

Flora and Fauna Inventory of Limestone Forests in Taft, Eastern Samar, Philippines

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ABSTRACT

This study provides a floral and faunal checklist of limestone forests in Taft, Eastern Samar, Philippines, a municipality that is a part of the Samar Island Natural Park. Nine (9) 20m x 20m plots were established to assess the tree species, while 18 line transects were placed within the plots for the assessment of the understory species. Various methods were used to assess the vertebrate faunal species of the study site. A total of 30 floral species belonging to 22 genera and 18 families were recorded in the study site. Among these, *Shorea negrosensis* Foxw. and *Wallaceodendron celebicum* Koord. were noted to be classified as vulnerable based on Department of Environment and Natural Resources Administrative Order (DAO) 2017-11 while *Artocarpus rubrovenius* Warb. was also classified as vulnerable on IUCN Red List of Threatened Species. The faunal species recorded had a total of 112 terrestrial vertebrates composed of 5 amphibian, 8 reptile, 87 bird, and 12 mammals. Among the birds, *Pithecophaga jefferyi*, *Phapitreron amethystinus*, *Ducula poliocephala*, and *Loriculus philippensis* were identified to have a critically endangered conservation status while *Nisaetus pinskeri*, *Buceros hydrocorax semigaleatus*, and *Penelopides affinis samarensis* were listed as endangered based on the DAO 2019-09 and/or IUCN Red List. Among the other vertebrates, *Platymantis rabori*, *Platymantis bayani*, and *Sus philippensis* were categorized as vulnerable based on the DAO 2019-09 and/or IUCN Red List.

Keywords: biodiversity, limestone forests, kaigangan, Samar Island Natural Park, Taft

INTRODUCTION

Samar Island is known to have rich and exemplary biodiversity. It is one of the fifteen biogeographic zones in the Philippines and is recognized to contain the country's largest remaining unfragmented tract of old growth lowland tropical rainforest. The island is also home to various endangered and endemic species (Holden, 2012; Madulid, 2000; PAWB-DENR, 1998). Due to its high ecological significance, the Samar Island Natural Park (SINP) was established to ensure the protection, conservation, and sustainable use of its natural resources by virtue of Presidential Proclamation No. 442 on 13 August 2003. This protected area has a total land area of 330,300 ha with buffer zone of 124,500 ha, located at the core of Samar Island, traversing the provinces of Northern Samar, Eastern Samar, and Samar.

Another distinctive feature of Samar Island is the

presence of massif karst limestone in the area. Incidentally, Samar Island holds the largest limestone formation found in the Philippines and is recorded to be the most prominent forest type in the SINP, locally known as *kaigangan* (Niedbala *et al.*, 2006; Restificar *et al.*, 2006; Audra 2000). Various studies of the biological resources in SINP have been previously conducted (Patindol 2016; Neidbala, 2006; Quimio, 2016; Meneses and Cootes, 2019). However, there is dearth of information regarding the biological species composition found in different forest types of the SINP, particularly with the limestone forest.

This study aimed to provide a floral and faunal species checklist found in the limestone forest of Taft, Eastern Samar, one of the municipalities covered by the SINP. The paper also determined the distribution and conservation status of the identified species in the study site. Karst formations support unique species diversity and endemism incomparable

to the species found in non-karst areas due to their peculiar features such as historical biogeography, rugged terrain formation, and climatic and edaphic factors (Meneses *et al.*, 2018; Clements *et al.*, 2006; Madulid, 2000). Hence, the monitoring and inventory of flora and faunal resources in the limestone forest of Taft, Eastern Samar may serve as a reference in providing future strategic plans for the sustainable use and conservation management of the biological resources specific for this unique ecosystem.

MATERIALS AND METHODS

Study Area

The study was conducted at Taft, Eastern Samar. It is a fourth-class municipality bounded by the municipalities of Can-Avid in north, Paranas in northwest, Sulat in south, and Kinabangan in southwest (Figure 1). It has a total land area of 231.27 km² and covers a total of 24 barangays (Sabulao and Egirani, 2009).

Floral Diversity Assessment

The biodiversity assessment in Taft, Eastern Samar

was conducted from 5–7 October 2019. Two types of methods were used to determine the floral species in the study site. The quadrat or plot technique was used to assess the trees (≥ 1 m), while line intercept technique was used for understory plant species. A total of nine 20m x 20m (Figure 1) vegetation plots were established to assess the tree species, and 18 line transects (2 line transects per plot) were established to assess the understory species. The location selection of sampling plots in the study site were based on the bio-physical characteristics of the area, including heterogeneity of biodiversity, topographic attributes (elevation), and the presence of anthropogenic disturbances in each sampling area. The collected plants were labelled with field tags before pressed using newspaper. The samples were enclosed in polyethylene plastic bags and soaked with 50% denatured alcohol before it was dried at the Ecology Laboratory and Plant Systematics Laboratory (PSL) of Institute of Biological Sciences (IBS), University of the Philippines Los Baños (UPLB). Each dried plant sample was brought to PSL for mounting and identification. Plant samples were identified with the assistance of experts. Voucher specimens were deposited at the Plant Biodiversity Division Herbarium (PBDH) of UPLB.

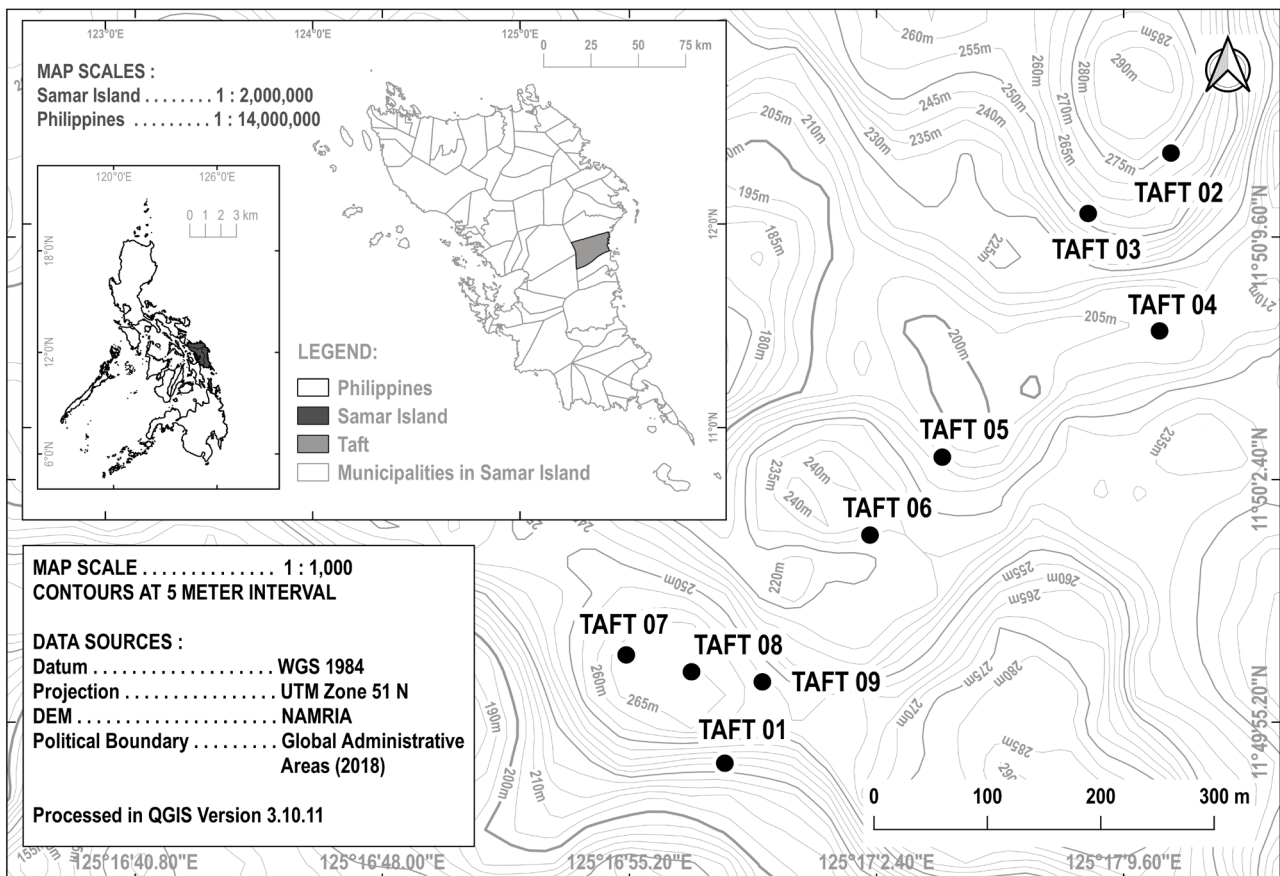


Figure 1. Location of nine sampling plots in the municipality of Taft, Eastern Samar.

Faunal Diversity Assessment

Various methods for the survey of terrestrial vertebrate diversity were adapted from the Department of Environment and Natural Resources (DENR) Manual on Biodiversity Assessment and Monitoring System for Terrestrial Ecosystems (Cruz *et al.*, 2017) to record the four major vertebrate groups (reptiles, birds, amphibians, and mammals).

Herpetofauna were hand-captured, or collected using forceps, snake hook/tongs and placed in separate labeled resealable plastic bags for easier identification. Alternating pit-fall traps with drift fences were used to capture amphibians and small lizards. The traps were checked every morning at around 0700 h and regularly until 1800h to limit predation by other wildlife and ensure retrieval of live captures. All individuals were immediately released after species identification.

Birds were surveyed using simple line transect count. Binoculars, field guides by Kennedy *et al.* (2000) and Arlott (2018), including online references by del Hoyo *et al.* (2020a; 2020b) were used to aid in species identification. A DSLR camera with telephoto lens was used for photo-documentation and a digital audio-recorder for recording bird calls. Twelve-meter mist nets were set to record cryptic, less vocal and nocturnal species of birds along possible flyways and feeding trees. Mist nets were nylon nets with 35mm sized mesh, set in 3-4 rungs with loose pockets to allow capture. Mist nets were checked periodically for possible netted individuals from 0530 h to 2000 h. Caught birds were retrieved and placed individually in cloth bags to minimize stress and injury. All individuals were immediately released after species identification.

Volant mammals (bats) were also captured using the mist nets for birds. Nets were left open until at least 2000 h or until the next morning but were closed during rainy weather conditions. Along each designated transect, 2-3 mist nets were set wherever possible. From 1930–2000 h, mist nets were checked every hour then checked again at 0500 h the next day. Each captured animal was carefully removed from the net and placed individually in cloth bags to minimize stress and injury. Regular checking of netted bats prevented them from being too entangled and prevents the net from being chewed upon and broken. This also warded off potential predators. All individuals were immediately released after species identification.

Small non-volant mammals, such as rats, were captured using steel mesh cage traps. Thinly sliced coconut meat

fried until brown and coated generously with peanut butter were used as bait. Rat traps were set around or near the mist nets set-up for trapping bats and along the designated transect, whenever possible. For trapping on the ground surface, the traps were positioned 5 to 10 m apart under root tangles, in front of burrow entrances, along runways, and beside or on top of fallen logs. Captures were retrieved early in the morning (*ca.* 0700 h) and bait was replaced in the late afternoon (*ca.* 1700 h). All individuals were immediately released after species identification. Camera traps were set up to photograph larger cryptic species. A digital camera with telephoto lens was also used for photo-documentation.

Indicators of animal presence such as footprints, fecal droppings, roosting and nesting sites, and other animal physical disturbances were also used. Ethnobiological data from local guides and people living near the study site were likewise used to indicate the probable presence specific wildlife in the survey area.

Endemicity and Conservation Status of Floral and Faunal Species

The endemicity and identification of plant species were verified using the International Plant Name Index (IPNI) and Co's Digital Flora (Pelsner *et al.*, 2011). The conservation status of each plant species was determined using the Updated National List of Threatened Philippine Plants and Their Categories (DAO No. 2017-11) while the Updated National List of Threatened Philippine Fauna and Their Categories (DAO No. 2019-09) was used for faunal species. Published literature, monographs, and other checklists regarding biodiversity in Taft were also reviewed in relation to occurrence and endemicity of faunal species. The endemic status of all species was verified by consulting available checklists and available online resources. The conservation status of floral and faunal species based on the International Union for Conservation of Nature (IUCN) Red List of Threatened Species (2020) were also assessed in this paper. The differences in IUCN Red List with DAO 2017-011 and DAO 2019-09 conservation statuses reflect differences in the threats of certain species on both spatial and taxonomic scales. For example, on a spatial scale, *Tropidolaemus subannulatus*, a pit viper, is classified as Least Concern by IUCN throughout its range in Borneo and the Philippines (Auliya *et al.*, 2012). However, its conservation status in the DAO 2019-09 is OTS, equivalent to Near Threatened, because it is often found in the local illegal pet trade network (BCSP, 2020). On a taxonomic scale, *Penelopides affinis*, the Mindanao hornbill, was assessed by IUCN as Least Concern throughout its range in the Mindanao

PAIC (Bird Life International, 2016). However, the DAO 2019-09 categorizes it as Endangered because of the restricted range and declining population trend of one of its subspecies, *Penelopides affinis basilanicus* (DENR-BCSP, 2020). In this and many other cases, the assessors of the DAO 2019-09 adopted a conservative approach to apply the conservation status of the most threatened subspecies to the species as a whole (Gonzalez *et al.*, 2018). The reflection of both global and local conservation statuses is valuable in evaluating extinction risks and conservation priorities on both levels.

RESULTS AND DISCUSSION

Flora Composition in Taft, Eastern Samar

The floristic inventory conducted in Taft, Eastern Samar recorded a total of 30 plant species, represented by 22 genera and 18 families. At least 15 plants were identified at species level, 7 plants at genus level and 8 plants were unidentified. The plants inventoried were composed of 4 species of pteridophytes, 1 species of gymnosperms and 18 species of angiosperms. The families Araceae, Arecaceae, Euphorbiaceae, Pandanaceae and Sapotaceae are represented with 2 species each. Meanwhile, the families of Lomariopsidaceae, Marattiaceae, Cycadaceae, Gnetaceae, Asparagaceae, Zingiberaceae, Fabaceae, Moraceae, Begoniaceae, Dipterocarpaceae, Sapotaceae, Gesneriaceae and Rubiaceae have 1 plant species each represented. Among the identified species, 5 plant species were noted to be endemic to the Philippines. These were the species of *Heterospathes intermedia* (Becc.) Fernando, *Codiaeum macgregorii* Merr., *Hancea wenzeliana* (Slik) S.E.C.Sierra, Kulju & Welzen, *Artocarpus rubrovenius* Warb., and *Shorea negrosensis* Foxw.

An existing study of floral composition within the boundary of Taft, Eastern Samar was previously conducted by Quimio (2016). A total of 212 woody species were recorded from five-priority watershed areas of SINP (Suribao watershed, Can-avid watershed,

Catubig watershed, Taft or Ulot watershed, and Basey watershed). Only 74 woody species were listed in the Taft or Ulot watershed. It was also observed that this watershed has the highest frequency of individuals of timber species with diameter at breast height (DBH) of 10 cm and larger compared to the other watersheds. Among all the plant species listed in all five watersheds, only three tree species were similarly recorded in this study. These species were *Gnetum gnemon* L., *Shorea negrosensis* Foxw., and *Wallaceodendron celebicum* Koord. It was also interesting to note that the presence of these species varied per watershed. The species of *Gnetum gnemon* L. was found in the watersheds of Taft, Can-Avid, Basey and Suribao. On the other hand, the species of *Shorea negrosensis* Foxw., and *Wallaceodendron celebicum* Koord. were found in the Taft watershed and Catubig watershed, respectively.

The vascular plant composition conducted in Taft, Eastern Samar was different than the floristic species found in the limestone forest of other areas in the Philippines, such as in Mount Lantoy (Lillo *et al.*, 2019), Mount Canbantug (Replan and Malaki, 2017) and Mount Tabunan (Cadiz and Buot, 2010). These areas were all classified as a Key Biodiversity Areas (KBA) located in Cebu, a province located in the Central Visayas Region, and these KBAs were described to have a terrain that is widely covered by limestone vegetated areas. A total of 112 floral species were observed in the Mount Lantoy. Among the native trees assessed in this site, it was observed that *W. celebicum* was the only species similar to the result of this study. The Mount Canbantug study recorded at least 132, species, and was dominated by the species of *Vitex parviflora*, *Pterocarpus indicus*, and plant species belonging to the family of Moraceae. Lastly, the Mount Tabunan study recorded 288 species and was most represented with the families of Moraceae, Meliaceae, and Araceae. These results only highlighted that there were different floristic composition in the limestone forest found in these KBAs compared with Taft, Eastern Samar.

Table 1. Floral composition of the limestone forest in Taft, Eastern Samar.

PLANT GROUP	FAMILY	SCIENTIFIC NAME	COMMON NAME	EXSICCATA	HABIT	CONSERVATION STATUS		ENDEMICITY
						IUCN	DAO	
Pteridophyta								
	Marattiaceae	<i>Angiopteris</i> sp.	Palko	Obeña 7152 (PBDH)	S			
	Aspleniaceae	<i>Asplenium vittaeforme</i> Cav. (unresolved name)	Lorog	Obeña 7063 (PBDH)	S			
	Lomariopsidaceae	<i>Cyclopetis crenata</i> (Fée) C. Chr.	Lukdo/ Blue green fern	Obeña 7111 (PBDH)	S			Non-endemic
	Cycadaceae	<i>Cycas</i> sp.	Pitogo	Obeña 7056 (PBDH)	T			

Table 1. Floral composition of the limestone forest in Taft, Eastern Samar (continued).

PLANT GROUP	FAMILY	SCIENTIFIC NAME	COMMON NAME	EXSICCATA	HABIT	CONSERVATION STATUS		ENDEMICITY
						IUCN	DAO	
Spermatophyta: Gymnospermae								
	Gnetaceae	<i>Gnetum gnemon</i> L.	Bago	Obeña 7073 (PBDH)	T	LC		Non-endemic
Spermatophyta: Angiospermae								
	Araceae	<i>Homalomena philippinensis</i> Engl.	Payaw	Obeña 7055 (PBDH)	H			Non-endemic
	Araceae	<i>Schismatoglottis calyptrata</i> (Roxb.) Zoll. & Moritzi	No common name (Taft plot 6)	Obeña 7140 (PBDH)	H			Non-endemic
	Pandanaceae	<i>Freycinetia</i> sp. (2)	No common name (Taft plot 7)		S			
	Pandanaceae	unidentified	Bariw		T/S			
	Asparagaceae	<i>Dracaena angustifolia</i> (Medik.) Roxb.	Tulang	Obeña 7065 (PBDH)	T			Non-endemic
	Arecaceae	<i>Heterospatha intermedia</i> (Becc.) Fernando	Banga	Obeña 7043 (PBDH)	T			Endemic
	Arecaceae	<i>Saribus rotundifolius</i> (Lam.) Blume	Anahaw	Obeña 7040 (PBDH)	S		OTS	Non-endemic
	Zingiberaceae	<i>Alpinia</i> sp.	No common name (SH 36)	Obeña 7062 (PBDH)	S			
	Euphorbiaceae	<i>Codiaeum macgregorii</i> Merr.	Marumanga		T			Endemic
	Euphorbiaceae	<i>Hancea wenzeliana</i> (Slik) S.E.C.Sierra, Kulju & Welzen	Apanang	Obeña 7041 (PBDH)	T			Endemic
	Fabaceae	<i>Wallaceodendron celebicum</i> Koord.	Banuyo/ Salukigi	Obeña 7044 (PBDH)	T		V	Non-endemic
	Moraceae	<i>Artocarpus rubrovenius</i> Warb.	Tugop	Obeña 7147 (PBDH)	T	VU	OTS	Endemic
	Begoniaceae	<i>Begonia</i> sp.	Kulasiman	Obeña 7052 (PBDH)	H			
	Dipterocarpaceae	<i>Shorea negrosensis</i> Foxw.	Lawaan na Pula (Takuban)	Obeña 7047 (PBDH)	T	LC	V	Endemic
	Sapotaceae	<i>Mamilkara fasciculata</i> (Warb.) H.J.Lam & Maas Geest.	Patsaragon	Obeña 7129 (PBDH)	T			Non-endemic
	Sapotaceae	<i>Palaquium</i> sp. (1)	Bagotambis	Obeña 7105 (PBDH)	T			
	Rubiaceae	<i>Lasianthus trichophlebus</i> Hemsl. ex F.B.Forbes & Hemsl.	Malabunot	Obeña 7049 (PBDH)	T			Non-endemic
	Gesneriaceae	<i>Cyrtandra</i> sp.	No common name (SH 38)		H			
		unidentified	Gisok	Obeña 7116 (PBDH)	T			
		unidentified	Yakal	Obeña 7151 (PBDH)	T			
		unidentified	Kamagong/ Bagonito	Obeña 7119 (PBDH)	T			
		unidentified	Langka-langka	Obeña 7155 (PBDH)	T			
		unidentified	Pamintaogon	Obeña 7128 (PBDH)	T			
		unidentified	Hambabalud	Obeña 7045 (PBDH)	T			
		unidentified	Lukdo bato	Obeña 7163 (PBDH)	S			

Notes: Conservation status based on the IUCN Red List of Threatened Species (NE = Not Evaluated, DD = Data Deficient, LC = Least Concerned, NT = near Threatened, VU = Vulnerable, EN = Endangered, CR = Critically Endangered, EW = Extinct in the Wild, EX = Extinct) and DENR Administrative Order 2017-11 (DD = Data deficient, OTS = Other Threatened Species, LC = Least Concern, V = Vulnerable, EN = Endangered, CR = Critically endangered). Exsiccata (PBDH = Plant Biology Division Herbarium)

Notable Flora Species

Among all the listed vascular plants in this study, the species of *Shorea negrosensis* Foxw. and *Wallaceodendron celebicum* Koord. were noted to have vulnerable conservation status while the *Artocarpus rubrovenius* Warb. and *Saribus rotundifolius* (Lam.) Blume have other threatened species status based on the DAO 2017-11. On the other hand, the conservation status based on IUCN Red List of Threatened Species shows that the *Shorea negrosensis* Foxw. and *Gnetum gnemon* L. are classified as least concerned species while *Artocarpus rubrovenius* Warb. has vulnerable status.

Shorea negrosensis Foxw.

Shorea negrosensis is classified as least concern (LC) based on the IUCN Red List of Threatened Species while vulnerable (VU) in DAO 2017-11. Moreover, *S. negrosensis* is endemic to the Philippines. Its distribution range includes the provinces of Luzon (Cagayan, Isabela, Aurora, Nueva Ecija, Laguna, Quezon, Camarines, Albay, Sorsogon, and Polillo), Visayas region (Negros,

Cebu, Leyte, Biliran, and Samar), and in the Mindanao Island (Zamboanga, Lanao, Cotabato, Bukidnon, Davao, Surigao, Agusan, and Basilan) (Pelser *et al.*, 2011). In some provinces of the Philippines, *S. negrosensis* are also used as fuelwood by the locals (Carandang *et al.*, 2013). This dipterocarp species is among the Philippine hardwoods exported to its international customers (Gambo-Lapitan *et al.*, 2012).

Wallaceodendron celebicum Koord.

Wallaceodendron celebicum (Figure 2A) belongs to the Family Fabaceae. It is classified as vulnerable (VU) species in DAO 2017-11. *W. celebicum* was among the 20 tree species promoted for reforestation farming across the Visayas and included as a preferred tree species for smallholder forestry in Leyte (Peque and Hölischer, 2014; Mangaoang and Pasa, 2003). This species was known to proliferate in the areas with elevation ranging from 0-850 masl. *W. celebicum* is dispersed across the different provinces of Benguet, Cagayan, Isabela, Aurora, Quezon, Camarines, Burias, Masbate, Negros, and Cebu (Pelser *et al.*, 2011).

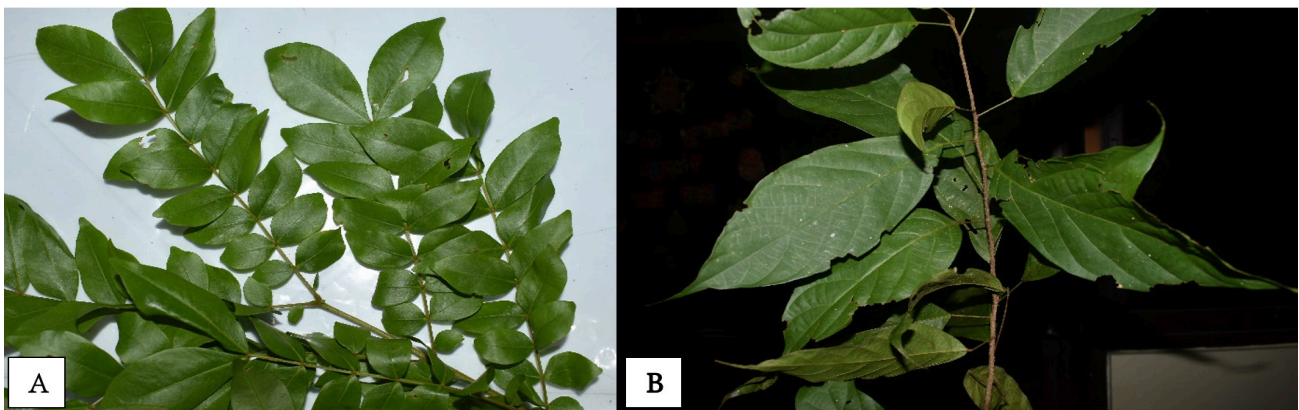


Figure 2. Notable floral species and endemic species in Taft, Eastern Samar. (A) *Wallaceodendron celebicum* Koord. and (B) *Hancea wenzeliana* (Slik) S.E.C.Sierra, Kulju & Welzen.

Fauna Composition in Taft, Eastern Samar

A total of 112 terrestrial vertebrates composed of 5 amphibian, 8 reptile, 87 bird, and 12 mammal species were recorded during the fieldwork (Table 2) with an overall endemism of 76 (67.86%). All five (100%) species of amphibians recorded were endemic to the Philippines, 4 (80%) of which were Mindanao Pleistocene Aggregate Island Complex (PAIC) endemics. Of the 8 reptiles, 7 (87.50%) were endemic to the country, 5 of which (62.50%) were endemic to the greater Mindanao PAIC. Of the 87 birds, 58 (66.67%) were endemic to the country, 19 of which (21.84%) were endemic to the greater Mindanao PAIC. Six (50%) of the mammal species were endemic to the country, 2 (16.67%) were endemic to the greater Mindanao faunal region. Available

published articles on the faunal diversity in Taft were focused on reptiles (Koch *et al.*, 2010; Siler and Brown, 2010; Siler *et al.*, 2010, 2011, 2012; Welton *et al.*, 2010, 2014) and amphibians (Siler *et al.*, 2009). Most of the fauna observed during the fieldwork represented new locality records for the municipality.

Four (4) out of 5 amphibian species recorded in the study site fell under the genus *Platymantis* of Family Ceratobatrachidae, while Family Ranidae was represented by a single species *Pulchrana grandocula*, all of which fell under Order Anura. It can be noted that most of the forest frogs (*Platymantis* spp.) recorded are highly terrestrial. Rabor's horned tree frog (*Platymantis rabori*) and Walter's limestone frog (*Platymantis bayani*) were both listed as Vulnerable (VU) in the Updated

National List of Threatened Philippine Fauna and Their Categories (DENR-DAO 2019-09; Gonzalez *et al.*, 2018).

Eight (8) reptilian species recorded in the study site belonged to 4 families all under Order Squamata. Family Scincidae was the most represented with 4 species. The remaining 3 families Varanidae, Gekkonidae, and Viperidae were represented by 1 species each. *Varanus samarensis* and *Tropidolaemus subannulatus* were categorized as Other Threatened Species (OTS) in the DENR-DAO 2019-09, while the remaining species were not yet assessed in the IUCN Red List, which means that further research is needed to conserve and protect these valuable animals.

The 87 bird species recorded in the study site belonged to 39 families under 12 orders. The most represented order was Passeriformes with 44 species belonging to 24 families. The following species are listed on the DENR-DAO 2019-09: Philippine eagle (*Pithecophaga jefferyi*), amethyst brown-dove (*Phapitreron amethystinus*), pink-bellied imperial pigeon (*Ducula poliocephala*), and Philippine hanging parrot (*Loriculus philippensis*) were categorized as Critically Endangered (CR); the southern rufous hornbill (*Buceros hydrocorax* ssp. *semigaleatus*), Samar hornbill (*Penelopides affinis* ssp. *samarensis*), and Pinsker's hawk-eagle (*Nisaetus pinskeri*) were categorized as Endangered (EN); Steere's pitta (*Pitta steerii* ssp. *coelestis*), little slaty flycatcher (*Ficedula basilanica*), northern silvery-kingfisher (*Ceyx flumenicola*), Philippine spinetailed swift (*Mearnsia picina*), Philippine green-pigeon (*Treron axillaris*), and Mindanao bleeding-heart dove (*Gallicolumba crinigera*) were categorized as Vulnerable (VU); lastly, the yellow-breasted tailorbird (*Orthotomus samarensis*), short-crested monarch (*Hypothymis helenae*), gray-throated sunbird (*Anthreptes griseigularis*), and Visayan pygmy-babbler (*Dasycrotapha pygmaea*) were categorized as Other Threatened Species.

A total of 5 volant mammal species were recorded in the study site all belonging to Family Pteropodidae under Order Chiroptera. All volant mammals were listed in the IUCN Red List as Least Concern (LC). On the other hand, 7 non-volant mammal species belonging to 5 families under 5 orders were recorded. The Philippine warty pig (*Sus philippensis*) was categorized as Vulnerable (VU) for both IUCN Red List and DENR-DAO 2019-09. Moreover, the Philippine tarsier (*Tarsius syrichta*) was considered Near Threatened (NT) under the IUCN Red List and categorized as Other Threatened Species (OTS) in the DENR-DAO 2019-09. The Oriental house rat (*Rattus tanezumi*) is an invasive alien species that

is considered an agricultural pest and poses a threat to other animals that are native to the limestone forest.

An existing study of faunal composition within the boundary of Taft, Eastern Samar was previously conducted by Patindol (2016). A total of 182 terrestrial vertebrates were recorded from five priority watersheds of SINP, same as the locations surveyed by Quimio (2016) for floral composition. One hundred nine (109) animals composed of 66 bird, 16 mammal, 13 reptile, and 14 amphibian species were recorded in Taft watershed from the previous study. It can also be noted that the Taft watershed had the highest species richness for amphibians compared to the other watersheds surveyed. Among all the animal species listed in all five watersheds by Patindol (2016), 51 records were similar within this study (Table 2). Moreover, the presence of these 51 species varied per watershed. *Platymantis rabori* was recorded in Taft for both this study and the previous survey by Patindol (2016). It is also worth noting that the species was recorded only in Taft watershed from the previous study. *Otosaurus cumingi* was recorded in this study, whereas it was listed only in the watersheds of Basey and Catubig from Patindol's survey in 2016. The *Dicrurus hottentottus* record from the previous survey was possibly *Dicrurus striatus samarensis* based on biogeographic distribution (del Hoyo *et al.*, 2020a). The remaining species were recorded in other watersheds aside from Taft.

Notable Fauna Species

***Platymantis bayani* Siler, Alcala, Diesmos, and Brown, 2009**

Walter's limestone frog is a species of forest frog first recorded by Siler *et al.* (2009) on the karst formations of Taft Forest Reserve, Eastern Samar at 140-meter elevation. This is the only *Platymantis* species in the Mindanao faunal region with a preference of a terrestrial, limestone microhabitat. No individuals were caught during the assessment, but further herpetological surveys might lead to successful observation of the species. *Platymantis bayani* was categorized as Data Deficient (DD) in the IUCN Red List and Vulnerable under the DENR DAO 2019-09.

***Cyrtodactylus sumuroi* Welton, Siler, Linkem, Diesmos, and Brown, 2010a**

This Samar Island endemic gekkonid (Figure 3A) is an evolutionary lineage of the *C. agusanensis* complex (Siler *et al.*, 2010; Welton *et al.*, 2010). The first specimen records of this species were from the forests of Eastern Samar, Taft, Barangay San Rafael (Welton *et al.*, 2010), which supports their presence in the limestone forests

Table 2. Terrestrial vertebrate fauna recorded from the forest over limestone in Taft, Eastern Samar.

ORDER	FAMILY	SPECIES	COMMON NAME	DISTRIBUTION	CONSERVATION STATUS*		REFERENCE
					IUCN	DAO 2019-09	
Anura	Ceratobatrachidae	<i>Platymantis corrugatus</i> (Duméril, 1853)	Philippine Wrinkled Ground Frog	Philippine endemic	LC	None	Fieldwork
		<i>Platymantis guentheri</i> (Boulenger, 1882)	Gunther's Wrinkled Ground Frog	Mindanao PAIC endemic	LC	None	Fieldwork
		<i>Platymantis</i> c.f. <i>guentheri</i> (Boulenger, 1882)	Gunther's Wrinkled Ground Frog	Mindanao PAIC endemic	LC	None	Fieldwork; Sanguila <i>et al.</i> 2016
		<i>Platymantis rabori</i> (Brown, Alcala, Diesmos, and Alcala, 1997)	Rabor's Forest Frog*	Mindanao PAIC endemic	LC	VU	Fieldwork
		<i>Platymantis bayani</i> (Siler, Alcala, Diesmos, and Brown, 2009)	Walter's Limestone Frog	Mindanao PAIC endemic; Taft, Samar	DD	VU	Fieldwork; Siler <i>et al.</i> 2009
	Ranidae	<i>Pulchrana grandocula</i> (Taylor, 1920)	Mindanao Striped Stream Frog	Mindanao PAIC Endemic	LC	None	Fieldwork
Reptiles							
Squamata	Scincidae	<i>Brachymeles samarensis</i> (Brown, 1956)	Brown's Short-legged Skink	Mindanao PAIC endemic; Samar island	NA	None	Siler & Brown 2010; Siler <i>et al.</i> 2011, 2012
		<i>Brachymeles samad</i> (Siler, Jones, Diesmos, Diesmos & Brown, 2012)	Eastern Visayas Slender Skink	Mindanao PAIC endemic; Samar and Leyte island	NA	None	Siler <i>et al.</i> 2012
		<i>Brachymeles orientalis</i> (Brown & Rabor, 1967)	Southern Burrowing Skink	Mindanao PAIC endemic	NA	None	Siler & Brown 2010; Siler <i>et al.</i> 2011, 2012
		<i>Pinoyscincus jagori jagori</i> (Peters, 1864)	Jagor's Sphenomorphus	Philippine endemic	LC	None	Fieldwork
		<i>Otosaurus cumingi</i> (Gray, 1845)	Cuming's Sphenomorphus*	Philippine endemic	NA	None	Fieldwork
	Gekkonidae	<i>Cyrtodactylus sumuroi</i> (Welton, Siler, Linkem, Diesmos & Brown, 2010)	None	Mindanao PAIC endemic; Samar island	NA	None	Siler <i>et al.</i> 2010; Welton <i>et al.</i> 2010
	Varanidae	<i>Varanus samarensis</i> (Koch, Gaulke & Böhme, 2010)	Samar Monitor Lizard	Mindanao PAIC Endemic	NA	OTS	Fieldwork; Koch <i>et al.</i> 2010; Welton <i>et al.</i> 2014
	Viperidae	<i>Tropidolaemus subannulatus</i> (Gray, 1842)	Keeled Green Pit Viper	Resident	LC	OTS	Fieldwork
Birds							
Accipitri-formes	Accipitridae	<i>Pithecophaga jefferyi</i>	Philippine Eagle*	Philippine endemic	CR	CR	Ethnobiologica l data; Bueser <i>et al.</i> 2003;

Table 2. Terrestrial vertebrate fauna recorded from the forest over limestone in Taft, Eastern Samar (continued).

ORDER	FAMILY	SPECIES	COMMON NAME	DISTRIBUTION	CONSERVATION STATUS*		REFERENCE
					IUCN	DAO 2019-09	
		(Ogilvie-Grant, 1896)					Clark et al. 2020; DENR 2014; Taylor <i>et al.</i> 2015
		<i>Nisaetus pinskeri</i> (Preleuthner & Gamauf, 1998)	Pinsker's Hawk-eagle	Philippine endemic	EN	EN	Hutchinson, R. 2015
		<i>Pernis ptilorhynchus</i> (Temminck, 1821)	Oriental Honey-buzzard	Resident	LC	None	Taylor, J. 2013
		<i>Pernis steerei</i> (W.L. Sclater, 1919)	Philippine Honey-buzzard	Philippine endemic	LC	None	Taylor, J. 2014
		<i>Accipiter trivirgatus</i> (Temminck, 1824)	Crested Goshawk	Resident	LC	None	Taylor, J. 2015
		<i>Accipiter virgatus</i> (Temminck, 1822)	Besra	Resident	LC	None	Taylor, J. 2016
		<i>Spilornis holospilus</i> (Vigors, 1831)	Philippine Serpent-eagle*	Philippine endemic	LC	None	Dy, I. 2016
Bucero- tiformes	Bucerotidae	<i>Buceros hydrocorax semigaleatus</i> (Tweeddale, 1878)	Southern Rufous Hornbill*	Mindanao PAIC endemic	VU	EN	Fieldwork
		<i>Penelopides affinis samarensis</i> (Steere, 1890)	Samar Hornbill*	Mindanao PAIC endemic	LC	EN	Fieldwork
Caprimulgi- formes	Apodidae	<i>Collocalia esculenta</i> ssp. <i>marginata</i> (Salvadori, 1882)	Gray-rumped Swiftlet/ Philippine Glossy Swiftlet*	Philippine endemic	LC	None	Hutchinson, R. 2018b
		<i>Collocalia troglodytes</i> (Gray, 1845)	Pygmy Swiftlet*	Philippine endemic	LC	None	Hutchinson, R. 2018b
		<i>Mearnsia picina</i> (Tweeddale, 1879)	Philippine Spinetailed Swift	Philippine endemic	NT	VU	Hutchinson, R. 2015
		<i>Aerodramus amelis</i> (Oberholser, 1906)	Ameline Swiftlet	Philippine endemic	LC	None	Hutchinson, R. 2018
		<i>Hirundapus celebensis</i> (Sclater, PL, 1866)	Purple Needletail	Resident	LC	None	Hutchinson, R. 2018b
	Hemiproc- nidae	<i>Hemiprocne comata</i> (Temminck, 1824)	Whiskered Treeswift	Resident	LC	None	Kearns, M. 2016
Columbi- formes	Columbidae	<i>Phapitreron amethystinus</i> (Bonaparte, 1857)	Amethyst Brown Dove*	Philippine endemic	LC	CR	Fieldwork

Table 2. Terrestrial vertebrate fauna recorded from the forest over limestone in Taft, Eastern Samar (continued).

ORDER	FAMILY	SPECIES	COMMON NAME	DISTRIBUTION	CONSERVATION STATUS*		REFERENCE
					IUCN	DAO 2019-09	
		<i>Chalcophaps indica</i> (Linnaeus, 1758)	Asian Emerald Dove*	Resident	LC	None	Dy, I. 2016
		<i>Ptilinopus occipitalis</i> (Gray, 1844)	Yellow-breasted Fruit Dove*	Philippine endemic	LC	None	Hutchinson, R. 2018b
		<i>Gallicolumba crinigera</i> (Pucheran, 1853)	Mindanao Bleeding Heart*	Mindanao PAIC endemic	VU	VU	Kearns, M. 2016
		<i>Phapitreron brevirostris</i> (Tweeddale, 1877)	Short-billed Brown Dove*	Mindanao PAIC endemic	LC	None	Hutchinson, R. 2018
		<i>Ptilinopus leclancheri</i> (Bonaparte, 1855)	Black-chinned Fruit Dove*	Resident	LC	None	Kearns, M. 2016
		<i>Ducula poliocephala</i> (Gray, GR, 1844)	Pink-bellied Imperial Pigeon	Philippine endemic	NT	CR	Kearns, M. 2017
		<i>Treron axillaris</i> (Bonaparte, 1855)	Philippine Green Pigeon	Philippine endemic	LC	VU	Canillas, R. 2015
Coraciiformes	Alcedinidae	<i>Halcyon gularis</i> (Kuhl, 1820)	Brown-breasted Kingfisher	Resident	LC	None	Hutchinson, R. 2018
		<i>Ceyx flumenicola</i> (Steere, 1890)	Northern Silvery Kingfisher	Mindanao PAIC endemic	NT	VU	Hutchinson, R. 2015
	Coraciidae	<i>Eurystomus orientalis</i> (Linnaeus, 1766)	Dollarbird*	Resident	LC	None	Cooleman, S. 2016
	Meropidae	<i>Merops americanus</i> (P. L. S. Müller, 1776)	Rufous-crowned Bee-eater	Philippine endemic	LC	None	Taylor, J. 2014
Cuculiformes	Cuculidae	<i>Centropus melanops</i> (Lesson, 1830)	Black-faced Coucal*	Mindanao PAIC endemic	LC	None	Hutchinson, R. 2018
		<i>Centropus viridis</i> (Scopoli, 1786)	Philippine Coucal*	Philippine endemic	LC	None	Hutchinson, R. 2018
		<i>Surniculus velutinus</i> (Sharpe, 1877)	Philippine Drongo-Cuckoo	Philippine endemic	LC	None	Hutchinson, R. 2018
		<i>Chrysococcyx xanthorhynchus</i> (Horsfield, 1821)	Violet Cuckoo	Resident	LC	None	Hutchinson, R. 2018b
		<i>Hierococcyx pectoralis</i> (Cabanis & Heine, 1863)	Philippine Hawk Cuckoo	Philippine endemic	LC	None	Kearns, M. 2016
		<i>Eudynamis scolopaceus</i> (Linnaeus, 1758)	Asian Koel/ Common Koel*	Resident	LC	None	Kearns, M. 2016
		<i>Cacomantis variolosus</i> (Vigors & Horsfield, 1826)	Brush Cuckoo*	Resident	LC	None	Kearns, M. 2016
Falconiformes	Falconidae	<i>Microhierax erythrogenys</i> (Vigors, 1831)	Philippine Falconet*	Philippine endemic	LC	None	Hutchinson, R. 2018b

Table 2. Terrestrial vertebrate fauna recorded from the forest over limestone in Taft, Eastern Samar (continued).

ORDER	FAMILY	SPECIES	COMMON NAME	DISTRIBUTION	CONSERVATION STATUS*		REFERENCE
					IUCN	DAO 2019-09	
Galliformes	Phasianidae	<i>Gallus gallus</i> (Linnaeus, 1758)	Red Junglefowl*	Resident	LC	None	Hutchinson, R. 2018b
Passeriformes	Artamidae	<i>Artamus leucorhynchus leucorhynchus</i> (Linnaeus, 1771)	White-breasted Woodswallow*	Resident	LC	None	Hutchinson, R. 2015
	Campephagidae	<i>Lalage melanoleuca</i> (Blyth, 1861)	Black-and-white Triller	Philippine endemic	LC	None	Hutchinson, R. 2015
		<i>Pericrocotus speciosus</i> (Forster, 1781)	Scarlet Minivet	Resident	LC	None	Hutchinson, R. 2015
	Cisticolidae	<i>Cisticola exilis</i> (Vigors & Horsfield, 1827)	Golden-headed Cisticola	Resident	LC	None	Kearns, M. 2016
		<i>Orthotomus frontalis</i> (Sharpe, 1877)	Rufous-fronted Tailorbird	Mindanao PAIC endemic	LC	None	Hutchinson, R. 2018
		<i>Orthotomus samarensis</i> (Steere, 1890)	Yellow-breasted Tailorbird*	Mindanao PAIC endemic	NT	OTS	Hutchinson, R. 2018
	Corvidae	<i>Corvus enca</i> (Horsfield, 1821)	Slender-billed Crow	Resident	LC	None	Hutchinson, R. 2018b
	Dicaeidae	<i>Dicaeum hypoleucum</i> (Sharpe, 1876)	Buzzing Flowerpecker*	Philippine endemic	LC	None	Hutchinson, R. 2018
		<i>Dicaeum trigonostigma</i> (Scopoli, 1786)	Orange-bellied Flowerpecker*	Resident	LC	None	Hutchinson, R. 2018
		<i>Dicaeum australe</i> (Hermann, 1783)	Red-keeled Flowerpecker	Philippine endemic	LC	None	Dy, I. 2016
	Dicruridae	<i>Dicrurus striatus samarensis</i> (Tweeddale, 1877)	Hair-crested Drongo/ Short-tailed Drongo*	Mindanao PAIC endemic	LC	None	Fieldwork
	Hirundinidae	<i>Hirundo tahitica</i> (Gmelin, JF, 1789)	Pacific Swallow	Resident	LC	None	Cooleman, S. 2016
	Irenidae	<i>Irena cyanogastra</i> (Vigors, 1831)	Philippine Fairy-bluebird*	Philippine endemic	NT	None	Hutchinson, R. 2018
	Laniidae	<i>Lanius cristatus</i> (Linnaeus, 1758)	Brown Shrike*	Resident	LC	None	Hutchinson, R. 2018
	Monarchidae	<i>Terpsiphone cinnamomea</i> (Sharpe, 1877)	Rufous Paradise Flycatcher*	Philippine endemic	LC	None	Dy, I. 2016
		<i>Hypothymis azurea</i> (Boddaert, 1783)	Black-naped Monarch	Resident	LC	None	Dy, I. 2016
		<i>Hypothymis helenae</i> (Steere, 1890)	Short-crested Monarch	Philippine endemic	NT	OTS	Hutchinson, R. 2015
	Muscicapidae	<i>Ficedula basilanica</i> (Sharpe, 1877)	Little Slaty Flycatcher	Mindanao PAIC endemic	VU	VU	Hutchinson, R. 2018
		<i>Cyornis ruficauda</i> (Sharpe, 1877)	Chestnut-tailed Jungle Flycatcher/ Rufous-tailed jungle Flycatcher	Resident	LC	None	Dy, I. 2016
	Nectariniidae	<i>Leptocoma sperata</i> (Linnaeus, 1766)	Purple-throated Sunbird*	Resident	LC	None	Hutchinson, R. 2018

Table 2. Terrestrial vertebrate fauna recorded from the forest over limestone in Taft, Eastern Samar (continued).

ORDER	FAMILY	SPECIES	COMMON NAME	DISTRIBUTION	CONSERVATION STATUS*		REFERENCE
					IUCN	DAO 2019-09	
		<i>Aethopyga pulcherrima</i> (Sharpe, 1876)	Metallic-winged Sunbird*	Mindanao PAIC endemic	LC	None	Hutchinson, R. 2018
		<i>Aethopyga bella</i> (Tweeddale, 1877)	Handsome Sunbird	Philippine endemic	LC	None	Hutchinson, R. 2018
		<i>Arachnothera flammifera</i> (Tweeddale, 1878)	Orange-tufted Spiderhunter	Mindanao PAIC endemic	LC	None	Hutchinson, R. 2018
		<i>Anthreptes griseigularis</i> (Tweeddale, 1878)	Gray-throated Sunbird	Philippine endemic	LC	OTS	Hutchinson, R. 2018
	Oriolidae	<i>Oriolus chinensis</i> (Linnaeus, 1766)	Black-naped Oriole*	Resident	LC	None	Hutchinson, R. 2015
		<i>Oriolus steerii</i> (Sharpe, 1877)	Philippine Oriole	Philippine endemic	LC	None	Hutchinson, R. 2015
	Pachycephalidae	<i>Pachycephala philippinensis</i> (Walkden, 1872)	Yellow-bellied Whistler*	Philippine endemic	LC	None	Hutchinson, R. 2018
	Paridae	<i>Pardaliparus elegans</i> (Lesson, 1831)	Elegant Tit	Philippine endemic	LC	None	Hutchinson, R. 2015
	Pellorneidae	<i>Ptilocichla mindanensis minuta</i> (Bourne & Worcester, 1894)	Striated Wren-Babbler	Mindanao PAIC endemic	LC	None	Hutchinson, R. 2018b
	Phylloscopidae	<i>Phylloscopus olivaceus</i> (Moseley, 1891)	Philippine Leaf Warbler	Philippine endemic	LC	None	Hutchinson, R. 2018
		<i>Phylloscopus borealis</i> (Blasius, 1858)	Arctic Warbler*	Resident	LC	None	Hutchinson, R. 2015
	Pittidae	<i>Pitta steerii</i> ssp. <i>coelestis</i> (Parkes, 1971)	Azure-breasted Pitta*	Mindanao PAIC endemic	VU	VU	Fieldwork
	Pycnonotidae	<i>Hypsipetes philippinus saturator</i> (E. J. O. Hartert, 1916)	Philippine Bulbul*	Philippine endemic	LC	None	Hutchinson, R. 2018
		<i>Brachypodius urostictus atricaudatus</i> (Parkes, 1967)	Yellow-wattled Bulbul*	Philippine endemic	LC	None	Hutchinson, R. 2018
		<i>Hypsipetes everetti</i> (Tweeddale, 1877)	Yellowish Bulbul*	Mindanao PAIC endemic	LC	None	Hutchinson, R. 2018
		<i>Pycnonotus goiavier</i> (Scopoli, 1786)	Yellow-vented Bulbul*	Resident	LC	None	Hutchinson, R. 2018
	Rhipiduridae	<i>Rhipidura samarensis</i> (Steere, 1890)	Visayan Blue-Fantail	Mindanao PAIC endemic	LC	None	Fieldwork
	Sittidae	<i>Sitta oenochlamys</i> (Sharpe, 1877)	Sulphur-billed Nuthatch	Philippine endemic	LC	None	Hutchinson, R. 2018
	Sturnidae	<i>Sarcops calvus</i> (Linnaeus, 1766)	Coleto*	Philippine endemic	LC	None	Dy, I. 2016

Table 2. Terrestrial vertebrate fauna recorded from the forest over limestone in Taft, Eastern Samar (continued).

ORDER	FAMILY	SPECIES	COMMON NAME	DISTRIBUTION	CONSERVATION STATUS*		REFERENCE
					IUCN	DAO 2019-09	
		<i>Rhabdormis mystacalis</i> (Temminck, 1825)	Stripe-sided Rhabdormis/ Stripe-headed Rhabdormis	Philippine endemic	LC	None	Dy, I. 2016
	Timaliidae	<i>Macronus striaticeps</i> (Sharpe, 1877)	Brown Tit-Babbler*	Mindanao PAIC endemic	LC	None	Hutchinson, R. 2018
	Zosteropidae	<i>Zosterops everetti</i> (Tweeddale, 1878)	Everett's White-eye	Resident	LC	None	Hutchinson, R. 2018
		<i>Sterrhoptilus nigrocapitatus</i> (Steere, 1890)	Black-crowned Babbler	Philippine endemic	LC	None	Hutchinson, R. 2018b
		<i>Dasyctropha pygmaea</i> (Ogilvie-Grant, 1896)	Visayan Pygmy Babbler	Mindanao PAIC endemic	NT	OTS	Hutchinson, R. 2018b
Piciformes	Megalaimidae	<i>Psilopogon haemacephalus celestinoi</i> (Gilliard, 1949)	Coppersmith Barbet	Resident	LC	None	Dy, I. 2016
	Picidae	<i>Mulleripicus fuliginosus</i> (Tweeddale, 1877)	Southern Sooty Woodpecker	Mindanao PAIC endemic	VU	None	Dy, I. 2016
		<i>Dryocopus javensis</i> (Horsfield, 1821)	White-bellied Woodpecker*	Resident	LC	None	Dy, I. 2016
		<i>Yungipicus maculatus</i> (Scopoli, 1786)	Philippine Woodpecker	Philippine endemic	LC	None	Hutchinson, R. 2018
Psittaciformes	Psittaculidae	<i>Loriculus philippensis</i> (Müller, 1776)	Philippine Hanging-Parrot*	Philippine endemic	LC	CR	Hutchinson, R. 2015
		<i>Bolbopsittacus humulatus</i> (Scopoli, 1786)	Guaiabero	Philippine endemic	LC	None	Hutchinson, R. 2018
Trogoniformes	Trogonidae	<i>Harpactes ardens</i> (Temminck, 1826)	Philippine Trogon	Philippine endemic	LC	None	Hutchinson, R. 2018
Mammals							
Chiroptera	Pteropodidae	<i>Ptenochirus minor</i> (Yoshiyuki, 1979)	Lesser Musky Fruit Bat	Mindanao PAIC endemic	LC	None	Fieldwork
		<i>Ptenochirus jagori</i> (Peters, 1861)	Greater Musky Fruit Bat	Philippine endemic	LC	None	Fieldwork
		<i>Haplonycteris fischeri</i> (Lawrence, 1939)	Fischer's Pygmy Fruit Bat	Philippine endemic	LC	None	Fieldwork
		<i>Cynopterus brachyotis</i> (Müller, 1838)	Lesser Dog-faced Fruit Bat*	Resident	LC	None	Fieldwork
		<i>Macroglossus minimus</i> (E. Geoffroy, 1810)	Dagger-toothed Long-nosed Fruit Bat	Resident	LC	None	Fieldwork
Primates	Tarsiidae	<i>Tarsius syrichta</i> (Linnaeus, 1758)	Philippine Tarsier*	Mindanao PAIC endemic	NT	OTS	Fieldwork

Table 2. Terrestrial vertebrate fauna recorded from the forest over limestone in Taft, Eastern Samar (continued).

ORDER	FAMILY	SPECIES	COMMON NAME	DISTRIBUTION	CONSERVATION STATUS*		REFERENCE
					IUCN	DAO 2019-09	
	Cercopithecidae	<i>Macaca fascicularis</i> (Raffles, 1821)	Long-tailed Macaque*	Resident	LC	None	Ethnobiological data
Rodentia	Muridae	<i>Rattus everetti</i> (Günther, 1879)	Philippine Forest Rat*	Philippine endemic	LC	None	Fieldwork
		<i>Rattus tanezumi</i> (Temminck, 1844)	Oriental House Rat/Asian House Rat*	Resident	LC	None	Fieldwork
Carnivora	Viverridae	<i>Paradoxurus philippinensis</i> (Jourdan, 1837)	Common Palm Civet*	Resident	LC	None	Fieldwork
		<i>Viverra zangalunga</i> (Gray, 1832)	Malayan Civet*	Resident	LC	None	Ethnobiological data
Artiodactyla	Suidae	<i>Sus philippensis</i> (Nehring, 1886)	Philippine Warty Pig*	Philippine endemic	VU	VU	Ethnobiological data

Notes: (*) in common name denotes that the species was also recorded in the study of Patindol (2016); CR- Critically Endangered, EN – Endangered, VU – Vulnerable, NT – Near Threatened, OTS – Other Threatened Species, LC – Least Concern, DD – Data Deficient, NA – Not Assessed.

of the municipality. *Cyrtodactylus sumuroi* had not yet been assessed in the IUCN Red List and DENR DAO 2019-09.

***Pithecophaga jefferyi* Ogilvie-Grant, 1896**

The Philippine eagle, also known as the National Bird of the Philippines, is endemic to the archipelago where it is known from the islands of Luzon, Samar, Leyte, and Mindanao (Bueser *et al.*, 2003). It is one of the most endangered species on the planet (Kennedy *et al.*, 2000). Estimates suggest that there were six pairs in Samar Island (BirdLife International 2020). Previous sightings were available in Calbiga and Taft Forest Wildlife (Philippine Eagle) Sanctuary in Eastern Samar (DENR, 2014; Taylor, 2015). It is categorized as Critically Endangered (CR) in both the IUCN Red List and DENR DAO 2019-09.

***Phapitreron amethystinus* Bonaparte, 1857**

The amethyst brown-dove (Figure 3B) is endemic to the Philippines. It can be differentiated from other brown-dove species by having a larger bill, less conspicuous white 'ear', violet upper back, and cinnamon undertail coverts (Kennedy *et al.*, 2000). An individual was recorded perched from a branch during the transect survey. It was categorized as Least Concern (LC) in the IUCN Red List but listed as Critically Endangered (CR) in the DENR DAO 2019-09.

***Pitta steeri coelestis* Parkes, 1971**

Steere's Pitta or Azure-breasted Pitta (Figure 3C) is endemic to the Mindanao faunal region where it is often associated with limestone forests (Kennedy *et*

al., 2000). The race *coelestis* is found in Samar, Leyte, and Bohol (Erritzoe, 2020). An individual was caught with a mist net but immediately released after species identification. Due to the species' small, fragmented population, and the continuous loss of their habitat, it was listed as Vulnerable for both the IUCN Red List and DENR DAO 2019-09.

***Ptenochirus minor* Yoshiyuki, 1979**

The lesser musky fruit bat (Figure 3D) is endemic to the Mindanao Faunal Region (Heaney *et al.*, 1998). They are dark bats with shortish, sturdy snouts. Individuals were caught during the field survey using mist nets. This species can easily be mistaken for *Ptenochirus jagori* but can be distinguished by the differences in forearm lengths 60-78mm and 76-90mm, respectively (Ingle and Heaney, 1992). It was categorized as Least Concern (LC) in the IUCN Red List.

***Sus philippensis* Nehring, 1886**

The Philippine warty pig is endemic to the Philippines. An abandoned wallowing site was observed along the trail, which indicated the presence of the species in the limestone forests of Taft. This species is heavily hunted for its meat (Heaney *et al.*, 1998) and is currently categorized as Vulnerable for both IUCN Red List and DENR DAO 2019-09.

Conservation Concerns

Major anthropogenic threats to the biodiversity of karst landscapes in Southeast Asia include limestone quarrying and mining. The limestone quarrying rate in

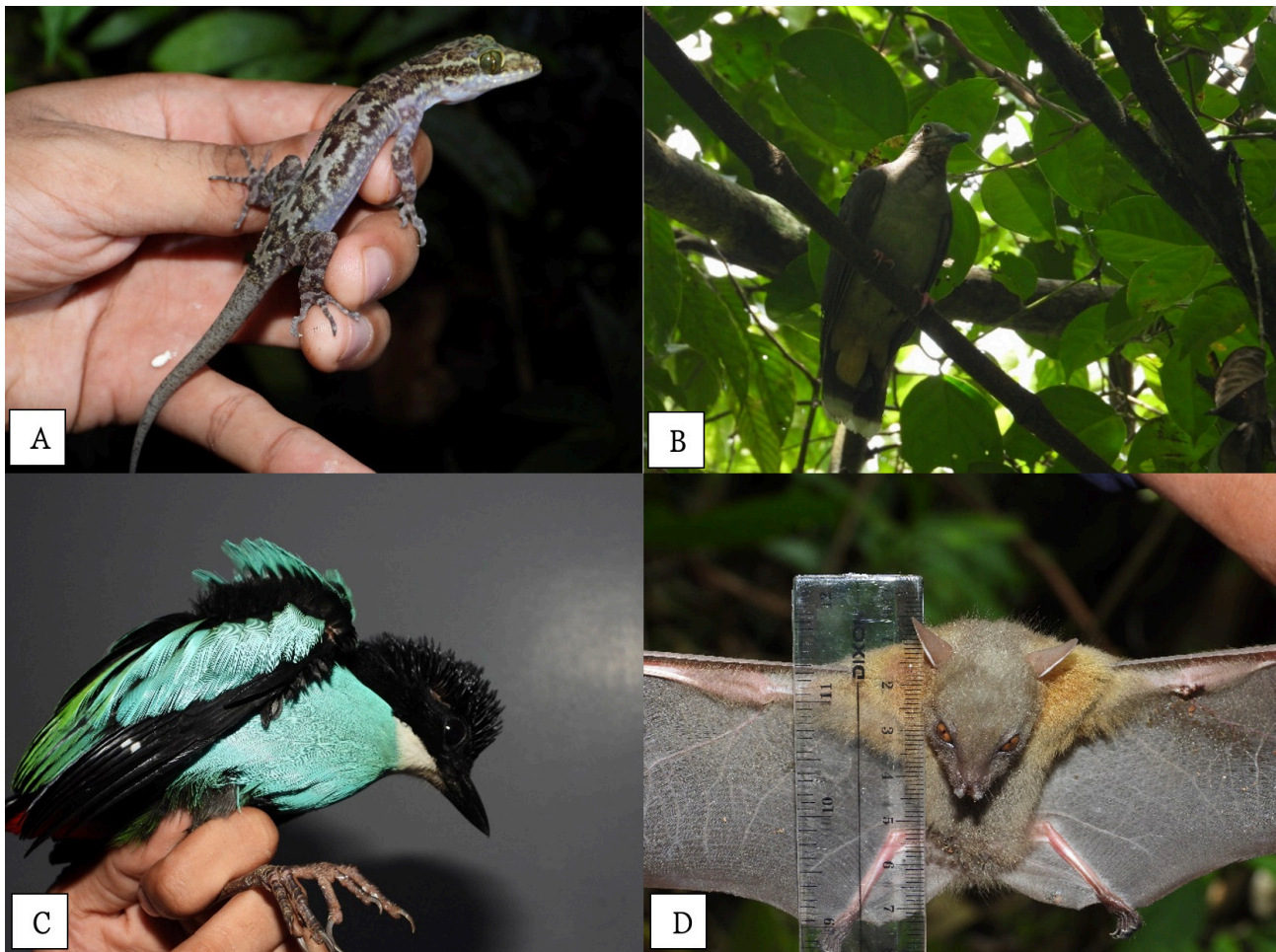


Figure 3. Some of the notable animal species found in the study site of San Rafael, Taft, Eastern Samar: A) *Cyrtodactylus sumuroi*, B) *Phapitreron amethystinus*, C) *Pitta steerii* ssp. *coelestis*, and D) *Ptenochirus minor*. Photographs by P.J. Tolentino.

this region is greater compared to other larger tropical regions. Moreover, the Southeast Asia has a higher mean annual increase in limestone quarrying rates from 1999-2003 (Clements *et al.*, 2006). This activity can be negatively consequential to the endemic species inhabiting this specific ecosystem, such as in the case of *Platymantis bayani* which is recorded to only occur in Taft, Eastern Samar and has limestone rock as its preferred microhabitat. According to the DENR-BMB (2020), the *Platymantis bayani* was primarily threatened by this extractive activity.

Prominent forest cover loss had been experienced by Samar Island in the previous years. This was attributed to the extensive logging and timber cutting, rattan extraction, and kaingin (clearing of land through slash-and-burn agriculture) in the province (Bugayong *et al.*, 2016). In 1987 and 1988, the province became the major log producer in the Eastern Visayas Region (Sabulao and Egirani, 2009). An estimated 86% decrease rate in forest cover was observed during the 1950s, and around 33% during mid-1980s (Hunnam *et al.*, 2004).

SINP also ranked second among the terrestrial protected areas in the Philippines in terms of having the largest forest cover loss (12,340 ha) from 2001–2012 (Apan *et al.*, 2017). Activities such as wood harvesting for charcoal, collection of endemic plants for medicinal and ornamental purposes, and illegal hunting and capturing of wild animals also exacerbated the degradation of the biodiversity in the karst landscape (Lillo *et al.*, 2019; Cadiz and Buot, 2010; Clements, 2006; Gillieson, 2005). If these practices continue, their adverse effects on biodiversity will be inevitable. For instance, despite being classified as least concern (LC) by the IUCN Red List, the population trend of *Shorea negrosensis* species has been in a decreasing trend due to illegal logging and timber extraction activities in the country (EDC, 2020).

Forest fragmentation inhibits the movement of species and increases their exposure to humans. Aside from habitat loss, the population of *Pithecopaga jefferyi* has been declining due to illegal hunting and poaching (Salvador and Ibanez, 2006). *Pithecopaga jefferyi* was

discovered in Samar Island during 1986 and current studies have shown that this species is still present in the municipalities of Taft and Calbiga (Taylor *et al.*, 2015). However, continuous degradation of the forest and occurrence of illegal hunting and poaching of this species would result in its extinction. Similarly, invasive alien species pose additional threats to the biodiversity of limestone forest in Taft, such as in the case of the invasive alien species *Rattus tanezumi*, which could outcompete the native rodent species, *Rattus everetti*. This may result in widespread crop damage in karst landscapes if no interventions are made to control or monitor the population of invasive alien species.

Several laws and regulations were implemented leading to the indirect protection of karst landscapes in Taft, Eastern Samar. One regulation is the Logging Moratorium Order imposed by the late President Corason Aquino in 1989 that ceased the existing logging operations in the province (Hunnam *et al.*, 2004). This was created in response to the intensive logging in Samar Island during 1950s-1980s which resulted in landslides and flashfloods causing the loss of lives and massive destruction of properties in the affected areas. After President Cory Aquino's administration, the leadership of succeeding Philippine presidents also recognized the importance of protecting the forests of Samar. Thus, the Proclamation no. 774, s. 1996 was signed by President Fidel V. Ramos declaring the rainforest of the provinces of Samar as a forest reserve. Eventually, the Proclamation no. 442, s. 2003 was enacted by President Gloria Macapagal Arroyo that classified SINP as a Protected Area under the National Integrated Protected Areas System (NIPAS) Law. In 1999, President Joseph Estrada also designated a forest area in Taft, Eastern Samar as a wildlife sanctuary for the Philippine Eagle under the Proclamation No. 155, s. 1999. Aside from being protected by the NIPAS Law, SINP was indirectly protected by the Mining Act of 1995, which prohibits the application of mining near the old growth forest. Since the SINP holds the largest intact old growth forest in the Philippines, quarrying and mining activities in this area is limited.

SUMMARY AND CONCLUSION

This study recorded a total of 30 flora species and 112 fauna species in Taft, Eastern Samar. Among all the listed vascular plants, the species of *Artocarpus rubrovenius* Warb., *Saribus rotundifolius* (Lam.) Blume, *Shorea negrosensis* Foxw. and *Wallaceodendron celebicum* Koord. were noted to have conservation status based on the IUCN Red List of Threatened Species and DAO 2017-11. Among the birds, *Pithecophaga jefferyi*, *Phapitreron amethystinus*, *Ducula poliocephala*, and

Loriculus philippensis were identified to have a critically endangered conservation status while *Nisaetus pinskeri*, *Buceros hydrocorax semigaleatus*, and *Penelopides affinis samarensis* were listed as endangered based on the Department of Environment and Natural Resources Administrative Order (DAO) 2019-09 and/or IUCN Red List. Among the other vertebrates, *Platymantis rabori*, *Platymantis bayani*, and *Sus philippensis* were categorized as vulnerable based on the DAO 2019-09 and/or IUCN Red List.

The karst landscape of Taft, Eastern Samar has a unique biodiversity composition. The continuous degradation of the forest area in Samar imposed threats to its natural resources, including the flora and fauna of limestone forest that are known to be highly vulnerable to disturbances. Without the proper and strict implementation of the laws, the prolonged exposure of the species residing in the limestone forest to the anthropogenic and natural disturbances may result in the decline of their population or eventually lead to their extinction.

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