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Diversity and Conservation Status of Reptiles in Aliwagwag Protected Landscape: Basis for Localized Instructional Material Development

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Abstract— This study aims to classify, determine IUCN conservation status and species diversity (H'), and create localized learning material of reptiles in Aliwagwag Protected Landscape (APL), Cateel, Davao Oriental: four families, 12 genera, and 13 species of reptiles observed in the study area. The IUCN status of all specimens was Least Concern, meaning that APL reptilians were still widely distributed and plentiful in the wild. Furthermore, the H' (2.521) and evenness (0.983) indicate that the reptilian species was moderately diverse and evenly distributed in the study area. The study output was a booklet about the local reptile species in APL. The booklet can help students learn and contribute to the conservation of local species.

Keywords— Reptiles, Localized Instructional Material, Species diversity, Evenness.

I. INTRODUCTION

More than one out of every five of the world's reptilians are at risk of going extinct, according to the Global Reptile Assessment. This assessment is part of the IUCN Red List of Threatened Species. A review of 10,196 reptilians found that 21% are likely to go extinct (Cox et al., 2022). The main dangers to reptiles are habitat loss and harvesting, which need to be addressed adequately by conservation efforts. Thus, conserving biodiversity requires knowledge and information to save and protect the species (Niesenbaum, 2019). In education, inadequate teaching and learning strategies and instructional material led to poor science performance. The educational materials were responsible for the unsatisfactory scientific results (Mishra & Yadav, 2013, as cited by Tupas, 2019). This suggests that the mastery of biology ideas is thoroughly obtained by utilizing the students' familiar teaching materials. Without instructional tools, teaching biology may undoubtedly lead to poor academic performance (Nuhu et al., 2021).

Aliwagwag Protected Landscape (APL) is a giant preserving piece of tropical rainforest in the lowland areas in the Philippines. Threats to APL's diversity and its environmental sustainability still exist, nevertheless. Human habitation in the area brings ecological disturbance and the presence of degraded habitats (Department of Environment and Natural Resources (DENR) Region XI). Diversity data is needed for protected areas in order to prioritize the importance of each species' protection, identify risks, support public education, raise environmental consciousness, and encourage local stakeholder pride and participation (Meneses et al., 2022). In the field of education, Maneule (2019) indicated that contextualized teaching resources and locally relevant instructional materials were crucial to educational transformation. In addition to meeting the pupils' immediate needs, it also results in improved academic performance. Additionally, it demonstrated positive results in the learners' performance as a successful method of transferring students' capacity for lifelong learning.

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There were studies conducted about Reptilian diversity in Mindanao, such as in Mounts Apo, Kitanglad, Hamiguitan, and Malindang (Mohagan et al. 2019) and Mount Busa, Sarangani Province (Pitogo et al., 2021). However, there is no published research about reptilian diversity and conservation status on the Aliwagwag Protected Landscape (APL).

On the other hand, there has been research on using indigenous species in science teaching and learning (Tupas, 2019) and utilizing instructional materials in teaching and learning biology (Ismail & Lukman, 2022). Nonetheless, the researcher has not yet found locally tailored educational materials for reptilian diversity and conservation in APL.

Addressing this significant research gap is relevant and essential, as any information about reptile diversity could contribute to the existing literature. Because habitat destruction continues to pose a significant danger to reptiles, additional research is required, particularly in Mindanao's forest-covered regions. Also, in education, creating localized instructional material for reptiles will help students identify reptiles they may have already seen but have been unable to name and identify.

This study was carried out to record, profile, and identify naturally occurring reptiles in Aliwagwag Protected Landscape (APL), Barangay Aliwagwag, Cateel, Davao Oriental, as well as to assess their conservation status. Specifically, the study aspires to answer the answer the following questions: what reptilian species are found in APL base on classification in terms of: family; genus; species; and IUCN Conservation Status? What is the Shannon-Weiner Index and Evenness Index? And lastly, what instructional material in Science can be developed relative to the biodiversity and conservation of reptiles in Aliwagwag Protected Landscape?

II. METHODOLOGY

This study utilized the descriptive design to determine the species diversity indices such as Shannon-Weiner Index and Evenness Index of reptiles in the study area. This design was employed to obtain complete and correct information about the classification in terms of its family, genus, species, and conservation status of reptiles in Aliwagwag Protected Landscape (APL).

Research Locale

The study was conducted in Aliwagwag Protected Landscape (APL), Davao Oriental. Aliwagwag is situated in the Eastern Mindanao Biodiversity Corridor, which contains one of the Philippines' largest remaining blocks of tropical lowland rainforests.

The protected landscape covers an area of ten thousand two hundred sixty-one (10,261.07) hectares, and the buffer zone contains an area of one thousand one hundred eighty-seven hectares (1,187.65 ha). It is located in two barangays, Maglahus and Aliwagwag. APL lies between 126o10'longitude and 7o40' latitude. It is located in the hilly interior of the municipalities of Cateel and Boston in Davao Oriental and certain parts of the municipality of Compostela in Davao de Oro, which are all hydrologically rich (see Figure 1).

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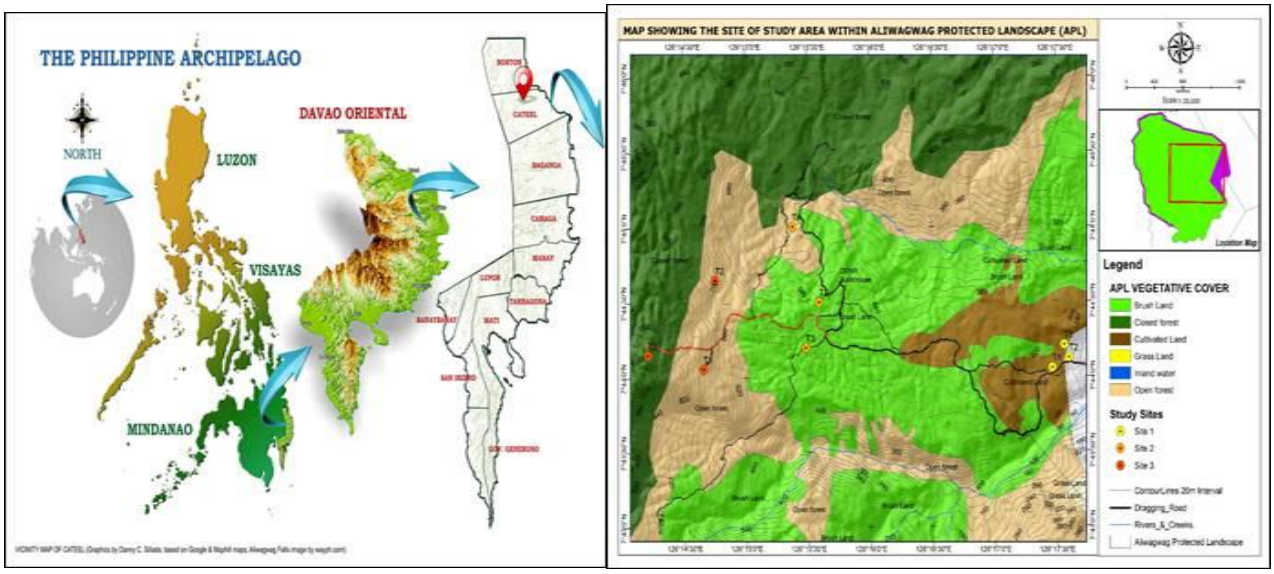

Figure 1: The Philippine Map Indicating the Location of Cateel, Davao Oriental and The Map of Aliwagwag Protected Landscape (APL)

Source: Sillada, D.C. based on Google & Maphill Maps, and Department of Environment and Natural Resources.

In this study, three (3) sites were surveyed by employing a 10 x 100 m strip transect, which was 10 m wide and 100 m long (Supsup et al., 2017). Three (3) transects were installed in every site and were randomly stationed in each of the sites to cover all possible areas where reptiles reside. The specimens that were observed in the study were identified in terms of family, genus, and species through the pictures, observation, and recording of traits on each reptile in the APL. All specimens were photographed in life whenever possible to document color pattern variation for identification and documentation purposes (Clores et al., 2020).

IUCN Conservation Status of reptiles was determined using the IUCN Conservation Status online database. Conservation status was based on the current published online database information of the International Union for Conservation of Nature (IUCN) Red List of Threatened Species, version 2022-2, (Clores et al., 2020). Moreover, the IUCN Red List Categories classify species' extinction risk from Extinct (EX) and Extinct in the Wild (EW), via the threatened categories Critically Endangered (CR), Endangered (EN) and Vulnerable (VU) to Near Threatened (NT) and Least Concern (LC). A species is listed as Data Deficient (DD) if insufficient data are available to make a conservation assessment (Bohm et al., 2013).

The researcher used the following indices to calculate and determine the species diversity of reptiles in the study area. Shannon-Weiner Index. Shannon-Weiner Index is frequently used to describe species diversity in a community (Sarma & Das, 2015). The index that consider both the number of species living in a habitat (species richness) and their relative abundance (species evenness) (Wilson & Gownaris, 2022). The value of the Shannon-Weiner Index is calculated using the formula: $H = \sum_{i=1}^{s} p_i \, (\ln p_i)$. The index was analyzed using the classification scheme proposed by Fernando et al. (1998) presented in table 1.

Table 1. Classification scheme for the Shannon Diversity Index (Fernando et al. 1998).

Relative values	Shannon-Wiener Diversity Index (H')
Very High	3.50 and above
High	3.0 0– 3.49
Moderate	2.50-2.99
Low	2.00-2.49
Very Low	1.99 and below

Evenness Index can be used to gauge how evenly distributed different species are in a group. The evenness of a community can be represented by Pielou's evenness index (Pielou, 1966). The value of the Evenness Index was calculated using the formula: J=H'/Hmax (Wilson and Gownaris, 2022). The Evenness index was used in this study to measure the distribution of different reptilian species inhibiting in the study area.

Development of Instructional Material

The researcher developed science instructional material based on the results and findings of the research study. It was a localized booklet of the different reptile species in the Aliwagwag Protected Landscape.

The booklet also included possible conservation and protection activities that will raise awareness and encourage the students to take good care of the reptiles, the biodiversity, and the environment. The localized booklet of reptiles in APL can be used in teaching, specifically in the Biodiversity and Ecosystem topic in the DepEd Curriculum and particularly in the content standard in the context of species concept.

III. RESULTS AND DISCUSSION

Classification of Reptiles

The researcher observed and recorded various reptilian species in the three sampling sites. The total number of reptiles found in the study area was 24, belonging to 13 species and under the four families. The documented reptiles were pre-identified through the iNaturalist app and different published studies and were confirmed and validated by the expert.

Table 2 lists the reptile species according to their family, genus, species, and IUCN conservation status for each sample collected and recorded at three different APL sampling locations. Additionally, the table includes the common name of every specimen and the number of individuals captured during the sampling.

The families that the specimens were taken from were Scincidae, Colubridae, Cyclocoridae, and Agamidae. Moreover, 12 genera and 13 species of reptiles were documented in the study area.

These species, belonging to snakes and lizards, were found in different microhabitats such as rocks, rotten logs, tree foliage, leaf litter, ground, and streamside or riverside.

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Table 2. Classification of Reptiles

Common name	Family	Genus	Species	No. of Individuals	IUCN Conserv-ation Status
Caraga sun skink	Scincidae	Eutropis	Eutropis caraga	4	Least Concern
Davao waterside skink		Tropidophorus	Tropidophorus davaoensis	4	Least Concern
Black-spotted Sphenomorphus		Sphenomorphus	Sphenomorphus variegatus	1	Least Concern
Jagor's Sphenomorphus		Pinoyscincus	Pinoyscincus jagori	2	Least Concern
Mindanao forest skink			Pinoyscincus abdictus	1	Least Concern
Muller's rat snake	Colubridae	Stegonotus	Stegonotus muelleri	2	Least Concern
Dumeril's Wolf Snake		Lycodon	Lycodon dumerilii	1	Least Concern
Variable reed snake		Calamaria	Calamaria lumbricoidea	1	Least Concern
White-lined Water Snake		Rhabdophis	Rhabdophis auriculatus	1	Least Concern
Philippine shrub snake		Oxyrhabdium	Oxyrhabdium modestum	2	Least Concern
Southern Triangle-spotted snake	Cyclocoridae	Cyclocorus	Cyclocorus nuchalis	2	Least Concern
common mock viper		Psammodynastes	Psammodynastes pulverulentus	2	Least Concern
Gunthers flying lizard	Agamidae	Draco	Draco guentheri	1	Least Concern

Scincidae Family

With four genera and five species, the Scincidae family comprises the most species in the study area. The family includes the species of Eutropis caraga, Tropidophorus davaoensis, Sphenomorphus variegatus, Pinoyscincus jagori and Pinoyscincus abdictus abdictus. Scincidae is a family of about 1300 species commonly known as skinks. They are among the most numerous and diversified groups of animals. Despite having smaller legs and a tendency to resemble lacertids, skinks often lack an apparent neck. A lot of them have shortened or nonexistent legs (like

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Typhlosaurus). The head is frequently blunt-ended because skinks often dig and burrow. They eat primarily insects, but only 15% are considered omnivores or herbivores (Berkovitz & Shellis, 2017).

Under the genus of Eutropis only the species of Eutropis caraga was observed, and it has four individuals recorded in the study area. The species were observed in the day basking on leaf litter or the ground in sites 2 and 1, an agricultural area; most of the crops were coconuts and a few bamboos. The genus Eutropis is a moderately sized group of scincid lizards widely and abundantly dispersed throughout Asia. It includes individuals that are native or endemic to the Philippines (Barley et al., 2020). The microhabitat where the E. caraga was observed corresponds to the observation of Venturina et al. (2023), where the specimen was found lying and hunting for food among dried coconut leaves and limestone outcrops. Also, Barley et al. (2020) recorded that E. caraga was observed in disturbed agricultural regions, coconut groves, and residential areas close to forests, suggesting that it can withstand some disturbance. Also, this species is active during the day and produces many offspring that have been found from sea level to 1,500 meters above sea level among leaf litter on the forest floor, in open environments close to forests, on seedlings, and beneath logs. Moreover, E. caraga was classified as IUCN's Least Concern. Due to its wide distribution, found in various habitat types, generally common, and slow pace of decline, this species is not considered to be in a higher threat category (IUCN, 2022).

Genus Tropidophorus also had one species observed, Tropidophorus davaoensis, and two individuals captured in the study area. This specimen was observed in site 2 on the stream of water hiding on rocks. This species in endemic in Mindanao, Philippines. There are presently 29 species in the genus Tropidophorus, which is found in peninsular Malaysia, Borneo, southern Philippines, mainland South-East Asia, northeastern India, Bangladesh, and southern China (Guo et al., 2021). Also, Quibod et al. (2021) recorded this species in lowland forests, which have been disturbed by logging for hardwood in Mt Arayat on the offshore island Dinagat. Moreover, Delima et al. (2007) collected this species along a dry creek with boulders on Mt. Hamiguitan, corresponding to the researcher's observation. Furthermore, T davaoensis was classified as Least Concern because of its wide distribution, estimated high population, and lack of likelihood of a rapid decline (IUCN, 2022).

Sphenomorphus variegatus is the only species under the genus of Sphenomorphus and has only one individual captured and recorded in the study area. The species is found in site 2, basking in the shrubs. This species is frequently found in Low elevation in Mindanao areas with mature second or first-growth forests (Sanguila et al. 2016). This species is commonly found on forest floors, beneath leaves and rotting logs, and on tree trunks up to a height of around two meters. Also, S. variegatus was classified by IUCN as Least Concern because it occurs in various protected areas, has a high population, and does not decline fast (IUCN, 2022).

Under the genus of Pinoyscincus, two species were recorded: Pinoyscincus jagori and Pinoyscincus abdictus abdictus, which were observed in the study area. P. jagori had two number of individual recorded and were observed in sites 1 and 2 on the forest floor, basking on leaf litter. At the same time, P. abdictus abdictus had one number of individuals and was observed only in site 2 on forest ground near the stream of water. The researcher's observation of the two species corresponds to the remark of Sanguila et al. (2016) that P. jagori, a large-bodied

skink, is widespread in disturbed and wooded areas up to 500 or 600 masl. P. abdictus abdictus is commonly found in various environments, such as interior mature and second-growth montane forests, riparian areas, and second growth forests bordering agricultural land. Moreover, the two species were classified as Least Concern because they have large populations and are tolerant of habitat modification and wide distribution (IUCN, 2022).

Colubridae Family

Under the family of Colubridae, only four species were observed and recorded by the researcher during the study: Stegonotus muelleri, Lycodon dumerilii, Calamaria lumbricoidea, and Rhabdophis auriculatus. Colubridae include seven subfamilies, namely: Natricidae, Pseudoxenodontinae, Dipsadinae, Scaphiodontophiinae, Calamariidae, Grayiinae and Colubrinae (Junqueira-de-Azevedo, et al., 2016). S. muelleri and L. dumerilii are under a subfamily of Colubrinae, while C. lumbricoidea is under a subfamily of Calamariinae, and R. auriculata is under a subfamily of Natricidae. Furthermore, the Colubridae also known as Colubrids is the largest family of snake. There are about 2000 species belonging to this family, which is more than half the total snake population in the world. Though many colubrids are not venomous, some species are venomous and very few are considered deadly to humans (Thornton, 2014).

Stegonotus genus is solely represented in the Philippines by one species, Stegonotus muelleri (Magdua, et al., 2023). S. muelleri was observed in site 1 and 2 in a ground near a stream of water, and two number of individuals were recorded in the study area. It concurs with the observation of Magdua et al. (2023), that found the S. muelleri coiled on an arum plant in a two meters wide stream in the secondary growth forest at Mt. Magdiwata, Bayugan Dos, San Francisco, Agusan del Sur. Furthermore, Genus Stegonotus (Colubridae: Colubrinae) has 24 known species which are distributed throughout Australia, Papua New Guinea, Indonesia, Malaysia, the Philippines, and other countries (O'Shea & Richards, 2021). However, there may be many more unrecognized taxa in this genus. This group includes both generalist consumers of invertebrates and vertebrates (frogs, lizards, snakes, and small mammals). At the same time, certain species are notable for being experts at eating lizards and snake eggs (Krey et al., 2019). Moreover, S. muelleri was classified as Least Concern because it was widely distributed in Mindanao's geographic region and is present in several protected areas (IUSC, 2022).

Under the genus Lycodon, only Lycodon dumerilii species were recorded, and one individual was captured in the study area. It was found in low ground and an agricultural area in site 1. According to Sanguila et al. (2016), this species is frequently encountered in the northeast Mindanao faunal region and has been reported from Mindanao and Samar. Also, it has been recorded from Mount Kitanglad Natural Park, Mount Malindang National Park, and the Malagos Watershed protected area (Pitogo et al., 2021). Additionally, L. dumerilii was IUCN classified as Least Concern because of its wide distribution and large population (IUCN, 2022).

Under the genus Calamaria, only Calamaria lumbricoidea was found in the study area, and one individual was recorded. It was observed in site 2, crawling in the grass. The specimen was identified as juvenile due to its color patterns. According to Sanguila et al. (2016), the species frequently encountered throughout the Mindanao Pleistocene Aggregate Island Complexes (PAIC) islands and mostly observed from sea level to 1,200 m on several

mountains of northeast Mindanao. Moreover, Venturina et al.'s (2023) finding corresponds to the observation of the research that C. lumbricoidea was a ground-dwelling snake and was found among leaf litter in a forest. Moreover, this species was listed as Least Concern due to its wide distribution from southern Thailand and the Philippines and tolerance of various habitats (IUCN, 2022).

Under genus Rhabdophis, species Rhabdophis auriculata was the only species, and one individual was observed in the study area. It was found in site 2, crawling in the ground. This species in endemic in the Philippines. In the study conducted by Sanguila et al. (2016), they recorded the species in several locations throughout Mindanao and Dinagat, such as on the forest floor and in riparian habitats in disturbed areas. The IUCN classification of R. auriculata was Least Concern because of its occurrence in many protected areas and recognized large population (IUCN, 2022).

Cyclocoridae Family

Family Cyclocoridae (formerly Lamprophiidae: Cyclocorinae) had only three species that were observed in the study area. The species includes the Oxyrhabdium modestum, Cyclocorus nuchalis, and Psammodynastes pulverulentus. It has been suggested recently that the family Cyclocoridae is a distinct Philippine-endemic family. Moreover, this family includes four Philippine-endemic genera, which comprises Cyclocorus (Triangle-spotted Snakes), Hologerrhum (Stripelipped Snakes), Oxyrhabdium (Philippine Burrowing Snakes), and Myersophis. Also, this family has seven species and three subspecies (Weinell et al., 2020).

Under the genus Oxyrhabdium, the researcher only observed the Oxyrhabdium modestum species and recorded two individuals in the study area. This species was found in site 1, on the rocks beside the stream. The genus Oxyrhabdium is one of the only four endemic genera of Philippine snakes (Brown et al., 2012). There are two species under this genus, the O. leporinum and O. modestum, and they are found on several islands in the Babuyan Islands Group, the islands of Camiguin Sur, Lubang, Mindoro, and Siquijor, as well as the Luzon, Mindanao, and Western Visayas Pleistocene Aggregate Island Complexes (PAICs) (Weinell et al., 2020). Also, Pitogo et al. (2021) documented most of their observations in and around streams, understory vegetation, rotten abaca leaves, and leaf litter. Moreover, O. modestum was classified as Least Concern because it was still widely distributed, and its population was not quickly declining (IUCN, 2022).

In the study area, only the Cyclocorus nuchalis was observed and recorded during the sampling in the study area that belongs to genus Cyclocorus. The species is found in leaf litter and ground in sites 2 and 3. The observation of the species is consistent with Supsup et al. (2017), who recorded this species crawling under leaf litter along a riverbank in secondary growth forest. Also, this species is endemic to the Philippines. Moreover, the genus Cyclocorus comprises two species: C. lineatus. and C. nuchalis, and is dispersed over the islands of Sibuyan and Tablas, the islands of Camiguin Sur, Lubang, Mindoro, and Siquijor, as well as the several islands that make up the Pleistocene Aggregate Island Complexes (PAICs) of Luzon, Mindanao, and Western Visayas (Leviton et al., 2018; & Pili and del Prado, 2018). This species was classified as Least Concern in the IUCN conservation status because of its persistence in disturbed habitats through a broad elevation range and wide distribution (IUCN, 2022).

Genus Psammodynates has only one species found in the study area. The species is Psammodynastes pulverulentus. It was found in site 3 in the ground on shrubs and grass. This species is a common snake in tropical Asia and is widely distributed from peninsular India to Taiwan through Nepal, Bhutan, Bangladesh, Myanmar, China, Thailand, Malaysia, Laos, Indonesia, and the Philippines (Kundu et al., 2021). This species inhabits low vegetation on the forest floor. Although it is also known from lowlands, it is identified to prefer wooded places and is frequently found in mountainous areas. Additionally, this species was under the Least Concern classification of IUCN conservation status because it was distributed widely and occurred in various protected areas (IUCN, 2022).

Agamidae Family

Lastly, the Family Agamidae include only the Draco guentheri captured in the study area. Over 350 species, 52 genera, and two subfamilies comprise the agamidae family. They come in various sizes, from tiny to large. The agamids are a diversified group of lizards that include semi-aquatic species that use water as a refuge and terrestrial species that live in deserts and tropical forests (Heying, 2003).

Draco guentheri is the only species under the genus of Draco that was observed, and one individual was recorded during the sampling in the study area. The species was found in site 1, on the coconut tree. The genus Draco is generally known as Southeast Asian Flying Lizards. With wing-like patagial membranes supported by extended thoracic ribs, this moderately sized radiation of arboreal (living in trees) lizards can glide over great distances (McGuire & Alcala, 2000). There is an indigenous and species-rich assemblage of this genus in the Philippines (McGuire & Alcala, 2000). Furthermore, this species was classified as Least Concerned in IUCN conservation status because of its wide distribution, commonness, and adaptability to a presumed large population (IUCN, 2022).

Diversity and Evenness of Reptilian Species

The species diversity index was determined using a Shannon-Weiner index and an Evenness Index. Table 3 presents the number of individuals, species richness, species diversity, and evenness per sampling site and the total or overall data in the APL.

Table 3. Biodiversity Indices of the Three Sampling Sites in Aliwagwag Protected Landscape

Sampling Site	Number of Individuals	Species Richness (S)	Species Diversity (H')	Evenness
Site 1	8	6	1.733	0.967
Site 2	12	8	2.095	1.007
Site 3	4	3	1.040	0.946
Overall	24	13	2.521	0.983

In site 1, with the elevation ranging from 100 to 350 meters above sea level (masl), eight individuals and six species richness (S) or reptile species were recorded in the study area. The Species diversity (H') has a value of 1.733. Using the classification scheme proposed by Fernando (1998), the diversity of reptiles in site 1 was considered to be very low, which indicates a few variety of reptilian species in the area. Meanwhile, the evenness of site 1 had a value of 0.967, indicating that the individuals of each species were evenly distributed.

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Correspondingly, site 1 was noted that the landscape had been disturbed due to nearby agricultural activity or cultivated land. The main crops grown there were abaca and coconut, which is thought to be the reason for the reduced species richness, diversity, and evenness compared to site 2. According to Wathen et al. (2014), low-elevation and undisturbed environments are where reptile species richness values are highest. Furthermore, the fact that disturbances are there suggests that the species in the area can withstand a moderate level of disturbance (Grismer et al., 2012).

In site 2, with the elevation from 350 to 750 masl, 12 individuals and eight species richness were recorded, which implies the highest reptiles being observed among the three sites. Further, site 2 has the highest H' among the three sites with the H' value of 2.095, which means it has a low diversity. Also, it has the highest evenness value of 1.007, indicating that the reptilian species in the site is evenly distributed in the area and reflects a balanced ecosystem where no single species dominates.

The vegetation cover, leaf litter, and the rocks in the stream of site 2 were observed as the factors for having the highest species richness, diversity, and evenness among the three sites in the study area. This result concurs with the findings of Balmores and Nuñeza (2015) in Bega Falls, Agusan del Sur which they state that the high abundance of reptiles, particularly the snakes, is a result of the boulders and other rocks, trees, and other plants that surround the falls and stream and provide suitable habitat for many reptile species. Moreover, Neel et al. (2012) state that rocks and clefts offer crucial microhabitats for reptiles, allowing them to control their body temperature, build adequate nests, and be free from predators.

In site 3, with an elevation of 750 to 1,000 masl, four individuals and three species were observed, the lowest number of individuals and species documented during the sampling period. Further, site 3 has the lowest H' with the value of 1.040, indicating very low reptile diversity. However, it has a high evenness value of 0.983, indicating that the site's reptilian distribution was evenly distributed. However, it has the lowest evenness compared to other sites.

Moreover, site 3 has the highest elevation compared to other sites. Also, it has less stream or body of water compared to site 2, which was thought to be a factor for having the lowest species richness and species diversity among the three sampling sites in the study area. This finding was consistent with the research conducted by Beukema (2011) and Relox et al. (2010), who discovered that both amphibians and reptiles can have significant species richness and diversity in forested lowland environments. Furthermore, according to Alcala (1986), snakes and other ectothermic reptiles prefer lower, elevated regions due to the greater temperatures, which are ideal for survival.

Overall, 24 individuals and 13 species of reptiles were recorded in APL. A total species diversity of 2.521 indicates that the study area has a moderate reptilian diversity, which means that moderate variety of reptilian species were observed in the study area. Meanwhile, the overall evenness value of the study area is 0.983, which shows that the reptilian species in the study area were evenly distributed as it has a value near one that shows perfect species

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evenness. Thus, it indicates that no single species of reptiles dominates the study area and reflects a balanced ecosystem. In the study by Mohagan et al. (2019) at the Long-Term Ecological Research sites in Mindanao, the finding shows that Mt. Hamiguitan, Mati, Davao Oriental, has species diversity with the value of 2.4972, which correspond in a very low H' and indicate that very minimal number of reptilian species present in the area. Mt. Apo has an H' value of 0.6829, followed by Mt. Kitanglad with an H' of 0.6365, and lastly, Mt. Malindang has a zero H', indicating very low reptilian diversity in the three mountains. Compared to the findings in APL, it has the highest overall H' value among the four mountains presented.

Thus, the result implies that APL could be a more favourable habitat for reptile species characterized by suitable microhabitats such as rich leaf litters, numerous rocks, and bodies of water, low elevation, relatively high temperature and present number of bodies of water. It accounts for the moderate species diversity and high evenness of reptiles in the study area. The findings of Balmores and Nuñeza (2015) correspond to the idea that the presence of food, varied vegetation structure, low elevation, boulders in streams, and suitable microhabitats contribute to the even distribution of reptiles. Moreover, high species richness, diversity, and evenness are attributed to the presence of aquatic habitats like rivers and streams, the soil's loamy texture, the leaf litter covering them, and the partially open canopy allowing light in (Nuñeza et al., 2016). Lastly, according to Mohagan et al. (2019), areas characterized by a close and somewhat open canopy layer, low elevation, higher temperatures compared to other locations, damp soil, fallen logs, and the presence of rushing and stagnant water may provide more suitable habitats for reptile species, resulting in high species diversity.

IV. CONCLUSIONS

Of the four families identified in the area, Scincidae, commonly known as skink, has the highest number of species. It is followed by a family of snakes or Colubridae with 4 species belonging to this family. Next is Cyclocoridae, identified as the Philippine-endemic family, containing 3 species. Lastly is the Agamidae, which has only one genus and species. All 13 reptilian species were classified as Least Concern in IUCN conservation status, which indicates that the reptiles in APL are widespread in the Mindanao region, occur in a variety of habitat types, are found in many protected areas, and is not thought to be declining quickly enough to warrant a higher threat level. The overall Shannon Weiner Index (H') rating of 2.521 indicates moderate reptilian diversity in the APL Furthermore, the research area's overall evenness value, which is 0.983, indicates that the reptile species were dispersed evenly because it has a value close to one, indicating high species evenness. Hence, the appropriate microhabitat and environmental conditions of the area account for the moderate species diversity and evenness of the area. A booklet titled "Local Species of Reptiles in Aliwagwag Protected Landscape" was created to provide contextualized and specific examples of several reptilian species in the area. This could be used as instructional material in teaching science.

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