









An annotated checklist of birds of the Dinagat Islands, Philippines

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Abstract

The Dinagat Islands hold a large and varied avian fauna with high rate of endemism and species of conservation concern. However, anthropogenic activities pose a grave threat to the avian diversity of these islands. We conducted a three-year (2017–2019) avifaunal survey using mist-nets to inventory the avian species of the islands. We recorded 37 species in 22 families. Seventeen species are Philippine endemic, one species is of conservation concern, and two species are newly recorded from the Dinagat Islands. We also present an annotated checklist of bird species of the Dinagat Islands based on our own surveys, three published studies, and an online database; 246 species in 71 families are included. The results of our study highlight the need for further assessment to conserve the island's avifaunal community, especially with increasing threats of anthropogenic disturbance.

Keywords

Avifauna, island diversity, mist netting, new island records, species inventory

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Introduction

The Philippines hosts a rich array of natural habitats leading to a diverse flora and fauna, both in terrestrial and marine ecosystems. The complex biological diversity of the Philippines, coupled with high rates of endemism, is an important component of the Earth's overall biological diversity, such that the Philippines is one of the 17 mega-diverse countries with an estimated total of 52,177 species of which 20,000 species are endemic (Mittermeier et

al. 1999 in Ambal et al. 2012; Ong et al. 2002; Posa et al. 2008). The Philippines boasts one of the richest avifaunas in the world, representing almost 6% of the world's total bird species, with 709 species of which 241 are endemic (Achondo et al. 2012; Panopio and Pajaro 2014; Jensen et al. 2020). Moreover, with the increasing monitoring of bird populations as well as in the population of ornithologist and avid bird watchers, new observations

are being recorded yearly. However, about 26% of the avian species in the Philippines are globally threatened (Jensen et al. 2020). As such, the country is considered a biodiversity hotspot of concern considering the continuous population declines of some threatened species, primarily caused by anthropogenically induced habitat loss.

The Philippines is composed of three major island regions of Luzon, Visayas, and Mindanao. The Mindanao Island region has the highest concentration of avian species primarily due to the high percentage of forest cover (Peterson et al. 2000; Mohagan et al. 2015). Mindanao Island also hosts at least 21% (50 species) of the total endemic birds occurring in the Philippines (Jensen et al. 2020). During the Pleistocene epoch, the present-day Mindanao was connected with other smaller islands, including Bohol, Leyte, Samar, the Dinagat Islands, Siargao, and Basilan, forming the Greater Mindanao faunal region, one of the largest Pleistocene islands in the Philippines; Greater Mindanao has the richest endemic fauna of all the Pleistocene islands (Peterson et al. 2000). Considering its association with the Pleistocene Greater Mindanao, the Dinagat Islands hold a diverse avifauna with high rates of endemism. This small island province, a part of the Eastern Mindanao Biodiversity Corridor and a northern extension of the mountains of Mindanao, was thought to have formed as a land bridge connecting the Northern Mindanao and Eastern Visayas during the Pleistocene epoch (Lillo et al. 2019; Villancio et al. 2020). Owing to the geographic history of the island and its rich upper and lower montane forests that provide suitable habitats for bird communities, the Dinagat Islands are recognized as an important bird area and one of the key areas for conservation in the Philippines (Haribon 2004; Lillo et al. 2019). Despite the rich avifaunal diversity of the Dinagat Islands, current information of its avifauna has been lacking. As such, monitoring changes to the island's avifaunal community is challenging, considering the continuous and imminent threats of destructive anthropogenic activities in the islands (Paz et al. 2013).

Biodiversity studies are anchored with the notion that generated data are complete and robust in order to provide a clearer understanding of the changes in species diversity, considering the impacts of both natural and anthropogenic stressors. Although extensive data collection and analysis have been generated for well-resolved taxa such as birds, data gaps are still prominent, especially in small, geographically isolated islands in the Philippines (Collen et al. 2008; Siddig 2019; Villancio et al. 2020). The lack of baseline information be problematic in monitoring habitats and species status, tracking and predicting species turnover due to environmental changes, and decision-making for conservation and protection of critical habitats (Geijzendorffer et al. 2016; Wetzal et al. 2018; Conde et al. 2019). In addition, considering the potential of birds as indicators of environmental health through the ecosystem services they provide, the lack of baseline data can affect the assessment of bird species as potential

bioindicators (Sekercioglu 2006; de la Peña-Domene et al. 2014; Egwumah et al. 2017; Mekonen 2017). Thus, the need for further studies, especially on small islands, is warranted to generate a robust and complete data (Heaney et al. 2002).

In this study, we present an updated inventory of bird species gathered from our field survey in selected areas within the Dinagat Islands. Each of our sampling sites characterize various habitat types including mature secondary forests, patches of lowland primary forests, and forests adjacent to a mining area. We reveal new geographical distribution records through a meta-analysis of three published studies and an online database of the birds of the Dinagat Islands. Likewise, we present species descriptions of prominent and notable species that we recorded in our field survey. Our study is intended to increase the understanding of the Dinagat's avifaunal community and to aid in forest conservation and management programs protecting the islands' bird communities in light of continuous anthropogenic disturbances.

Study Area

The province of Dinagat Islands is a small geographically isolated island located at the west side of Leyte, south side of Leyte Gulf and northeast of Surigao del Norte. The Dinagat islands has a total area of 96,746 ha of rolling mountainous terrain with a maximum elevation of 3,048 m above sea level. At present, there is only 34% forest cover left in the Dinagat islands, most of which are areas claimed and operated by mining companies (Pedregosa-Hospodarsky 2009). The rainy season is prominent, from November to January, and there is no pronounced dry season (Villancio et al. 2020).

We conducted an avifaunal survey in eight sites within the municipalities of Basilisa and Loreto in the Dinagat Islands from 2017 to 2019 (Fig. 1). We established three sampling sites in Basilisa at Mount Arayat, Cambiatao, and Rosita, and five sampling sites in Loreto at Mount Bil-at, Mount Magkuno, Mount San Ramon, Mount Kongking, and Mount Redondo (Table 1).

Methods

Mist netting was employed during the study to assess the composition and structure of bird communities in each sampling site (Table 2). We used 6 m × 3 m mist nets with four pouches and a mesh size of 30 mm. Ground nets were placed in a series by merging four or five nets adjoined by poles. For canopy nets, two or three nets were vertically placed 20–25 m above the ground; they were raised by a pulley. Ground and canopy nets were placed in suspected flyways, forest clearings, and in areas with possible high density of bird species. These nets were left open for five days and four nights per sampling site, with occasional net checking every 30 min from 0600–1500 h for bird captures. Sampling efforts differ between years due to the differences in the number of mist nets



Figure 1. Map of the Province of Dinagat Islands, Philippines showing the eight sampling sites (red dots) in the municipalities of Basilisa and Loreto.

used, which was subjected to their availability (Table 2).

Captured birds were identified to species using Kennedy et al. (2000), and endemism and conservation status was based on the IUCN Red List (IUCN 2021). We recorded age, weight, and sex of birds together with other standard biometric measurements such as tail, tarsus, beak, wingspan, and total lengths for all the captured specimens. Some of the unidentified bird species were sent to the Ornithology Department under the Zoology Division of the National Museum of Natural History, Manila for confirmation of these species. Collected voucher specimens were placed in a 90% formalin solution. Voucher specimens were deposited in the Zoology Division of the National Museum of Natural History in Manila. Collection of voucher specimens was in accordance to our Wildlife Gratuitous Permit No. R13-2019-33 given by the Department of Environmental and Natural Resources Regional Office XII. Collected data were combined with previous published species listings to create an annotated checklist of the birds of the Dinagat Islands. The checklist is arranged into family, species, conservation statuses based on the IUCN (2021) Red List.

Results

A total of 300 individuals of birds belonging to 37 species in 22 families were captured after a total of 1,530

Table 1. Sites in the municipalities of Loreto and Basilisa in the Province of Dinagat Islands, Philippines, where the faunal samples were collected and recorded

Sampling Sites	Coordinates	Elevation (m a.s.l.)	Site Description
Mount Arayat	10°07'30"N, 125°37'03"E	395	Farthest site from mining site; composed of dense patches of primary forests; minimal disturbance from illegal logging
Mount Bil-at	10°24'28"N, 125°39'51"E	92	Sampling sites were primary forests and forest fragments adjacent to active and recently decommissioned mining pits; forest edges were also sampled; high to minimal disturbance
Cambiatao	10°05'58"N, 125°33'24"E	138	Secondary growth forest dominated by herbaceous plants and shrubs, and small dbh trees; adjacent decommissioned mine site; minimal active disturbance
Mount Magkuno	10°24'19"N, 125°37'39"E	249	Located adjacent to active mining operation; highly disturbed site with patches of primary forest
Rosita	10°24'28"N, 125°33'29"E	138	Ranges from open areas to secondary forests; Dominated by herbaceous plants and shrubs; decommissioned mine site; minimal active disturbance
Mount Kongking	10°24'06"N, 125°38'49"E	619	Located adjacent to a strip-mining operation; highly disturbed site with patches of primary forest
Mount San Ramon	10°24'05"N, 125°38'22"E	624	Disturbed by strip mining; only patches of primary forest remain in the site
Mount Redondo	10°20'54"N, 125°38'05"E	845	High-altitude "bonsai forest." located adjacent to a mine pit; minimally disturbed

Table 2. Summary of mist-net sampling effort at each site. Sampling effort is calculated on the number of sampling days, number of mist-nets, and total mist-net days.

Site	2017			2018			2019		
	SD ^a	No. of nets	ND ^b	SD ^a	No. of nets	ND ^b	SD ^a	No. of nets	ND ^b
Mount Arayat	—	—	—	7	30	210	5	50	250
Cambiatao	3	20	60	1	20	20	5	50	250
Rosita	—	—	—	3	30	90	4	30	120
Mount Bil-at	—	—	—	6	30	180	—	—	—
Mount Magkuno	—	—	—	1	30	30	4	50	200
Mount Kongking	—	—	—	—	—	—	2	30	60
Mount San Ramon	—	—	—	—	—	—	1	30	30
Mount Redondo	—	—	—	—	—	—	1	30	30
Totals	3	—	60	18	—	530	22	—	940
Total net days	1,530								

^aSD: sampling days; ^bND: net days

net-days (Table 3). Species accumulation and rarefaction curves of our mist-net sampling did not reach an asymptote, suggesting that additional species would likely be captured with additional sampling effort (Fig. 2). Among the captured bird species, 17 (46%) are endemic: 15 are Philippine endemics and two are Greater Mindanao endemics (Table 3). Furthermore, 19 individuals of the Near Threatened *Irena cyanogastra* Vigors, 1831 was also captured in our mist nets.

The Columbidae was the most species-rich family comprising of five species (Table 3). This was followed by the Dicaeidae, Nectariniidae, Pycnonotidae, and Sturnidae with three species each (Table 3). The most abundant family in terms of numbers of individuals is the Pycnonotidae with 124 (41%) individuals captured. The Philippine endemic *Poliolophus urostictus* (Salvadori, 1870) was the most abundant, with 55 individuals

captured (18.3%), followed by the Philippine endemic *Hypsipetes everetti* (Tweeddale, 1877) with 35 individuals (11.7%), and the non-endemic *Pycnonotus goiavier* (Scopoli, 1786) with 34 individuals (11.3%). Furthermore, our mist nets captured two migratory species, *Lanius cristatus* (Linnaeus, 1758) and *Cuculus saturatus* (Blyth, 1843) (Table 3).

We compiled a cumulative total of 246 bird species belonging to 71 families recorded from the Dinagat Islands, based on our study, three other published studies, and an online avian database (Table 5). This bird community assemblage is composed of 104 resident species (~43%), 59 endemic species (~24%), and 56 migrant species (~23%) (Table 5). Among the endemic species, 42 species are Philippine endemics, while 17 species are Greater Mindanao endemics (Table 4). Twenty-five species are threatened according to the IUCN (2021) Red

Table 3. List of bird species caught during the survey done in the municipalities of Loreto and Basilisa in the Dinagat Islands from 2017–2019. Included are residency status, conservation status from the IUCN Red List (2021), and number of individuals caught per species with relative abundance in parenthesis. Families, scientific names of species, and residency statuses are from Jensen et al. (2020).

Family	Species	English Name	Residency ^a	Conservation Status ^b	Mist-net captures
Accipitridae	<i>Spilornis holospilus</i>	Philippine Serpent Eagle	E (PH)	LC	1 (0.3%)
Alcedinidae	<i>Halcyon coromanda</i>	Ruddy Kingfisher	R	LC	1 (0.3%)
	<i>Halcyon smyrnensis</i>	White-throated Kingfisher	R	LC	1 (0.3%)
Apodidae	<i>Collocalia marginata</i>	Grey-rumped Swiftlet	R	LC	22 (7.3%)
	<i>Collocalia troglodytes</i>	Pygmy Swiftlet	E (PH)	LC	6 (2.0%)
Caprimulgidae	<i>Caprimulgus manillensis</i>	Philippine Nightjar	E (PH)	LC	4 (1.3%)
Cisticolidae	<i>Orthotomus nigriceps</i>	Black-headed Tailorbird	E (GM)	LC	1 (0.3%)
Columbidae	<i>Phapitreron amethystinus</i>	Amethyst Brown Dove	E (PH)	LC	3 (1.0%)
	<i>Chalcophaps indica</i>	Common Emerald Dove	R	LC	3 (1.0%)
	<i>Geopelia striata</i>	Zebra Dove	R	LC	1 (0.3%)
	<i>Treron vernans</i>	Pink-necked Green Pigeon	R	LC	1 (0.3%)
	<i>Phapitreron leucotis</i>	White-eared Brown Dove	E (PH)	LC	1 (0.3%)
Cuculidae	<i>Cuculus saturatus</i>	Himalayan Cuckoo	M	LC	1 (0.3%)
Dicaeidae	<i>Dicaeum australe</i>	Red-keeled Flowerpecker	E (PH)	LC	12 (4.0%)
	<i>Dicaeum hypoleucum</i>	Buzzing Flowerpecker	E (PH)	LC	8 (2.7%)
	<i>Prionochilus olivaceus</i>	Olive-backed Flowerpecker	E (PH)	LC	9 (3.0%)
Estrildidae	<i>Lonchura atricapilla</i>	Chestnut Munia	R	LC	2 (0.7%)
Hirundinidae	<i>Hirundo tahitica</i>	Pacific Swallow	R	LC	1 (0.3%)
Irenidae	<i>Irena cyanogastra</i>	Philippine Fairy-bluebird	E (PH)	NT	19 (6.3%)
Laniidae	<i>Lanius cristatus</i>	Brown Shrike	M	LC	5 (1.7%)
Locustellidae	<i>Cincloramphus timoriensis</i>	Tawny Grassbird	R	LC	2 (0.7%)
Muscicapidae	<i>Monticola solitarius</i>	Blue Rock Thrush	R	LC	1 (0.3%)
	<i>Saxicola caprata</i>	Pied Bush Chat	R	LC	1 (0.3%)
Nectariniidae	<i>Cinnyris jugularis</i>	Olive-backed Sunbird	R	LC	12 (4.0%)
	<i>Leptocoma sperata</i>	Purple-throated Sunbird	E (PH)	LC	20 (6.7%)
	<i>Anthreptes malacensis</i>	Brown-throated Sunbird	R	LC	2 (0.7%)
Phylloscopidae	<i>Phylloscopus olivaceus</i>	Philippine Leaf Warbler	E (PH)	LC	1 (0.3%)
Pycnonotidae	<i>Hypsipetes everetti</i>	Yellowish Bulbul	E (PH)	LC	35 (11.7%)
	<i>Poliolophus urostictus</i>	Yellow-wattled Bulbul	E (PH)	LC	55 (18.3%)
	<i>Pycnonotus goiavier</i>	Yellow-vented Bulbul	R	LC	34 (11.3%)
Strigidae	<i>Otus everetti</i>	Everett's Scops Owl	E (GM)	LC	1 (0.3%)
Sturnidae	<i>Aplonis panayensis</i>	Asian Glossy Starling	R	LC	5 (1.7%)
	<i>Sarcops calvus</i>	Coleto	R	LC	3 (1.0%)
	<i>Rhabdornis mystacalis</i>	Stripe-headed Rhabdornis	E (PH)	LC	1 (0.3%)
Timaliidae	<i>Macronous striaticeps</i>	Brown Tit-Babbler	E (PH)	LC	22 (7.3%)
Turnicidae	<i>Turnix suscitator</i>	Barred Buttonquail	R	LC	2 (0.7%)
Zosteropidae	<i>Zosterops everetti</i>	Everett's White-eye	R	LC	1 (0.3%)

^a R = resident; M = migrant; E (PH) = Philippine endemic; E (GM) = Greater Mindanao endemic.

^b Conservation status were based on the IUCN Red List. LC = Least Concern; NT = Near Threatened; CR = Critically Endangered.

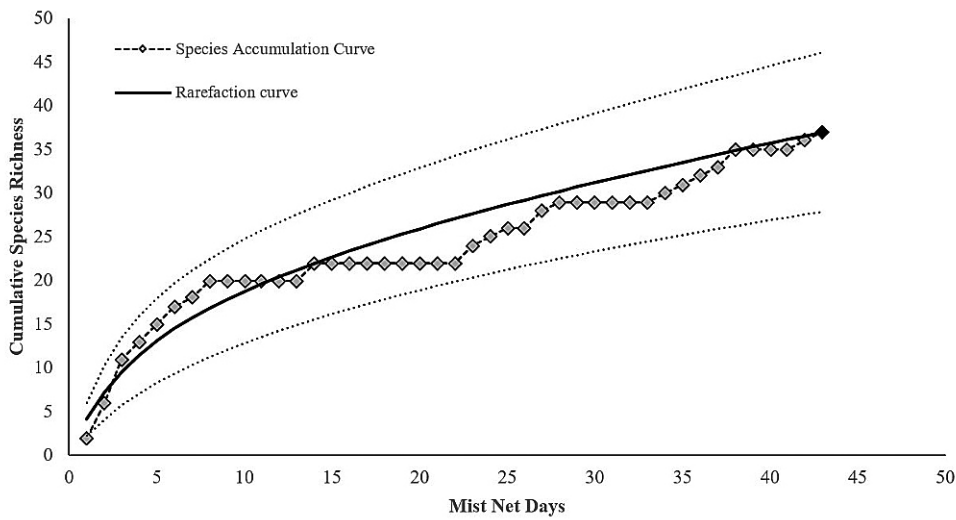


Figure 2. Species accumulation curve based on mist-net captures during the avifaunal survey in the municipalities of Basilisa and Loreto, Province of Dinagat Islands, Philippines. Black-filled diamond in the pooled accumulation curve represent the total captured species against the total mist-net days while dashed lines represents the 95% confidence intervals.

Table 4. Summary of published studies of birds in the Dinagat Islands. Included in the table are the number of families, species, total number of endemic species together with the endemicity rate in parenthesis, number of Philippine and Greater Mindanao endemics, and migrant species of each database.

	Heaney and Rabor 1982	Kennedy et al. 2000	Haribon 2004	Lepage 2021	Current study	Overall
No. of families	40	46	40	68	22	71
Species richness	91	115	74	235	37	246
Endemic species	38 (41.8%)	46 (40.0%)	36 (48.6%)	56 (24.2%)	17 (46.0%)	59 (24.0%)
Philippines	28	33	25	39	15	42
Greater Mindanao	10	13	11	17	2	17
Migrant species	14	15	2	53	2	56
Resident/migrant	2	3	1	15	—	15
Near endemic	2	2	2	5	—	5

Table 5. Annotated checklist of birds in the Dinagat Islands based on published studies, including our study. Included are residency status and conservation status from the IUCN (2021) Red List. Family and species, as well as residency statuses, are based on Jensen et al. (2020). Highlighted species are newly reported from the Dinagat Islands.

Taxon	Residency ^a	Conservation status ^b	Heaney and Rabor 1982	Kennedy et al. 2000	Haribon 2004	Lepage 2021	Current study
Acanthizidae							
<i>Gerygone sulphurea</i>	R	LC				+	
Accipitridae							
<i>Accipiter trivirgatus</i>	R	LC	+	+	+	+	
<i>Haliastur indus</i>	R	LC	+	+	+	+	
<i>Spilornis holospilus</i>	E (PH)	LC	+	+	+	+	+
<i>Pernis steerei</i>	E (PH)	LC		+	+	+	
<i>Butastur indicus</i>	M	LC				+	
<i>Haliaeetus leucogaster</i>	R	LC				+	
<i>Nisaetus pinskeri</i>	E (PH)	EN				+	
<i>Elanus caeruleus</i>	R	LC				+	
<i>Pernis ptilorhynchus</i>	R/M	LC				+	
<i>Aviceda jerdoni</i>	R	LC				+	
<i>Nisaetus cirrhatus</i>	R	LC				+	
<i>Circus melanoleucos</i>	R/M	LC				+	
<i>Accipiter virgatus</i>	R	LC				+	
<i>Ichthyophaga ichthyaetus</i>	R	NT				+	
Acrocephalidae							
<i>Acrocephalus orientalis</i>	M	LC				+	
<i>Acrocephalus stentoreus</i>	R	LC				+	
Alaudidae							
<i>Mirafrja javanica</i>	R	LC				+	

Taxon	Residency ^a	Conservation status ^b	Heaney and Rabor 1982	Kennedy et al. 2000	Haribon 2004	Lepage 2021	Current study
Alcedinidae							
<i>Halcyon smyrnensis</i>	R	LC	+	+		+	+
<i>Pelargopsis capensis</i>	R	LC	+	+	+	+	
<i>Todiramphus chloris</i>	R	LC	+	+	+	+	
<i>Ceyx argentatus</i>	E (GM)	NT		+	+	+	
<i>Halcyon coromanda</i>	R/M	LC				+	+
<i>Ceyx margarethae</i>	E (PH)	LC				+	
Anatidae							
<i>Dendrocygna arcuata</i>	R	LC	+	+	+	+	
<i>Spatula querquedula</i>	M	LC				+	
Anhingidae							
<i>Anhinga melanogaster</i>	R	NT				+	
Apodidae							
<i>Aerodramus amelis</i>	E (PH)	LC	+	+		+	
<i>Collocalia marginata</i>	E (PH)	LC	+	+	+	+	+
<i>Collocalia troglodytes</i>	E (PH)	LC	+	+	+	+	+
<i>Apus pacificus</i>	M	LC				+	
<i>Cypsiurus balasiensis</i>	R	LC		+		+	
Ardeidae							
<i>Butorides striata</i>	R/M	LC	+	+	+	+	
<i>Egretta sacra</i>	R	LC	+	+	+	+	
<i>Ixobrychus cinnamomeus</i>	R	LC		+		+	
<i>Ardea alba</i>	R/M	LC				+	
<i>Bubulcus coromandus</i>	R/M	LC				+	
<i>Egretta garzetta</i>	R/M	LC				+	
<i>Nycticorax caledonicus</i>	R/M	LC				+	
<i>Ixobrychus sinensis</i>	R	LC				+	
<i>Ixobrychus eurhythmus</i>	M	LC				+	
<i>Ixobrychus flavicollis</i>	R	LC				+	
<i>Gorsachius goisagi</i>	M	EN				+	
<i>Gorsachius melanolophus</i>	R	LC				+	
<i>Ardea purpurea</i>	R	LC				+	
<i>Ardea intermedia</i>	R/M	LC				+	
Artamidae							
<i>Artamus leucorhynchus</i>	R	LC	+	+	+	+	
Bucerotidae							
<i>Buceros hydrocorax</i>	E (PH)	VU	+	+	+	+	
<i>Penelopides affinis</i>	E (GM)	LC	+	+	+	+	
<i>Rhabdotorrhinus leucocephalus</i>	E (GM)	NT	+	+	+	+	
Burhinidae							
<i>Esacus magnirostris</i>	R	NT				+	
Cacatuidae							
<i>Cacatua haematuropygia</i>	E (PH)	CR	+	+	+	+	
Campephagidae							
<i>Lalage nigra</i>	R	LC	+	+	+	+	
<i>Pericrocotus speciosus</i>	R	LC				+	
<i>Coracina striata</i>	R	LC				+	
Caprimulgidae							
<i>Lyncornis macrotis</i>	R	LC	+	+		+	
<i>Caprimulgus affinis</i>	R	LC				+	
<i>Caprimulgus jotaka</i>	M	LC				+	
<i>Caprimulgus manillensis</i>	E (PH)	LC					+
Charadriidae							
<i>Charadrius mongolus</i>	M	LC	+	+			
<i>Pluvialis fulva</i>	M	LC	+	+		+	
<i>Pluvialis squatarola</i>	M	LC	+	+			
<i>Charadrius peronii</i>	R	NT		+		+	
<i>Charadrius dubius</i>	R/M	LC				+	
<i>Charadrius alexandrinus</i>	M	LC				+	
<i>Charradrius leschenaultia</i>	M	LC				+	
Ciconiidae							
<i>Ciconia episcopus</i>	R	VU				+	

Taxon	Residency ^a	Conservation status ^b	Heaney and Rabor 1982	Kennedy et al. 2000	Haribon 2004	Lepage 2021	Current study
Cisticolidae							
<i>Cisticola exilis</i>	R	LC	+	+	+	+	
<i>Orthotomus nigriceps</i>	E (GM)	LC	+			+	+
<i>Cisticola juncidis</i>	R	LC		+		+	
<i>Orthotomus frontalis</i>	E (GM)	LC		+	+	+	
Columbidae							
<i>Chalcophaps indica</i>	R	LC	+	+		+	+
<i>Columba vitiensis</i>	R	LC	+	+		+	
<i>Ducula poliocephala</i>	E (PH)	NT	+	+		+	
<i>Gallicolumba crinigera</i>	E (GM)	VU	+	+	+	+	
<i>Phapitreon amethystinus</i>	E (PH)	LC	+	+	+	+	+
<i>Phapitreron leucotis</i>	E (PH)	LC	+	+	+	+	+
<i>Ptilinopus occipitalis</i>	E (PH)	LC	+	+	+	+	
<i>Streptopelia chinensis</i>	R	LC	+	+	+	+	
<i>Streptopelia bitorquata</i>	R	LC	+	+	+		
<i>Treron vernans</i>	R	LC	+	+	+	+	+
<i>Ducula aenea</i>	R	LC				+	
<i>Geopelia striata</i>	R	LC		+	+	+	+
<i>Treron axillaris</i>	E (PH)	LC		+		+	
<i>Caloenas nicobarica</i>	R	NT				+	
Coraciidae							
<i>Eurystomus orientalis</i>	R	LC				+	
Corvidae							
<i>Corvus macrorhynchos</i>	R	LC	+	+	+	+	
Cuculidae							
<i>Cacomantis merulinus</i>	R	LC	+	+		+	
<i>Centropus melanops</i>	E (GM)	LC	+	+	+	+	
<i>Centropus viridis</i>	E (PH)	LC	+	+		+	
<i>Cuculus micropterus</i>	M	LC	+	+			
<i>Eudynamis scolopaceus</i>	R	LC	+	+	+	+	
<i>Cacomantis sepulcralis</i>	R	LC				+	
<i>Centropus bengalensis</i>	R	LC				+	
<i>Clamator coromandus</i>	M	LC				+	
<i>Chrysococcyx xanthorhynchus</i>	R	LC				+	
<i>Surniculus lugubris</i>	R	LC				+	
<i>Hierococcyx sparverioides</i>	M	LC				+	
<i>Cuculus optatus</i>	M	LC				+	
<i>Cuculus saturatus</i>	M	LC				+	+
Dicaeidae							
<i>Dicaeum australe</i>	E (PH)	LC	+	+	+	+	+
<i>Dicaeum bicolor</i>	E (PH)	LC	+	+		+	
<i>Dicaeum hypoleucum</i>	E (PH)	LC	+	+	+	+	+
<i>Dicaeum trigonostigma</i>	R	LC	+			+	
<i>Prionochilus olivaceus</i>	E (PH)	LC	+	+	+	+	+
<i>Dicaeum ignipectus</i>	R	LC				+	
Dicruridae							
<i>Dicrurus hottentottus</i>	R	LC				+	
Estrildidae							
<i>Lonchura leucogastra</i>	R	LC	+	+	+	+	+
<i>Lonchura atricapilla</i>	R	LC	+	+	+	+	
Eurylaimidae							
<i>Sarcophanops steerii</i>	E (GM)	VU	+	+	+	+	
Falconidae							
<i>Falco severus</i>	R	LC	+	+		+	
<i>Microhierax erythrogenys</i>	E (GM)	LC				+	
<i>Falco peregrinus</i>	R/M	LC				+	
Fregatidae							
<i>Fregata ariel</i>	M	LC				+	
<i>Fregata minor</i>	M	LC				+	
Hemiprocnidae							
<i>Hemiprocne comata</i>	R	LC				+	

Taxon	Residency ^a	Conservation status ^b	Heaney and Rabor 1982	Kennedy et al. 2000	Haribon 2004	Lepage 2021	Current study
Hirundinidae							
<i>Hirundo tahitica</i>	R	LC		+	+	+	
<i>Hirundo rustica</i>	M	LC				+	
<i>Delichon dasypus</i>	A	LC				+	
Irenidae							
<i>Irena cyanogastra</i>	E (PH)	NT	+	+	+	+	+
Jacaniidae							
<i>Hydrophasianus chirurgus</i>	R	LC				+	
<i>Irediparra gallinacea</i>	R	LC				+	
Laniidae							
<i>Lanius cristatus</i>	M	LC	+	+	+	+	+
<i>Lanius schach</i>	R	LC				+	
Laridae							
<i>Anous stolidus</i>	R	LC		+		+	
<i>Sterna sumatrana</i>	R	LC		+		+	
<i>Sternula albifrons</i>	R/M	LC		+		+	
<i>Onychoprion fuscatus</i>	R/M	LC				+	
<i>Onychoprion anaethetus</i>	R	LC				+	
<i>Chlidonias hybrida</i>	M	LC				+	
<i>Chlidonias leucopterus</i>	M	LC				+	
<i>Sterna dougallii</i>	M	LC				+	
<i>Sterna hirundo</i>	R	LC				+	
<i>Thalasseus bergii</i>	R	LC				+	
Locustellidae							
<i>Megalurus palustris</i>	R	LC		+	+	+	
<i>Cincloramphus timoriensis</i>	R	LC		+		+	+
<i>Locustella lanceolata</i>	M	LC				+	
<i>Helopsaltes fasciolatus</i>	M	LC				+	
Megalaimidae							
<i>Psilopogon haemacephalus</i>	R	LC				+	
Megapodiidae							
<i>Megapodius cumingii</i>	R	LC		+	+	+	
Meropidae							
<i>Merops viridis</i>	R	LC	+	+	+	+	
<i>Merops philippinus</i>	R	LC				+	
Monarchidae							
<i>Hypothymis helena</i>	E (PH)	NT	+	+	+	+	
<i>Terpsiphona cinnamomea</i>	NE	LC	+	+	+	+	
<i>Hypothymis coelestis</i>	E (PH)	VU		+	+	+	
<i>Hypothymis azurea</i>	R	LC				+	
Motacillidae							
<i>Anthus gustavi</i>	M	LC	+	+		+	
<i>Anthus richardi</i>	A	LC	+	+	+		
<i>Motacilla cinerea</i>	M	LC	+	+		+	
<i>Motacilla tschutschensis</i>	M	LC		+	+	+	
<i>Anthus hodgsoni</i>	M	LC				+	
<i>Anthus cervinus</i>	M	LC				+	
<i>Anthus rufulus</i>	R	LC				+	
Muscicapidae							
<i>Copsychus mindanensis</i>	E (PH)	LC	+	+	+	+	
<i>Ficedula basilanica</i>	E (GM)	VU	+	+	+	+	
<i>Monticola solitarius</i>	R/M	LC	+	+		+	+
<i>Muscicapa griseisticta</i>	M	LC	+	+		+	
<i>Cyornis ruficastra</i>	R	LC		+		+	
<i>Cyornis ruficauda</i>	R	LC				+	
<i>Saxicola caprata</i>	R	LC				+	+
<i>Cyanoptila cyanomelana</i>	M	LC				+	
Nectariniidae							
<i>Aethopyga pulcherrima</i>	E (GM)	LC	+	+	+	+	
<i>Anthreptes malacensis</i>	R	LC	+	+	+	+	+
<i>Leptocoma sperata</i>	E (PH)	LC	+	+	+	+	+
<i>Aethopyga bella</i>	E (PH)	LC		+	+	+	

Taxon	Residency ^a	Conservation status ^b	Heaney and Rabor 1982	Kennedy et al. 2000	Haribon 2004	Lepage 2021	Current study
<i>Arachnothera flammifera</i>	E (GM)	LC		+		+	
<i>Cinnyris jugularis</i>	R	LC		+		+	+
Oriolidae							
<i>Oriolus chinensis</i>	R	LC		+	+	+	
<i>Oriolus steerii</i>	E (GM)	LC				+	
Pachycephalidae							
<i>Pachycephala philippinensis</i>	E (PH)	LC	+			+	
Pandionidae							
<i>Pandion haliaetus</i>	M	LC				+	
Paridae							
<i>Periparus elegans</i>	E (PH)	LC				+	
Passeridae							
<i>Passer montanus</i>	I	LC				+	
Pellornidae							
<i>Ptilocichla mindanensis</i>	E (GM)	LC				+	
Phaethontidae							
<i>Phaethon rubricauda</i>	A	LC				+	
Phasianidae							
<i>Excalfactoria chinensis</i>	R	LC		+	+	+	
<i>Gallus gallus</i>	R	LC				+	
Phylloscopidae							
<i>Phylloscopus borealis</i>	M	LC	+	+		+	
<i>Phylloscopus olivaceus</i>	E (PH)	LC	+	+	+	+	+
<i>Phylloscopus examinandus</i>	M	LC				+	
<i>Phylloscopus xanthodryas</i>	M	LC				+	
Picidae							
<i>Yungipicus maculatus</i>	E (PH)	LC	+	+	+	+	
<i>Dryocopus javensis</i>	R	LC	+	+	+	+	
<i>Chrysocolaptes lucidus</i>	E (GM)	LC				+	
Pittidae							
<i>Pitta sordida</i>	R	LC	+	+	+	+	
<i>Pitta erythrogaster</i>	NE	LC				+	
Podicipedidae							
<i>Tachybaptus ruficollis</i>	R	LC				+	
Procellariidae							
<i>Ardenna pacifica</i>	M	LC				+	
<i>Calonectris leucomelas</i>	M	LC				+	
<i>Bulweria bulwerii</i>	A	LC				+	
Psittaculidae							
<i>Loriculus philippinensis</i>	E (PH)	LC		+		+	
<i>Tanygnathus lucionensis</i>	NE	NT				+	
Pycnonotidae							
<i>Hypsipetes everetti</i>	E (PH)	LC	+	+	+	+	+
<i>Poliolophus urostictus</i>	E (PH)	LC	+	+	+	+	+
<i>Pycnonotus goiavier</i>	R	LC	+	+	+	+	+
<i>Hypsipetes philippinus</i>	E (PH)	LC				+	
Rallidae							
<i>Porzana cinerea</i>	R	LC	+	+		+	
<i>Amaurornis phoenicurus</i>	R	LC	+	+	+	+	
<i>Gallirallus torquatus</i>	R	LC	+			+	
<i>Porzana pusilla</i>	M	LC	+	+		+	
<i>Amaurornis olivacea</i>	E (PH)	LC		+		+	
<i>Gallixrex cinerea</i>	R	LC		+		+	
<i>Gallirallus striatus</i>	R	LC				+	
<i>Rallina fasciata</i>	SU	LC				+	
<i>Rallina eurizonoides</i>	R	LC				+	
<i>Gallirallus philippensis</i>	R	LC				+	
<i>Porzana pusilla</i>	R	LC				+	
<i>Porphyrio pulverulentus</i>	E (PH)	LC				+	
<i>Gallinula chloropus</i>	R/M	LC				+	
Rhipiduridae							
<i>Rhipidura nigritorquis</i>	E (PH)	LC	+	+			

Taxon	Residency ^a	Conservation status ^b	Heaney and Rabor 1982	Kennedy et al. 2000	Haribon 2004	Lepage 2021	Current study
Rostratulidae							
<i>Rostratula benghalensis</i>	R	LC	+	+		+	
Scolopacidae							
<i>Actitis hypoleucos</i>	M	LC	+	+		+	
<i>Gallinago megala</i>	M	LC	+	+		+	
<i>Numenius phaeopus</i>	M	LC	+	+		+	
<i>Tringa brevipes</i>	M	LC	+	+		+	
<i>Limosa lapponica</i>	M	NT				+	
<i>Arenaria interpres</i>	M	LC				+	
<i>Calidris pugnax</i>	M	LC				+	
<i>Calidris acuminata</i>	M	LC				+	
<i>Calidris subminuta</i>	M	LC				+	
<i>Calidris ruficollis</i>	M	NT				+	
<i>Calidris alba</i>	M	LC				+	
<i>Gallinago gallinago</i>	M	LC				+	
<i>Tringa nebularia</i>	M	LC				+	
<i>Tringa tetanus</i>	M	LC				+	
<i>Tringa glareola</i>	M	LC				+	
Stenostiridae							
<i>Cullicapa helianthea</i>	R	LC			+		
Strigidae							
<i>Otus everetti</i>	E (GM)	LC	+	+	+	+	+
<i>Otus gurneyi</i>	E (GM)	VU	+	+	+	+	
<i>Ninox spilocephala</i>	E (GM)	NT		+		+	
<i>Ninox scutulata</i>	R	LC				+	
<i>Ninox randi</i>	NE	NT				+	
Sturnidae							
<i>Rhabdornis mystacalis</i>	E (PH)	LC	+	+	+	+	+
<i>Aplonis panayensis</i>	R	LC	+	+	+	+	+
<i>Sarcops calvus</i>	R	LC	+	+	+	+	+
Sulidae							
<i>Sula sula</i>	R	LC				+	
<i>Sula leucogaster</i>	R/M	LC				+	
Timaliidae							
<i>Macronus striaticeps</i>	E (PH)	LC	+	+	+	+	+
Trogonidae							
<i>Harpactes ardens</i>	E (PH)	LC	+	+	+	+	
Turdidae							
<i>Zoothera andromedae</i>	R	LC			+		
<i>Turdus obscurus</i>	M	LC				+	
Turnicidae							
<i>Turnix sylvaticus</i>	R	LC				+	
<i>Turnix suscitator</i>	R	LC					+
Tytonidae							
<i>Tyto longimembris</i>	R	LC				+	
Zosteropidae							
<i>Zosterops everetti</i>	NE	LC	+	+	+	+	+
<i>Sterrhoptilus capitalis</i>	E (GM)	LC				+	

^a R = resident; I = introduced; M = migrant; NE = near endemic; E (PH) = Philippine endemic; E (GM) = Greater Mindanao endemic; SU = status unknown; A = accidental; R/M = resident with migrant populations.

^b Conservation statuses were based on the IUCN Red List. LC = Least Concern; NT = Near Threatened; VU = Vulnerable; EN = Endangered; CR = Critically Endangered.

(+) indicates presence of a species in a particular study/database.

List: 15 Near Threatened, seven Vulnerable, two Endangered, and one Critically Endangered (Table 4). The family Scolopacidae was the most species-rich, with 15 species, followed by Accipitridae, Ardeidae, and Columbidae with 14 species each (Table 5).

Two species are newly reported from the Dinagat Islands: *Caprimulgus manillensis* Walden, 1875 and the *Turnix suscitator* (Gmelin, 1789). We describe the notable species captured in our mist nets during our field survey.

Accipitridae

Spilornis holospilus Virgors, 1821

Philippine Serpent Eagle

Figure 3A

Material examined. PHILIPPINES – **Dinagat Islands** • Mount Magkuno, Loreto; 10°24'52"N, 125°37'12"E; 319 m a.s.l.; 05.VI.2019; G. Villancio leg.; mist-net capture; 1 ♂ juvenile.

Identification. A Philippine endemic found throughout the country except the Palawan Faunal Region. Common in riverine forests, wooded foothills, and open country. Identifiable by its fan-shaped crest on the nape and broad white bands near trailing edge in its under wing. Immature individuals have a buff head with dark brown streaks and bars in its crest. Distinguishable from *Spilornis cheela* Latham, 1790 by its geographic distribution, primarily occurring in the Palawan Faunal Region, and by its more defined spots on the underside and wings, broader crest, and un-feathered tarsi (Ferguson-Lees and Christie 2001).

Alcedinidae

Halcyon coromanda Latham, 1790

Ruddy Kingfisher

Figure 3B

Material examined. PHILIPPINES–**Dinagat Islands** • Cambiatao, Basilisa; 10°5'58"N, 125°33'24"E; 138 m a.s.l.; 21.X.2017; G. Labiano leg.; mist-net capture; 1 ♀ adult.

Identification. Found in all major islands in the Philippines except Panay, Samar, and Leyte. Uncommon in forests, second growth, and mangroves and along forest streams. *Halcyon coromanda* has a rufous with bluish-violet and whitish throat, silvery white stripe with blue that runs from the back up to the rump. Bills and legs are reddish orange (Kennedy et al. 2000; BirdLife International 2021)

Halcyon smyrnensis (Linnaeus, 1758)

White-throated Kingfisher

Figure 3C

Material examined. PHILIPPINES–**Dinagat Islands** • Cambiatao, Basilisa; 10°05'58"N, 125°33'24"E; 125 m a.s.l.; 03.VI.2019; G. Labiano leg.; mist-net capture; 1 ♂ subadult.

Identification. Found throughout the islands in the Philippines and common near rivers and, streams and in open country and forests. *Halcyon smyrnensis* is a medium-sized kingfisher found throughout the country. Identified by its rufous head, breast, and belly. Distinguished by its white throat and turquoise-blue back, wing, and tail, with bill, legs, and eye ring orange-red (Kennedy et al. 2000).

Cisticolidae

Orthotomus nigriceps Tweeddale, 1878

Black-headed Tailorbird

Material examined. PHILIPPINES–**Dinagat Islands** • Mount Magkuno, Loreto; 10°24'52"N, 125°37'12"E; 319 m a.s.l.; 17.VI.2019; G. Labiano leg.; mist-net capture; 1 ♂ subadult.

Identification. Endemic to the Greater Mindanao Faunal Region. Common amongst the dense tangles in forest understory, forest edges, and secondary growth. Distinguished by its black head with white lores, eye-ring, and eyebrow, and yellowish-olive body, which is darker on the tail. Wing coverts are black, edged with olive green and yellow; lower breast and belly are dark grey with white tips forming a scalloped appearance. Females are similar to males, but throat, breast, and belly are white, throat and upper breast with dark grey flecking. Upper mandible black and lower mandible pearly white (Kennedy et al. 2000).

Columbidae

Phapitreron amethystinus Bonaparte, 1855

Amethyst Brown Dove

Figure 3D

Materials examined. PHILIPPINES–**Dinagat Islands** • Mount Arayat, Basilisa; 10°07'30"N, 125°37'03"E; 395 m a.s.l.; 14.IV.2018; G. Labiano leg.; mist-net capture; 1 ♀ adult • Mount Arayat, Basilisa; 10°07'30"N, 125°37'03"E; 395 m a.s.l.; 15.IV.2018; G. Labiano leg.; mist-net capture; 1 ♂ adult • Mount Arayat, Basilisa; 10°07'30"N, 125°37'03"E; 395 m a.s.l.; 22.VI.2018; R. Sales leg.; mist-net capture; 1 ♂ adult.

Identification. A Philippine endemic species that is distributed throughout the country except Masbate, Mindoro, Panay, Palawan, Batanes, and the Babuyan group of islands. Commonly inhabits patches of original dipterocarp forest and transition forest in lowlands, small valleys, and flatlands among the hills and slope of scrub forests. A large brown dove with dark grey head and reddish, naked skin surrounding the eyes. Below the eyes, a black line and another buff line directly below runs from the mouth to the nape. Upperparts are iridescent purple, and rump, tail, and wing greyish brown. Throat rusty brown, becoming greyer on the belly and cinnamon-colored from the lower belly to the tail. Bill black and legs purplish red (Kennedy et al. 2000; DENR 2019).



Figure 3. Species captured in Dinagat Islands during our survey. **A.** *Spilornis holospilus*. **B.** *Halcyon coromanda*. **C.** *Halcyon smyrnensis*. **D.** *Phapitreron amethystinus*. **E.** *Phapitreron leucotis*. **F.** *Treron vernans*.

***Phapitreron leucotis* (Temminck, 1823)**

White-eared Brown Dove

Figure 3E

Material examined. PHILIPPINES–**Dinagat Islands**

• Cambiatao, Basilisa; 10°05'58"N, 125°33'24"E; 138 m a.s.l.; 03.VI.2019; G. Labiano leg.; mist-net capture; 1 ♀ adult.

Identification. A Philippine endemic distributed throughout the country except in the Palawan islands. Common in a variety of habitats from second growth to montane forests. Smaller than *P. amethystinus*. A brown dove with greenish- to reddish-bronze iridescence on the collar; tail broadly striped with grey; sides of throat rufous and throat light reddish becoming darker on the breast, then yellowish on belly. Bill black and legs red (Kennedy et al. 2000).

***Treron vernans* (Linnaeus, 1771)**

Pink-necked Green Pigeon

Figure 3F

Material examined. PHILIPPINES–**Dinagat Islands**

• Cambiatao, Basilisa; 10°5'58"N, 125°33'24"E; 138 m a.s.l.; 22.X.2017; G.Labiano leg.; mist-net capture; 1 ♀ specimen.

Identification. Resident of the Philippines, distributed throughout the country, except in the Batanes and Babuyan groups of islands. Common in mangroves, cultivated areas, and lowland forests. A brightly colored green pigeon with a notable pinkish neck, black-and

yellow wing feathers, and bright yellow undertail. Males are distinguished by their brighter pink necks, bright orange breast patch, and gray-blue crown, while females are plainer than males, with greenish head feathers and yellow-green vents (Kennedy et al. 2000).

Dicaeidae

***Dicaeum australe* (Hermann, 1783)**

Red-keeled Flowerpecker

Figure 4A

Material examined. PHILIPPINES–**Dinagat Islands** •

Mount Arayat Basilisa; 10°07'30"N, 125°37'03"E; 400 m a.s.l.; 15.IV.2018, 22.VI.2018, 23.VI.2018, 11.VI.2019; J.F. Beloy & R. Sales leg.; mist-net capture; mist-net capture; 4 specimens (3 ♀, 1 ♂) • Mount Bil-at, Loreto; 10°24'28"N, 125°39'51"E; 92 m a.s.l.; 12.VI.2018; J.F. Beloy leg.; mist-net capture; 2 ♂ adults • Rosita, Basilisa; 10°24'28"N, 125°33'29"E; 295 m a.s.l.; 29.V.2019; R. Sales leg.; mist-net capture; 1 ♂ Adult, 1 ♀ subadult • Cambiatao, Basilisa; 10°05'58"N, 125°33'24"E; 138 m a.s.l.; 03.VI.2019, 04.VI.2019; R. Sales leg.; mist-net capture; 2 specimens (1 ♂, 1 ♀) • Mount Magkuno, Loreto; 10°24'52"N, 125°37'12"E; 319 m a.s.l.; 18.VI.2019; G. Labiano leg.; mist-net capture; 1 ♂ specimen.

Identification. A Philippine endemic species that is distributed throughout the country except on Mindoro, Palawan, Sibuyan Island, Panay, and Negros. Common in forest canopies, forest edges, secondary growth, and shrubs in open country. *Dicaeum australe* is one of the



Figure 4. Species captured in the Dinagat Islands during our survey. **A.** *Dicaeum australe*. **B.** *Dicaeum hypoleucum*. **C.** *Prionochilus olivaceus*. **D.** *Irena cyanogastra*. **E.** *Leptocoma sperata*. **F.** *Macronous striaticeps*.

most common flowerpecker species captured in our mist nets. Upperparts glossy blue-black; chin and sides of throat white, and the rest of the underparts grey with a characteristic narrow scarlet stripe down center to the breast and belly. Females are similar to males but paler. The rather long curved beak and legs are black (Kennedy et al. 2000).

***Dicaeum hypoleucum* Sharpe, 1876**

Buzzing Flowerpecker

Figure 4B

Material examined. PHILIPPINES–**Dinagat Islands** • Mount Arayat, Basilisa; 10°07'30"N, 125°37'03"E; 400 m a.s.l.; 22.VI.2018, 23.VI.2018, 09.VI.2019, 11.VI.2019 ; J.F. Beloy, G. Labiano & G. Villancio leg.; mist-net capture; 8 specimens (5 ♂, 3 ♀).

Identification. A Philippine endemic species found only in the islands that form the part of the Luzon and Mindanao Faunal Regions. Common in the understory layer of forests, forest edges, and secondary growth forests. A small bird with dark brown upperparts and greyish white below; long, thin bill black, and legs dark brown to grey (Kennedy et al. 2000).

***Prionochilus olivaceus* Tweeddale, 1877**

Olive-backed Flowerpecker

Figure 4C

Material examined. PHILIPPINES–**Dinagat Islands** • Mount Arayat, Basilisa; 10°07'30"N, 125°37'03"E; 400

m a.s.l.; 13.IV.2018, 21.VI.2018, 22.VI.2018, 09.VI.2019, 10.VI.2019; R. Sales leg.; mist-net capture; 8 specimens (6 ♂, 2 ♀) • Mount Magkuno, Loreto; 10°24'52"N, 125°37'12"E; 319 m a.s.l.; 15.VI.2019; G. Labiano leg.; mist-net capture; 1 ♂ adult.

Identification. A Philippine endemic species occurring only in the islands that form the part of the Luzon and Mindanao Faunal Regions. Common in the understory layer of the forest, forest edges, and secondary growth forests. Olive green upperparts with white stripes down center of the greyish throat and breast. Upper mandible of bill black, and lower mandible blue-grey with a black tip.

Irenidae

***Irena cyanogastra* Vigors, 1831**

Philippine Fairy-bluebird

Figure 4D

Material examined. PHILIPPINES–**Dinagat Islands** • Mount Arayat, Basilisa; 10°07'32"N, 125°37'05"E; 398 m a.s.l.; 12.IV.2018, 13.IV.2018, 14.IV.2018, 21.VI.2018, 22.VI.2018, 09.VI.2019, 10.VI.2019, 12.VI.2019; J.F. Beloy, G. Labiano & R. Sales leg.; mist-net capture; 15 specimens (7 ♀, 8 ♂) • Mount Bil-at, Loreto; 10°24'28.8"N, 125°39'51.8"E; 92 m a.s.l.; 13.VI.2018; J.F. Beloy leg.; mist-net capture; 1 specimen • Mount Magkuno, Loreto; 10°24'52"N, 125°37'12"E; 319 m a.s.l.; 15.VI.2019; G. Villancio leg.; mist-net capture; 3 ♂ adults.

Identification. A Philippine endemic species restricted

to the Luzon and Mindanao Faunal Regions. Near Threatened according to the IUCN (2021). Common in forest canopies, either flying singly or in small flocks. Contrasting blue and black plumage; black above the bill to the upper breast; cap royal blue with slight violet tinge; rest of the body deep indigo blue. Upper tail coverts tipped with royal blue and wing coverts tipped with blackish blue. Underparts below breast deep indigo; undertail-coverts deep indigo-blue, broadly tipped glossy royal blue. Iris blood-red; bill and legs black. Female similar to male but with duller plumage (Kennedy et al. 2000; IUCN 2020; Wells 2020; BirdLife International 2021).

Nectariniidae

Leptocoma sperata (Linnaeus, 1766)

Purple-throated Sunbird

Figure 4E

Material examined. PHILIPPINES—**Dinagat Islands** • Cambiatao, Basilisa; 10°05'58"N, 125°33'24"E; 138 m a.s.l.; 21.X.2017, 02.VI.2019; G. Labiano leg.; mist-net capture; 3 ♀ adults • Mount Arayat, Basilisa; 10°07'32"N, 125°37'05"E; 398 m a.s.l.; 12.IV.2018, 13.VI.2018, 21.VI.2018, 22.VI.2018; J.F. Beloy leg.; mist-net capture; 1 ♀ adult, 3 ♂ Adult • Mount Magkuno, Loreto; 10°24'52"N, 125°37'12"E; 319 m a.s.l.; 24.IV.2018, 15.VI.2019; R. Sales leg.; 3 ♂ adults • Mount Bil-at, Loreto; 10°24'28"N, 125°39'51"E; 92 m a.s.l.; 12.VI.2018; J.F. Beloy leg.; mist-net capture; 1 ♂ adult • Rosita, Basilisa; 10°24'28"N, 125°33'29"E; 295 m a.s.l.; 27.V.2019, 28.V.2019, 29.V.2019, 30.V.2019; R. Sales leg.; mist-net capture; 9 specimens (4♂, 5 ♀)

Identification. A resident of the Philippines also in southeast Asia, Sumatra, Java, India, and Borneo. Common in lowlands, including mangroves and secondary growth, in cultivated areas, and in gardens. The most abundant species in the family Nectariniidae. Males very colorful, with iridescent, coppery-green crown and neck; maroon mantle, and characteristic iridescent purple chin and throat. Females smaller than males and mostly olive with brown edging and yellowish to whitish on the breast and vent. Bill and legs black (Kennedy et al. 2000; Cheke et al. 2020).

Timaliidae

Macronus striaticeps Sharpe, 1877

Brown Tit-Babbler

Figure 4F

Material examined. PHILIPPINES—**Dinagat Islands** • Mount Arayat, Basilisa; 10°07'32"N, 125°37'05"E; 398 m a.s.l.; 12.IV.2018, 21.VI.2018, 22.VI.2018, 09.VI.2019, 10.VI.2019; G.Labiano & R. Sales leg.; mist-net capture; 5 ♂ (3 subadults, 2 adults) • Mount Bil-at, Loreto; 10°24'28"N, 125°39'51"E; 92 m a.s.l.; 19.IV.2018, 20.IV.2018; G.Labiano leg.; mist-net capture; 1 ♂ adult, 1 ♀ adult • Mount Magkuno, Loreto; 10°24'52"N, 125°37'12"E; 319 m a.s.l.; 15.VI.2019,

16.VI.2019; G.Villancio leg.; mist-net capture; 2 ♀ (1 subadult, 1 adult) • Cambiatao, Basilisa; 10°05'58"N, 125°33'24"E; 138 m a.s.l.; mist-net capture; 2 specimens • Rosita, Basilisa; 10°24'28"N, 125°33'29"E; 295 m a.s.l.; 30.IV.2018, 27.V.2019, 28.V.2019, 29.V.2019; G.Labiano & R. Sales leg.; mist-net capture; 2 ♀ (1 subadult, 1 adult), 7 specimens.

Identification. A Philippine endemic, common in dense underbrush of forests, forest edges, and secondary growth. Head and sides of face black, with prominent white shaft streaks; upperparts rufous brown, feathers of middle back with long white shafts extending beyond base of tail; throat white to buff; underparts rufous, mottled with buff white; bill and legs dark pearly grey (Kennedy et al. 2000).

Pycnonotidae

Poliolophus urostictus (Salvadori, 1870)

Yellow-wattled Bulbul

Figure 5B

Materials examined. PHILIPPINES—**Dinagat Islands** • Cambiatao, Basilisa; 10°05'58"N, 125°33'24"E; 138 m a.s.l.; 01.II.2018, 03.VI.2019; G. Labiano leg.; 1 specimen • Mount Arayat, Basilisa; 10°07'32"N, 125°37'05"E; 398 m a.s.l.; 12.IV.2018, 13.IV.2018, 14.IV.2018, 21.VI.2018, 22.VI.2018, 08.VI.2019, 09.VI.2019, 10.VI.2019, 11.VI.2019; G.Labiano, R. Sales, & J.F. Beloy leg.; mist-net capture; 11 ♀ (7 adult, 4 subadult), 10 ♂ (9 adults, 1 subadult) • Mount Bil-at, Loreto; 10°24'28"N, 125°39'51"E; 92 m a.s.l.; 21.IV.2018, 12.VI.2018; R. Sales leg.; 3 specimens • Rosita, Basilisa; 10°24'28"N, 125°33'29"E; 295 m a.s.l.; 30.IV.2018, 02.V.2018, 27.V.2019, 28.V.2019, 29.V.2019, 30.V.2019; R. Sales & G.Labiano leg.; 9 ♀ (4 adults, 5 subadults), 8 ♂ (5 adults, 4 subadults) • Mount Magkuno, Loreto; 10°24'52"N, 125°37'12"E; 319 m a.s.l.; 15.VI.2019, 16.VI.2019, 17.VI.2019, 18.VI.2019; R. Sales & G. Labiano leg.; 4 ♀ adults, 4 ♂ adults.

Identification. A Philippine endemic distributed throughout the country, except on the islands of Cebu, Masbate, Mindoro, Panay, Palawan, and Sulu. Fairly common in secondary forests and edges usually seen singly, in pairs, or in small groups. One of the most abundant species captured in our mist nets. Dull brown to grey, with short crest and white belly; diagnostic medium-sized yellow wattle around the eye. Tail tipped with white and with a dark subterminal band. Bill and legs black (Kennedy et al. 2000).

Hypsipetes everetti (Tweeddale, 1877)

Yellowish Bulbul

Figure 5A

Material examined. PHILIPPINES—**Dinagat Islands** • Cambiatao, Basilisa; 10°05'58"N, 125°33'24"E; 138 m a.s.l.; 21.X.2017, 22.X.2017, 03.VI.2019, 05.VI.2019, 06.VI.2019; J.F. Beloy, G.Labiano & R. Sales leg.; mist-net capture; 6 ♂ (5 adults, 1 subadult) • Mount Arayat, Basilisa; 10°07'32"N, 125°37'05"E; 398 m



Figure 5. Species captured in Dinagat Islands during our survey. **A.** *Hypsipetes everetti*. **B.** *Poliolophus urostictus* **C.** *Pycnonotus goiavier*. **D.** *Otus everetti*.

a.s.l.; 12.IV.2018, 13.IV.2018, 14.IV.2018, 21.VI.2018, 09.VI.2019, 11.VI.2019; J.F. Beloy, G. Labiano, & R. Sales leg; 15 specimens • Mount Bil-at, Loreto; 10°24'28"N, 125°39'51"E; 92 m a.s.l.; 22.IV.2018; J.F. Beloy leg.; mist-net capture; 2 ♂ adults • Mount Magkuno, Loreto; 10°24'52"N, 125°37'12"E; 319 m a.s.l.; 15.VI.2019; J.F. Beloy leg.; mist-net capture; 1 ♂ adults, 1 ♀ adults.

Identification. Restricted to Mindanao and eastern Visayas. Dependent on lowland forests, secondary forests, and forest edges. Large, yellow to olive bulbul, with cinnamon throat and brownish cheeks and breast. Upper bill olive grey and lower bill grey (Kennedy et al. 2000; Haribon Foundation 2004).

***Pycnonotus goiavier* (Scopoli, 1786)**

Yellow-vented Bulbul

Figure 5C

Material examined. PHILIPPINES–Dinagat Islands • Cambiatao, Basilisa; 10°05'58"N, 125°33'24"E; 138 m a.s.l.; 21.X.2017, 22.X.2017, 01.II.2018, 02.VI.2019, 03.VI.2019, 04.VI.2019, 05.VI.2019; J.F. Beloy, G. Labiano, & R. Sales leg.; 19 ♂ adults, 11 ♀ adults • Rosita, Basilisa; 10°24'28"N, 125°33'29"E; 295 m a.s.l.; 30.IV.2018, 02.V.2018, 28.V.2019, 30.V.2019; J.F. Beloy, G. Labiano, & R. Sales leg.; mist-net capture; 4 specimens (escaped).

Identification. Resident to the Philippines and found

throughout the country except the Batanes and Babuyan Island groups. Fairly common in garden scrub and lowland secondary forests but never in mature forests. White eyebrow, cheeks, and throat contrast with dark brown forehead and short crest. Blackish loreal stripe and ring around eye. Neck to back brown to olive brown. Wing brown; wing coverts and flight feathers ashy brown. Tail olive-brown with ashy framing. Breast and belly white, with brown streaks; vent and undertail coverts yellow. Bill blackish and legs dark grey (Kennedy et al. 2000; Fishpool et al. 2020).

Strigidae

***Otus everetti* (Tweeddale, 1879)**

Everett's Scops Owl

Figure 5D

Material examined. PHILIPPINES–Dinagat Islands • Mount Arayat, Basilisa; 10°07'32"N, 125°37'05"E; 398 m a.s.l.; 12.VI.2019; G. Labiano leg.; mist-net capture; 1 ♂ subadult.

Identification. A Mindanao Faunal Region endemic distributed on the islands of Basilan, Biliran, Bohol, Dinagat, Leyte, Samar, and Mindanao. Commonly found in the understory of forests and at forest edges. Crown and face blackish brown and face, eyes orange, and ear tufts prominent. Legs are feathered to the toes. Smaller than *Otus megalotis* Walden, 1875 but larger than *Otus*



Figure 6. Species captured in Dinagat Islands during our survey. **A.** *Caprimulgus manillensis*. **B.** *Turnix suscitator*.

nigrorum Rand, 1950. Bill ivory-horn and legs grey (Kennedy et al. 2000; BirdLife International 2021).

SPECIES NEWLY REPORTED FROM THE DINAGAT ISLANDS

Caprimulgidae

Caprimulgus manillensis Walden, 1875

Philippine Nightjar

Figure 6A

Material examined. PHILIPPINES–**Dinagat Islands** • Cambiatao, Basilisa; 10°05'58"N, 125°33'24"E; 138 m a.s.l.; 20.X.2017; G. Labiano leg.; mist-net capture; 1 ♂ specimen • Rosita, Basilisa; 10°24'28"N, 125°33'29"E; 295 m a.s.l.; 30.IV.2018; G. Labiano leg.; mist-net capture; 1 ♂ adult • Rosita, Basilisa; 10°24'28"N, 125°33'29"E; 290 m a.s.l.; 27.V.2019; R. Sales leg.; mist-net capture; 1 ♂ adult, 1 ♀ adult

Identification. Newly recorded from the Dinagat Islands. A Philippine endemic species occurring throughout the country except on Batanes, Babuyan group of islands, and the Palawan and Sulu Faunal Regions. A relatively uncommon nocturnal species that roosts and nests on the ground during day. Head has a greyish brown coloration, streaked with blackish brown and indistinct, dark brown, tawny, and buff lines on wing coverts. Differs from similar nightjars in its geographic range by terminal white spot on two outermost tail feathers, unlike

the subterminal spots in *Caprimulgus jotaka* Temminck & Schlegel, 1845 and the mostly white other tail feather in *Caprimulgus affinis* Horsfield, 1821 (Kennedy et al. 2000; Peterson et al. 2008; Cleere and Kirwan 2020; BirdLife International 2021).

Turnicidae

Turnix suscitator (Gmelin, 1789)

Barred Buttonquail

Figure 6B

Material examined. PHILIPPINES–**Dinagat Islands** • Cambiatao, Basilisa; 10°05'58"N, 125°33'24"E; 138 m a.s.l.; 01.II.2017; G. Labiano leg.; mist-net capture; 1 ♂ adult • Rosita, Basilisa; 10°24'28"N, 125°33'29"E; 295 m a.s.l.; 30.IV.2018; G. Labiano leg.; mist-net capture; 1 ♀ adult.

Identification. Resident of the Philippines, occurring on the islands of Luzon, Mindoro, Palawan, Masbate, Negros, and Panay. Relatively common in dry grasslands, in scrub, and along dirt roads. Breast and upper belly heavily barred, tail coverts rufous, and upperparts chestnut or rufous with black and buff mottling. Females similar to males, but with more chestnut on the scapules and with black plumage from the throat to the belly. Bill yellow, with a black tip in males and a green tip in females. Legs greenish yellow (Kennedy et al. 2000).

Discussion

We inventory the bird species recorded from the Dinagat Islands by integrating our list of species captured during a three-year survey with species lists of previous studies. The earliest attempt to provide a comprehensive list of bird species of the Dinagat Islands was by Heaney and Rabor (1982) who surveyed the municipalities of Loreto and Libjo. Later, the Haribon Foundation (2004) surveyed birds of Mounts Kambinliw and Redondo. The book published by Kennedy et al. (2000) provides information on the distributions of Philippine bird species and an online avian database (Lepage 2021) provides a repository of bird species on each island based on varied ornithological resources and local bird watchers. Thus, our study provides an up-to-date list of bird species in the Dinagat Islands. The 244 species recorded from previous surveys represents approximately 37% of the total number of bird species present in the Philippines, while the 42 Philippine endemics and 17 Greater Mindanao endemics represents roughly 46% and 59% of Philippine and Greater Mindanao endemics, respectively (Jensen et al. 2020). Our fieldwork added two species previously not recorded from the islands, elevating the total number of bird species recorded in the Dinagat Islands to 246 species.

From our mist-net captures, the 37 species of birds represent 5% of the total number of species found in the Philippines and 8% of the total number of species recorded in the Mindanao islands (Jensen et al. 2020; Lepage 2021). Furthermore, the 15 Philippine endemics

and two Greater Mindanao endemics represent 16% and 4% of the total Philippine endemics and Pleistocene region endemics, respectively (Jensen et al. 2020).

The dominance of some families and species suggests differences in vegetational characteristics and the availability of primary source of sustenance for birds in our sampling sites. For instance, abundance and richness of families Columbidae, Dicaeidae, and Nectariniidae in Mount Arayat suggest the abundance of fruiting and flowering trees at this site, and these families are known to forage in areas that are abundant in berries and flowers (Pagaduan and Afuang 2012). Likewise, forest-dependent species such as *Poliolophus urostictus* and *Hypsipetes everetti* were exclusively captured in Mount Arayat, as these species are commonly associated with primary forest and forest edges (Kennedy et al. 2000; IUCN 2021). On the other hand, *Pycnonotus goiavier* and *Geopelia striata* were exclusively captured in relatively degraded areas such as Rosita and Cambiatao, and these species are known to tolerate disturbance and rarely found in mature primary forest (Kennedy et al. 2000; IUCN 2021).

We also recorded bird species of notable conservation status that were not captured in our mist nets. For instance, sightings and calls of species of Bucerotidae were observed: *Penelopides affinis* Tweeddale, 1877 (Endangered) was observed in Mount Bil-at, *Rhaddotorhinus leucocephalus* (Vieillot, 1816) (Vulnerable) was sighted in Mount Arayat and Mount Magkuno, and the *Buceros hydrocorax* Linnaeus, 1766 (Endangered) was recorded in Mount Arayat. Furthermore, sightings and calls of *Anas luzonica* Fraser, 1839 (Vulnerable) were sighted and heard during our net watch in Rosita and Cambiatao (IUCN 2021).

The results of our three-year survey of bird communities in selected areas in the Dinagat Islands highlights important implications to conservation and protection of forest areas in the islands. However, additional sampling effort and survey sites are needed to improve representation, as shown by the species accumulation curve (Fig. 2).

The ecological services provided by species of pycnonotids and columbids are important in forest dynamics, particularly in regenerating brushlands and secondary forests such as in Cambiatao and Rosita. These species are known to be efficient seed dispersers of various fruiting tree species (Pagaduan and Afuang 2012; Duco et al. 2020). Furthermore, the presence of endemic species and forest specialists in areas with known anthropogenic disturbances, such as on Mount Bil-at and Mount Magkuno, suggest the viability of the adjacent primary forest for communities of endemic species and other forest-specialist species.

Considering the implications of bird species to forest health and dynamics, proper conservation management and mitigation strategies should be implemented to protect bird communities in the Dinagat Islands, especially in areas which are deforested and highly disturbed by mining (Passell 2000). Passell (2000) showed that

significant increases in species richness and diversity of birds were observed after three years of restoration of tin mining site; Passell also suggests that inexpensive restoration efforts could produce significant ecological results.

Despite the inadequate sampling of our survey, our data may serve as a basis for future avian surveys of the islands, as well as to enhance the conservation and management of forested areas in the present. We recommend, as did Villancio et al. (2020), the urgent need for more ecological surveys in the Dinagat Islands to account for all possible species considering the discovery of the new island distribution records which highlights the possible underestimation of bird communities in the island, as well as the increasing risk of local extinction considering the booming rate of land conversion and deforestation.

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Authors' Contributions

Conceptualization: GGV. Data curation: JFB, GL, RAD, RJS. Formal analysis: RJS, GGV, JFB, GL, RAD. Funding acquisition: GGV, EA. Investigation: JFB, GGV, RAD, RJS, GL. Methodology: GGV. Project administration: EA, GGV. Resources: RAD, RU. Supervision: EA, GGV. Validation: RAD, RU. Visualization: RJS, RAD. Writing – original draft: JFB, RJS, GGV, GL. Writing – review and editing: EA, GGV, GL, RU, JFB, RJS, RAD.

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