Crake										
<i>Tringa sp.</i>										
<i>Treron vernans</i> Pink Necked Pigeon										
<i>Treron pompadora</i> Pompadour Green Pigeon								1	1	2 4
<i>Phapitreron leucotis</i> White Eared Fruit Dove	R	E	P	O	R	T	E	D		
<i>Phapitreron amethystina</i> Amethyst brown dove		1	1	1	1	6	2			12
<i>Ptilinopus merrilli</i> Cream Bellied Fruit Dove										
<i>Ptilinopus leclencheri</i> Black Chinned Fruit Dove										
<i>Ducula aenea</i> Green Imperial Pigeon	2	3	4	3	7	12	2	4	11	48
<i>Ducula poliophelia</i> Pink Bellied Imperial Pigeon										
<i>Ducula bicolor</i> Pied Imperial Pigeon		1								1
<i>Macropygia phasianella</i> Reddish Cuckoo Dove	R	E	P	O	R	T	E	D		
<i>Streptopelia bitorquata</i> Island Collared Dove										
<i>Chalcophaps indica</i> Common Emerald Dove										
<i>Gallicolumba luzonica</i> Luzon Bleeding Heart	R	E	P	O	R	T	E	D		
<i>Tanygnathus lucionensis</i> Blue Naped parrot	R	E	P	O	R	T	E	D		
<i>Tanygnathus sumatranus</i> Blue backed Parrot	R	E	P	O	R	T	E	D		
<i>Loriculus philippensis</i> Philippine Hanging Parrot						1		1		2
<i>Eudynamys scolopacea</i> Common Koel										
<i>Phaenicophaeus superciliosus</i> Red Crested Malkoha			2		6	7	6	4	6	31
<i>Centropus viridis viridis</i> Philippine Coucal	3	1	1		2	1		1		9
<i>Centropus unirus</i> Rufous Coucal			2	2	2		6	8	2	22
<i>Ninox philippensis</i> Philippine Hawk Owl	R	E	P	O	R	T	E	D		
<i>Batrachostomus septimus</i> Philippine Frogmouth	R	E	P	O	R	T	E	D		
<i>Collocalia vanikorensis</i> Island Swiftlet	1									
<i>Collocalia esculenta</i> Glossy Swiftlet	1									

<i>Collocalia troglodytes</i> Pygmy Swiftlet	1																		
<i>Harpectes ardens</i> Philippine Trogon			2	2		1	2	2	2										11
<i>Alcedo cyanopectus</i> Indigo banded Kingfisher									2										2
<i>Alcedo melanurus</i> Philippine dwarf Kingfisher									1										1
<i>Halcyon smyrnensis</i> White Throated Kingfisher																			
<i>Eurystamus orientalis</i> Dollarbird				1															
<i>Penelopides manillae subnigra</i> Tarctic Hornbill	2	2	16	8	11	5	3	2	5	54									
<i>Mulleripicus funebris</i> Sooty Woodpecker					1														1
<i>Chrysocolaptes lucidus</i> Greater Flameback			2	5	1	1	1	2											12
<i>Coracina striata</i> Bar Bellied Cuckoo Shrike					1														1
<i>Lalage nigra</i> Pied Triller																			
<i>Pycnonotus urostictus</i> Yellow Wattled Bulbul	3	1	2	2		9		5	9	31									
<i>Hypsipetes philippinus</i> Philippine Bulbul	2	6	4	1	4		10	8	11	46									
<i>Dicrurus balicassius</i> Balicassiao		1	1		6	4	2	1	7	22									
<i>Oriolus chinensis</i> BlackNaped Oriole	2	1	1			3	1	1		9									
<i>Irena cyanogaster</i> Philippine fairy Bluebird																			
<i>Corvus macrorhynchus</i> LargeBilled Crow				1	1		1			3									
<i>Copsycus luzoniensis</i> White Browed Shama	3	2	6	5	5	14	4	6	14	59									
<i>Cisticola</i> sp.																			
<i>Cyornis rufigastra</i> Mangrove Blue Flycatcher					3	3	3			9									
<i>Hypothymis azurea</i> Black Naped BlueMonarch					1		1	1	2	5									
<i>Hypothymis helenae</i> Short Crested Monarch								1											
<i>Tersiphone cinnamomea</i> Rufous Paradise Flycatcher	1	1	3	2		2	5	1	2	17									
<i>Anthus novaseelandiae</i> Richard's Pipit																			
<i>Artamus leucorhynchus</i> White Breasted Woodswallow																			
<i>Lanius cristatus</i> Brown Shrike																			
<i>Aplonis panayensis</i> Glossy Starling			1				3	1		5									
<i>Sarcops calvus</i> Coleto	2	3	3		1	7	4	4	5	29									
<i>Nectarinia sperata</i> Purple Throated sunbird	1			1	3	5		1	1	12									
<i>Nectarinia jugularis</i> Olive-Backed Sunbird																			
<i>Arachnothera longistra</i> Little Spider Hunter																			
<i>Aethopyga shelleyi</i> Lovely Sunbird			1							1									
<i>Diceaum trigonostigma</i> Orange Bellied Flowerpecker	1	2	1	1		1	5		1	12									
<i>Diceaum hypoleucum</i> Buzzing Flowerpecker																			
<i>Diceaum pygmaeum</i> Pygmy Flowerpecker		1	1			1	1		1	5									
<i>Passer montanus</i> Eurasian Tree Sparrow																			
<i>Lonchura leucogastra</i> White Bellied Munia								1	1	2									
<i>Lonchura malacca</i> Chestnut Munia																			
<i>Aethopyga pulcherrima</i> Mountain Sunbird																			
<i>Pitta erythrogaster</i> Red breasted Pitta	B	A	YA	W	AK	T	R	A	P	1									
<i>Cuculus sparveroides</i> Large Hawk Cuckoo				1						1									

Reported=report by local inhabitant or recorded outside formal study period

Table 6: Netting Data

SPECIES	Primary	Secondary	Agro	Bucaos	Panukulan
Rostratula bengalensis			1		
Spilornis holospilus			1		
Accipiter virgatus			1		
Phapiteron amethystina			3		
Phapiteron leucotis			3		
Chalcophaps indica		2	13		
Ninox philippensis			1		
Collocalia esculenta			1		
Harpactes ardens	1	2			
Alcedo cyanopectus	1	3	4	2	
Halcyon smyrnensis			2		
Ceyx melanurus		3			
Halcyon chloris				2	
Lalage nigra				3	
Pycnonotus urostictus		5			
Hypsipetes philippinus	4	11	4	4	14
Dicrurus balicassius		2	2		
Oriolus chinensis			3	1	
Irena cyanogaster					2
Copsychus luzoniensis	3	6			3
Cyornis rufigaster		2	2	3	2
Rhipidura javanica				1	
Hypothymis azurea	1	3			1
Hypothymis helenae	1				
Terpsiphone cinnamomea	1	8	3		5
Lanius cristatus					1
Nectarinia sperata		1	1		
Nectarinia jugularis		1		5	
Dicaeum trigonostigma			1		
Lonchura malacca					1
Lonchura leucogaster	3	2			
Species Richness	10	14	17	8	8
Total No. Individuals	15	51	56	21	29
Shannon Weiner Species Diversity, H	0.82	1.03	0.96	0.85	0.7

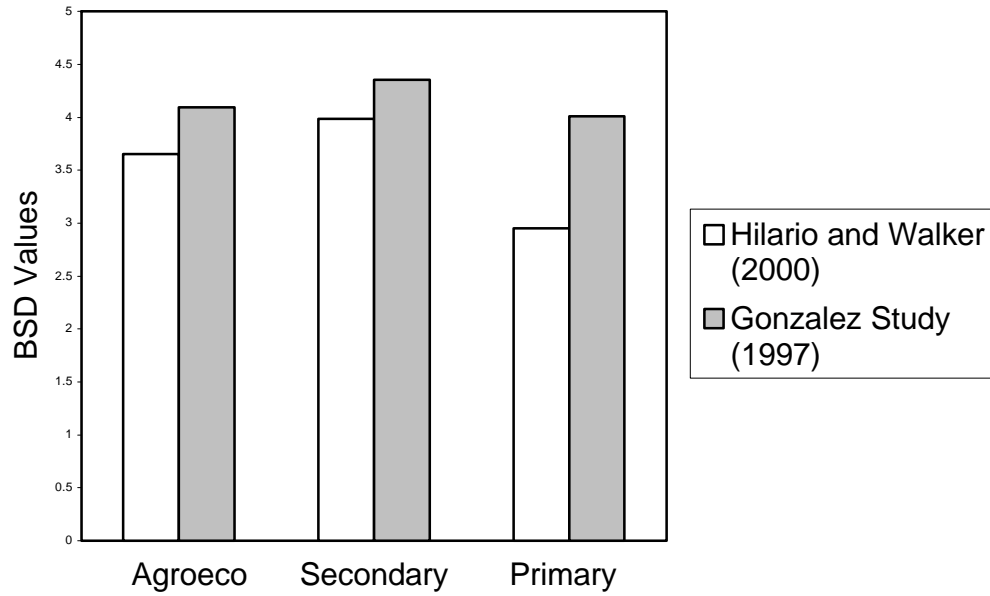
NB: Netting regime consistent in primary, secondary and agroecosystem though only conducted for a short period on an informal basis in Bucaos and Panukulan Panukulan-netting conducted on fringe of secondary forest and in area with Pandans and free-flowing water

Table 7. LIST OF SPECIES FOR WHICH ACOUSTIC RECORDS WERE OBTAINED

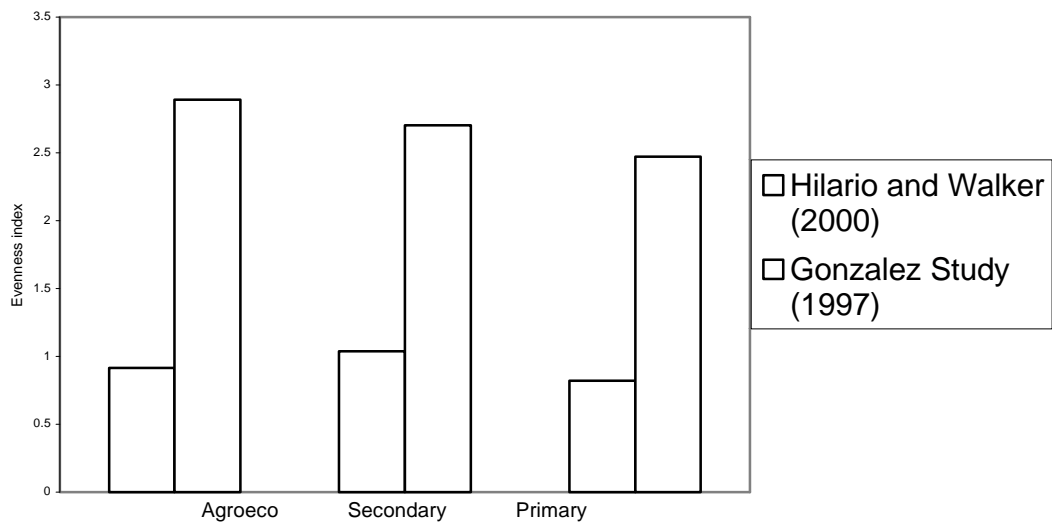
Amaurornis pheoncurus White Brested Swamphen
Phapitreron amethystina Amethyst Brown Dove
Ducula aenea Green Imperial Pigeon
Macropygia phasianella Reddish Cuckoo Dove
Tanygnathus lucionensis Blue Naped Parrot ? (TBC)
Phaenicophaeus superciliosus Red crested malkoha
Centropus viridis viridis Philippine Coucal
Halcyon smyrnensis White Throated kingfisher
Penelopides manillae subnigra Tarictic Hornbill
Chrysocolaptes lucidus Greater Flameback
Pycnonotus urostictus Yellow wattled Bulbul
Hypsipetes philippinus Philippine Bulbul
Dicrurus balicassius Balicassiao
Oriolus chinensis Black Naped Oriole
Copsychus luzoniensis White Browed Shama
Cyornis rufigastra Mangrove Blue Flycatcher
Hypothymis azurea Black Naped Monarch
Artamus leucorhynchus White Breasted Swallow
Sarcops calvus Coletto
Nectarinia sperata Purple Throated Flowerpecker
Dicaeum trigonostigma Orange Bellied Flowerpecker
Pitta erthyrogaster Red Breasted Pitta

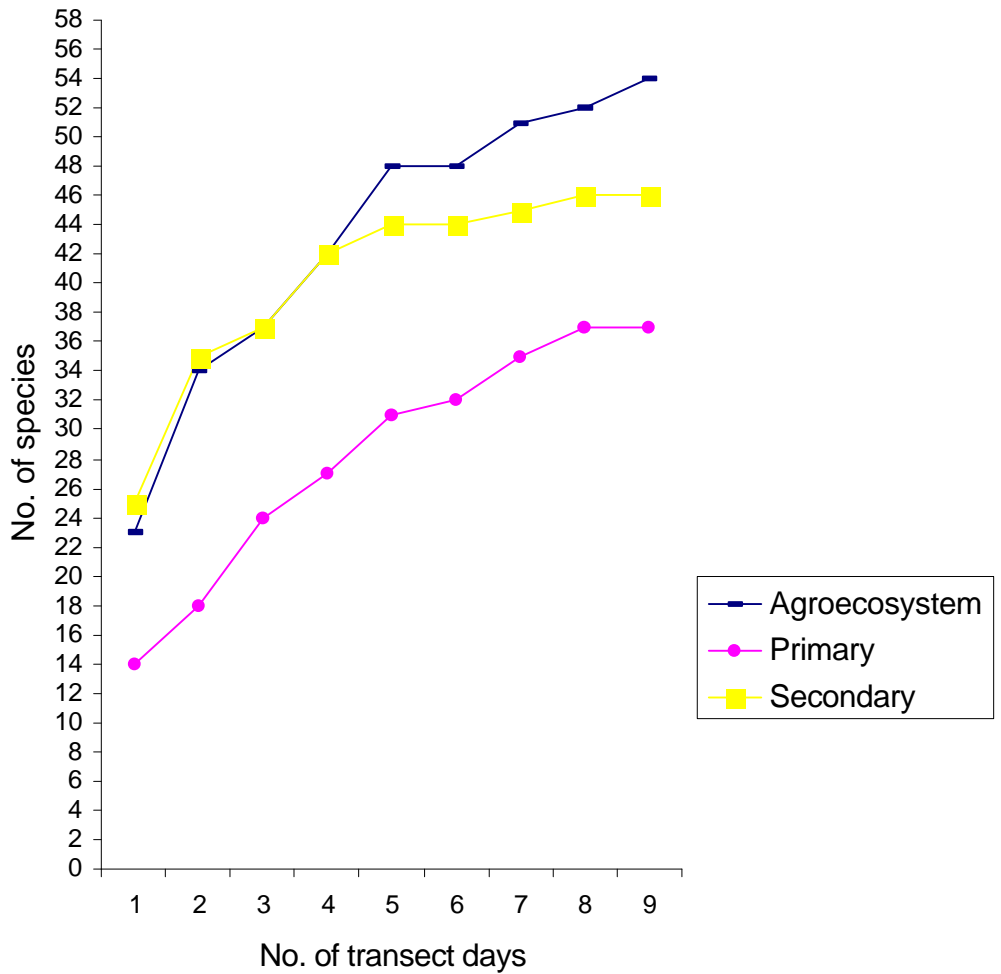
Records donated to the British Library of Wildlife Sounds
TBC=To be confirmed

Graph 1. Comparison of Bird Species Diversity (Shannon-Weiner) Values of Gonzalez (1997) and Hilario and Walker (2000), on the three habitat areas (agroecosystem, secondary and primary forests)



Graph 2. Comparison of Evenness indices of Gonzalez (1997) and Hilario and Walker (2000) on three habitat types (Agroecosystem, primary and secondary forests)





Graph 3. Species Discovery Curve of species on primary and secondary forests of Sibulan Watershed and the Agroecosystems of Brgy. Mahabangkahoy, Polillo, Quezon

INDICES- based on transect data (Graphs 1&2)

Similarity Indices between the three habitats are high. Agroecosystem and secondary forest habitat showed 67% similarity, the primary and secondary forest showed 73% and the agroecosystem and primary showed 72%. The intermixed vegetation of the primary and the secondary forest areas and the highly fragmented nature of the primary forest may have attributed to this high similarity. Further, the presence of frugivorous birds tends to be defined by the presence of fruiting trees rather than purely habitat boundaries. Birds roosting/nesting in the high forest canopy though with a more extensive feeding range and those inhabiting edge habitats further contribute to such high values. An active nest of the Philippine Serpent Eagle, *Spilornis holospilus* was viewed in the primary forest during the study period. Differences between habitats largely reflect the presence of more specialist species such as *Hypothymis helenae*, a sallying insectivore found in the understorey of forests.

Based on the transect the highest Bird Species Diversity (BSD) (Graph 1) was in the secondary forest (4.00148), then the agroforestry ecosystem (3.65203), and lastly, the primary forests (2.949028); the same trend, though over a narrower range of values was reported by Gonzalez in 1997 and the same pattern is evident in indices calculated from the 1999 netting data (Table 6). The low diversity in the primary forest may be partly equated to the effects of forest fragmentation, coupled to postulated lower densities. Habitat degradation in the primary forest, due to human exploitation and natural calamities may have caused typically intolerant species to exploit sub-optimum habitat in the secondary forest.

The highest evenness index (Graph 2) was from the secondary forest, then the agroecosystem and lastly the primary forest. A maximum evenness value refers to the situation where each species is equally represented in terms of its number of individuals. The particularly low index of the primary forest may reflect disturbance. In appreciating that these values fall within a narrow range, are effected by a multitude of variables and are derived from temporally-limited data interpretations should be viewed cautiously. The secondary forest holds both specialist and generalist feeders, which coupled to high habitat heterogeneity limits dominance and competitive exclusion. It is highly possible that species more typical of the primary forest such as *Harpactes ardens* have more recently began to exploit the sub-optimum secondary forest.

ENDEMIC BIRDS AND BIRDS OF CONSERVATION IMPORTANCE

Five of the seven Polillo endemic sub-species were recorded during the study period: *Accipiter trivirgatus catroi*, *Harpactes ardens minor*, *Chrysocolaptes lucidus grandis*, *Copsychus luzoniensis parvimaclatus*, *Penelepidoides manillae subnigra*. The latter four species were all encountered more frequently in the primary than secondary forest. The Trogon was caught in both primary and secondary forest though only recorded during transects in the primary forest; accounts from Gonzalez and ethnobiological studies have not previously recorded the Trogon in the secondary forest. The Polillo Crested Goshawk, observed near the rice paddies with a frog in its talons, is frequently seen by

local inhabitants in the agroforestry. A possible sound recording was obtained of *Tanygnathus*

THREATENED AND NEAR-THREATENED SPECIES

11 of the 14 near-threatened species in the Polillo Islands were recorded during the study period:

Ixobrychus eurythmus, *Ptilinopus merrilli*, *Centropus unirufous*, *Ceyx melanurus*, *Hypothymis helenae*, *Terpsiphone cinnamomea* (Collar and Andrew 1988), *Anas luzonica*, *Gallinula luzonica*, *Alcedo cyanopectus*, *Penelepidoides manillae*, *Irena cyanogaster* (Birdlife International 1994). *Gorsachius melanolophus*, the Malayan Night Heron, observed on Polillo in 1996 was not sighted.

The two threatened species, *Tanygnathus lucionensis* observed in Bucao in 1996, and *Cacatua haematuropgia*, observed in Agta-Sabang in 1996 were also not sighted. According to the Ecology Steward there have been no Philippine Cockatoos seen in Sibulan for the past ten years. The bird's nesting preference for holes in big 'dead' trees made them an easy target for poachers. The emergence of new branches signified the time just prior to fledgling and led to the subsequent capturing of birds for the pet trade; this led to its local extinction. Local reports indicate that *Tanygnathus sumatranus* is seen around Sitio Mahabangkahoy on occasions when banana fruit ripens.

The survey has confirmed the presence of *Irena cyanogaster*, *Macropygia phasianella* and *Ptilinopus leclancheri* whose absence in 1996 was hypothesised to be due to local extinction. *Irena cyanogaster* was first observed in the watershed reserve by J. C. Gonzales and R. Wilkinson in February 1999 (personal communication). This species was most evident in Panukulan near the forest/agroforestry fringe. *Ptilinopus leclancheri* was seen to be feeding on a fruiting *Ficus benjamina*.

NEW RECORDS

The 13 additional records to the 1996 survey were:(n = new record for the island)

Phapitreron leucotis (n), *Ptilinopus leclancheri*, *Treron vernans* (n), *Ducula poliocephala* (n), *Macropygia phasianella*, *Rostratula benghalensis* (n), *Rallus striatus* (n), *Irena cyanogaster*, *Aethopyga pulcherrima* (n), *Pitta erythrogaster* (n), *Cuculus sparveroides*, *Ardea purpurea* (n), and *Arachnothera longirostra* (n). *A. longirostra* is supposedly endemic to Leyte, Bohol, Mindanao and Samar (Dickinson, 1991) however several sightings have been reported in agroforestry sites of Polillo. Sunbirds showed considerable phenotypic variation. *Phapitreron leucotis* has been successfully introduced to Polillo.

The limited plateau of the Species Discovery Curves (Graph 3), in particular that in the agroecosystem suggests that the number of species has been under-recorded.

CONSERVATION CONCERNS

Deforestation

The establishment of the Polillo Stewardship Program (funded by the North of England Zoological Society) has prohibited hunting and logging in the watershed area; small-scale

logging activities were however evident during the study period. The remaining fragmented forest has further been prone to the effects of typhoons.

Tourism

The evident development of tourism including the construction of hotels and recreational fishing ponds in the mangroves signifies a severe threat to avifaunal habitats. The mangroves are further victim to the effects of spreading cultivation, charcoal production and collection of poles for domestic purposes (Gonzalez 1997).

Pesticides in the Agroecosystem

The impacts on wildlife of commercial pesticides used in the agroecosystem surrounding the Sibulan Watershed Reserve remain unknown. Studies in the United States show that organophosphorous and carbonate pesticides, the major constituents of all pesticides today have been related to wildlife die-off (Smith, 1987). Other effects related to pesticide use were lowered reproductive success on species whose major food items consisted of fish, reptiles, amphibians or birds and decrease in eggshell thickness. Birds become contaminated by consuming prey items that have accumulated chlorinated hydrocarbon pesticides (Henny, 1972). Applications even at a recommended rate of a certain organophosphorus and carbonate pesticides may still cause die-off (Smith, 1987).

IDEAS FOR FURTHER RESEARCH

- 1) Monospecific studies on the globally threatened, near-threatened and endemic birds of Polillo. Species diet requirements and extent of range, are fundamental parameters to be considered given the extent of forest fragmentation.
- 2) Intensive coastal surveying especially at Bucao to assess accurately the threat posed by coastal developments and tourism. Document seasonal changes and produce guidelines so as to minimize the impact of such developments. Surveys should be extended to include other faunal and floral elements of this habitat. Notes should be obtained on breeding, feeding and roosting sites and where possible specific dietary information obtained.
- 3) A survey of the frugivores: Focus research around fruiting trees and identify species-specific relationships. Information on fruiting trees is further important for afforestation programmes.
- 4) *Gallicolumba luzonica*-roosting surveys
Survey specified patches of forest intensively for roosting birds; reports of *G.luzonica* in the 1999 survey period were mainly obtained in the early evening. Survey design must minimize disturbance since this could otherwise be a very destructive exercise.
- 5) Detailed observations on *Nectarinia* species. Investigate genetic diversity and consider patterns of speciation. Compare with mainland data.
- 6) Surveys in the north of the island where comparatively little research has been conducted.
- 7) Analyse the concentration of pesticides in the abiotic and biotic environment.

RECOMMENDATIONS

It is fundamental that support is continued for the work of the Ecology Steward (sponsored by the North of England Zoological Society) whose achievements in terms of

preventing hunting and logging have been remarkable; his role has been absolutely pivotal within the community. The situation in the study region should be considered a template for the future of the rest of the island. The remaining forest is severely fragmented and thus all attempts should be made to reduce further fragmentation. An afforestation program 'RECLAIMING THE FORESTS FOR THE FUTURE', should be considered. It is of great concern that the local people are being ostracized from their forests and their traditional livelihoods being deprived; hunting and logging bans have evidently been crucial however methods of sustainable extraction should not routinely be discouraged. It is fundamental that the intrinsic values of conserving the forest and mangroves are actively recognized by the community and that the needs of the local people are bound within conservation policies.

The impact of tourism and its threats, require prudent planning and the implication of formal conservation policies if it is not to be detrimental to the fauna and flora of the island.

In addition to the above the following recommendation should also be noted:

- 1) Responsible use of pesticides by the farmers, including restricted seasonal usage and avoidance of overspray. Leave buffer zones, areas which have not been sprayed or sprayed with a less hazardous pesticide, around field perimeters where wildlife tend to feed and nest. Finally, the use of pesticides less hazardous to non-target species, but equally effective against target species will help minimize wildlife mortality (Smith, 1987).
- 2) Have a cheap alternative for toxic chemicals and fertilizers for agricultural use, especially on agroecosystems that are very near the Watershed Area.

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Acknowledgements

Thanks to Vicente Yngente, and our guide Lito Bulalacao whose knowledge and commitment was invaluable, to Prof Juan Carlos T. Gonzalez whose field skills and involvement in the acoustic analyses warrant further recognition and for his thesis 'The Ecology and Distribution of Birds in the Polillo Island, Philippines' (1997), which proved an invaluable reference source material. Further thanks to the writings of John E. Du Pont and E. Dickinson, R. S. Kennedy and K.C. Parkes, whose books 'Philippine Birds, 1971' and 'The Birds of the Philippines, 1991' respectively were consulted regularly; and to the British Ornithologists Union for donation of the latter book. Thanks also to Juan Cornejo for valuable assistance and ornithological expertise and to Dr R. Wilkinson for helpful comments on the manuscript.

