A TAXONOMIC ACCOUNT OF LIZARDS ALONG ESTABLISHED TRAILS IN MTS. PALAY-PALAY MATAAS-NA-GULOD PROTECTED LANDSCAPE, LUZON ISLAND, PHILIPPINES

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ABSTRACT

Twenty three species of lizards were recorded in Mts. Palaypalay-Mataas-Na-Gulod Protected Landscape. Belonging to four families; Agamidae is represented by three species, Gekkonidae with seven species, Scincidae with twelve species and Varanidae with one species. Fifty two percent of the species in Mts. Palaypalay-Mataas-Na-Gulod Protected Landscape is endemic which is dominated by forest species. Lizard diversity decreases with increase in elevation. Three major habitats (forest, stream and human habitation) were observed to be occupied by the species and habitat overlaps were observed as some species can occupy all habitat types.

INTRODUCTION

There is more to the study of the distribution of organisms and species assemblage than simply documentation. Studies in phylogenetics, biogeography, conservation, and management require distribution data on their investigations. Also, considering the rates by which natural habitats are destroyed or altered because of burgeoning human population, the need to discover and protect wildlife populations become more apparent. Human activities aggravated by natural phenomena have rendered wildlife species with limited population size vulnerable to extinction. Despite the current success on environmental awareness, many organisms need to be surveyed (Kanapi, 1988), identified and properly documented to assess their conditions and determine to what extent they are affected by human-induced ecological problems. This study presents baseline information on the species accounts and distribution of lizards of Mts. Palay-palay Mataas-Na-Gulod Protected Landscape (MPMNGPL).

Mts. Palaypalay-Mataas-Na-Gulod Protected Landscape (MPMNGPL) in Ternate Cavite has a total land area of 3,973.13 has and rises about 650 m above sea level. It was proclaimed as a wildlife sanctuary on October 26, 1976 by virtue of proclamation No. 1594 as National Park and was changed to a Protected Landscape by the virtue of Proclamation No. 1315 signed on June 27, 2007. The protected area is situated in the municipalities of Maragondon

and Ternate in Cavite Province and Nasugbu in Batangas Province with coordinates of 120°38'-120°42' east longitude and 14°15' north latitude (Maranan, 1999). It is bounded on the north by Puerto Azul Beach Resort and Calumpang Point Naval Reservation on the south by timber lands and on the west by the China Sea (Maranan, 1999).

METHODOLOGY

Study Area

Mts. Palaypalay-Mataas-Na-Gulod Protected Landscape is part of three prominent volcanic centers of the Cavite-Batangas Highlands of Luzon volcanic plugs, lava agglutinates and a well-preserved cone, which is probably the youngest vent in the region. Mataas na Gulod is a sizeable composite volcano with an eroded summit caldera. Volcanic plugs, old vents, and ignimbrites were observed along its rims and caldera floor. Mataas na Gulod caldera is completely within the Bataan Lineament (extending from the eastern side of Zambales ophiolite down to the northern part of Mindoro). Magma samples of the three prominent volcanoes were related to each other (Maranan, 1999).

Forest cover at the area is estimated at 63% (a mixture of Molave, *Vitex parvilora*) and Dipterocarp type of vegetation) while 37% of the area is classified as nonforest (Maranan, 1999). Majority of the area is covered by secondary growth forest because the place was intensively logged in the past. The patches of open grassland, bush, and cogonal areas in the park are being rehabilitated and reforested (Maranan, 1999).

The park falls to climatic Type I having two pronounced seasons. It is dry from November to April and wet during the rest of the year. August has the highest registered rainfall and an average of 2000 mm is measured yearly. The average wind velocity is 3.08 mile/second, the average humidity is 57%, which is lowest in April (Maranan, 1999).

Sampling techniques

The study site was set along the established trails in the forest and along the Palikpikan steam starting from 200m elevation up to 500m above sea level.

The study was conducted initially from January to March of 1999 and quarterly visits (March, June, September and January) for the succeeding years until January of 2009. Collection of data employed two sampling methods, first is time-constrained searches where sampling is not done in random and surveyors were free to work in places where favored by lizards, increasing the chances of observing rare and fossorial species that might otherwise be overlooked utilizing other survey methods (Adams *et al,* 1996). This method is a plotless sampling technique that provides relative abundance and species

richness data. And second is microhabitat sampling which is done in 5 hrs per sampling on likely refuges of lizards such as leaf-litter, logs, rocks and trees. Day and night sampling was done to observe diurnal and nocturnal species. The intensity of searches varied from observation of active individual species to destruction of microhabitat with iron bar or bolo. Data collected included notes on species behavior and habitat preferences.

Sampling was performed day and night and was conducted by 2 to 3 persons from 0800 to 1300 hrs during the day and from 2000 to 0100 hrs at night for an average of 10 hrs per sampling day with a total of 40 days with an accumulated 400 hrs. Specimens were captured by hand, with scoop nets and sometimes with a slingshot (to immobilize) for skinks and agamids. Pentax PZ-70 SLR film camera equipped with Pentax SMC 80-200mm telephoto lens was also used to document specimen from afar (or at a distance). Captured specimens were placed in collecting bags. Notes on coloration of the specimen, microhabitat preferences and behavior at the time of capture were taken. Preliminary identification of specimen was made using taxonomic field guides such as "Philippine Lizards of the Family Scincidae" by Brown and Alcala (1980), The Philippine Lizards of the Family Gekkonidae" by Brown and Alcala (1978) and the "Philippine Reptiles and Amphibians" by Rabor (1981). Verification of species identification were based on voucher specimens deposited at De La Salle University-Dasmariñas and at the Herpetology section of The Philippine National Museum with the help of Dr. Arvin Diesmos.

RESULTS AND DISCUSSION

A total of twenty three species were recorded in the study area. Fourteen genera in four families are represented by the following number of species; Agamidae with three species, Gekkonidae with seven species, Scincidae with twelve species and Varanidae with one species.

A brief account of each taxon has been provided below including distribution records, and other notes on natural history.

Agamidae:

Bronchocela cristatella (KUHL, 1820)

Two individuals of this species were observed perched on vegetation along the steam in the forest preferring green vegetation to camouflage and avoid detection. This species is distributed in the islands of Balabac, Bohol, Busuanga, Cagayan Sulu, Calauit, Camiguin (Sur), Carabao, Catanduanes, Culion, Dinagat, Guimaras, Leyte, Luzon, Marinduque, Mindanao, Mindoro, Negros, Palawan, Panay, Pan de Azucar, Ponson, Samar, Siargao, Sibutu (Sulus), Sibuyan, Tablas, Polillo, Luzon, Mindoro, Panay and Negros.

Draco spilopterus WIEGMANN, 1834

This is a diurnal species that is very active during the day and is commonly known as the "Philippine Flying Dragon". This is an arboreal lizard equipped with a lateral skin fold on its side that allows the animals to glide from tree to tree. Males can be distinguished from the females by the presence of a dewlap, a skin fold located on the throat area. Seven specimens were observed mostly males (six out of seven) displaying the dewlap while trying to attract females.

Gonocephalus sp.

Five individuals of this unidentified forest dragon were collected in the forest. Individuals of this genera were observed perched on woody shrubs or wildlings in the forest floor. This species have the ability to change color and blend well with the background making it very difficult to detect. The taxonomy of the species occurring in Luzon is still unclear. No clear accounts for taxonomic identification have been reported yet.

Gekkonidae:

Cosymbotus platyurus (SCHNEIDER, 1792)

Commonly known as the "flat-tailed house gecko", this species is native to Asia and was first documented by Gray to have a wide distribution in the Philippines (Brown and Alcala, 1978). This is a nocturnal lizard preying on insects attracted towards light. Individuals of this species were commonly observed in man-made structures like houses, lamp posts, and concrete structures like bridges and water irrigation channels. Most of the species observed in the area were observed in DENR compound of the protected area.

Cyrtodactylus philippinicus (STEINDACHNER, 1867)

Also known as *Gonydactylus philippinicus,* the common name of this species is "Philippine bent-toed gecko" which is an endemic species found in some islands in country (Brown and Alcala, 1978). One specimen was found perched on a tree trunk in the forest near the stream. This species is also nocturnal and prey on insects like small beetles and moths.

Gehyra mutilata (WIEGMANN, 1834)

The distribution of this lizard includes the Philippines and some parts of Asia (Brown and Alcala, 1978). Commonly known as the "Stump-toed gecko, this species is nocturnal and overlaps with the distribution of the flat-tailed house gecko and the bent-toed gecko in the area. Noticeable, this species prefers the vegetation like trees and garden plants found within the DENR station.

Gekko gecko (LINNAEUS, 1768)

This species can be observed in the area both in the forest and in man-made structures. Known as the "Tokay gecko", vocalizing individuals of this species can be heard almost any time of the day. This lizard is very shy, cryptic and secretive and observed to prefer habitats like lampposts, house ceiling, dead trees, tree barks and tree holes.

Gekko monarchus (SCHLEGEL IN DUMÃ©RIL AND BIBRON, 1936)

This lizard was first given the genus *Platydactylus* by Schlegel *in* Duméril & Bibron in 1836, and was changed to its present name by Gunther in 1879 (Brown and Alcala, 1978). This species is widely distributed in the Philippines and can also be found in the Malay Peninsula and Indo-Australian Region (Brown and Alcala, 1978). Individuals of this species are observed both in the forest and in man-made structures like houses, lampposts, bridges and road railings. One notable difference of this lizards from the others also associated with man-made structures is its behavior of avoiding well lit areas.

Hemidactylus frenatus (SCHLEGEL IN DUMÃ©RIL AND BIBRON, 1936)

Locally known as the "Spiny-tailed House Gecko", this lizard was first documented in Java (Schlegel *in* Duméril & Bibron, 1836) and the first specimen was described by Cope (1868) as *H. longeceps* (Brown and Alcala, 1978). This species is commonly associated with human settlements and is native to the Oriental Region. Most individuals of this species were also observed to occur in the man-made structure within the DENR station. This nocturnal species was observed catching insects on lamp posts and ceiling near lit light bulbs.

Hemidactylus stejnegeri OTA & HIKIDA, 1989

This species is observed in disturbed habitats like, secondary growth forest, agricultural plantations and human settlement areas. This species is commonly known as "Stejneger's leaf-toed gecko", nocturnal and observed in tree trunks and lamp posts. This lizard is a native of Chia, Taiwan and the Philippines islands of Luzon and Panay (Brown and Alcala, 1978).

Scincidae:

Brachymeles bonitae DUMÃ©RIL & BIBRON, 1839

This fossorial species is commonly known as the "Pretty short-legged forest skink. This is a Philippine endemic and its distribution includes the islands of Kalotcot, Luzon, Marinduque, Masbate, Mindoro, Polillo, Sibuyan and Tablas (Crombie, 1994). This is a forest found in microhabitat described as decaying logs and thick decaying forest litters.

Brachymeles boulengeri boulengeri TAYLOR, 1922

This is another fossorial species with a common name of Boulenger's short-legged forest skink. This species also an endemic which are found only in the islands of Mindoro, Panay and Luzon (Brown and Alcala, 1980). This forest species also prefers decaying log and can only be observed by digging out from burrows under the fallen decaying logs.

Dasia grisea (GRAY, 1845)

This lowland species is commonly known as Gray's tree skink. Diurnal in activity, however very elusive, observed to prefer rock crevices, lifted tree barks and sometimes found near human settlements hiding in wood stock-files. This lizard is native to Malaysia, Indonesia and the Philippine islands of Mindoro, Marinduque, Semirara Islands, Luzon (Brown and Alcala, 1980).

Eutropis multifasciata (KUHL, 1820)

This lizard is a diurnal forest species which can also be found in lowland disturbed forest areas. Commonly known as the "Striped sun skink", its distribution includes India, China, Thailand, Myanmar, Laos, Cambodia, Veitnam, Malaysian Peninsula, Singapore, Indonesia, New Guinea and the Islands of the Philippines (Negros, Panay, Palawan: Calamian Islands, Luzon) (Brown and Alcala, 1980).

Sphenomorphus coxi divergens TAYLOR, 1922

Another Philippine endemic, this lizard is commonly as Cox's forest skink. Its distribution includes the islands of Luzon, Marinduque and Mindoro (Brown and Alcala, 1980). This species was observed in the forest even in disturbed or secondary growth area.

Sphenomorphus cumingi (GRAY, 1845)

Usually found in mid-elevation forest. Commonly known as "Cuming's forest skink", this species was observed both in intact and secondary growth forest. Prefers habitat like burrows in the forest floor, rook crevices, fallen logs and forest litters, this lizards are very fast runners and very difficult to catch. This endemic species is found in Mindanao, Bohol, Dinagat, Luzon, Mindoro, Calotcot, Sibuyan, Sicogon and Panay (Brown and Alcala, 1980).

Sphenomorphus decipiens (BOULENGER, 1894)

This species is observed in forested areas both intact and secondary growth. Commonly known as "Black-sided forest skink", this species is found in mid-elevation forest preferring forest floor with thick litters and rocky areas. This is an endemic species and its distribution includes the islands of Luzon, Mindanao, Tablas, Leyte and Samar (Brown and Alcala, 1980).

Sphenomorphus steerei STEJNEGER, 1908

This is very similar with *S. jagori* in terms of size and relatively smaller compared with *S. cumingi.* Commonly known as "Steere's forest skink", this is a forest species also found in intact and secondary growth forest. This Philippine endemic is found in the islands of Mindanao, Camiguin, Bohol, Leyte, Cebu, Siquijor, Panay, Negros, Poro, Sibuyan, Pacijan, Danjudoro, Guimaras, Ponson, Sicogon, Gigante South, Tablas, Mindoro, Calagna-an, Luzon (Brown and Alcala, 1980).

Lamprolepis smaragdina philippinica (MERTENS, 1929)

This lizard is commonly observed in low vegetation, in gardens near houses at low elevations. This species likes to bask during bright sunny morning in areas that it considers its basking territory. It was observed that while basking, it chases away other lizard that comes near it. This species was also noticed to occur in low vegetation forest (200 to 300 above sea level in the study area). It commonly occurs throughout the Philippines. It was first described as *Scincus smaragdinus* based on the specimen obtained from New Guinea and was redescribed as *Lamprolepis smaragdina philippinica* by Mertens in 1928 (Brown and Alcala, 1980).

Lipinia pulchella pulchella GRAY, 1845

This subspecies occurs in the islands of Luzon and Mindanao. It is found only in the Philippines (Brown and Alcala, 1980). This arboreal lizard is very active during the day. During the sunniest time of the day, this lizard likes to bask on fallen log either found in the forest or along the stream. This is a small lizard with two bright yellow stripes dorsally from the snout to the end of its tail.

Sphenomorphus jagori jagori (PETERS, 1864)

This is Philippine endemic and found in Luzon, some Visayan Islands and in Mindanao (Brown and Alcala, 1980). This is species is common on the open forest floor and along the stream. Most individuals observed in the forest are adults and surprisingly, many of the specimens observed along the stream are immature of sub-adult differentiated by relatively smaller size and the reddish or pinkish coloration of the tail on the ventral side. It is interesting to note that once this species is confronted with a potential predator, its evasive technique is to blend with the environment and remain motionless, but once given the opportunity to escape, it runs very fast and also a very efficient tree climber.

Mabuya multicarinata borealis BROWN & ALCALA, 1980

This species is very common in the study area. It can be found everywhere at any time of the day sometimes even at night. This lizard also likes to bask under the sun. it has been observed on rocky banks of Palikpikan Crick catching insects. It was also found hiding in tree holes, bamboo cuttings, and under decaying logs. This lizard species is also a good tree climber. Distribution ranges from Luzon, Masbate, Cebu, Negros, Caluya,

Semirara, Sicigon, Gigante North and Gigante South Islands (Brown and Alcala, 1980).

Varanidae:

Varanus salvator marmoratus (WIEGMANN, 1834)

This lizard is locally known as "bayawak" or the marbled water monitor lizard. This lizard is priced for its meat as a delicacy and good quality skin that is used in leather crafts. One specimen was captured and was released after body measurements were taken and the sex determined. In the study site, this species is very shy, this species can only be observed afar and while trying to avoid detection. This subspecies is endemic and it is threatened right now because of commercial hunting (Gaulke, 1992).

Lizard Endemicity of MPMNGPL

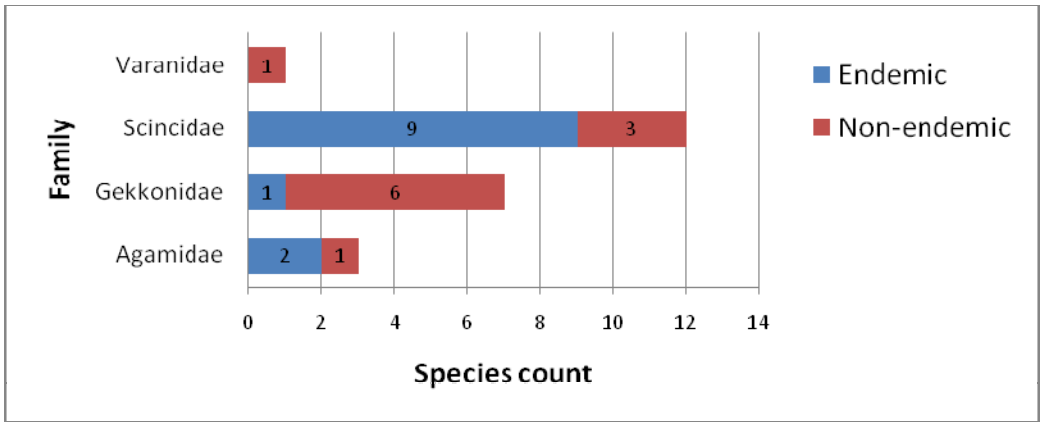

Figure 1. Distribution of endemic lizard species per family

Out of the twenty three species of lizards in the area, twelve (52%) are endemic which is relatively high considering that the reptile endemism in the country is about 67% (Center for Applied Biodiversity Science). Majority of this endemic species represents the scincids (9 out of 3 species) and the agamids (2 out of 3 species) which are known to be associated with forest habitats. The observations of such species over a continually degraded habitat suggest either, that forest dwelling species are able to persist over a degraded habitat or that the areas continue to harbor species dependent on the forests despite the disturbances. However, the extent into which this resilience (of the species) and the perceived stability (of the habitat for harboring forest dependent species) remain anecdotal pending dedicated and extensive research on these topics in the area.

Elevation Distribution of Lizards of MPMNGPL

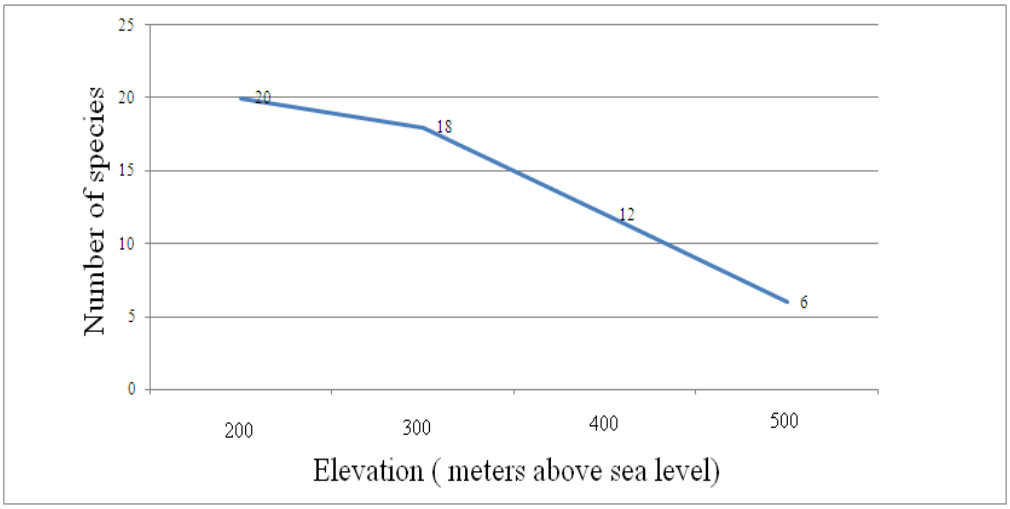

Figure 2. Elevational distribution of observed species of MPMNGPL

Data obtained reveal that elevation is inversely proportional with species richness. As elevation increases, the number of species decreases. This finding is consistent with the results of the study conducted in Mt. Makiling regarding the elevation distribution of skinks where species number declined as elevation increases (Custodio, 1986). One reason for this is that environmental conditions become harsher with increasing altitude preventing some species from further colonization of more elevated habitats (Ditto, 1996). Furthermore, habitat heterogeneity is inhibited because of limited environmental variability resulting in specialized niches in which few species are able to survive (Ditto, 1996). This only supports that, at some point, the structural complexity of the habitat positively influence species diversity (Heatwole, 1982).

Habitat Distribution of Lizard of MPMNGPL

Habitat types in the study area were categorized into three: forest, stream, and human habitation. It was observed that some lizard species were not limited to only one habitat. This was probably caused by the overlap of these distinct habitat-forming areas known as ecotone like farm or human settlement areas in forest edges where buffer zones like stream banks and vegetation near houses could serve as a means for these species to gradually adapt to an adjacent habitat. On the other hand, there were also species that were observed to occur only at specific habitats like *H. frenatus* which was observed only in human habitation like houses and agricultural areas that are constantly associated with human activities.

Majority of the observed species are forest dwellers (16 out of 23 species). However, these species also occur in disturbed areas like secondary

growth forest, artificial commercial forests, and agricultural lands. These findings agree with the history of the place of being intensively logged during the 1950s where forest cover remains to about 62% (patches of primary and secondary forest) and it is just slowly recovering from that fate when it was declared a protected area in 1976. Compared with other mountains with the same volcanic history like Mt. Makiling and the Zambales, MPMNGPL have the lowest species accounts (Custodio, 1986; Taylor, 1922).

Twelve of the 23 species were observed to be associated with human habitations (houses, huts, lamp posts, and buildings of PAWB compound). All of these species belong to family Gekkonidae and except for *H. frenatus*, are associated with the forest.

Seventeen out of the 23 species were found to dwell along the stream. This kind of habitat provides these species essentials like basking areas like fallen logs and big rocks, foraging areas to catch food like insects, and retreat as resting areas and refuge against threats where individuals can easily evade predators by going into rock crevices or under fallen logs. These species can also be detected in other habitats like the forest, on trees or in forest litters. It is interesting to note that more than 50% of observed individuals for these species are juveniles. These juveniles are much smaller than the adults and have different coloration of the tails which is reddish or pinkish. Scalation is not yet fully developed as their body appears smooth. The moist condition, relatively lower temperature, and the abundant food resources in the stream provide a favorable condition that allows these young individuals to survive. The moist condition favors high rate of decomposition that makes small plants and insects available as food materials for these lizards. Another advantage of being in the stream is that rocks offer a very suitable retreat for these animals once threatened. Rock and crevices are good hiding places and basking areas during this fragile stage of their life.

CONCLUSION

Twenty three species of lizards identified within 14 genera were recorded in Mts. Palaypalay-Mataas-Na-Gulod Protected Landscape. Belonging to four families; Agamidae is represented by three species, Gekkonidae with seven species, Scincidae with twelve species and Varanidae with one species.

Fifty two percent of the species observed in established trails in Mts. Palaypalay-Mataas-Na-Gulod Protected Landscape is endemic which is dominated by forest species.

Lizard diversity decreases with increase in elevation. Remaining intact forest patches are mostly distributed at higher elevation (500 masl and above) where strict forest species were found.

Three major habitats were observed to be occupied by the species and habitat overlaps were observed to be associated with all habitat types. Forest

areas are characterized by patches of primary and secondary growth where old growth forest situated at higher elevation. Stream areas are characterized by the aquatic habitats like pools and running water with big rocks, fallen logs, stream vegetation and open areas with abundant sunlight. Areas with human habitation include settlement areas with man-made structures and continuous human activities.

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