Republic of the Philippines
Department of Environment and Natural Resources
PROVINCIAL ENVIRONMENT AND NATURAL RESOURCES OFFICE
MIMAROPA Region

SEP 15 2022

DENR MIMAROPA RECORDS SECTION
RECEIVED
04 OCT 2022
INCOMING OUTGOING
BY: DATS NO.
TIME:

MEMORANDUM

FOR : The Regional Executive Director
1515 L&S Bldg., Roxas Blvd.,
Ermita, Manila

FROM : The OIC, PENR Officer

SUBJECT : SUBMISSION OF BIODIVERSITY MONITORING SYSTEM REPORT OF APO REEF NATURAL PARK FOR THE 2ND SEASON OF 2022

Respectfully forwarded is the memorandum dated September 7, 2022 of CENRO Sablayan relative to the submission of Biodiversity Monitoring System (BMS) Report of Apo Reef Natural Park for the wet season of 2022. The monitoring was conducted using the transect swim and transect walk on August 9, 10 and 14, 2022. Further, key findings from the activity and proposed actions are presented below.

BMS Method	**Species or Resource Use**	**Important Observations**	**Proposed Action/s**
Field Diary	Fairy Pitta, Spotted Imperial Pigeon, Metallic Pigeon, and white breasted Waterhen	These birds were recorded for the first time in ARNP. Also, Fairy Pitta, which is threatened under the IUCN Red List, has only been recorded twice in the Philippines.	Enhance the capacity of management staff in monitoring birds
Transect Walk	Black-naped Tern	There was an almost ten-fold increase in the total number of birds this wet season due to Black-nape Terns. The species was only found to be nesting within the Restricted Area in Apo Island this year based n anecdotes of long-standing Park Rangers.	Scale-up the enforcement of PA rules and regulations in Apo Island
Transect Swim	Fish indicators	There were no signs of recovery in terms of indicator fish abundance in Bahura 10	Intensify patrolling and enhance capacity of management staff on reef survey techniques
	Crown of Thorns Starfish	Low counts of CoTS were recorded in Parolang Putol and San Antonio	Conduct thorough searches for CoTs.

ERNESTO E. TAÑADA
09/16/2022

So. Pag-asa, Brgy. Payompon, Mamburao, Occidental Mindoro
E-mail: tsdoccmin042@gmail.com / penroocc.mindoro@denr.gov.ph

Republic of the Philippines
Department of Environment and Natural Resources
MIMAROPA Region
COMMUNITY ENVIRONMENT AND NATURAL RESOURCES OFFICE

September 7, 2022

MEMORANDUM

FOR : The Regional Executive Director
DENR MIMAROPA Region
Ermita, Manila

THRU : The PENR Officer
Mamburao, Occidental Mindoro

FROM : The CENR Officer

SUBJECT : SUBMISSION OF BIODIVERSITY MONITORING SYSTEM REPORT OF APO REEF NATURAL PARK FOR THE 2ND SEASON OF 2022

Respectfully forwarded is the Biodiversity Monitoring System (BMS) Report of Apo Reef Natural Park (ARNP) for the wet season of 2022. The surveys using the transect swim and transect walk methods were conducted on August 9 to 10 and August 14, respectively. The Protected Area Management Office of ARNP reported positive findings which include the following:

- Increase in the total number of birds in Apo Island for this wet season as compared to previous years due to Black-naped Terns. Nests of these highly sensitive birds were observed within the Restricted Area of Apo Island.
- Four bird species were recorded for the first time in ARNP. Three of which were because of the daily efforts of Park Rangers to record notable flora and fauna. One of the species that they recorded is the Fairy Pitta which is threatened under the IUCN Red List. This is the first record of this species in Mindoro and only the second in the Philippines.

Attached herewith is the narrative report with appendices.

For information and record.

PENRO
RECEIVED BY:
DATE: 09-12-22
TIME: 01:03

RECORDS
RECEIVED BY:
DATE: 9/9/22
TIME: 3:48pm

FOR. ANASTACIO A. SANTOS, MPA

Department of Environment and Natural Resources
MIMAROPA Region
APO REEF NATURAL PARK
Protected Area Management Office

September 7, 2022

MEMORANDUM

FOR : The Regional Executive Director
DENR-Region 4B – MIMAROPA
1515 L&S Bldg., Roxas Blvd., Ermita, Manila

THRU : The OIC, PENR Officer
Mamburao, Occidental Mindoro

The CENR Officer

FROM : The Protected Area Superintendent

SUBJECT : SUBMISSION OF BIODIVERSITY MONITORING SYSTEM REPORT OF APO REEF NATURAL PARK FOR THE 2ND SEASON OF 2022

Respectfully submitted is the Biodiversity Monitoring System (BMS) Report of Apo Reef Natural Park for the wet season of 2022. The ecological monitoring (transect swim and transect walk) was conducted on August 9, 10, and 14. The key findings from the transect swims, transect walk, and field diary are presented below.

BMS Method	Species or Resource Use	Important Observations
Field Diary	Fairy Pitta, Spotted Imperial Pigeon, Metallic Pigeon, and White-breasted Waterhen	These birds were recorded for the first time in ARNP. Three of which were photographed by Park Rangers Kelvin U. Zubiri and Michael D. Dagdag. Among these is the Fairy Pitta which has only been recorded twice in the Philippines.
Transect Walk	Black-naped Tern	There was an almost ten-fold increase in the total number of birds this wet season due to Black-naped Terns. The species was only found to be nesting within the Restricted Area in Apo Island this year based on anecdotes of long-standing Park Rangers.
Transect Swim	Fish Indicators	There were no signs of recovery in terms of indicator fish abundance in Bahura 10.
	Crown-of-Thorns Starfish	Low counts of CoTS were recorded in Parolang Putol and San Antonio.

Attached herewith is the narrative report with appendices. Kindly note that an abridged BMS Report using the standard format is included in the appendices.

For information and record.

KRYSTAL DAYNE T. VILLANADA

National Highway, Brgy.Sto. Niño, Sablayan, Occidental Mindoro
E-mail: aporeefnaturalpark@gmail.com

Biodiversity Monitoring System Report

2nd Semester of 2022

I. Introduction

Apo Reef Natural Park (ARNP) is a 15,799-hectare offshore Marine Protected Area (MPA) located along the Mindoro Strait, approximately 30 kilometers off the western coast of Sablayan. The MPA covers two oceanic atolls that each has a rocky islet: Binanggaan and Tinangkapan. To the east of these atolls is another islet (Apo Island) surrounded by fringing reef. ARNP supports high species biodiversity that is characteristic of coral reefs within the Coral Triangle. It is known to host at least 481 species of fish and 63 genera of hard corals. In addition to this, 100 species of waterbirds and non-waterbirds have been recorded in ARNP in previous assessments.

Monitoring activities play an important role in the management of marine resources especially in Marine Protected Areas (MPAs). Several monitoring programs have been established worldwide like the Atlantic and Gulf Rapid Reef Assessment (AGRRA), Caribbean Coastal Marine Productivity Program (CCMPP), Great Barrier Long-term Monitoring Program, and Reef Check. In the Philippines, a widely used monitoring protocol within government-managed MPAs is the Biodiversity Monitoring System (BMS). The Biodiversity Monitoring System (BMS) was developed by the Department of Natural Resources and the Nordic Agency for Development and Ecology to guide Protected Area Management Offices (PAMOs) in providing data that shape effective management decisions. The BMS includes five simple and cost-effective methods in monitoring biodiversity that can be carried out even in the absence of a specialist staff. Three of these methods are used in ARNP and they are namely, transect swim, transect walk, and field diary.

The BMS has been implemented in ARNP since its roll out in 2001. At present, the transect walk and transect swim methods are conducted twice a year while the field diary method is practiced daily. The specific objectives of the implementation of BMS in ARNP are the following:

1. To obtain information on the floral and faunal populations of the Protected Area; and,
2. To identify sources of threats and develop tailor-fit management actions that address them.

II. Methodology

Four previously established sites in ARNP that are each marked with cement blocks (Figure 1) were surveyed for fish and invertebrate indicators on August 9 and 10, 2022. In each site, one observer snorkeled along two 100-m transects to identify and count all the fish indicators that were within 2.5 m of both sides of the transect line. Another observer recorded invertebrate individuals along the same belt transects. The fish indicators that were sought were based from Hodgson et al. (2006). These were namely, butterflyfish, groupers, moray eels, parrotfish, snappers, sweetlips, Barramundi Cod (*Cromileptes altivelis*), Bumphead Parrotfish (*Bolbometopon muricatum*), and Humphead Wrasse (*Cheilinus undulatus*). Meanwhile, the invertebrate indicators were sea urchins, giant clams, and crown-of-thorns starfish.

The transect walk was conducted along the permanent 1500-m transect route used in Apo Island on August 14, 2022 (Figure 2). The animals encountered and other observations (i.e. presence of marine litter and other threats) during the approximately one-hour transect walk were recorded. It is important to note that majority of the animals recorded using this method are birds thus, the analysis was focused on this taxon.

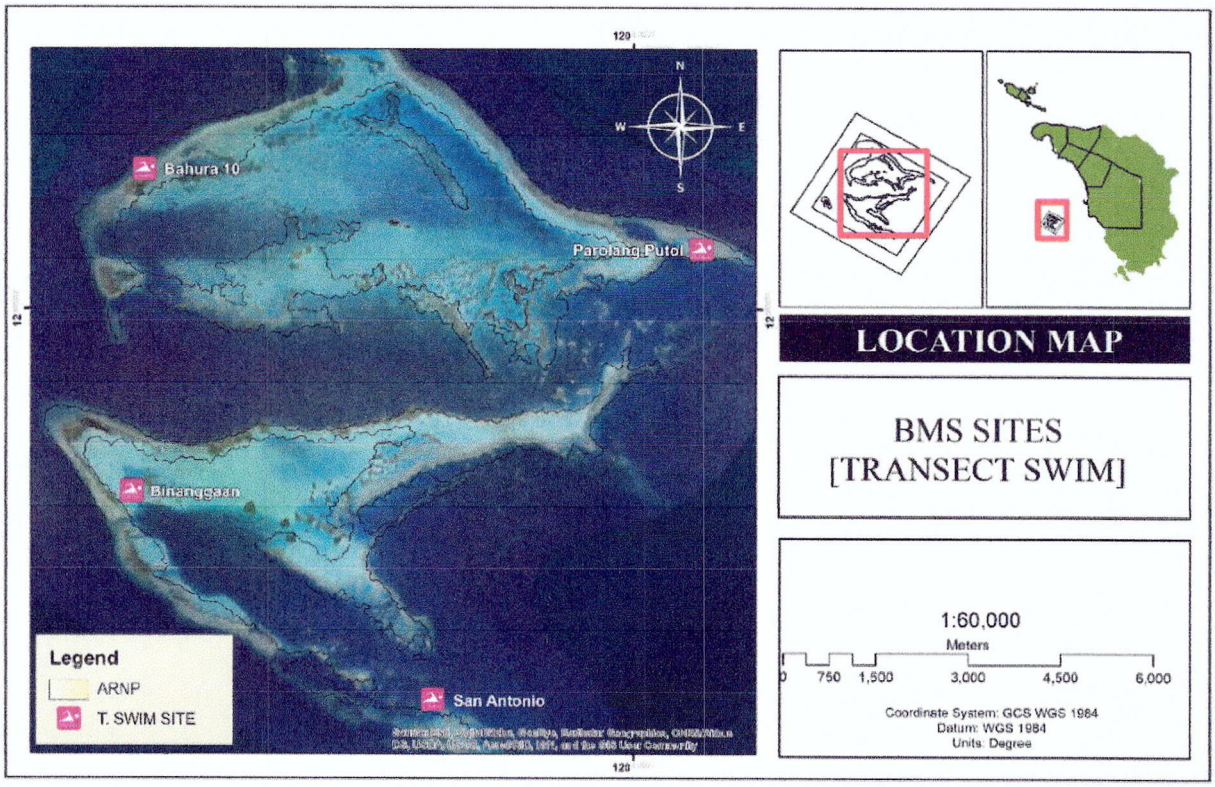

Figure 1. Four transect swim sites in Apo Reef Natural Park namely, Bahura 10, Binanggaan, Parolang Putol, and San Antonio.

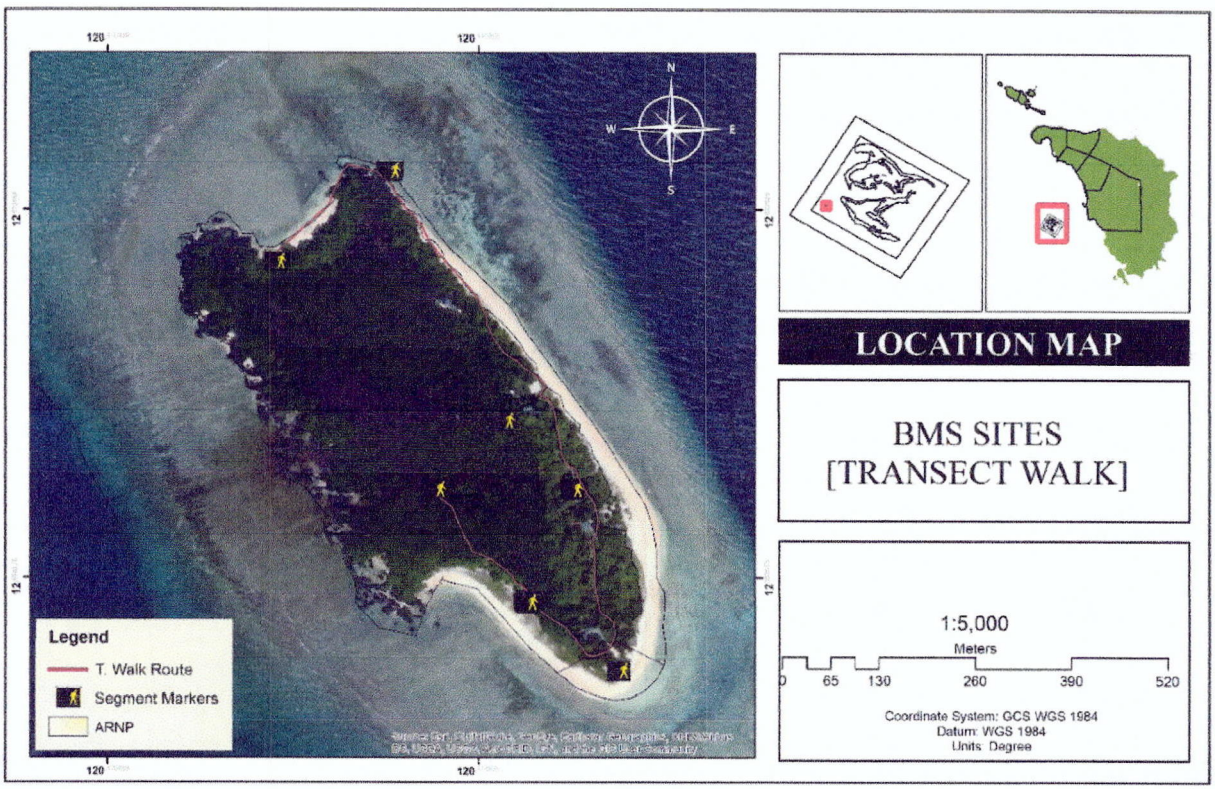

Figure 2. 1500-meter transect walk route in Apo Island, Apo Reef Natural Park.

Species accounts and other important observations of park rangers during their daily foot patrols were recorded in a field diary. The format of the field diary is less comprehensive than

that of the Grinnell System. It only included the following information: date, time, locality, and the species encountered including count and activity at the time of observation. Some of the species accounts were accompanied by photographs taken using digital single-lens reflex camera. These photographs were forwarded to experts in the field for accurate species identification.

III. Results and Discussion

Transect Swim

Four of the indicator fish taxa were recorded along the belt transects surveyed: butterflyfishes, snappers, groupers, and parrotfishes (excluding Barramundi Cod, Bumphead Parrotfish. Humphead Wrasse) (*Bolbometopon muricatum*) and Humphead Wrasse *(Cheilinus undulatus*) were only recorded off-transect in Binanggaan and San Antonio, respectively. In particular, at least 4 individuals of Bumphead Parrotfish were present within the second belt transect in Binanggaan which was not surveyed due to an incoming squall. It is likely that the school of Bumphead Parrotfish was feeding because a freshly crushed staghorn coral colony was observed in the first transect. Meanwhile, the observed Humphead Wrasse in San Antonio was a lone juvenile as evidenced by a relatively smaller size and two black markings radiating from the back of its eye.

Among the sites, the highest abundance of fish indicators was recorded in Parolang Putol (37.5 individuals/500 m^2) (Figure 3). It was followed by San Antonio and Binanggaan (34 individuals/500 m^2) but the latter only yielded high counts of juvenile parrotfishes. Bahura 10 had the least abundance of fish indicators (25.5 individuals/500 m). The abundance of fish indicators in Parolang Putol and San Antonio may be attributed to the visually higher hard coral cover and more structurally complex benthos in these sites as compared to the two other sites. This may be supported by the higher numbers of butterflyfishes (20-21 individuals/500 m^2) in these sites than Binanggaan and Bahura 10. All butterflyfish species recorded in Parolang Putol and San Antonio are known to feed on coral polyps (Cole et al., 2008). Notably, obligate coral-feeding species specifically dominated both sites. These species are highly dependent on coral resource availability and are thus, more abundant in coral-dominated areas (Bozec et al., 2005; Pratchett & Berumen, 2008; Pratchett et al., 2013).

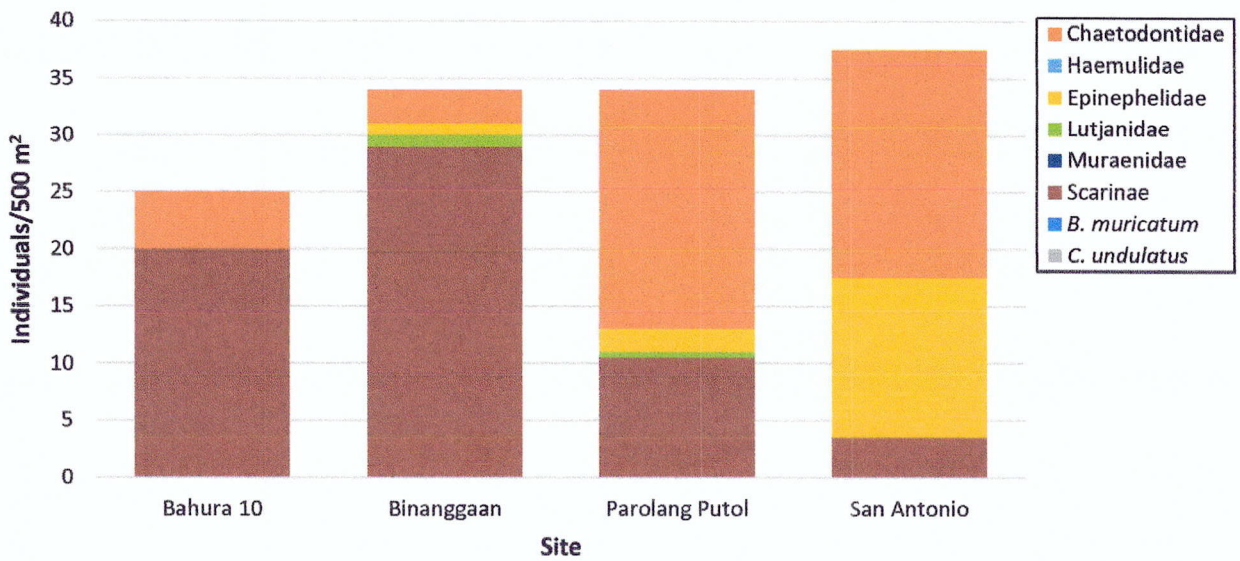

Figure 3. Abundance of fish indicators in the four transect swim sites surveyed on August 9 and 10, 2022.

The average abundance of indicator fish per year from 2017 to 2022 are shown in Figure 4. The estimates in San Antonio and Parolang Putol remained fairly the same from last year, especially in terms of butterflyfish abundance. This is important to note because CoTS individuals were observed in these sites during the first quarter of last year, prompting continuous CoTS surveillance and control. The results possibly indicate that surveillance and control of CoTS in these areas were able to minimize coral cover loss which could have affected the abundance of corallivorous butterflyfishes. It can also be observed that all four sites experienced a decline in indicator fish from 2017 to 2018. The decrease likely reflected hard coral cover (HCC) loss caused by storms (Severe Tropical Storm *Ramil* in late-2017) and the primary CoTS outbreak in 2018 wherein a total of 2,099 individuals were culled. HCC loss likely continued in 2019 due to another CoTS outbreak which appeared to be larger in scale (10,680 individuals culled) and storms (Typhoon *Tisoy* and *Ursula*), bringing down the overall average HCC in ARNP to 10.20% by 2020 (Ticzon et al., 2022). Despite this, indicator fish abundance in three of the four sites were able to return to pre-disturbance levels by 2020. The findings from a wider coral reef monitoring initiative in ARNP similarly reported a stable reef fish community amidst major perturbations between 2017 and 2020 (Ticzon et al., 2022). These possibly indicate resilience of reef fish community to coral cover loss which has been reported by Holbrook et al., 2008. In Bahura 10, it is possible that HCC loss was much greater (~0%) which in turn caused the reef fish community to face a steep decline. There are no signs of recovery in this site following the disturbances from late-2017 to 2019.

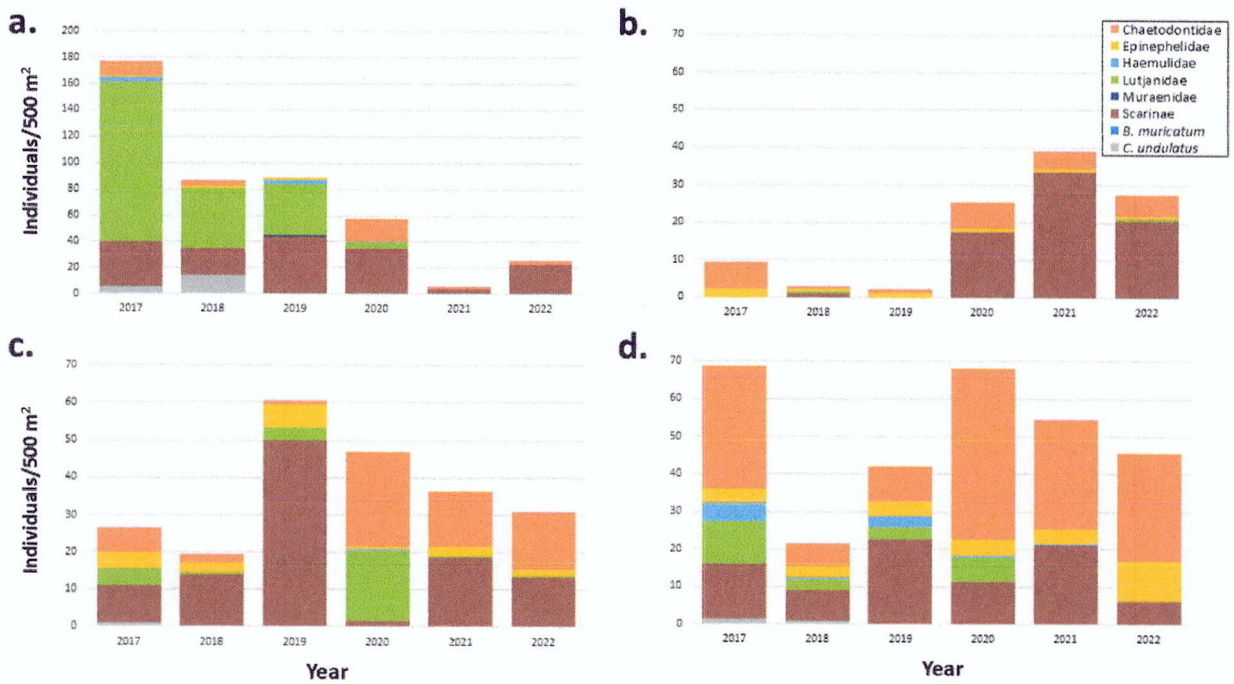

Figure 4. Average abundance of indicator fish per year from 2017 to 2022. a.) Bahura 10, b.) Binanggaan, c.) Parolang Putol, and d.) San Antonio.

During the dedicated macroinvertebrates survey, all indicator taxa (CoTS, Giant Clams, and Sea Urchins) were recorded (Figure 5). CoTS were only recorded in two sites: Parolang Putol (1 individual) and San Antonio (2 individuals). Although these numbers are low and massive feeding scars were not observed along the belt transects, thorough searches in the sites are needed in order to acquire more reliable data on CoTS density which may be compared against existing CoTS outbreak thresholds like Babcock et al. (2014). Giant clams and sea urchins were recorded in all sites. The abundance of the former was highest in Binanggaan

(102 individuals/500 m^2), followed by Parolang Putol (44.5 individuals/500 m^2) and San Antonio (40.5 individuals/500 m^2). Meanwhile, the highest sea urchin abundance was recorded in Parolang Putol (49 individuals/500 m^2). There were no notable differences in the abundance of these taxa before and after the disturbances in between 2017 and 2020 (Figure 6).

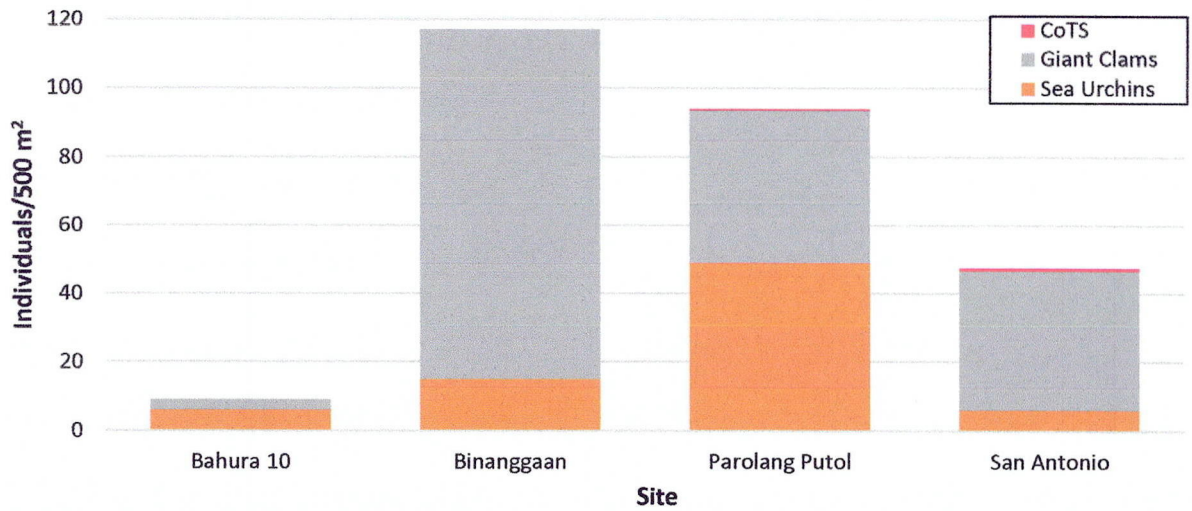

Figure 5. Abundance of macroinvertebrate indicators in the four transect swim sites surveyed on August 9 and 10, 2022.

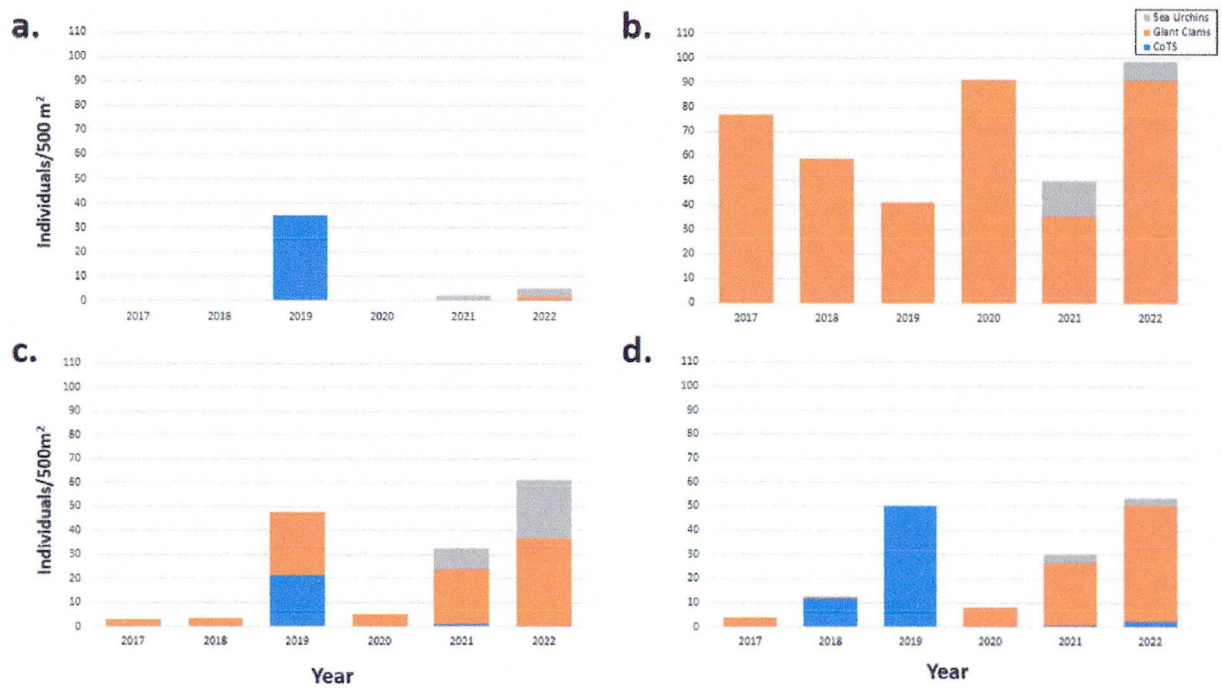

Figure 6. Average abundance of macroinvertebrate indicators per year from 2017 to 2022. a.) Bahura 10, b.) Binanggaan, c.) Parolang Putol, and d.) San Antonio.

Transect Walk

11 species of birds, each belonging to a distinct family, were recorded during the survey along the transect walk route. None of which are threatened and most birds are recorded in the island year-round. These are namely, Black-naped Oriole, Olive-backed Sunbird, Collared

Kingfisher, Philippine Pied Fantail, and Eurasian Tree Sparrow. Others are seasonal visitors like the Pied Imperial Pigeon and Barn Swallow. The most abundant species recorded was the Black-naped Tern (368 individuals), followed by Barred Rail (21 individuals) and Black-naped Oriole (19 individuals). Although Black-naped Tern has already yielded the highest count, it is important to note that the actual count was underestimated because the view from 1250- to 1500-meter section of the trail is highly obstructed. Therefore, it is challenging to provide an accurate count of this species especially when the Black-naped Terns are disturbed.

Table 1. Bird species recorded along the 1500-m transect on August 14, 2022.

Family	Common Name	Scientific Name	Range*	Highest Count
Hirundinidae	Barn Swallow	*Hirundo rustica*	M	12
Rallidae	Barred Rail	*Hypotaenidia torquata*	R	21
Oriolidae	Black-naped Oriole	*Oriolus chinensis*	R	19
Laridae	Black-naped Tern	*Sterna sumatrana*	R/M	368
Alcedinidae	Collared Kingfisher	*Halcyon chloris*	R	3
Ardeidae	Egret	*Egretta sp.*	-	3
Passeridae	Eurasian Tree Sparrow	*Passer montanus*	R/Int	12
Columbidae	Pied Imperial Pigeon	*Ducula bicolor*	R	8
Charadriidae	Plover	*Plover sp.*	M	1
Nectariniidae	Olive-backed Sunbird	*Cynniris jugularis*	R	9
Rhipiduridae	Philippine Pied Fantail	*Rhipidura nigritorquis*	R	1

* R – Resident, M – Migrant, R/M – Resident and Migrant

Black-naped Terns are confirmed breeding visitors to Apo Reef Natural Park (Figure 5). They arrive as early as April and then leave around September. In the most recent waterbirds survey with the MBCFI last July 2022, the most abundant species was also Black-naped Terns with 824 individuals. It was observed to be most abundant in Apo Island across the three islands, nesting on piles/aggregated coral rubbles at a restricted area along the sandy beach (Figure 5a). During the mentioned survey, a total of 71 chicks and 253 eggs were recorded in Apo Island alone.

The total count for the second semester was almost ten-fold the first semester primarily due to breeding Black-naped Terns in Apo Island (Figure 6). Other seasonal visitors to the island including the Pied Imperial Pigeon and Barn Swallow also contributed to the increase during the second semester but to a much lower degree. This year marks the highest count of terns in Apo Island in the last five years (Figure 7). Anecdotes from long-serving Park Rangers suggest that little to no nesting activity of Black-naped Tern were occurring within the *Restricted Area* in the previous years. Hence, this may serve as a good indication that human disturbance has been minimized along the area because Black-naped Terns are among the most sensitive seabird species. It also poses a challenge to management staff to ensure the strict implementation of PA rules and regulations to prevent tourist-violators from entering the important nesting area.

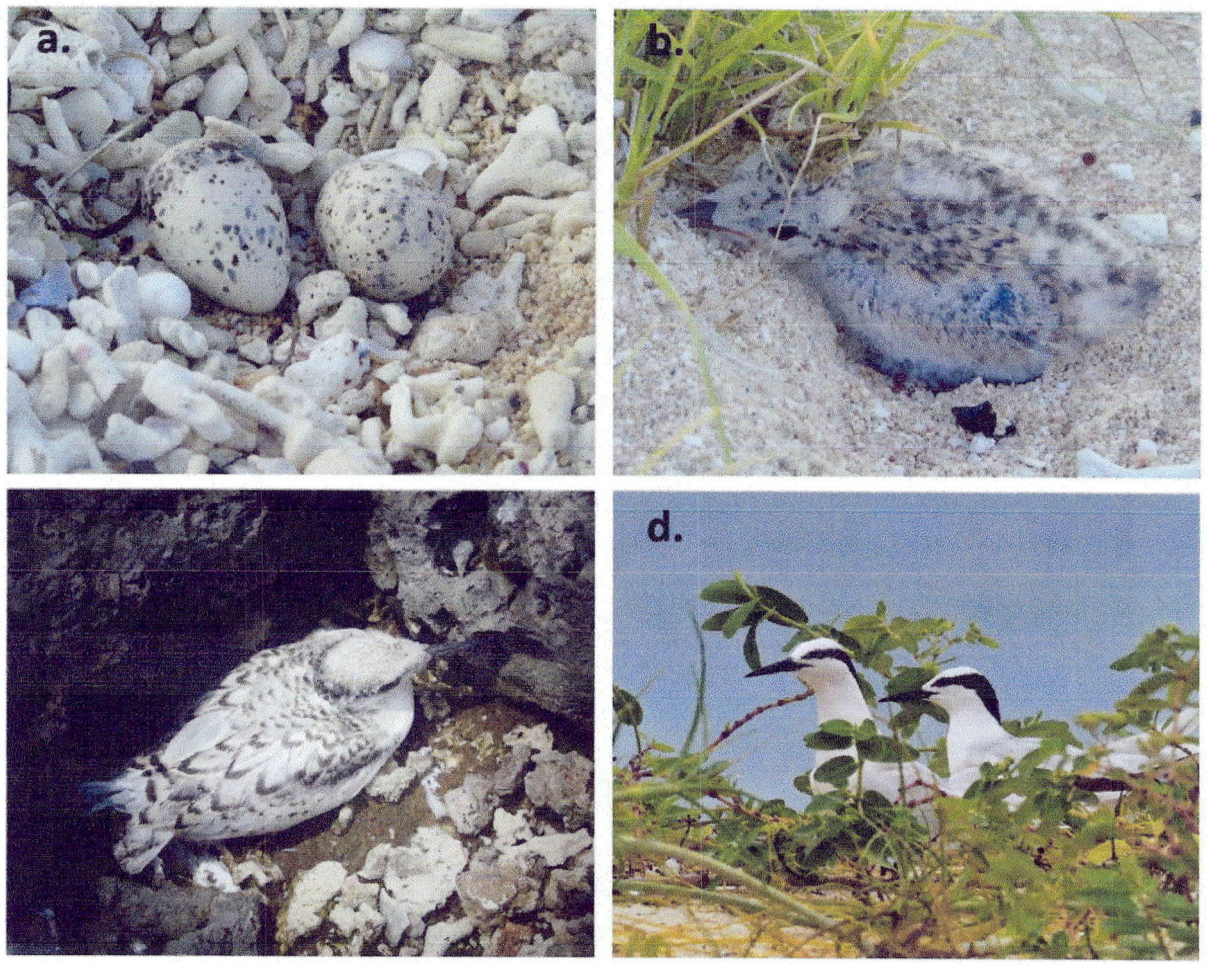

Figure 5. Immature (a-c) and adult (d) Black-naped Terns observed in Apo Reef Natural Park during the breeding season.

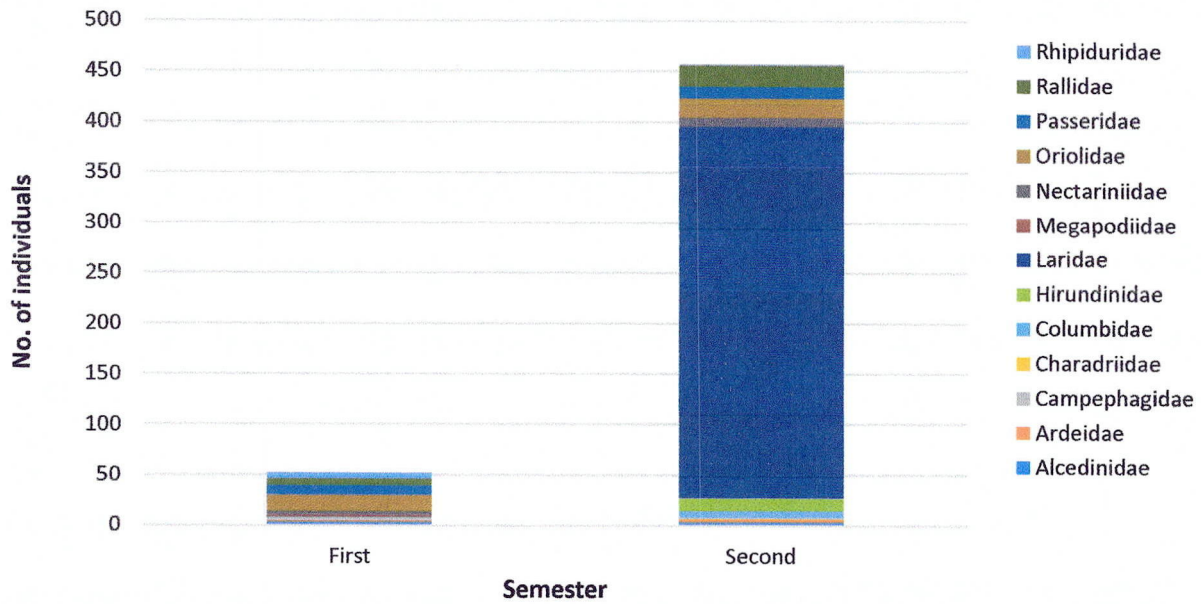

Figure 6. Count of birds during the first and second semester of 2022.

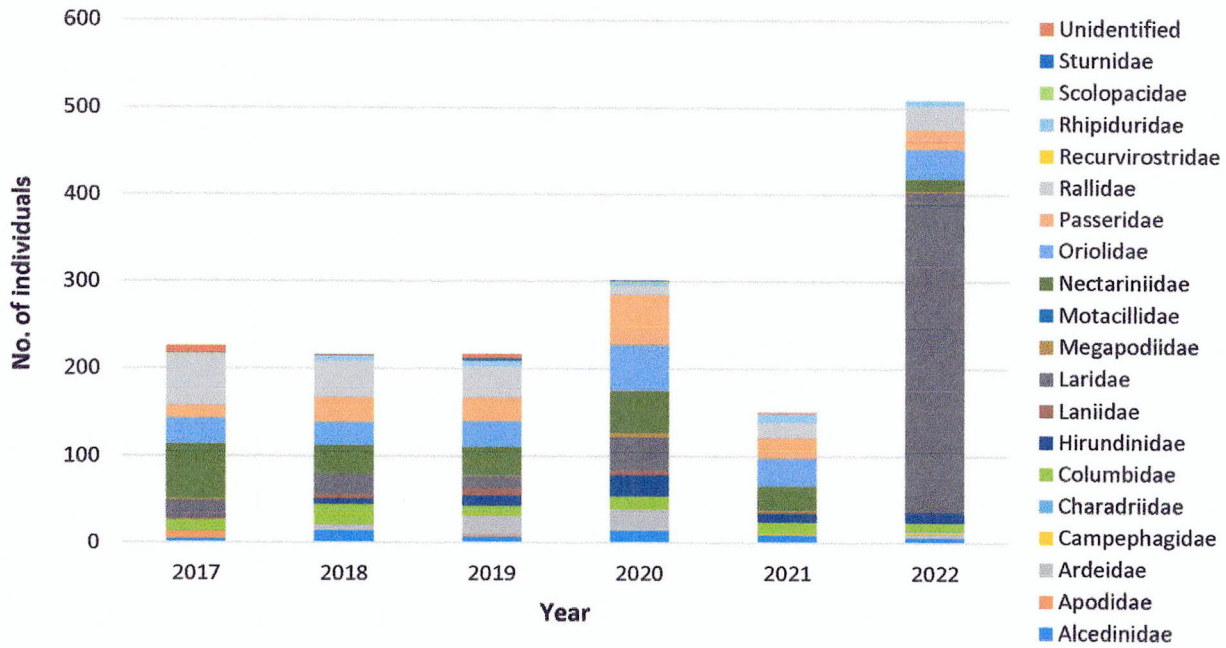

Figure 7. Count of birds within the breeding season of terns in ARNP from 2017 to 2022.

Field Diary

12 notable bird species were recorded using the field diary method from March to August 2022. Four of which were only documented in ARNP for the first time: the Metallic Pigeon, Spotted Imperial Pigeon, White-breasted Waterhen, and Fairy Pitta (Figure 8). The Fairy Pitta and Spotted Imperial Pigeon are threatened and both listed as *Vulnerable* under the IUCN Red List of Threatened Species. The former falls under the same classification in the National List of Threatened Fauna while the latter is classified as *Endangered*. The Philippines is not within the normal distribution range of Fairy Pitta. Thus, it is considered vagrant. This recent sighting is the first record in Mindoro Island and only the second record in the Philippines, with the first national record being in Balabac, Palawan (Jensen et al., 2015). On the other hand, Spotted Imperial Pigeons are endemic to the Philippines. An individual of this species was seen with Pied Imperial Pigeons in Apo Island from June 17 to 18, 2022. Spotted Imperial Pigeons inhabit montane and lowland forests but they have been observed to migrate locally to coastal and marine habitats or limestone habitats. Among the possible suggested reasons driving this seasonal movement are: a.) availability of food and b.) saltwater for bathing.

Aside from the Spotted Imperial Pigeon and Fairy Pitta, eight more threatened species were recorded (Table 2). These include the Beach Thick-Knee and small island specialists namely, the Nicobar Pigeon *(Caloenas nicobarica)*, Mantanani Scops Owl (*Otus mantananensis*), and Philippine Megapode *(Megapodus cumingii)*. During the waterbirds survey held on July 16 to 19, 2022, threatened seabirds were also recorded. One of these is the Bridled Tern which breeds amongst the crevices of the limestone formations within Apo Reef Natural Park. A total of 757 adult Bridled Terns, 11 chicks, and 13 eggs were recorded within ARNP this year. The count of Bridled Tern juveniles and eggs was highly underestimated because a dedicated survey for nests in Binanggaan, wherein adults were most numerous, was not conducted due to safety reasons.

Figure 8. New bird records in ARNP from January to August 2022: Fairy Pitta (a), Spotted Imperial Pigeon (b), Metallic Pigeon (c), and White-breasted Waterhen (d).

Table 2. Notable bird species recorded in Apo Reef Natural Park from March to August 2022.

Common Name	Scientific Name	Range*	Conservation Status**		Highest Count
			IUCN Red List	PH Red List	
Philippine Megapode	*Megapodius cumingii*	R	LC	VU	3
Beach Thick-Knee	*Esacus magnirostris*	R	NT	EN	1
Mantanani Scops Owl	*Otus mantananensis*	NE	NT	VU	3
Metallic Pigeon	*Columba vitensis*	R	LC	OWS	1
Nicobar Pigeon	*Caloenas nicobarica*	R	NT	EN	1
Spotted Imperial Pigeon	*Ducula carola*	R	VU	EN	1
Brown Booby	*Sula leucogaster*	R/M	LC	EN	1
Brown Noddy	*Anous stolidus*	M	LC	VU	1
Bridled Tern	*Onychoprion anaethetus*	M	LC	OTS	757
Greater Crested Tern	*Thalasseus bergii*	M	LC	VU	6
White-breasted Waterhen	*Amaraurnis phoenicurus*	M	LC	OWS	1
Fairy Pitta	*Pitta nympha*	A	VU	VU	1

* R – Resident, M – Migrant, R/M – Resident and Migrant, A – Accidental, NE – Near Endemic
** OWS – Other Wildlife Species, LC – Least Concern, NT – Near Threatened, VU – Vulnerable EN – Endangered

IV. Conclusions and Recommendations

The four pre-established sites for transect swim were monitored during the wet season of 2022. Parolang Putol had the highest abundance of fish indicators (37.5 individuals/500m^2), followed by San Antonio (34 individuals/500m^2). Higher abundance of coral-feeding butterflyfishes was also recorded in these sites, likely indicating better coral reef health than Bahura 10 and Binanggaan. CoTS individuals were recorded in these coral-rich areas although in low numbers. Thorough searches for CoTS are recommended to be conducted in these sites. Among the four sites, Bahura 10 is the only site which showed a persistent decrease in terms of abundance of fish indicators after the major disturbances within late-2017 to 2019. These disturbances may have caused a larger HCC loss in the area which can result into a steep decline in reef fish community. More frequent patrolling should be conducted to ensure that illegal fishing activities do not impede with the recovery in this site, and other coral reef areas in ARNP which are facing continuous HCC loss based on Ticzon et al. (2022). The capacity of management staff on coral reef monitoring techniques, particularly fish identification and size estimation and benthic life form identification, should also be continuously developed.

The 1500-m transect at Apo Island was also surveyed using the transect walk method. Most of the birds recorded are present in Apo Island year-round. However, the most notable and numerous species was Black-naped Tern (*Sterna sumatrana*) with 368 individuals. This is the highest count of terns acquired around the same month in the last five years. Although this increase and the nesting of Black-naped Terns within the restricted area are good indications that human disturbance are minimized, initiatives addressing threats to different life stages of Black-naped Terns in the island should be scaled-up. These shall include PA rules and regulations particularly in Apo Island in order to prevent the illegal entry of tourists to the important nesting area. Moreover, ways on minimizing disturbance to terns by foot traffic along the trail may be explored. Other threats to seabirds like marine litter and likely predation by invasive species should also be addressed.

Using the field diary method, twelve notable bird species were recorded from March to August 2022. Four of which were bird species that were only recorded for the first time in ARNP. These were namely, the Fairy Pitta, Spotted Imperial Pigeon, Metallic Pigeon, and White-breasted Waterhen. Three of these new bird records are attributed to Park Rangers Kelvin U. Zubiri and Michael D. Dagdag. These include the Fairy Pitta which marks the first record of the species in Mindoro and only the second in the Philippines. Given these achievements, training programs on bird survey techniques involving Park Rangers, even those under Contract of Service, should be continuously supported and widened to include other skills aside from bird identification and counting such as bird photography.

Prepared by:

HUGO IGNACIO G. SALVADOR
CMEMP Extension Officer

Reviewed and submitted by

KRYSTAL DAYNE T. VILLANADA
Protected Area Superintendent

V. References

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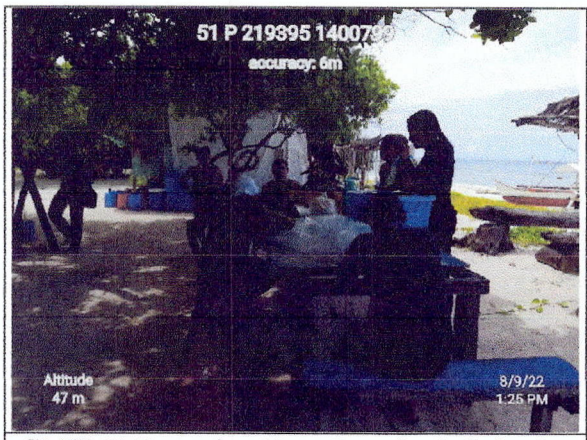
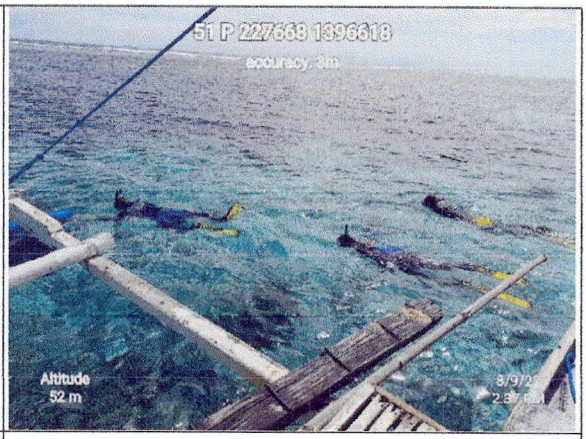
VI. Appendices

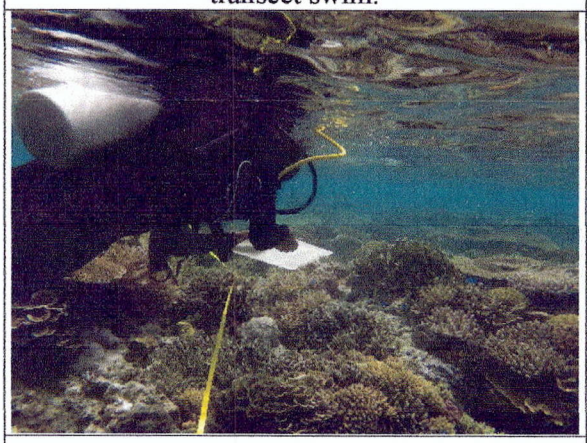
Appendix A. Photodocumentation of the field surveys using methods from the Biodiversity Monitoring System on August 9, 10, and 14, 2022.



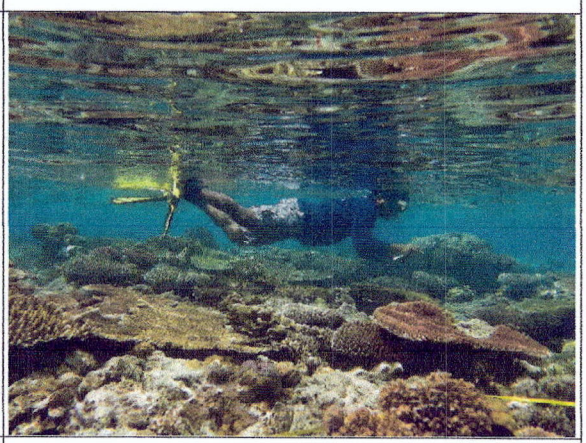
CMEMP Extension Hugo Ignacio G. Salvador distributing tasks to Park Rangers prior to the transcect swim.



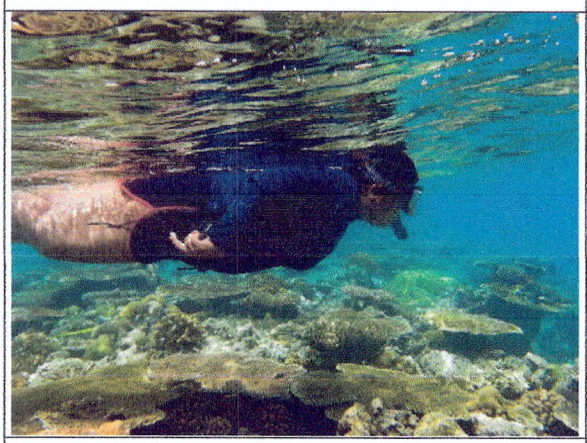
Park Rangers searching for concrete block markers in San Antonio on August 9, 2022.



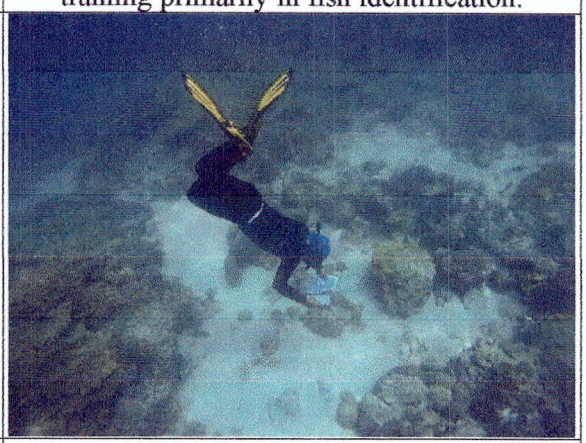
CMEMP-EO Salvador conducting a fish visual survey in Parolang Putol on August 10.



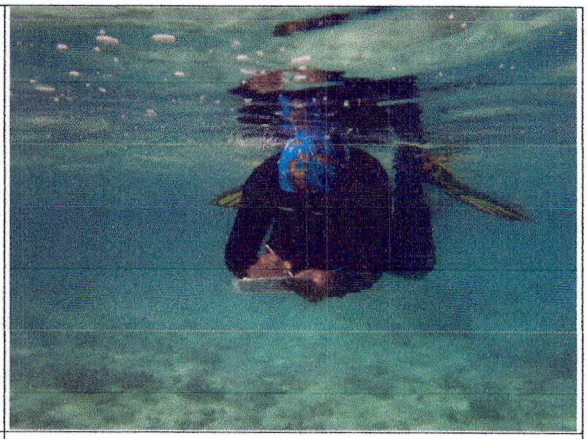
Park Ranger Roberto P. Beringuela participating in the fish visual survey as part of their in-situ training primarily in fish identification.

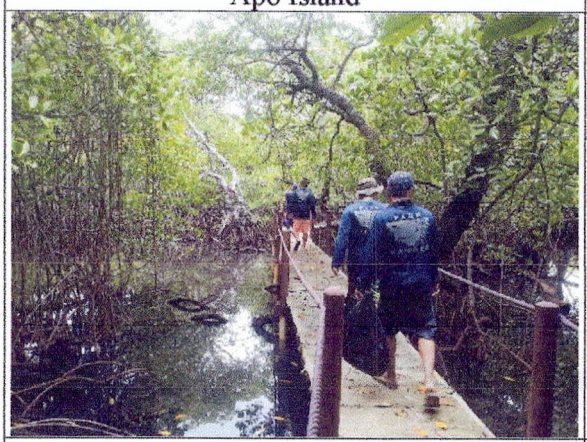


Protected Area Superintendent Krystal Dayne T. Villanada conducting a dedicated macroinvertebrate survey in Parolang Putol.



Forest Ranger Efraim Z. Pagador closely inspecting the features of a fish in Parolang Putol.

	
Park Ranger Michael D. Dagdag reeling the second transect in Parolang Putol.	Forest Ranger Efraim Z. Pagador assisting in recording fishes in Bahura 10.
	
Lunch provided Mylits Resto Bar on August 10, 2022.	PMF Roberto P. Beringuela recording their observations along the 0-250 m section of the transect walk route on August 11, 2022.
	
Park Ranger Temart E. Rebito collecting marine debris scattered amongst a rubble pile in Bora-boracay.	PMF Roberto P. Beringuela inspecting crevices of karstic rocks for invertebrates.

	
Boat Captain Mark Dennis M. Barretto sealing a garbage bag filled with marine debris from the first 500 meters of the transect walk route.	Park Ranger Temart E. Rebito taking charge as the recorder starting at the 750-m mark of the transect walk route
	
Park Rangers counting the Black-naped Terns along the sandy shore at the restricted portion of Apo Island	Black-naped Terns flying upon sensing the presence of the rangers even along the trail.
	
Park Rangers heading to the lagoon to observe birds and other notable fauna.	Park Ranger Kelvin U. Zubiri recording their observations at the lagoon

Appendix B. Abridged BMS Report (using the standard format).

Name of Protected Area: Apo Reef Natural Park
Name of PAMB: Apo Reef Natural Park – Protected Area Management Office
2nd Semester of Year 2022

I. Introduction

The Biodiversity Monitoring System aims to improve the information available for decision-makers in Protected Areas through the regular collection of data on natural biological resources and their utilization. The focus is on identifying trends in biodiversity and the participation of protected area communities in PA management.

The BMS includes four methods which are the Focus Group Discussions (FGD), Field Diaries, Photo-documentation, and Transects. Only two of which are implemented in Apo Reef Natural Park (ARNP). They are as follows:

1. **Field Diaries** are used by PA staff during regular patrols and other field activities in the protected area. This method comprises standardized recording of routine observations on resource use and wildlife in a simple pocketbook or data sheet. Information may be own observations or second-hand information.

2. Transects are somewhat similar to routine patrolling using field diary. However, transects are permanent demarcated routes where there are precise recommendations on where to walk or swim, when to do it, and what to note. Two types of which are conducted in ARNP bi-annually: the transect walk and transect swim. The transect walk is conducted along a permanent 1500-m transect in Apo Island, ARNP. Meanwhile, the transect swim is conducted in four different sites namely, Bahura 10, Binanggaan, Parolang Putol, and San Antonio.

II. Proposed Management Interventions

None of the management interventions proposed are needing direct action from the Protected Area Management Board. Thus, we opted to present proposed management actions in the next section.

III. Important Observations

The summary and recommendations from the implementation of BMS during the wet season of 2022 is shown in the table below.

BMS Method	Species or Resource Use	Change Observed and Reason	Proposed Action/s
Field Diary	Fairy Pitta, Spotted Imperial Pigeon, Metallic Pigeon, and White-breasted Waterhen	These birds were recorded for the first time in ARNP. Three of which were photographed by Park Rangers Kelvin U. Zubiri and Michael D. Dagdag.	***Enhance the capacity of management staff in monitoring birds*** Park Rangers, both contractual and permanent, have shown great improvement in the recent years with monitoring birds. To date, they are responsible for at least 17 new bird records in ARNP. Their capacity should be enhanced further not only by ensuring their regular participation in the Waterbirds Surveys of MBCFI but also by initiating other training activities like bird photography.
Transect Walk	Black-naped Tern	There was an almost ten-fold increase in the total number of bird count this wet season and it was attributed to Black-naped	***Scale-up the enforcement of PA rules and regulations in Apo Island*** Black-naped Tern is among the most sensitive seabird species. Human

BMS Method	Species or Resource Use	Change Observed and Reason	Proposed Action/s
		Terns that are breeding along the sandy beach of Apo Island.	disturbance in nesting areas can lead to nest abandonment and mortality of eggs and chicks. This is why it is important to ensure that visitors do not illegally enter the *Restricted Area* wherein hundreds of Black-naped Tern eggs were recorded. ***Develop a rat control or eradication program*** Invasive rats are a big threat to birds, especially surface nesters like Black-naped Terns. Hence, a comprehensive assessment of the rat populations in Apo Island shall be conducted. The results of the assessment shall then be used to formulate and implement an effective rat population control method.
Transect Swim	Fish Indicators	There were no signs of recovery in terms of indicator fish abundance in Bahura 10.	***Intensify patrolling*** Implement stricter patrolling in Bahura 10 to ensure that anthropogenic disturbances, such as illegal fishing, do not impede with the recovery of the site. This is also applicable for Parolang Putol and San Antonio. ***Enhance capacity of management staff on reef survey techniques*** The capacity of the management staff to conduct reef surveys should be improved. This may be done through continuous participation in researches involving coral reef monitoring (i.e. *SMaRT-Corals*) and propose the funding of a series of training activities to DENR-BMB.
	Crown-of-Thorns Starfish	CoTS individuals were recorded in Parolang Putol and San Antonio.	***Conduct thorough searches for CoTS*** Timed dives should be conducted in Parolang Putol and San Antonio to thoroughly search for CoTS. The CoTS densities that will be acquired from the timed dives shall be used to decide whether culling is necessary.

I. Summary of Data

a. *Summary of Field Diary data from March to August 2022*

The summary of the Field Diary data is presented in the table below. The data included in the table below are limited to the sightings of notable species within the mentioned duration.

Resource Use or Species	Location	Count	How Observed	Date	Observer	Remarks
Beach Thick-Knee	Restricted Area	1	Seen	03/03/2022	MDDagdag	Foraging
Philippine Megapode	Rangers Station	3	Seen	03/03/2022	MDDagdag	Foraging

Resource Use or Species	Location	Count	How Observed	Date	Observer	Remarks
Nicobar Pigeon	Rangers Station	1	Seen	03/03/2022	MDDagdag	Foraging
Beach Thick-Knee	Picnic Ground	1	Seen	03/04/2022	MDDagdag	Foraging
Green Turtle	Rangers Kiosk	24	Seen	03/04/2022	MDDagdag	Hatchlings
Philippine Megapode	Rangers Station	2	Seen	03/05/2022	MDDagdag	Foraging
Blacktip Shark	Restricted Area	1	Seen	03/05/2022	MDDagdag	Swimming
Philippine Megapode	Rangers Station	2	Seen	03/05/2022	MDDagdag	Foraging
Blacktip Shark	Restricted Area	1	Seen	03/06/2022	MDDagdag	
Beach Thick-Knee	Picnic Ground	1	Seen	03/07/2022	MDDagdag	Foraging
Whimbrel	Helipad	1	Seen	03/16/2022	MDDagdag	
Philippine Megapode	Restricted Area	1	Seen	03/16/2022	MDDagdag	
Blacktip Shark	Lagoon	1	Seen	03/16/2022	MDDagdag	
Nicobar Pigeon	Rangers Station	1	Seen	03/17/2022	MDDagdag	Foraging
Beach Thick-Knee	Lighthouse	1	Seen	03/18/2022	MDDagdag	Foraging
Nicobar Pigeon	Rangers Station	1	Seen	03/18/2022	MDDagdag	Foraging
Philippine Megapode	Rangers Station	1	Seen	03/19/2022	MDDagdag	Foraging
Beach Thick-Knee	Helipad	1	Seen	03/19/2022	MDDagdag	Foraging
Philippine Megapode	Rangers Station	3	Seen	03/22/2022	MDDagdag	
Philippine Megapode	Rangers Station	1	Seen	03/25/2022	KJZubiri	
Mantanani Scops-Owl	Rangers Station	1	Seen	03/25/2022	KJZubiri	
Green Turtle	Apo Island (Front)	2	Seen	03/27/2022	KJZubiri	Mating
Philippine Megapode	Rangers Station	1	Seen	03/28/2022	KJZubiri	Flying
Philippine Megapode	Rangers Station	2	Seen	04/12/2022	KJZubiri	
Bridled Tern	Ego Wall	3	Seen	04/15/2022	MDDagdag	Flying
Philippine Megapode	Rangers Station	1	Seen	04/16/2022	MDDagdag	Perched
Philippine Megapode	Rangers Station	2	Seen	04/16/2022	MDDagdag	
Nicobar Pigeon	Rangers Station	1	Seen	04/18/2022	MDDagdag	
Philippine Megapode	Rangers Station	1	Seen	04/18/2022	MDDagdag	
Nicobar Pigeon	Rangers Station	1	Seen	04/19/2022	MDDagdag	Foraging
Philippine Megapode	Rangers Station	2	Seen	04/20/2022	KJZubiri	Walking
Beach Thick-Knee	Restricted Area	1	Seen	04/20/2022	KJZubiri	Walking
Nicobar Pigeon	Rangers Station	1	Seen	04/21/2022	KJZubiri	Walking
Nicobar Pigeon	Rangers Station	1	Seen	04/22/2022	KJZubiri	Walking
Nicobar Pigeon	Rangers Station	1	Seen	04/22/2022	KJZubiri	Walking
Mantanani Scops-Owl	Rangers Station	1	Seen	04/22/2022	KJZubiri	Perched
Fairy Pitta*		1	Seen	04/24/2022	KJZubiri	
Black-naped Tern	Lagoon	3	Seen	04/28/2022	MDDagdag	
Nicobar Pigeon	Rangers Station	1	Seen	04/28/2022	MDDagdag	Foraging
Philippine Megapode	Rangers Station	3	Seen	04/28/2022	MDDagdag	
Beach Thick-Knee	Picnic Ground	1	Seen	04/29/2022	MDDagdag	
Beach Thick-Knee	Lighthouse	1	Seen	04/30/2022	MDDagdag	Foraging
Nicobar Pigeon	Rangers Station	1	Seen	05/01/2022	MDDagdag	
Philippine Megapode	Picnic Ground	2	Seen	05/01/2022	MDDagdag	
Philippine Megapode	Boardwalk	2	Seen	05/02/2022	MDDagdag	
Nicobar Pigeon	Rangers Station	1	Seen	05/10/2022	MDDagdag	
Beach Thick-Knee	Helipad	1	Seen	05/10/2022	MDDagdag	
Common Myna	Rangers Station	1	Seen	05/12/2022	MDDagdag	
Nicobar Pigeon	Rangers Station	1	Seen	05/12/2022	MDDagdag	
Pitta	Rangers Kiosk	1	Seen	05/13/2022	MDDagdag	
Nicobar Pigeon	Rangers Station	1	Seen	05/13/2022	MDDagdag	
Beach Thick-Knee	Restricted Area	1	Seen	05/13/2022	MDDagdag	
Nicobar Pigeon	Rangers Station	1	Seen	05/14/2022	MDDagdag	
Blacktip Shark	Restricted Area	1	Seen	05/15/2022	MDDagdag	
Beach Thick-Knee	Restricted Area	1	Seen	05/16/2022	MDDagdag	
Common Myna	Rangers Station	1	Seen	05/17/2022	MDDagdag	Flying

Resource Use or Species	Location	Count	How Observed	Date	Observer	Remarks
Nicobar Pigeon	Rangers Station	1	Seen	05/25/2022	MDDagdag	
Beach Thick-Knee	Rangers Kiosk	1	Seen	05/26/2022	MDDagdag	
Nicobar Pigeon	Rangers Station	1	Seen	05/27/2022	MDDagdag	
Blacktip Shark	Lighthouse	2	Seen	05/28/2022	MDDagdag	Swimming
Nicobar Pigeon	Picnic Ground	1	Seen	05/28/2022	MDDagdag	
Beach Thick-Knee	Restricted Area	1	Seen	05/28/2022	MDDagdag	
Beach Thick-Knee	Lighthouse	1	Seen	05/29/2022	MDDagdag	
Common Myna	Rangers Station	1	Seen	05/29/2022	MDDagdag	Foraging
Common Myna	Rangers Station	1	Heard	05/31/2022	MDDagdag	
Black-naped Tern	Restricted Area	Flock	Seen	05/31/2022	MDDagdag	
White-breasted Waterhen*	Rangers Kiosk	1	Seen	05/31/2022	MDDagdag	
Nicobar Pigeon	Picnic Ground	1	Seen	06/01/2022	MDDagdag	
Beach Thick-Knee	Rangers Kiosk	1	Seen	06/22/2022	MDDagdag	Flying
Nicobar Pigeon	Rangers Station	1	Seen	06/22/2022	MDDagdag	
Beach Thick-Knee	Rangers Kiosk	1	Heard	06/24/2022	MDDagdag	
Beach Thick-Knee	Bora-boracay	1	Seen	06/26/2022	MDDagdag	
Black-naped Tern	Restricted Area	7	Seen	06/27/2022	MDDagdag	
Beach Thick-Knee	Helipad	1	Seen	07/06/2022	MDDagdag	
Nicobar Pigeon	Rangers Station	1	Seen	07/07/2022	MDDagdag	
Philippine Megapode	Rangers Station	2	Seen	07/07/2022	MDDagdag	Foraging
Black-naped Tern	Restricted Area	Flock	Seen	07/08/2022	MDDagdag	
Nicobar Pigeon	Rangers Station	1	Seen	07/09/2022	MDDagdag	
Philippine Megapode	Rangers Station	2	Seen	07/09/2022	MDDagdag	Foraging
Black-naped Tern	Restricted Area	36	Seen	07/11/2022	MDDagdag	Hatchlings
Metallic Pigeon*	Helipad	1	Seen	07/12/2022	MDDagdag	
Black-naped Tern	Restricted Area	100+	Seen	07/13/2022	KJZubiri	Flying and Perched
Hawksbill Turtle	Rangers Kiosk	1	Seen	07/14/2022	KJZubiri	Nesting
Mantanani Scops Owl	Rangers Station	1	Seen	07/15/2022	KJZubiri	Perched
Mantanani Scops Owl	Rangers Station	3	Seen	07/15/2022	KJZubiri	Perched
Bridled Tern	Apo Island	35	Seen	07/16/2022	Birders**	
Bridled Tern	Binanggaan	385	Seen	07/16/2022	Birders**	
Bridled Tern	Tinangkapan	41	Seen	07/16/2022	Birders**	
Black-naped Tern	Apo Island	347	Seen	07/16/2022	Birders**	
Black-naped Tern	Binanggaan	158	Seen	07/16/2022	Birders**	
Black-naped Tern	Tinangkapan	191	Seen	07/16/2022	Birders**	
Spotted Imperial Pigeon*	Lighthouse	1	Seen	07/16/2022	Birders**	
Brown Noddy	Apo Island	1	Seen	07/17/2022	Birders**	Sick
Bridled Tern	Apo Island	36	Seen	07/17/2022	Birders**	
Bridled Tern	Binanggaan	532	Seen	07/17/2022	Birders**	
Bridled Tern	Tinangkapan	64	Seen	07/17/2022	Birders**	
Black-naped Tern	Apo Island	231	Seen	07/17/2022	Birders**	
Black-naped Tern	Binanggaan	94	Seen	07/17/2022	Birders**	
Black-naped Tern	Tinangkapan	260	Seen	07/17/2022	Birders**	
Greater Crested Tern	Barkong Lutang	3	Seen	07/17/2022	Birders**	
Spotted Imperial Pigeon*	Lighthouse	1	Seen	07/17/2022	Birders**	
Bridled Tern	Apo Island	25	Seen	07/18/2022	Birders**	
Bridled Tern	Binanggaan	565	Seen	07/18/2022	Birders**	
Bridled Tern	Tinangkapan	63	Seen	07/18/2022	Birders**	
Black-naped Tern	Apo Island	346	Seen	07/18/2022	Birders**	
Black-naped Tern	Binanggaan	48	Seen	07/18/2022	Birders**	
Black-naped Tern	Tinangkapan	143	Seen	07/18/2022	Birders**	

Resource Use or Species	Location	Count	How Observed	Date	Observer	Remarks
Spotted Imperial Pigeon*	Lighthouse	1	Seen	07/18/2022	Birders**	
Brown Booby	Apo Island	1	Seen	07/18/2022	Birders**	
Green Turtle	Apo Island (Front)	3	Seen	07/18/2022	KJZubiri	Mating
Spinner Dolphin	Parolang Putol	25	Seen	07/26/2022	KJZubiri	Swimming
Bridled Tern	Binanggaan	50	Seen	07/26/2022	KJZubiri	Flying
Black-naped Tern	Binanggaan	10+	Seen	07/26/2022	KJZubiri	Flying
Mantanani Scops Owl	Rangers Station	1	Heard	07/26/2022	KJZubiri	
Philippine Megapode	Rangers Station	2	Seen	07/29/2022	KJZubiri	Foraging
Bridled Tern	Binanggaan	5	Seen	07/29/2022	KJZubiri	Flying
Black-naped Tern	Parolang Putol	3	Seen	07/29/2022	KJZubiri	Flying
Philippine Megapode	Rangers Station	2	Seen	08/03/2022	MDDagdag	
Monitor Lizard	Picnic Ground	1	Seen	08/03/2022	MDDagdag	Track
Monitor Lizard	Sampalok Area	1	Seen	08/04/2022	MDDagdag	Track
Philippine Megapode	Picnic Ground	1	Seen	08/04/2022	MDDagdag	
Philippine Megapode	Picnic Ground	2	Seen	08/06/2022	MDDagdag	
Black-naped Tern	Restricted Area	Flock	Seen	08/07/2022	MDDagdag	
Nicobar Pigeon	Rangers Station	1	Seen	08/08/2022	MDDagdag	

*New bird record in ARNP

**The three volunteer birders were Jasmin C. Meren, Ronet S. Santos, and Peter Simpson

a. *Summary of Transect Swim data for the second semester of 2022*

PA Name: Apo Reef Natural Park **Total No. of Transect Swim Sites:** 4

Name of transect route	Date of survey	Priority species and uses recorded	No. individuals/500 m² during the 2nd Semester
San Antonio	August 9	Butterflyfish (*Chaetodontidae*)	20
		Parrotfish (*Scarinae*)	3.5
		Grouper (*Epinephelidae*)	14
		Giant Clam (*Tridacninae*)	40.5
		Sea Urchin (*Echinoidea*)	7
		CoTS (*Acanthaster sp.*)	2
Binanggaan	August 9	Butterflyfish (*Chaetodontidae*)	3
		Parrotfish (*Scarinae*)	29
		Grouper (*Epinephelidae*)	1
		Giant Clam (*Tridacninae*)	102
		Sea Urchin (*Echinoidea*)	15
Parolang Putol	August 10	Butterflyfish (*Chaetodontidae*)	21
		Parrotfish (*Scarinae*)	10.5
		Grouper (*Epinephelidae*)	2
		Snapper (*Lutjanidae*)	0.5
		Giant Clam (*Tridacninae*)	44.5
		Sea Urchin (*Echinoidea*)	49
		CoTS (*Acanthaster sp.*)	0.5
Bahura 10	August 10	Butterflyfish (*Chaetodontidae*)	5
		Parrotfish (*Scarinae*)	20
		Giant Clam (*Tridacninae*)	3
		Sea Urchin (*Echinoidea*)	6

b. *Summary of Transect Walk data for the second semester of 2022*

PA Name: Apo Reef Natural Park **Total No. of Transect Walk Sites:** 1

Name of transect route	Date of survey	Priority species and uses recorded	No. of recorded during the 1st Semester
1500-m route in Apo Island	August 14	Barn Swallow	12
		Barred Rail	21
		Black-naped Oriole	19
		Black-naped Tern	368
		Collared Kingfisher	3
		Egret sp.	3
		Eurasian Tree Sparrow	12
		Pied Imperial Pigeon	8
		Plover sp.	1
		Olive-backed Sunbird	9
		Philippine Pied Fantail	1