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Relative Abundance of the Philippine Scops-Owl *Otus megalotis megalotis* (Walden) in Marinduque and Mt. Makiling, Philippines

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Abstract

A total of 128 survey broadcast points in each site were conducted in the municipality of Gasan, Marinduque and in the Makiling Forest Reserve that determined the species abundance, detection rate and response time to playback calls.

Higher abundance and detection rate of the Philippine Scops Owls were found in Marinduque (*t=5, P=0.0007, 30.46%*). The species detection rate decreased as the distance from the playback station increased. Distance and response time were affected by terrain and vegetation in both areas. Availability of suitable habitat is probably the major factor that determines species' population status.

Key words: Relative abundance, Philippine Scops Owl, Marinduque, Mt. Makiling

Introduction

Birds are among the best known of Earth's faunal biodiversity (Robertson and Liley, 1998). However, there are still substantial gaps in our knowledge of their abundance or density (Rands, 1998). The Philippines alone has 577 species of birds wherein at least 185 (572 species and 172 endemics in Kennedy *et al*. 2000) are endemic to the archipelago (Nuytemans, 1998). In relation to the size of its landmass, the Philippines is one of the world's major centers of biodiversity and endemism, yet it has received less attention from the international conservation community (WCSP, 1997).

The Birdlife International (2004) has led the way in identifying the important sites through its Important Bird Areas (IBAs) Programme. Identified are 117 IBAs in the country wherein only 34 (29%) are considered ornithologically well known, 63 (54%) are incompletely known while 20 (17%) are poorly known. Surveys in Mt. Makiling, Marinduque and in other regions of the country included in the IBAs are urgently needed (Mallari *et al*. 2001).

Collecting quantitative data on as many as possible at the same time creates much merit and is often a sensible approach because looking for threatened birds can be time consuming with a little data in return. There are many good reasons for counting birds and most surveys target a particular species or area. Surveys are carried in specific areas to know habitat condition as well as the species that occurs in them.

Knowledge about the population dynamics of world's most threatened species is urgently needed (Bibby *et. al*. 1998).

Originally, the Philippines was almost covered by the tropical rainforest. However, due to persistent loss of rainforests from 58 to 17 % between 1932 and 1991, several species of raptors are currently threatened

with extinction (Gamauf *et al*. 1998; Nuytemans, 1998).

Among the 178 species of owl in the world, the screech owl and scops owls of the genus *Otus* form a widespread group with more than 40 recognized species. A few of these species are present in the temperate region, whilst most are found in the tropics. Generally, *Otus* is characterized as a small owl with inconsistent ear tufts. Owls are enigmatic and often have plumage patterns and colorations resembling bark and dry leaves. This makes the systematic based on morphology hard and confusing (Miranda *et al*. 1999).

There are three families of owls with each one having representative species in the Philippines. These are the Strigidae or the True Owls, Phodilidae or Bay Owls and Tytonidae or Grass Owls (Kennedy *et al*. 2000). On the other hand, Parry-Jones (2001) listed only two families: Tytonidae and Strigidae and divided it into subfamilies such as *Tytoninae, Phodilinae, Buboninae* and *Strigidae.*

Within the Philippine archipelago, there are nine species of Scops owls, with eight belonging to the genus *Otus* and one species belonging to the genus *Mimizuku* (Miranda *et al*. 1999). Of these nine Scops owls, six are endemic to the Philippines while one is near endemic, the Mantanani Scops Owl *(*Kennedy *et al*. 2000).

In the country today, account of endemic raptors is limited of a few studies, focused mostly on the Philippine Eagle and some diurnal species. While the nocturnal birds of prey are often left in the dark, unknown hitherto, with its bleak future as well. Studying the basic population biology of raptors is challenging but rewarding (Temple, 1992). As there is a growing concern on the environment, the government has intensified its law to protect and conserve wildlife through the Republic Act 9147 also known as the Wildlife Conservation and Protection Act. Among the provision of the said act was the introduction, reintroduction or restocking of endemic or indigenous wildlife for population enhancement or recovery purposes that should also undergo scientific study on bioecology. Bioecolgy includes knowing the density or abundance of raptorial species. Information on raptor population is also urgently needed in order to monitor the long-term responses of birds to changing environmental conditions and to design protected areas large enough to maintain viable population (Hayes, 1991). This is important, since these animals are also vital as indicators of ecosystem health.

The Philippine Scops Owl (*Otus megalotis megalotis*) is one of the country's smallest horned or tufted owls that are still common (Kennedy *et al*. 2000). However, due to persistent loss of our lowland forest, its population may be declining and it could be in danger of becoming extinct in the future. If wanton habitat destruction and persecution continues, the endemic Philippine Scops Owl may be lost forever.

Prompt action should be made to save and conserve these precious species from alarming condition. In this light, it is vital to document the biology of this species before they are gone forever.

Field Techniques in Avian Studies

Large bodied uncommon species like raptors must be understood to learn about habitat fragmentation effects on these species. The best way to understand this is to conduct detailed individual species studies (Hagan and Grove, 1999). Survey is one of the ways to study individual species.

Fuller and Mosher (1987) defined a faunal survey as a process of finding individuals in relation to geographic areas or habitat features. It was known as enumeration or index of abundance of individuals in an area from which inferences about populations can be made. Observers conducting raptor surveys locate birds by aural, physical or other indirect signs of their presence like nest structure, molted feathers, pellets, or defecation.

In comparison with other birds, raptors are considered rare (Temple, 1992) and often secretive (Pendleton, 1989) but widely dispersed. They require a greater survey area, time and availability of people (Fuller and Mosher, 1987; Temple, 1992; Pendleton, 1989).

Surveys have been used by many researchers to index densities of wintering birds of prey, distribution, population trends, habitat use, and relative abundance (Andersen and Rongstad, 1989). These studied were also mentioned in Titus *et al*. (1989) Smallwood (1995), Houston and Schmutz (1995) Babcock (1995), Hansen and Flake (1995), Woodbridge et al. (1995), Gerstell and Trost (1995), England *et al*. (1995), Donázar *et al*. (1995), Herren *et al*. (1996), Eakle *et al*. (1996), Cerasoli and Penteriani (1996), Holroyd and Banasch (1996), Yosef (1996), Purger (1996), Marin and Schmitt (1996), Watson *et al*. (1999), Avotins (2004), and Nijman (2004). Surveys were also conducted to accurately assess potential impacts of some projects such as hydroelectric development to species inhabiting an area (Brodeur *et al*. 1994), as well as life history in the urban setting (Millsap and Bear, 2000).

Broadcast surveys using prerecorded calls at known locations were employed with many species of owls (e.g. short-eared owls, barred owls, boreal owls) in other countries. Playbacks of recorded vocalizations are often used to detect woodland raptors, which has been developed in the past decade to locate owls (Watson et al. 1999). Imitating or broadcasting a recording of owl vocalization can elicit vocal responses or approach. It is also useful for increasing detections used for plotting the distribution and obtaining relative abundance of breeding raptors. However, it is known how different vocalizations and sources of calls affect responsiveness on the distance and proportion of the birds responding to broadcast (Fuller and Mosher, 1987). It is appropriate to use point counts or point transects if the observer decided to use broadcast vocalizations.

Fuller and Mosher (1987) suggested that owl surveys should begin after sunset. The observer should play five minutes of broadcast, rotating the direction of the speaker 180° after each call. Then stop for 5 minutes after each broadcast to look and listen for raptors. Initial contacts, with all individuals either by visual or aural are listed during the broadcast, and also for five minutes afterwards. The chances of recounting the same bird could be reduced. The observer can accumulate a spot-map to aid in interpretation of raptors distributions. This can be done by plotting the approximate location of contacts on a map. Stops were set at 0.8km to obtain continuous coverage of an area.

Taxonomy and Distribution of Focal Species

The Philippine Scops-Owl (Figure 1) was previously known as Oriental Screech Owl and Luzon Collared Scops- Marshall (1978) (*Otus bakkamoena megalotis*) with

synonyms *Lempijus megalotis* Walden 1875, *Scops whiteheadi* Ogilvie-Grant 1895 (as cited by DuPont, 1971; Dickinson *et al*. 1991). It belongs to Phylum Chordata, Class Aves, Order Strigiformes, and Family Strigidae. This owl is known to ornithologist around the world in the scientific name *Otus megalotis megalotis.*

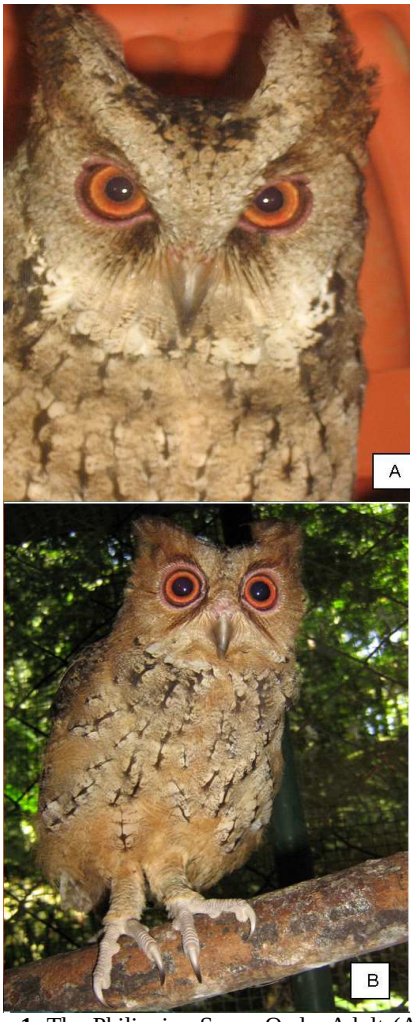

Figure 1. The Philippine Scops Owl , Adult (A) and Juvenile (B). Marinduque, Catanduanes, and recently known in Polillo (Grossman and Hamlet, 1964; Kennedy *et al*. 2000; Gonzalez, 2006).

This owl is locally known as "bukaw" in Visayas and "kuwago" in the vernacular language. This species can be found in Luzon, and also distributed in the islands of

The Philippine Scops Owl (*Otus megalotis megalotis*) is the largest in the Scops- Owl species in the Philippines (Kennedy *et al.* 2000). In 1971, du Pont described this owl having as gray phase with a blackish crown, white eye stripe, gray brown upper parts with a white line and light gray under parts with dark streaks. Its red phase is similar but rufous brown instead of gray. The bill and cere is ivory horn in color while the eyes are orange red. Feet are colored dirty white or flesh gray. The tarsus is feathered to the toes. Similar species like the Mindanao and Luzon Scops Owls are much smaller and are restricted to elevations above 1000masl (du Pont, 1971; Kennedy *et al*. 2000).

In 1999, the result of the DNA study of the six endemic species of *Otus* and one species of *Mimizuku* found out that the genus *Otus* is not monophyletic. Miranda *et al.* (1999) suggested that there are two discrete groups for the species in the Philippines- the montane clade and lowland forms. The higher or montane forms include the Luzon Scops –Owl (*Otus longicornis)*, Mindoro Scops- Owl (*Otus mindorensis*), and Mindanao Scops-Owl (*Otus mirus*). Consequently, the lowland clades include the Philippine Scops-Owl from Luzon (*Otus megalotis megalotis*), from Mindanao (*Otus megalotis everetti* and *Mimizuku gurneyi*) and from Panay and Negros (*Otus megalotis nigrorum*). This means that the montane taxa have a separate evolutionary history unlike their lowland congeners.

The Luzon Collared Scops-Owl shares a dense, fragmented plumage patterns with other Philippine Owls (*bakkamoena*,

longicornis, mindorensis, mirus) usually a pattern rendered inconspicuous against a dark back. However, *Otus megalotis* resembles non-Philippine forms of *O. bakkamoena* more than the three other Philippine taxa currently bearing the name *bakkamoena* (Marshall, 1978) .

Marshall (1978) also observed that the tarsus of *Otus megalotis* is heavily feathered like a muff. Generally, Scops-Owls lay 4-5 eggs in holes, natural hollows in trees, and deserted nest of other birds anywhere from 5-40 meters above the ground. Incubation by the female begin after the first, second or third egg (Grossman and Hamlet, 1964). Owl's chicks hatch after an average of 26-30days (Bunn et al. 1982 as cited by Haresign and Moiseff, 1988; Grossman and Hamlet, 1964). Newly hatched owls are covered with dense white down and they are semi-altricial. The Philippine Scops –Owl is semi-altricial or nidicolous (Sanchez, 2005). Nidicolous are young that are born blind, with little down, unable to walk and relies on parental care.

Breeding

Kennedy *et al*. (2000) suggested that Philippine Scops Owl might breed throughout the year since young birds are collected in February and May. It is also evident that breeding took place year round since birds with enlarged gonads were recorded from March, April, and October. Captive owls at the Center for Philippine Raptors breed from early November to June (Sanchez, 2005).

None of the owls build their own nest (Grossman and Hamlet, 1964; Parry-Jones, 2001; Wayne, 1972). Most of them prefer old raptor nest, roots or holes in trees, caves and even burrows. The Philippine Scops Owl uses natural and artificial nest such as clay or plastic pots, nest box made up of plywood, termitarium or termite mound, and wood cavity. However, lack of nest in captivity could drive them to use the ground by digging a shallow cavity (Sanchez, 2005).

Habits

Generally, owls are active at dawn and dusk wherein their main preys are also active. Most owls find their prey by "still hunting" rather than "constant flying" which helps them conserve energy (Federation of Zoological Gardens, 1998). The Philippine Scops Owl frequents clothesline poles, roof or nearby trees in villages early in the evening waiting for prey. Consequently, they are easily captured or killed by hunters or those fearing their ominous presence (Sanchez, 2005). The Philippine Scops Owls vocalization is a powerful cry best written as "oik-oik-oik-ook". Throughout Southeast Asia it is believed that an owl's calling near a house means someone therein will die (Marshall, 1978).

Diet

All owls catch prey using their talons. Scops- owl rely mainly on insect and small mammals, small reptiles, bats, amphibians (Parry-Jones, 2001), and birds (The Federation of Zoological Gardens, 1998). However, Kirk (1992) stated that the diet of many owls is influenced by habitat and season. In captivity the Philippine Scops Owl eats live laboratory rat, lean pork or beef and chopped rabbit meat. Presence of invertebrate remains such as centipede, cicada, millipede, spiders, large grasshoppers, moth, and katydid suggest that insects and other invertebrates are included in the diet. It is also observed that insect and invertebrates preys are preferred

over lean meat. The Philippine Scops Owl also ate skink (Mabuya sp.) that were offered or entered its cage. (Sanchez, 2005).

Materials and methods

The Philippine Scops Owl is confined to greater Luzon EBA or greater Luzon faunal region, which includes Pleistocene island aggregates, like Catanduanes and Marinduque. To represent Luzon Island, Mt. Makiling was chosen due to its accessibility. This mountain is popular to tourist, bird watchers, and has been well studied by biologists from the University of the Philippines Los Baños. However, Mallari *et al*. (2000) noted that this mountain is under threat are from unauthorized conversion of forest to agricultural land, illegal settlement, and by expanding cleared areas exploited by migrant settlers. In addition, rubbish and vandalism of hikers and campers is very evident throughout the park while settlers within and adjacent this mountain are engaged in bird trade and hunting. On the other hand, Marinduque's forest is presumed to be under pressure from slash and burn farming and collection of forest products. It's been high time to survey and investigate the quality and extent of remaining forest habitats and the current status of restricted range birds in this island (Mallari *et al*. 2001).

Both study areas are currently facing threats from various human interventions. As one of the denizens of these areas, the Philippine Scops Owl needs to be studied to further assess if it has adapted to environmental pressures. As on top of the food chain with high influence on the nutrient flow, these predatory species are easily affected by environmental pressures making them good ecosystems indicator.

Marinduque (Gasan)

Marinduque is an island of 172, 700 hectares situated off the southwestern coast of Luzon. Its highest peak is about 1, 153 meters and it lies on 13° 25' N 121° 57' E. Most of the forest cover remaining on the island is likely to be lowland type with some montane forest. Ornithological coverage in the island is sparse and only six endemic subspecies of birds are known (Amethyst Brown Dove *Phapitreron amethystina imeldae*; Blackish Cuckoo-shrike *Coracina coerulescens deschauenseei*; White Browed Shama *Copsychus luzoniensis shemleyi*; Mangrove Blue Flycatcher *Cyornis rufigastra marinduquensis*; Purple-throated Sunbird *Nectarinia sperata marinduquensis*; and Mountain White-eye *Zosterops montanus gilli*. These six subspecies are as equally important as the Philippine Scops Owl and could be adapted as an icon of each townships of the island province.

The remaining forests on the island are under heavy pressure from clearance for agriculture and collection of forest products. Possibly, woodcarving has also put some pressure on Marindudue's remaining forest trees. The survey areas were main roads and tail adjacent to foothills and were composed of coconut palms, farm lots, river, and secondary forest. The barangays Bognuyan, Bachao-Ibaba and Bachao-Ilaya were located at the town of Gasan and on the foot of Barangay Tabionan wherein some of the last few remaining forest of Marinduque could be found on (Figure 2).

Makiling (Makiling Forest Reserve)

Mount Makiling rises about 1,143 meters above sea level and lies 14° 09' N 121° 11' E (Birdlife Int'l, 2004) in Laguna Province southern Luzon. It has a total of 4, 250

hectares wherein 3,328.65 hectares was declared as forest reserve in Proc. No. 106 on 1910 and as a national park in Proc. No. 692 on 02 August 1960. It was proposed as a forest reserve under NIPAS and now is under the jurisdiction of the University of the Philippines Los Baños (Mallari *et al*. 2001).

Extensive forest covers most of Mount Makiling (Figure 3) except on some lower slopes that are already cleared for several types of agriculture. It is located 65 km south of Manila and was also cited as a wildlife sanctuary , an important watershed, and source of natural spring, thus popular among tourists and birdwatchers alike (Mallari *et al.* 2001).

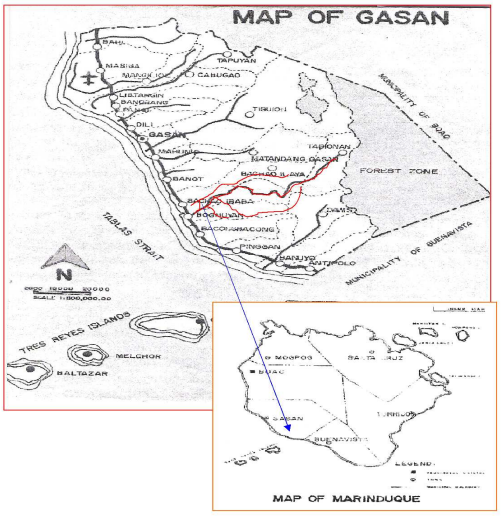

Figure 2. Area surveyed (in red) at Gasan, Marinduque. Map modified from Gasan Annual Report 2006.

Survey method

Prior to the survey, a call of the Philippine Scops-Owl in captivity at the Center for Philippine Raptors was recorded using a Sony TCM-400DV cassette-recorder. The recorder was hanged inside the cage of the owl at about 1800hrs while it was set at double recording time (2.4cm/s). it was then removed the next morning and was played. The best vocalization was then chosen and was repeatedly recorded in another cassette tape also set in double recording time.

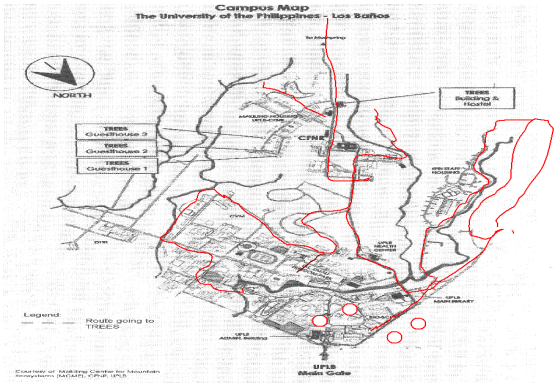

Figure 3. Area surveyed (in red lines and circle) at Mt. Makiling. Map modified from MCME.

Each person joining the survey had to familiarize with the vocals by playing the prerecorded calls. Since all of them are denizens of the specific survey site familiarization with the sound became easier as they always hear the same sound.

Prior to the survey, equipment were assured to be in good condition and replacement or extra were also on the backpack. Same equipment was used in each survey sites. Each person in the survey wore black and non-sound producing textile to increase camouflage and to lessen disturbance of other nocturnal wildlife.

Each survey route had broadcast stations distanced 200 meters apart. Point counts were done by maximizing stations that could be searched during the whole night. Surveys were carried at dusk until dawn on nights with good weather conditions. The survey was done using point count method with audio calls.

Conducting the point count with audio calls. A total of 128 taped vocal stations or playback points equivalent to 25.6 kilometers per study area were surveyed on foot from dusk to dawn. The survey was done during the breeding season of the owl as their responsiveness to be greatest and relatively few outside responses outside the season (Laidig and Dobkin, 1995). In Marinduque, barangays Bognuyan, Bachao-Ibaba and Bachao-Ilaya main roads and farm trails were surveyed. On the other hand, the Los Baños side of Mt. Makiling was the site chosen for the study. Survey area started from the UP gate to the Jamboree site, Makiling Botanic Gardens, and to Agila Base of the mountain. Using the same taped vocals and tape recorder (Sony TCM- 400DV) a total of five and six routes were surveyed on foot up to five times in both sites, respectively. The author together with one to three persons conducted the monitoring to effectively locate the direction and distance of the bird. To maximize the time, each survey point was scanned from dusk to dawn depending on the length of night and route that could be covered.

The point count stations were established on national road and trails of both sites. Broadcast stations were marked using plastic straw tied on plants while coconuts were tagged an "x" mark. Special landmark like big tree, vines or fallen log were also used as marker.

At the start of the transect the recorder of the observations noted the time (Appendix table 3) in the record sheet.

During scanning, the area around the station was searched for owls using halogen flashlights and headlamps. At each point, scanning using halogen rechargeable flashlights and headlights was done 360 degree arc from the highest canopy to the undergrowth. Scanning of the area depended on the thickness of the plants surrounding the survey point. Immediately, flashlights and headlamps were shut off and taped vocals were played 360 degrees arc after the scanning. During playback and observation at each station, the recorder stayed at the same point to maintain the 200 meters distance. Both scanning and broadcasting approximately took two minutes. Throughout the survey all observations were recorded by a single individual. The other companions monitored the minutes after each broadcast as well as the number and location of the owl.

Finally, five additional minutes of scanning after broadcasting was done. Birds detected aurally or visually were recorded on the data sheet including direction (Azimuth bearing), number of individuals, and estimated distance using the following distance bands (0-50m, 51-100m, 101-150m, and 151-200m). Owls that were recorded to vocalize from the same position or bearing were counted as one unless calls were detected to come from a pair or two individuals were seen. Additionally, the time interval when each owl was seen or heard (during scanning and broadcasting, 1st min. after broadcasting, 2nd min. after broadcasting, 3rd to 5th min. after broadcasting) was also noted.

The observers then set off to the next point and repeated the same procedure. At the end of each survey, the time was also noted. Same length of points (200m) and survey time (dusk or dawn) were strictly observed during the survey. The distance between broadcast points was measured using the casual stride equivalent to 1 meter when the pedometer did not coincide with the number of pacing with a series of trial.

Megaphone was not used after the trial due to loud feedback that might frighten the owls and other nocturnal species. During the survey no unnecessary noise was done. Some points were adjusted in highly populated areas or less tree areas.

Relative abundance analysis

The relative abundance of the Philippine Scops Owl in both areas was calculated as the total number of owls observed/ (number of broadcast stations covered x 0.2 km) to obtain owls per kilometer. Relative abundance with respect to owls per hour was calculated as the number of owls observed / (7 minutes x number of broadcast points/ 60 mins.). Response time and detection rate were compared between site by using time and distance bands. In order to detect the response time and detection a total of five taped c vocalization retort rating categories and four distance bands were designated. Categories such as during scanning and playback, first minute, second minute, and third to fifth minutes after broadcasting were used to time response of individual owl. Additionally, four distance bands (1-50 meters, 51-100meters, 101-150meters, and 151-200meters) were used to approximate location of the responding owl. Detection rate was calculated as number of responses/total number of station visits.

Results and discussion

Owl response to playback calls. A total of 107 Philippine Scops Owl were recorded from Marinduque while 39 individuals were detected in Mt. Makiling (Table 1). Most of the owls recorded were detected through vocals. Owls were hardly seen even when lighted with halogen rechargeable flashlight (JONHLITE 2,000,000 candle power) although detected less than 10 meters away due to ability to hide and be camouflaged. Some of the owls reacted to playback, so much that they went near the survey team.

Table 1. Relative abundance of owls in Marinduque site .

# OF STATIONS COVERED	# OF OWLS OBSERVED	OWL KM*	OWL HR**	DETECTION		
				Vocal	Visual	Both
22	13	2.95	5.07	13		
22	25	5.68	0.73	25	1	2
17	13	3.82	6.57	13		2
42	3	0.35	6.12	3		1
25	26	5.2	8.9	26		
Total	107	18	36.39	101	1	5
Mean	21.4	3.6	7.2			

*Number of owls observed / (# of stations covered x 0.2km)
** Number of owls observed/ (7mins. X # of stations covered/60mins.)

This was observed in both surveys areas wherein three owls in Marinduque and one in Mt. Makiling were seen. The study corroborate with the findings of Marshall (1978) that even cryptic coloration of the scops-owl implies that it is a forest denizen. Its abundance in the coconut grove signifies that they can spill into habitat degraded by man. It is believed that those owls that flew near the observers were breeding pairs ready to defend their territory. However, the increasing effect of the third or fourth night being attracted to induced call in territory of some *megalotis* pair reported by Marshall (1978) was contrary to the findings of the study. The owl seen in Mt. Makiling immediately responded and flew to the observers' position even the induced call was done the first time inn that broadcast station. In Marinduque, the pair attacked

during the second visit to the area. Marshall also stated that scops-owls pair refused to respond or come closer to imitated or taped-recorded version of their songs except for the occasional pairs in the aggressive phase of their reproductive cycle.

Relative abundance in Marinduque. A total of 107 individuals of the Philippine Scops Owl were seen or heard in the 128 playback stations conducted in Marinduque. Each owl around the 200 meters from the broadcast station was counted. In general, eighteen owls per kilometer or 36.39 owls per hour were detected during the survey (Table 1). Owls were detected in all routes surveyed wherein the highest number accounted in relation to the station covered was 5.68/km or 9.73/hr. This means that this owl is abundant in the survey site. It may be speculated that a smaller space and probably 18 owls/km or two in every two hundred meters could be found. The two owls could be found in every 0.2km. If that is each calling back in such particular station is considered to have pair.

In Marinduque site, even at the mangrove near the seashore, an owl was heard. Their presence in such areas signified that it has occupied a wide range of habitat. Its occupancy in areas altered by humans in Marinduque Island indicated that they could live in undisturbed to less disturbed landscapes.

Relative abundance in Mt. Makiling. Thirty-nine individuals of the Philippine Scops Owl were observed in Mt. Makiling. Only 6.68 owls/km or 11.88/hr were observed in this site. The highest number of observed owl in this survey area was 2.56 owls/ km or 4.4 owls per hour (Table 2). Most of the owls in this site were detected at the Makiling Forest Rainforest Park which is less disturbed and has more foraging areas like farmlands. In the lower campus owls were hardly detected even if the survey was conducted during the vacation and at times when residents of the area were sleeping. Although the surveyed area is composed of big trees it is believed that owl in this site was of low abundance. Places where this owl was previously recorded were visited to find out its existence. These were areas like Mt. Data St. in Los Baños Subdivision, Christian School International and in between UPLB administration building and Makiling School Incorporated. However, none of those areas had positive indications of its presence. The low occurrence of owls in Mt. Makiling especially in the lower portions could be due to human intervention and lack of foraging areas despite presence of large trees and some palms suitable for their refuge.

Relative abundance between sites/ islands. Without considering the distinctness of each habitat of both survey sites, this study found that the relative abundance of the Philippine Scops Owls in Marinduque (Gasan) is 67% higher than in Mt. Makiling. In the latter, there were lots of hiding places for the owls to choose however, the population of this species (UP Gate, DTRI side to Agila base and BSP-Jamboree) was found to be significantly lower (2.74%) than the olws detected in Marinduque (t=5, P=0.0007). Philippine Scops Owl was not detected in the lower campus where it was recorded before while in Marinduque, owls were detected in all routes.

Regardless of the differences in ecological characteristics between sites, Marinduque has been favored by the owls due to wide variety of prey, less disturbance and possibly lack of artificial lights. At least

in a portion of the study site in Mt. Makiling, specifically in the Rainforest Park more owls were detected. Higher abundance of owls in that site was probably linekd to a wide variety of prey associated with farmlands and less interruption at nighttime from people and artificials lights. It was also obvious that more owls detected were near farmlands in both sites.

Meanwhile except for the national road, most survey routes in Marinduque were slightly disturbed. These were areas along crops planted on kaingin with root crops, papaya, and bananas which wrere not frequently visited. The surveyed area ws compose of coconut plantations mixed with secondary forest while farms were widely spaced. In spite lacking large tree cavities for daytime roost and nesting, the owl favored areas in the lowland due to abundance of prey. Instead o large cavities coconut and other palms with thick hanging dried fronds, bamboo grove, and thick palms fronds were utilized by this owl as nesting areas.

These finding supports the claim of Marchesi and Sergio (2004) that the mottled owl and scop owl were considered tolerant to deforestation. This was probably the reason why they are found near forest edges, semi-open areas, and secondary mature forest. Likely, Zalewski (1994) and Millsap and Bear (2000) coined birds species that have found natuural food resources and have changed their feeding or shifted to abundant prey in that area as polyphagous. This suggested that the Philippine Scops Owls were good invaders since they can inhabit many environments and adapt to preying on the most abundant species. Watson *et al.* (1999) stated that low detection rate was attributed to a relatively low density of the species but also habitat and range (Dunne, 1987). Other than low population density, low abundance of the Philippine Scops Owls in Mt. Makiling can be attributed to disturbance and lack of prey items on campus. In Mt. Makiling, there were lots of hiding palces fro the owls to choose however, the population of the species in this area (UP Gate, DTRI side to Agila Base and BSP-Jamboree) was found to be lower (2.74%) than the owl detected in Marinduque.

Compared to the survey area in Marinduque the effect of street lights might as well drove the Philippine Scops Owl to unlighted areas of the Makiling Forest Reserve since owl hunted and frequented dark areas.

In both sites some owls were heard even while the team was on their way to the first point or station. Loud outcry of the Philippine Scops Owl even in broad daylight was also noted by the author since 1999 during his walk through the secondary forest of the Makiling Botanic Gardens.

Detection Rates and Response Time of Owl as a Measure of Effectiveness of the Taped Vocals

Detection rates. For the 128 broadcast stations in each survey area in Mt. Makiling and Marinduque, 39 and 107 individual owls were detected, respectively. In Marinduque 106 owl responses were recorded. To sum up atotal of 146 individual owls were detected by way of its retort call. Only one owl was observed visually and did not hear to vocalize while six individuals were both heard and seen. Figure 4 showed that detecting owl by visual, aural, and both detection cues in the survey areas has the same trend. This affirms that counting owls through vocalization using playback was more rewarding than visual and aural

contact alone. For the Marinduque Island, detection rate was 83.59% while the other survey site was lower by 51.3%. detection aret in this study was calculated as the total owl responses divided by the number of points visited multiplied by 100.

In figure 5, it was evident that detection of the Philippine Scops Owl was mostly by its retort call to taped playback. The detection curve (Figure 6) showed that the discovery of the owl was related to its distance to the playback station. As the distance of the owl from the station increased its detection decreased. Detection of owls in dark night was hard without vocalization and solicitation call.

Generally, low number of owls visually detected in both sites could be attributed to hardship in spotting the bird even if it was calling or even when strong flashlights were used. This was due to the density of the foliage and the owl's ability to camouflage added with the darkness of the night. Ninety-seven percent (39 scops-owls) of the recorded owls during the surveys in Mt. Makiling was heard while the 3% (1 head) vocalized and was also seen. In Marinduque, 94% (101) of the total owls vocalized but were not seen during the survey while 5% (5 individuals) vocalized and were seen as well. Only 1% (1 owl) of the owls surveyed in the said area was seen perching on coconut frond with his mate. In the study of Watson *et al*. (1999) for the Northern Goshawk, they found out that the highest detection in the said species was by vocalization (68%), while vocalization and visual detection, visual, and attacks on surveyor were respectively lower. They also found out that the broadcast calling increases detection rates for all occupied nests.

Meanwhile in the other site especially in the barrios where coconut were the dominant plants Philippine Scops Owls were easier to spot perching on fronds of coconut palms than in tree dominated landscapes. Spotting of owls in both places could also be affected by the fact that this bird has keen sense of hearing and eyesight in lowlight night, which makes them easily detect would be predators. As this owl avoids contacts with humans visual detection was less. Marshall (1978) stated that the forest birds hid themselves while the border village birds were conspicuous on limbs of coconut fronds. It was assumed that detection rates of owls much depends on its availability and the density of the plants in the survey area.

Response time. In Marinduque, the 325 (34 heads) of the owls responded during the last 3-5 minutes of the point followed by 27% (28 heads), 21% (23 heads) and 21% (22 heads) from the first scanning to second minutes after broadcasting respectively. On the other hand, 37% (14 heads) responded on the first minute after broadcasting in Mount Makiling. This was followed by 26% (10 heads), 24% (10 heads) for the last 3-5 minutes after broadcasting and 13% (5 heads) during the second minutes after the playing of taped vocals. A slight difference in all of the timed answer to solicited call in Makiling site was noted in Table 3. This means that the time solicited call was played has a very slight to negligible effect on the response of the owl in this site. On the other hand, Table 3 depicts that there were also slight differences from the survey time most of the owls in this site responded during scanning and broadcasting and on the 3rd-5 minutes of the survey. It was thought that because of the dense vegetation and

topography of the area the number of owls that responded was low. Sound may have traveled slowly from the center of the calling station to the farthest distance it could reach. This may explain why more owls responded in the first minute and the last three to five minutes after the broadcast. Otherwise, it would mean that this owl's population was decreasing in Mt. Makiling. In contrast with Marinduque, Mt. Makiling survey has more cliff, roads and trails are ascending with dense vegetation.

In figure 6, it is evident that there was no relationship between time of response and the owls distance. But a strong influence of contact time to response time of owls was observed in Marinduque. Hence, the response of owls decreased as the observation time after the scanning and playback call increased. The histogram showed that even the farthest distance of 200 meters an owl would response or vocalizes immediately to intruders or would be predators. Terrain and vegetation have possible effect to elicit response of this owl in both sites. The vegetation in Marinduque was not dense which made the sound travel fast making the owl respond instantly. Meanwhile, in Mt. Makiling survey sites terrain and thick vegetation impedes the sound from traveling fast thereby making low relationship between response time and distance. The response time fluctuated wherein the contact times from the scanning and broadcast to 1st minute after playback increased and then declined to the 2nd minute after playback and incremented to the last (Figure 7). However, the last two contact times' response were lower than the 1st two contact times while no response was recorded within the last 101-200m distance. There are no obvious comparisons between sites in terms of contact times' response against distance since Mt. Makiling is well vegetated and its topography was much less different from Marinduque.

Responsiveness of the owls to taped vocals suggests that monitoring using broadcast call to determine their population status shows potential as a useful method to understand distribution and abundance, and to verify trends and habitat association. However, this is still subjected to the type of vegetation and topography of the area to be surveyed since those are among the factors that influence survey counts aside from habitat use and behavior (Fuller and Mosher, 1981).

Results of the study showed that the playback call used was effective in soliciting a call of the owl in up to 200 meters range in both sites. Only, there were slight differences in the topography of the area that affected the owl's response to contact time.

Detection rate as to distance. A summary of the Philippine Scops Owl detected for Marinduque and Makiling survey area at estimated distance categories was included in Table 3. The Philippine Scops Owl detection in both sites was dictated by the distance of each owl from the broadcast station. The majority of the owls detected on both site was within the one to 100 meters fro playback stations. It was found out that the detection in the said owl diminishes as the distance away from the broadcast station increases. In comparison with the summarized owls detected with respect to distance category in Grossheusch (2005), the detection trend decreases from the second category to the last from the adjacent tree or shaded by the canopy.

Table 4 depicted that the highest detection during the survey was within one

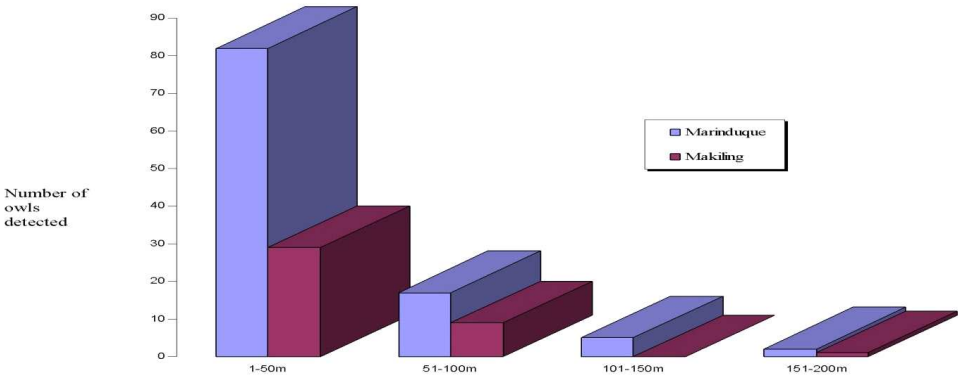

Figure 4. Number of Philippine Scops Owls detected per distance bands in Mt. Makiling and Marinduque survey sites.

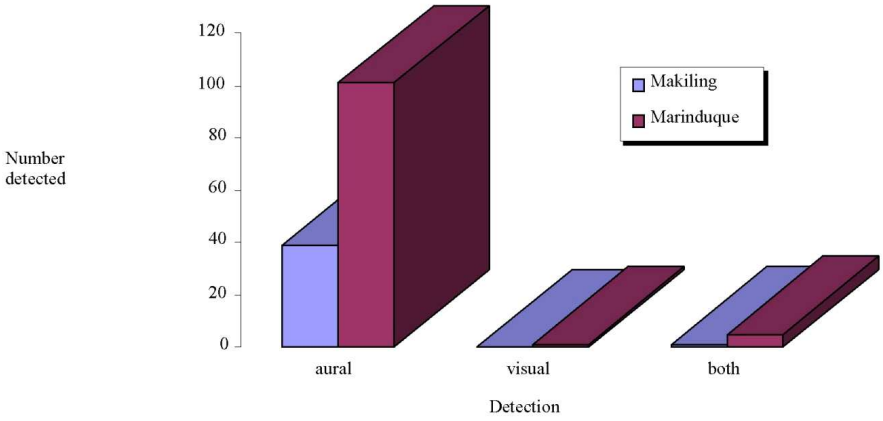

Figure 5. Number of Philippine Scops Owls observed per detection type in Marinduque and Mt. Makiling survey sites.

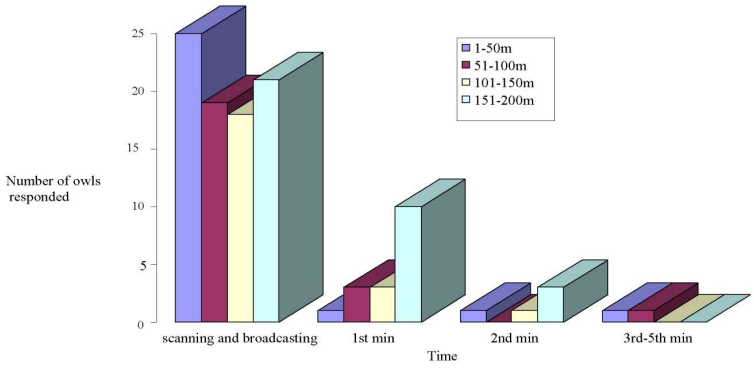

Figure 6. Number of Philippine Scops Owls responded per time and distance from the point station in Marinduque survey site.

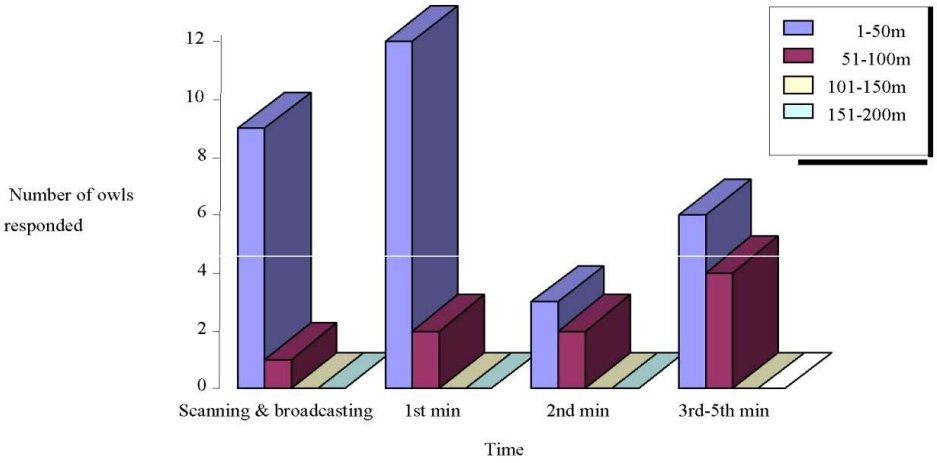

Figure 7. Number of Philippine Scops Owls responded per time and distance from the point station in Mt. Makiling survey site.

Table 3.The number of owls detected and response time to playback call.

TIME	TOTAL NUMBER OF OWLS RESPONDING___ Marinduque	Mt. Makiling
	N (%)	N (%)
During scanning and broadcasting	28 (26%)	10 (26%)
1st minute after broadcasting	23 (21%)	14 (37%)
2nd minute after broadcasting	22 (21%)	5 (13%)
3rd-5th minute after broadcasting	34 (32%)	10 (24%)

Table 4. Number and distance of responding owl to playback call.

DISTANCE (METERS)	TOTAL NUMBER OF OWLS RESPONDED	
	Marinduque	Mt. Makiling
	N (%)	N (%)
1-50m	82 (77%)	29 (74%)
51-100m	17 (16%)	9 (23%)
101-150m	5 (5%)	0 (0%)
151-200m	2 (2%)	1 (3%)

to fifty meters of the point. Seventy-seven percent of the entire 107 detected owls in Marinduque were estimated to be in first (1-50 meters) band. In Mt. Makiling the first band also has the highest concentration of detected Philippines Scops Owl constituting 74% of the entire population observed in the said mountain. On the other hand, 81 individuals (16%) and 29 individuals (23%) were detected in the 51-100 meters from the broadcast point in Marinduque and Mt. Makiling respectively. The results in this study contrasted with Grosshuesch (2005) wherein the distance where most of the owls heard are within >100 to 500 meters and only 8-10 % of owls were detected in the 01-100 meters band.

Distance inversely related with the detection rate in the Northern Goshawk (Watson *et al.* 1999). This was also found in this study where lesser response was observed as the distance from the playback station becomes far (Table 4). This could be attributed to how far the speaker's broadcast call could go and the density of trees that could block the sound coming from the tape player. Reduced detection could also have been partly a consequence of the limitation to hear responding bird from a farther distance.

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