Significant records of birds on Puerco Island, Roxas, Palawan, Philippines

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ABSTRACT

We documented a total of 53 species of birds on Puerco Island from May 2016 to December 2019 using a combination of modified area search method and photo-documentation. The number of birds increased from only 15 species in 2014 to 53 in December 2019. Records included two endangered species, 18 migratory and 28 native birds. Monthly monitoring of Barred Rail *Hypotaenidia torquata*, Olive-backed Sunbird *Cinnyris jugularis* and Collared Kingfisher *Todiramphus chloris* showed varying levels of abundance. Nest monitoring of the Near-threatened Philippine Scrubfowl *Megapodius cumingii cumingii,* locally called "tabon", using close circuit television cameras, showed a significant increase from only three nests reported in 2012 to 154 in September 2019. The changes in the species composition and the increase in the breeding population of Philippine Scrubfowl are attributed to the integration of conservation management strategies on Puerco Island.

Keywords: Endangered, Megapodius, Tabon

INTRODUCTION

The Philippines is an archipelago made up of 7,641 islands with 722 known birds of which 254 are endemic to the country (Allen 2020). The list of species is likely to increase to more than 722 as new records are added (Allen 2020). The revisions in taxonomy elevated a number of subspecies to species level thereby contributing to the increase in the number of endemic birds to 254 (Campbell et al. 2016; Cai et al. 2019; Allen 2020; McClure et al. 2020). Majority of the endemic species are restricted to one or a few groups of islands.

Most bird studies in the country focus on the endemic and resident birds on major islands with very few information available on smaller islands (Alcala and Sanguila 1969; Jakosalem et al. 2002; King et al. 2003; Paguntalan

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et al. 2004). Small islands play an important role in the conservation of coastal and small island bird specialists including the Philippine Scrubfowl *Megapodius cumingii cumingii* and the Near-threatened Mantanani Scops Owl *Otus mantananensis mantananensis*. The Mantanani Scops owl is distributed mainly in a chain of small islands from southern Philippines that include Palawan, Mindoro up to Romblon (Kennedy et al. 2000). It is a poorly understood species with few studies conducted in the Philippines (Kennedy et al. 2000; Sloan 2017). The Philippine Scrubfowl, on the other hand, used to be common in coastal beach areas up to montante forests until it has been extirpated in most of its distribution range (Kennedy et al. 2000; del Hoyo et al. 2014; Bashari et al. 2017). Unlike the Mantanani Scops Owl, there were documentations on breeding ecology of the Philippine Scrubfowl (Kennedy et al. 2000; Aala 2001; King et al. 2003) with studies of Torres and Mendoza (2000) and Tabayag and Cruz (2013) focusing on a number of small islands in Palawan including Puerco Island.

Small islands with coastal mudflats are also important sites for migratory shorebirds including threatened species. There are currently seven threatened migratory shorebirds (IUCN 2020) that regularly visit coastal mudflats namely: Christmas Frigatebird *Fregata andrewsi* (Critically Endangered), Far Eastern Curlew *Numenius madagascariensis* (Endangered), Great Knot *Calidris tenuirostris* (Endangered), Chinese Egret *Egretta eulophotes* (Vulnerable), and Malay Plover *Charadrius peronii* (Near-threatened).

Birds dependent on coastal beaches and small islands are vulnerable to urban and tourism development (Kennedy et al. 2000; Ma et al. 2019; Zhang and Ouyang 2019). The Philippine Scrubfowl was identified as one of the species affected by loss of habitat due to coastal and beach development (Kennedy et al. 2000; del Hoyo et al. 2014; Bashari et al. 2017). In the course of monitoring bird populations on Puerco Island, it became apparent that information on birds on small islands in the Philippines is scanty. A full profile of the bird species on Puerco Island documenting the changes in the species composition from 2016 to 2019 provides pertinent information needed for future small island management.

METHODS

Study Site

The Island of Puerco (also called Banwa Private Island) falls within the political jurisdiction of the Municipality of Roxas, Palawan (Figure 1). The conservation program of the 6.2 ha island is privately managed by Aquos Foundation Inc. Prior to 2006, much of the vegetation on the island was

dominated by coconuts. There were few species of wildlife seen in the area including the Mantanani scops owl and a small breeding colony of Philippine Scrubfowl. It is because of the presence of a breeding population of Philippine Scrubfowl that a 200 square meter area was set aside as a Tabon Breeding Sanctuary by Aquos Foundation Inc. In the course of the development of the island, native species of beach forest trees and associated plants were replanted.

Figure 1. Aerial view of Puerco Island (Banwa Private Island), Roxas, Palawan.

Synchronized Bird Count

A modified version of the Area Search method (Dunn et al. 2006) used in monitoring bird populations in small geographic areas was adopted in this study. Researchers divided the island into eight units and observers were assigned to a pre-identified count station, separated at least 100 m apart to record birds for three minutes within 0800-0900 h, using 10x42 roof-type binoculars and 20-60x60 spotting scope. Information gathered include location, date, habitat type, species (sex and age if possible), distance from the observer and the number of individuals. Bird observations were conducted simultaneously every 19th day of each month. Areas were repeatedly searched, and location of territorial birds was plotted on a detailed map. The Field Guide

to the Birds of ASEAN (Lee et al. 2018) and A Guide to the Birds of the Philippines (Kennedy et al. 2000) were used as references. Photos were taken to verify species identification.

Four land birds e.g. Philippine Scrubfowl, Olive-backed Sunbird, Collared Kingfisher and the Barred Rail) were used as indicators in monitoring population trends on the island. The Philippine Scrubfowl was chosen as it was the flagship bird of the Aquos Foundation Inc.; the Barred Rail was included since it was one of the predators of the Philippine Scrubfowl eggs and chicks; and the Collard Kingfisher and Olive-backed Sunbird were added as both were common breeding residents on the island. Bird observations were primarily conducted by the Philippines Biodiversity Conservation Foundation Inc. and the trained staff of Aquos Foundation Inc. from May 2016 to December 2019. The monthly population counts were grouped to calculate mean number of individuals using the formula $\mu = \Sigma x/N$, where μ (mean number of individuals in a species) is the sum (Σ) of individuals in a species (x) divided by the number of individuals (N). The conservation status of birds was based on IUCN (2020) and DAO (2019).

Philippine Scrubfowl Monitoring

Monitoring of Philippine Scrubfowl breeding population on Puerco Island was conducted using three Close Circuit Television (CCTV) high-definition cameras strategically located to allow observations without creating disturbance. A total of 4,008 observation hours (1,344 h in 2017, 672 h in 2018 and 1,992 h in 2019) were spent covering 09-16 March, 08-17 April, 26 May to 03 June 2017; January, April, September–October 2018; and 06 September–30 December 2019.

Training on Bird Monitoring

Prior to the conduct of regular bird monitoring, a total of 14 island staff, two representatives from Community Environment and Natural Resources Office (CENRO) and the Municipal Environment and Natural Resources Office (MENRO) of Roxas participated in the wildlife identification and monitoring training conducted last 24-25 June 2017. The training involved classroom-type lectures, field activities and identification of species. Trained personnel initially joined the count as observers before officially joining the monthly synchronized bird counts.

RESULTS

Abundance

A total of 53 species of birds were recorded on the island (Figure 2) of which three were threatened, 22 were migratory and the rest were native to the Philippines. The threatened birds include the Far Eastern Curlew *N. madagascariensis,* Great Knot *C. tenuirostris*, and the Chinese Egret *E. eulophotes*. The Near-threatened species include the Eurasian Curlew *Numenius arcuata,* Japanese Paradise Flycatcher *Terpsiphone atrocaudata periophthalmica,* and the Mantanani Scops Owl *O. m. mantananensis* (Figure 2; Table 1).

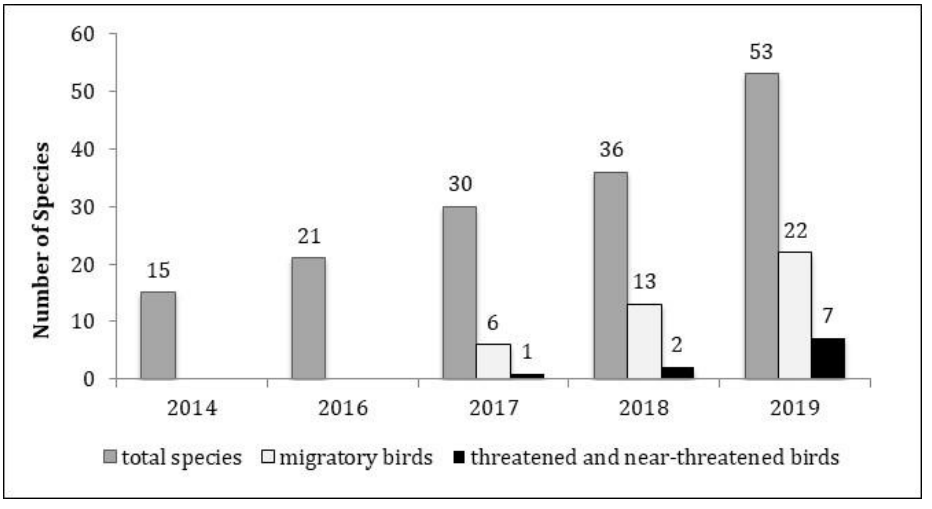

Figure 2. Yearly comparison of the number of species of birds recorded in the island.

Bird surveys from 2014–2016 recorded mostly breeding species as visits were conducted off migratory season. The addition of the migratory waterbirds significantly increased the number of species from 2017-2018 (Figure 2). In 2018 we recorded for the first time the Western Koel *Eudynamys scolopacea* and Northern Boobok *Ninox japonica*. The Northern Boobok was photographed feeding on the Philippine Scrubfowl chick while the Western Koel was observed searching for insects and worms on leaves of trees. Both were observed again in 2019.

The highest number of species of birds was seen in 2019 where a total of 17 birds were documented for the first time (Figure 2). Among the new records were the migratory Japanese Paradise Flycatcher and a number of species of doves e.g. Pink-necked Green Pigeon *Treron vernans*, Grey-capped Emerald Dove *Chalcophaps indica* and Pied Imperial Pigeon *Ducula bicolor*.

Table 1. List of bird species recorded in Puerco island from 2014-2018. Note that * stand for Threatened and Near-threatened birds (IUCN 2020).

Species Name	2014	2016	2017	2018	2019
Lesser Frigatebird *Fregata ariel*	X	X	X		X
Brown Booby *Sula leucogaster*	X				
Barred Rail *Hypotaenidia torquata*	X	X	X	X	X
*Philippine Scrubfowl *Megapodius cumingii cumingii*	X	X	X	X	X
Pacific Reef Egret (dark phase) *Egretta sacra*	X	X	X	X	X
Little Egret *Egretta garzetta*	X	X	X	X	X
*Chinese Egret *Egretta eulophotes*		X	X	X	X
Intermediate Egret *Egretta intermedia*			X	X	X
Great-billed Heron *Ardea sumatrana*			X	X	
Striated Pond Heron *Butorides striatus*	X	X	X	X	X
Black-crowned Night Heron *Nycticorax nycticorax*	X	X	X	X	X
Cattle Egret *Bubulcus ibis*					X
Black-winged Stilt *Himantopus himantopus*					X
Osprey *Pandion haliaetus*	X	X	X	X	
Malay Plover *Charadrius peronii*			X		
Lesser Sand Plover *Charadrius mongolus*				X	X
Greater Sand Plover *Charadrius leschenaultii*			X	X	X
Whimbrel *Numenius phaeopus*				X	X
*Eurasian Curlew *Numenius arcuata*			X	X	X
*Far Eastern Curlew *Numenius madagascariensis*				X	X
Ruddy Turnstone *Arenaria interpres*			X	X	X
*Great Knot *Calidris tennuirostris*			X	X	X
Common Sandpiper *Actitis hypoleucos*			X	X	X
*Grey-tailed Tattler *Tringa brevipes*				X	X
Common Greenshank *Tringa nebularia*				X	X
Common Redshank *Tringa totanus*				X	X
Black-naped Tern *Sterna sumatrana*				X	X
Whiskered Tern *Chlidonias hybridus*		X		X	X
Greater Crested Tern *Sterna bergii*					X
Grey-capped Emerald Dove *Chalcophaps indica*					X
Pied Imperial Pigeon *Ducula bicolor*					X
Pink-necked Green Pigeon *Treron vernans*					X
Western Koel *Eudynamys scolopaceus*			X		
Himalayan Cuckoo *Cuculus saturatus*				X	
Northern Boobok *Ninox japonica*			X		X
*Mantanani Scops Owl *Otus mantananensis mantananensis*	X	X	X	X	X
Savanna Nightjar *Caprimulgus affinis*		X	X	X	X
Glossy Swiftlet *Collocalia esculenta*	X	X	X	X	X
Collared Kingfisher *Halcyon chloris*	X	X	X	X	X
Common Kingfisher *Alcedo atthis*				X	X
Barn Swallow *Hirundo rustica*		X	X	X	X
Golden-bellied Gerygone *Gerygone sulphurea*		X			X
Glossy Starling *Aplonis panayensis*	X	X	X	X	X
Brown Shrike *Lanius cristatus*			X	X	X
Rufous-crowned Bee Eater *Merops americanus*					X
*Japanese Paradise Flycatcher *Tersiphone atrocaudata periophthalmica*					X
Artic Warbler *Phylloscopus borealis*					X
White-Breasted Wood Swallow*Artamus leucorynchus*					X
Grey Wagtail *Motacilla cinerea*					X
Olive-backed Sunbird *Cinnyris jugularis*	X	X	X	X	X
Eurasian Tree Sparrow *Passer montanus*	X	X	X	X	X
Chestnut Munia *Lonchura atricapilla*		X	X	X	X
Scaly-breasted Munia *Lonchura nisoria*		X	X	X	
Total species	**15**	**21**	**30**	**36**	**46**
Total migratory birds*	**1**	**2**	**20**	**17**	**21**
Total threatened and near-threatened birds**	**2**	**3**	**5**	**7**	**8**

Bird Population Monitoring

The mean population count of Olive-backed Sunbird was five with a range of 2-9 individuals. Monthly population fluctuations remain relatively the same except for the month of October where 2–3 sunbirds were observed. Most records were of eight individuals (n=29) and only two instances where nine individuals were observed. The highest number of individuals of Collared Kingfisher was six (month of September) with a mean weekly average of three individuals (n=29). Each individual or pair was observed to maintain a territory within the island (Figure 3).

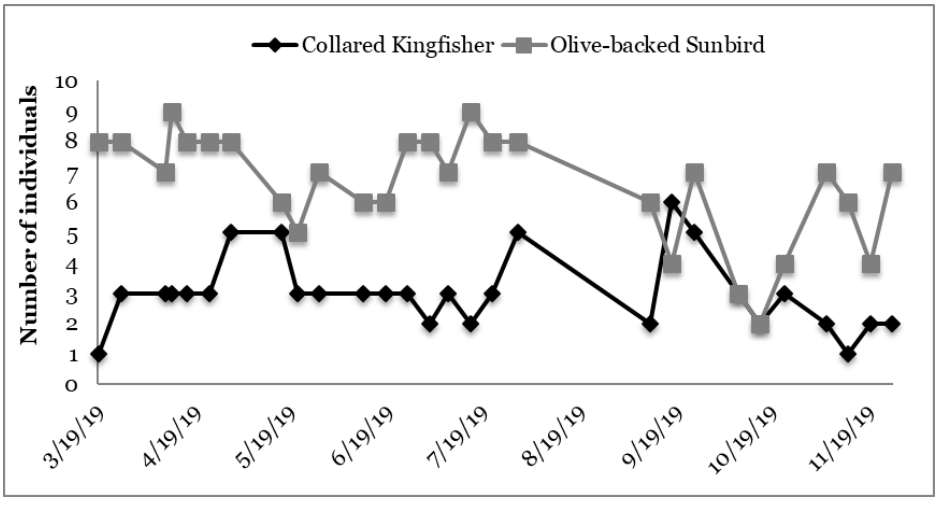

Figure 3. Weekly comparison of number of individuals of Olive-backed Sunbird and Collared Kingfisher in Puerco Island from 19 March 2019 to 19 November 2019.

Barred Rail population fluctuates from eight to 19 individuals with a mean monthly average of 13 (n=29). Highest population was recorded in the months of March and May. The Reef Egrets were frequently observed in mudflats and coastal areas. The synchronized counts on land often excluded the birds in the mudflats. Individuals reported here only include breeding birds actively making and tending nests (June–July) and birds roosting on top of trees or coconut during high tide. This had introduced a bias and we limit discussion on the number of breeding pairs (Figure 4).

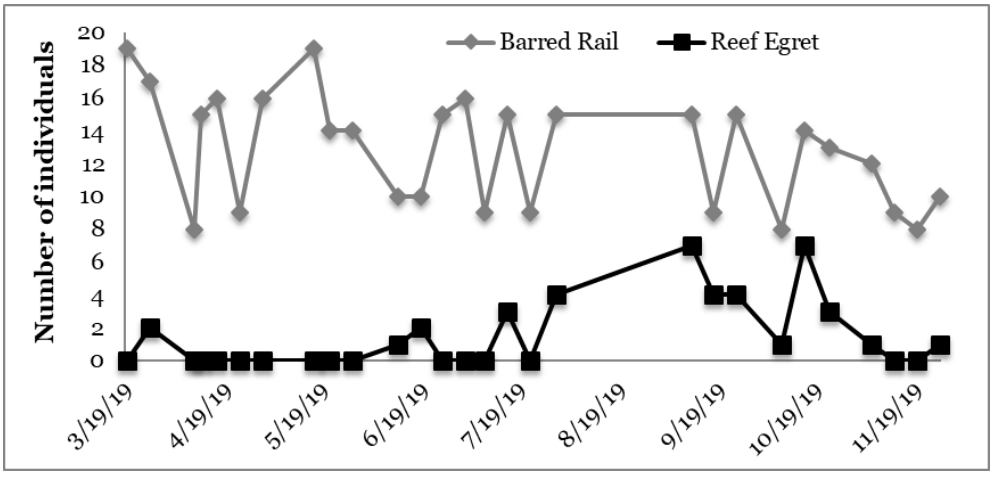

Figure 4. Weekly comparison of population counts of Reef Egret and Barred Rail in Puerco Island from 19 March 2019 to 19 November 2019.

Population monitoring of the Philippine Scrubfowl showed a significant increase in the number of active nest burrows from 2017 to 2019. The highest number of individuals tending nest burrows was consistently observed in the month of September (Figure 5). We recorded a total of 285 nests in at least seven clusters from March 2016 to November 2019. The highest count of active nest was 154 in September 2019 including nests in three more locations not covered by CCTV. No nesting activities were observed in late November until December since 2016.

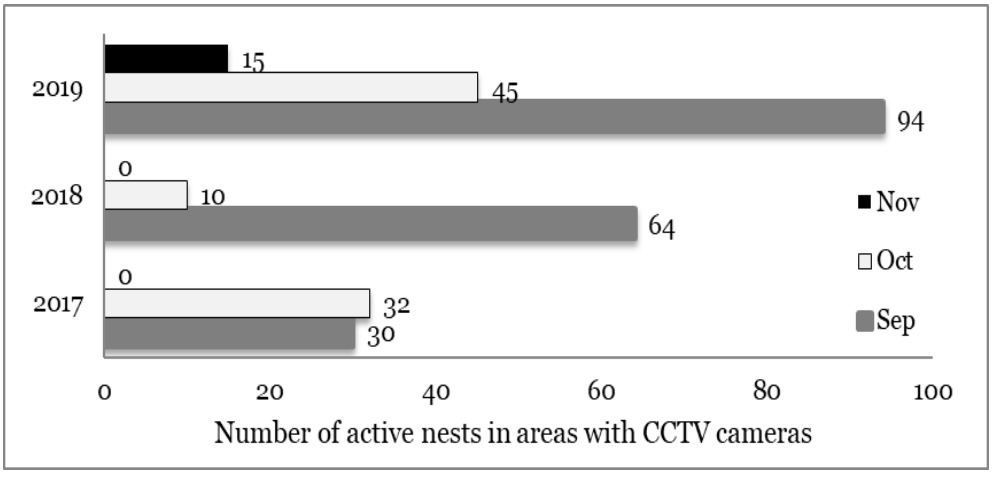

Figure 5. Annual comparison of the number of active nests counted from three nest mounds from September 2017 to 2019 in Puerco Island, Roxas, Palawan.

Species Accounts

Chinese Egret *E. eulophotes* Swinhoe, 1860 (IUCN Vulnerable; DAO Vulnerable) – Solitary birds were observed feeding on exposed seagrass beds and mudflats. At least six individuals were counted at low tide last October 2019. The bird was a frequent visitor of Puerco Island arriving as early as September and staying until early March.

Far Eastern Curlew *N. madagascariensis* Linnaeus, 1766 (IUCN Endangered; DAO Endangered) – At least three individuals were observed on separate occasions feeding on exposed mudflats. Individuals were seen roosting with other shorebirds on exposed sand bars during peak high tide.

Great Knot *C. tenuirostris* Horsfield, 1821 (IUCN Endangered; DAO Endangered) – A single individual was also observed on the exposed seagrass bed in March 2018. Several birds were observed in nearby sandbars and in Johnson Island.

Malay Plover *C. peronii* Schiegel, 1865 (IUCN Near-threatened; DAO Vulnerable) – On 14 May 2018, one female individual was seen and photographed along the shoreline during low tide on Puerco Island.

Philippine Scrubfowl *M. c. cumingii* Dillwyn, 1853 (IUCN Near-threatened; DAO Endangered) - A nest field with at least six colonies were closely monitored from 2016 to 2019. The nesting fields were occupied with breeding adult birds from January to early November on the island. On the months of November to late December of each year, no adult bird was observed on the island. In addition to this, we also identified four predators of *M. c. cumingii* chicks from the CCTV footages. Five Barred Rails were seen working in groups exposing eggs and harrasing the adult tending the nest. The Reef Egret *Egretta sacra*, Striated heron *Butorides striatus* and Northern Boobok *Ninox japonica* were also captured on camera preying on chicks emerging from the nest.

Mantanani Scops Owl *O. m. mantananensis* Sharpe, 1892 (IUCN Near-threatened; DAO Other Threatened Wildlife) – A breeding pair was found in Puerco Island that had successfully bred since 2014. An active nest was found lodged in between base of coconut fronds in June 2017. At least one or two immature owls were observed in the months of June 2017 and May 2018. Immature individuals were seen with their parents up to about four months and from November to June, only two mature individuals were recorded. Birds actively vocalized from 1800 h to around 2000 h and again at 0430 h just before daybreak. A pair was observed perched on a wire above the golf course last 03 October 2019. One of the pairs was seen perched

inconspicuously on a branch of *Delonix regia* about five meters from the trail on 04 October 2019. No immature bird was observed.

Pied Imperial Pigeon *D. bicolor* Scopoli, 1786 (IUCN Least Concern; DAO Other Threatened Wildlife) – The bird was first seen one morning on January 2018 and was since regularly sighted in 2019. One individual was observed roosting on a branch of a tree inside the 200 m² Tabon sanctuary last 24 May 2019 and two individuals on 03 October 2019.

Japanese Paradise Flycatcher *T. a. periophthalmica* Ogilvie-Grant, 1895 (IUCN Near-threatened; DAO Other Threatened Wildlife) – a female was photographed searching for insects among trees in the beach forest section last 23 September 2019.

Black-winged Stilt *H. himantopus* Linnaeus, 1758 (IUCN Least Concern; DAO Other Threatened Wildlife) – an immature individual was observed along the shoreline late evening last 27 August 2019. The bird may have temporarily stopped and rested on the island before flying to a different location. It was somewhat weak when it arrived and was no longer seen the following day.

Savanna Nightjar *C. affinis* Horsfield, 1821 (IUCN Least Concern; DAO Other Wildlife Species) – Only one mature individual was regularly heard calling early in the evening and just before daybreak. The bird was photographed camouflaged among the dried leaves close to the Tabon Wildlife Sanctuary on the island.

DISCUSSION

The number of species recorded on Puerco was still increasing as new records are added to the island every year. Among the smaller islands in the Philippines, Puerco has a relatively higher number of species compared to smaller islands off the coast of Cebu (Paguntalan et al. 2004), Danjugan Island in Negros (King et al. 2003) and in Palawan (Matillano et al. 2008; Tabayag and Cruz 2013). Danjugan Island is at least five times larger than Puerco with only 39 species (King et al. 2003) while the 173-ha island of Carnaza has 34 species of birds (Paguntalan et al. 2004). While larger islands are expected to have more species (Ricklefs 1999; Paguntalan et al. 2004; Hortal et al. 2009; Gonzalez et al. 2010; Bucol et al. 2011), increased field observations and continuous monitoring would result to more bird records even in remote islands (Mittermeier et al. 2013; Reeve et al. 2015).

We also see an increasing trend of number of species added to the island after the conduct of bird identification and monitoring training. Nine

birds were added from 2017 to 2018 and 11 birds were recorded for 2019 alone. It appears that improved capacity of citizen scientists in identification and skills in searching for birds largely contributed to the new records. In similar activities, citizen science when done properly was proven to provide adequate information in monitoring birds (Dunn et al. 2006; Kamp et al. 2016).

The improvement of the quality of the beach forest and vegetation on the island influenced the species composition and diversity. As more native trees were added in Puerco, it created new habitats for birds. The Western Koel, Northern Boobok and Japanese Paradise Flycatcher stayed for a week while the Pink-necked Green Pigeon visited the island to feed on ripe fruits. As more trees have matured, doves like the Pied Imperial Pigeon appeared. It was first recorded in January 2018 and was regularly observed to roost in Puerco since May 2019. Doves are known to roost and nest in small islands with tall trees (Kennedy et al. 2000), while migrants like the Japanese Paradise Flycatcher would look for beach and lowland forests (Spath et al. 2018). Their presence provided information on bird movement and the seasonal changes in the species composition on small islands.

The number of breeding birds had also increased. Currently there were 13 breeding species namely: Philippine Scrubfowl (*M. c. cumingii*), Mantanani Scops Owl (*O. m. mantananensis*), Savannah Nightjar (*C. affinis*), Pacific Reef Egret (*Egretta sacra*), Black-crowned Night Heron *(Nycticorax nycticorax*), Barred Rail (*H. torquata*), Collared Kingfisher (*T. chloris*), Glossy Swiftlet (*Collocalia esculenta*), Barn Swallow (*Hirundo rustica*), Glossy starling (*Aplonis panayensis*), Olive-backed Sunbird (*C. jugularis*), Eurasian Tree Sparrow (*Passer montanus*) and Chestnut Munia (*Lonchura atricapilla*). There was only one breeding pair of Mantanani Scops Owl (*O. m. mantananensis*) and Savannah Nightjar (*C. affinis*).

The low abundance of the Mantanani Scops Owl, Savannah Nightjar, Olive-backed Sunbird and Collared Kingfisher was partly attributed to the size of the island and available habitat. This pattern was also similar to Polillo Islands (Gonzalez et al. 2010) and the 36 islands in the Andaman archipelago where bird abundance decreases with island size (Thiollay 1997). Rails, Collared Kingfisher and Olive-backed Sunbird are considered generalist and survive even in highly modified habitats (Steadman and Freifeld 1998; Kennedy et al. 2000; Jakosalem et al. 2019). Rails are also known for their ability to disperse and survive even on remote small islands (Kennedy et al. 2000). The presence of at least three threatened migratory birds, breeding populations of the Near-threatened Philippine Scrubfowl and a resident breeding pair of a small-island specialist (e.g. Mantanani Scops owl) highlights the key role and global importance of smaller islands like Puerco Island.

The significant increase in the Philippine Scrubfowl breeding population was largely attributed to the protection of the nesting habitat and the absence of hunting. There were only six individuals (three breeding pairs) reported on Puerco Island in November 2012 (Tabayag and Cruz 2013). At that time, vegetation was mostly made up of coconuts (*Cocos nucifera*) and a few exotic trees e.g. *Delonix regia*. Hunting and egg poaching was also reported by locals. In 2016, the Banwa Private Island allocated breeding areas for Philippine Scrubfowl and prohibited hunting in the area. The creation of the Aquos Foundation Inc. in 2018 was a positive move towards the integration of the biodiversity conservation program in the management of the island. The baseline information has already been laid down and the program structure had been created. The regular wildlife monitoring activities did not just update the list of species on the island, it also generated population counts of breeding residents in small islands.

There were 10 more islands close to Puerco within the Green Island Bay in Palawan. We suspect that a number of birds moved from one island to another to search for food and establish breeding territories including the Mantanani Scops Owl. The Philippine Scrubfowl was also observed to leave Puerco Island starting late October to December. It was highly possible that some individuals disperse to the other islands after breeding season. It is imperative that surveys will also be conducted in the nearby islands especially during breeding and migration season.

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