de la Paz et al. / The Philippine Journal of Fisheries 28(2): 129-142
DOI: 10.31398/tpjf/28.1.2020-0015

July - December 2021

RESEARCH ARTICLE

Marine Mammals Occurring in the Negros Occidental Coastal Wetlands Conservation Area, Philippines

Manuel Eduardo de la Paz*, Jacob Nathaniel Luther, Stiffy Marie Espinosa, Bea Chiara Festin, Rubena Marie Santillan, John Paul Gabriel, La Vera U. Sombito, Jozette G. Hisu-an, Regie Antonette R. Salvilla, Johanna Marie Cardinal, Trisha Marie Lotayco, Pamela Montoya

University of St. La Salle, Bacolod City, Negros Occidental

ABSTRACT

The Negros Occidental Coastal Wetlands Conservation Area (NOCWCA) is the Philippines' 7th Ramsar Site of Wetlands of International Importance. It spans 89,607 ha comprising the municipal waters of 10 adjacent towns and municipalities. Its waters are part of the Guimaras Strait in the north and the Panay Gulf in the south. This research aimed to assess marine mammal diversity in these coastal wetlands. Marine mammal species here were documented through strandings, interview surveys, and boat surveys. Ten species of marine mammals, including the dugong (*Dugong dugon*), have stranded in the NOCWCA for the past ten years. Three species were encountered in the boat surveys: Indo-Pacific bottlenose dolphin (*Tursiops aduncus*), Long-snouted spinner dolphin (*Stenella longirostris longirostris*), and Irrawaddy dolphin (*Orcaella brevirostris*). All species were encountered in close proximity to fishing boats, indicating possible interactions. The presence of these marine mammals here highlights the importance of these areas as essential habitats.

*Corresponding Author: *m.delapaz@usls.edu.ph*
Received: *September 23, 2020*
Accepted: *December 15, 2020*

Keywords: *Marine mammals; Irrawaddy dolphins, Dugong, coastal wetlands, Negros Occidental*

1. INTRODUCTION

Coastal habitats in Southeast Asia are one of the most heavily exploited ecosystems in the world but are also home to some of its most vulnerable marine mammal species (Smith and Jefferson 2002). For most developing countries in this region, coastal resources provide food security, employment, and social stability for many communities living below the poverty line (Silvestre et al. 2003). In the Philippines, an archipelagic country with 7,610 islands and a coastline of 36,289 km, extensive modification of coastal areas, as well as overfishing and heavy boat traffic, have led to the decimation of certain species of marine mammals such as the Dugong (*Dugong dugon*) and Irrawaddy dolphin (*Orcaella brevirostris*). Threats associated with these animals, such as bycatch, depletion of prey, habitat degradation, noise, and pollution, are primarily concentrated in coastal areas (Santos and Aquino 2012) compared to deeper, off-shore habitats. Dugongs, which used to occur throughout the archipelago (Marsh et al. 2002; Yaptinchay 1994), have already lost 30-50% of their seagrass habitats (Aquino et al. 2012). On the other hand, Irrawaddy dolphins are found in coastal and estuarine habitats and occur in small, patchy populations that have been decreasing at an alarming rate (Minton et al. 2017; Dolar et al. 2018). Dolar and Sabater (2011) predict that further habitat loss, climate change, and heavy fishing pressure on fish prey will push these two species to the brink of extinction.

Conservation of these endangered marine mammals will, for a large part, need to be approached through ecosystem-based management (Hoyt 2005). All marine mammals are protected under several national laws such as the Fisheries Code of the Philippines (Republic Act 8550 as amended by R.A. 10654), the Philippine Wildlife Protection and Conservation Act (R.A. 9147), the Department of Environment and Natural Resources' (DENR) Administrative Order (DAO) 2004-15, and the Department of Agriculture's Fisheries Administrative Order (FAO) 208.

However, their distribution across a vast and diverse seascape also requires management initiatives up to the local level (e.g., provincial/municipal/barangay) (Whitty 2016). For example, more attention has been given to the endangered dugong, which is also protected under DAO No. 55-1991 and locally through municipal ordinances in Roxas, Palawan, and Taragona, Davao Oriental (Aquino et al. 2012). Similarly, Irrawaddy dolphins in Malampaya Sound, Palawan, are protected under the Malampaya Sound Protected Land and Seascape of the National Integrated Protected Areas System (NIPAS) Act, as well as Municipal Ordinance No. 05-04 (Dolar et al. 2012a). In Guimaras Strait, City Ordinance No. 17-02 of Bago City, Negros Occidental designated a marine protected area for Irrawaddy dolphins (Teruel et al. 2017).

In 2017, the Negros Occidental Coastal Wetlands Conservation Area (NOCWCA), the Philippines' seventh Ramsar site of Wetlands of International Importance (Ramsar Site 2271), was established. It consists of 89,607 ha of coastal wetlands encompassing the municipal waters of 10 adjacent cities and municipalities of Negros Occidental, including Bago City, Pulupandan, Valladolid, San Enrique, Pontevedra, Hinigaran, Binalbagan, Himamaylan City, Kabankalan City, and Ilog (Ramsar 2016). The wetlands are essentially part of the world's highest marine shorefish diversity concentration (Carpenter and Springer 2005). The establishment of the NOCWCA was largely accredited to its importance as a coastal resource, rich biodiversity, and feeding ground for migratory birds. Notable fauna here includes 72 waterbird species such as the endangered great knot (*Calidris tenuirostris*), far eastern curlew (*Numenius madagascariensis*) and spotted greenshank (*Tringa guttifer*); endangered marine turtles such as the green sea (*Chelonia mydas*) and olive Ridley (*Lepidochelys olivacea*) turtles; and unique shellfish such as the angel's wings clam (*Cyrtopleura costata*) and short-necked nylon shell (*Paphia undulata*) (Paguntalan and Jakosalem 2016; Martinez et al. 2017). It is also the known habitat of a small subpopulation of critically endangered Irrawaddy dolphins, which inhabit a small estuarine area at the Bago River's mouth (Dolar et al. 2018; de la Paz et al. 2020). Their presence here has also led to their habitat's designation as an Important Marine Mammal Area (IMMA) by the International Union for the Conservation of Nature (IUCN MMPATF 2019).

Increased awareness of the value of marine mammals among local stakeholders has led to more frequent reporting of stranding events of Irrawaddy dolphins and other marine mammal species. While regular surveys in the Bago-Pulupandan estuary showed that the Irrawaddy dolphins were somewhat restricted to a minimal home range (de la Paz et al. 2020), there is a need to investigate if these dolphins and other marine mammals may also occur in adjacent habitats. This paper aims to present the marine mammal species that occur or have occurred in NOCWCA through interview surveys, stranding reports, and vessel-based surveys. It provides updates and supports previous records of species in the area.

2. MATERIALS AND METHODS

2.1. Survey Site

The NOCWCA spans most of the central-west coasts of Negros Island in central Philippines. The northern part of the wetland is part of Guimaras Strait, a small, narrow body of water that separates Negros Island from Guimaras Island. The southern part is part of the Panay Gulf, which separates Negros Island from Panay Island and the adjacent Sulu Sea (Fig.1).

Figure 1. Map of Negros Island showing boundaries of Negros Occidental Coastal Wetlands Conservation Area (NOCWCA)

Most of NOCWCA is characterized by muddy soft-bottom habitats, with mangroves and sandy beaches lining the coastlines. Nine rivers and several tributaries from three major watersheds feed in freshwater and mineral input into this estuarine wetland, making the coastal waters too turbid to allow the growth of coral reefs and seagrass beds (Baltazar et al. 2017). Instead, the muddy waters provide a suitable habitat for various invertebrate species that have provided a significant source of livelihood for gleaning and shellfish fishery (Martinez et al., 2017).

2.2. Data Collection

2.2.1 Interview Surveys and Stranding Data

Semi-structured interview surveys were conducted in 7 coastal municipalities of the NOCWCA, as well as neighboring sites (San Lorenzo, Guimaras Island, east of NOCWCA, and the Municipality of Manapla, and Silay and Talisay Cities, north of NOCWCA). Interviews were particularly focused on fishers who regularly went out to sea or retired fishers who have had at least 10 years of experience fishing in the NOCWC area.

Coastal villages (barangays) were visited after securing permission from the local government unit and the Barangay captain. Fishers were asked the following questions:

1. Do you see marine mammals (dugongs, whales and dolphins) in the area?
2. What kind of marine mammals do you see?
3. Where do you see these animals?
4. How often do you see these animals?
5. When is the best time to see these animals?
6. When was the last time that you saw these animals?
7. Have you seen any strandings of these animals lately? When and where did this happen?
8. Where do you report these strandings?

For the second and seventh questions, fishers were provided with identification guides of different marine mammals reported in the Philippines (Alava et al. 2012; Songco 2012) so that they can identify which species were familiar with them. Printed maps of Guimaras Strait and Panay Gulf with gridlines to represent 5 x 5 km for each square, were provided to let fishers point out the approximate locations of their sightings (Question # 3).

Further information on dolphin strandings were collected from the Agricultural Offices of each municipality and from a marine mammal stranding database managed by the University of St. La Salle.

2.2.2. Boat Surveys

Information from the interview surveys were partly used to design a line transect for boat-based surveys in the NOCWC Area. The boat surveys made use of 11 transect lines that were set 1-2 km from the coastline and which extended 15 km offshore and were 4 km apart. Transect lines were oriented at perpendicular to the coastline to allow the detection of cetacean density gradients along the coastline as well as onshore / offshore (Minton et al. 2011; Dawson et al. 2008) (Fig. 2).

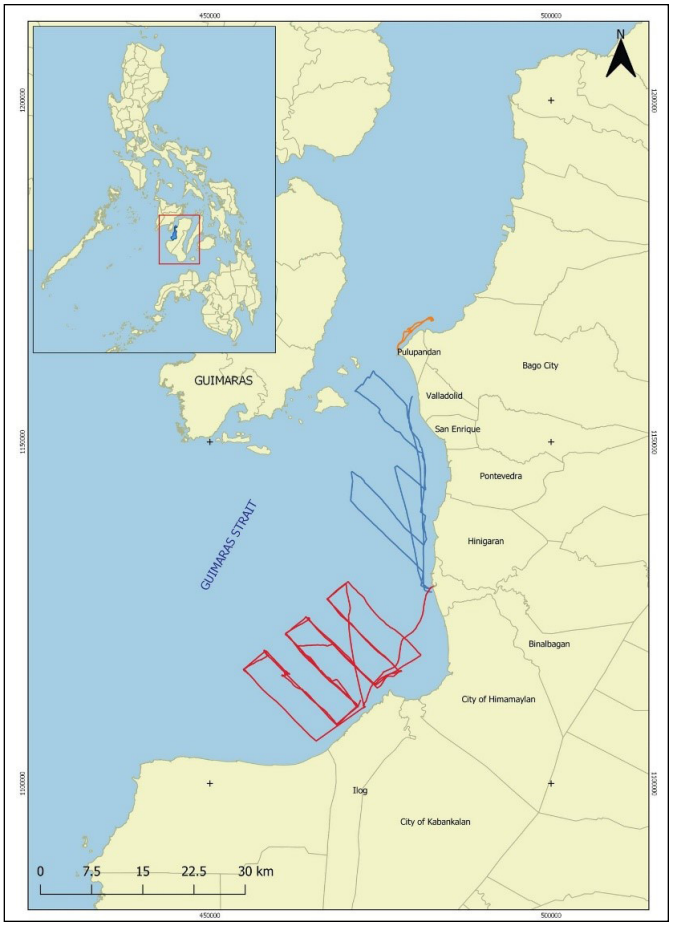

Figure 2. Map of the study site showing the track lines covered by the boat surveys. Red lines indicate the first segment while blue lines indicate the second segment and orange lines indicate the third segment of the survey.

Limitations on the availability of a survey boat to cover the entire study area prompted us to divide the survey transect into three segments, using different survey boats. The first segment consisted of the municipal waters of Ilog, Kabankalan, and Himamaylan, which were surveyed in 27-28 August 2017 and 21-23 September 2018; the second segment consisted of the municipal waters of Binalbagan, Hinigaran, Pontevedra, San Enrique, and Valladolid and were surveyed on 24 September, 2018 and 21 March 2019; and the last segment covered the coastal waters of Pulupandan and Bago City, which were surveyed on 25 September 2018 and 24 May 2019. Aside from this continuous transect, regular surveys were conducted by the researchers in the Bago-Pulupandan area to monitor the Irrawaddy dolphins.

Surveys in the first segment made use of a 15 m outrigger patrol boat of the Municipality of Ilog with an open observation deck 3.5 m high. In the second segment, the survey boat used was a 15 m outrigger fishing boat with an open observation deck 2 m high. The third segment made use of two 6-m outrigger fishing boats and which had no elevated observation deck. Transect lines were navigated at a speed of 12-14 km per hour from as early as 0600H in favorable sea conditions of Beaufort Sea State (BSS) <3 to allow for optimal observations. When BSS increased beyond 3, search effort was stopped as this made it difficult to spot animals amidst white caps and rough sea conditions.

During the surveys, observers took turns scanning the horizon for signs of any animals on the water using 10 x 50 binoculars or their naked eyes. Observers rotated to occupy five different positions on the boat: three observers stood on the deck, one on each side covering 90^0 from the front to the left or right side of the boat, and a primary observer who stood in the middle to scan 180^0 of the front of the boat. A fourth observer was positioned on the boat's bow to spot any animals that may surface too close to the boat for the three other observers to spot. The fifth position was the fisheries encoder, who recorded any fishing gear's presence and type during the survey. The fifth position was assisted by one of the boat crew who helped identify the fishing gears encountered. Gears were also verified with the help of the local municipal agriculturists. All observers rotated their positions every 30 min to avoid observer bias on a particular position (Dolar et al. 2006). Observers were allowed to rest between the primary and left spotter positions to avoid observer fatigue.

When an observer on-effort spotted any animal on the surface, search effort was stopped, and the survey boat was directed to approach the location of the sighted animal. The data encoder recorded the exact location, species, group size, and group behavior of the animals during an interaction. Photographs of the animals and their dorsal fins were taken using a digital SLR camera with 300-400 mm zoom lenses to confirm species identification and possible individual identification using photo-ID techniques. Photographs of the dolphins' dorsal fins and flukes were sorted out and examined for markings such as scratches, cuts, and nicks that could be used to identify individual dolphins. Identifiable dolphins were then assigned catalog numbers and included in a database for future resighting reference.

3. RESULTS

3.1 Interview Surveys

Interview surveys have confirmed the presence of different kinds of marine mammals sighted around Guimaras Strait and Panay Gulf. Table 1 shows the number of respondents and coastal barangays covered by the interview surveys. Of the 209 fishers interviewed, 94.25% have reported sighting marine mammals at least once in the last 10 years: 76.55% have sighted dolphins, 19.14% have sighted a whale, and 55.02% sighted a dugong.

Table 1. Number of respondents interviewed for each city/municipality

City / Municipality	No. of respondents	Percentage
Manapla	19	9.1
E.B. Magalona	28	13.4
Silay	12	5.7
Talisay	11	5.3
Valladolid	15	7.2
San Enrique	20	9.6
Hinigaran	39	18.7
Binalbagan	22	10.5
San Lorenzo	43	20.6
Total	**209**	**100**

The most common species reported by fishers include bottlenose dolphin (*Tursiops* sp.), spotted dolphin (*Stenella attenuata*), spinner dolphin (*S. longirostris*), Risso's dolphin (*Grampus griseus*), and Irrawaddy dolphin (*Orcaella brevirostris*). Other species reported include Fraser's dolphin (*Lagenodelphis hosei*), short-finned pilot whale (*Globicephala macrorhynchus*), Indo-Pacific humpback dolphin (*Sousa chinensis*), melon-headed whales (*Peponocephala electra*), and rough-toothed dolphin (*Steno bredanensis*) (Table 2). There were also reports of dugong (*Dugong dugon*) in Guimaras Island (San Lorenzo) and northern Negros (Manapla, Visayan Sea), and killer whale (*Orcinus orca*) in the southern Negros (Cauayan, Sulu Sea) area. Two fishers reported humpback whales (*Megaptera novaeangliae*) from San Lorenzo and one in E.B. Magalona, and one Blainville's beaked whale (*Mesoplodon densirostris*) was reported by one fisher from Manapla.

Marine mammals from the stranding records compiled from local government offices and by the authors for the past 10 years are listed in Table 3. The list totals ten species, including the dugong. The most common species that have stranded, Irrawaddy dolphins and Indo-Pacific bottlenose dolphins, were all found freshly dead.

Table 2. Sightings of marine mammals as reported by fishers in the interview surveys

	City / Municipality								
	Silay	Talisay	Valladolid	San Enrique	Manapla	Hinigaran	San Lorenzo	Binalbagan	EB Magalona
Blainville's beaked whale					√				
Bryde's whale							√		
Blue whale			√			√			
Bottlenose dolphin		√		√	√	√		√	
Dugong	√		√		√		√	√	√
Dwarf-spinner dolphin						√			
False killer whale							√		
Fraser's dolphin	√						√		√
Indo-Pacific humpback dolphin						√	√		
Irrawaddy dolphin	√	√	√					√	
Killer whale		√					√		
Long-snouted spinner dolphin		√		√	√	√	√		√
Melon-headed whale			√						
Omura's whale			√						
Pantropical spotted dolphin	√	√	√			√	√		
Pygmy sperm whale			√						
Risso's dolphin	√	√	√	√	√	√	√		
Rough-toothed dolphin						√	√		
Short-finned pilot whale			√						√
Striped dolphin	√		√			√			

Table 3. Marine mammal stranding records from Negros Occidental since May 2011. Stranding codes are as follows: 1. Live stranding; 2. Freshly dead carcass; 3. Decomposing carcass; 4. Advance state of decomposition; 5. Butchered

Common Name	Species	Age Class	Location	Date of Stranding	Stranding Code
Irrawaddy dolphin	*Orcaella brevirostris*	calf	Pulupandan	May-11	2
Irrawaddy dolphin	*Orcaella brevirostris*	calf	Pulupandan	May-11	2
Irrawaddy dolphin	*Orcaella brevirostris*	adult	Pulupandan	Jul-13	2
Bottlenose dolphin	*Tursiops* sp.	adult	Pulupandan	Jun-13	3
Dugong	*Dugong dugon*	adult	EB Magalona	21-Jul-14	3
Pygmy sperm whale	*Kogia breviceps*	adult	Pulupandan	11-Jul-15	2
Irrawaddy dolphin	*Orcaella brevirostris*	calf	Bago		2
Pantropical Spotted dolphin	*Stenella attenuata*	Multiple adutls	Bago	14-Jun-16	1
Fraser's dolphin / Spinner dolphin	Unidentified; possibly *L. hosei* or *Stenella* sp. Due to small, pointy pectoral fin	undetermined	Pulupandan	Oct-16	5
Irrawaddy dolphins	*Orcaella brevirostris*	calf	Pulupandan	Oct-16	2
Short-finned pilot whale	*Globicephala macrorhyncus*	adult	Bacolod	2017	1
Short-finned pilot whale	*Globicephala macrorhyncus*	adult	E.B. Magalona	2017	1
Risso's dolphin	*Grampus griseus*	adult	Valladolid	20-May-16	1
Irrawaddy dolphin	*Orcaella brevirostris*	subadult	Pulupandan	12-May-17	2
Unidentified carcass	n.a.		Binalbagan	23-Apr-17	4
Undetermined	n.a.		Binalbagan	Apr-17	
Fraser's dolphin	*Lagenodelphis hosei*	calf	Binalbagan	reportedly 9 years prior 2018 (Z. Cari-an, Binalbagan MENRO)	2
Unidentified carcass	undertermined		Binalbagan	reportedly 9 years prior 2018 (Z. Cari-an, Binalbagan MENRO)	4
Irrawaddy dolphin	*Orcaella brevirostris*	adult	Bago	January 13, 2019, but initially reported January 3, 2019	4
Dugong	*Dugong dugon*	adult	Pulupandan	6-Feb-19	3
Bottlenose dolphin	*Tursiops* sp.		Sagay City	23-April-2019	2
Pygmy killer whale	*Fenesa attenuata*	adult + juvenile	Hinigaran	24-May-2019	1
Pygmy killer whale	*Fenesa attenuata*	adult	Kabankalan	25-May-2019	1
Irrawaddy dolphin	*Orcaella brevirostris*	adult	Pulupandan	9-July-2019	2
Long snouted-spinner dolphin	*Stenella longirostris*		Bayawan	12-August-2019	1
Long-snouted spinner dolphin	*Stenella longirostris*	adult	Pulupandan	13-August-2019	3

3.2. Cetacean Encounters

A total of 563 km was covered, and 58 hours were spent on-effort during the boat surveys (Fig. 2). The line transects were heavily limited by strong winds brought by the northeast monsoon. Hence, the third segment only concentrated on surveying the Irrawaddy dolphins' coastal habitat in Pulupandan and was not able to cross the rest of the Strait. Only three species were encountered during four sightings: long-snouted spinner dolphins, Indo-Pacific bottlenose dolphins, and Irrawaddy dolphins. Both long-snouted spinner and Indo-Pacific bottlenose dolphins were encountered in the same area at depths of 82 m within 13.25 km from the coastline of the Municipality of Ilog (Fig. 3). The bottlenose dolphins consisted of approximately 20-30 individuals and included at least one calf. The group size of the spinner dolphins was not estimated because of the very brief encounter. Further examination of photo data revealed the presence of cutaneous nodules or skin disease in the bottlenose dolphins.

Irrawaddy dolphins were encountered in estuarine waters outside Bago River's mouth and its adjacent coastal waters in Bago City and Pulupandan (Fig. 3). These sightings occurred in waters less than 2 km from shore, where they were usually feeding in groups near tidal nets and small fishing boats.

3.3. Fishing Gear Encounters

Fishing gears encountered during the transect surveys were not quantified due to fishing boats' tendency to move around and the possibility that some gears may have been recorded twice while traversing parallel transect lines. A list of gears encountered is shown in Table 4.

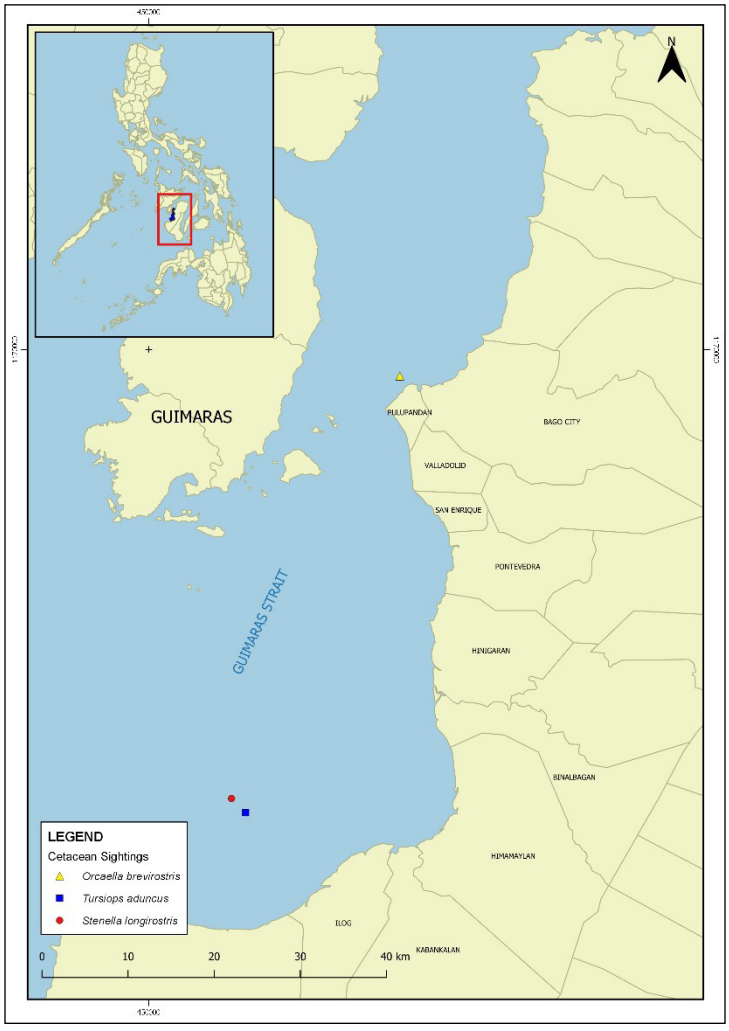

Figure 3. Distribution of sightings of marine mammals during the vessel surveys

Common fishing gears encountered during the survey included the *arong* or *payaw*, a type of fish aggregating device (FAD) made of bamboo and coconut branches set in waters 10-50 meters deep; trawls; and boats fishing with *labay* (multiple hook and lines) or set longlines. Purse-seiners and trawlers were observed to be concentrated at the offshore points of the first and third, as well as along the second leg in depths of approximately 80-130 meters.

4. DISCUSSION

The long-snouted spinner and bottlenose dolphins encountered during the vessel surveys were among the four species also encountered by Dolar et al. (2006) when they conducted a zigzag line transect survey of the Sulu Sea and parts of Panay Gulf in 1994 and 1995. The other species reported in Panay Gulf by Dolar et al. (2006) were the Risso's dolphin and the dwarf sperm whale (*Kogia sima*). Even though these species were not encountered during this survey, the Risso's dolphin appeared to be one of the most common species reported by fishers during the interviews. In 2016, a live stranding of a male subadult *G. griseus* occurred in the coastal waters of Valladolid (Table 2),

Table 4. Fishing gears and the corresponding fish caught

Fishing gear	Fish species caught
Pukot (gill net)	*Tabagak, Tuloy, Guma-a, Lagaw, Bulaw, Balantyong, Sapsap, Salmonite, Kasag, Malasugi, Tangigue, Gusaw, Bugaong, Punat, Kanugtok, Tulingan,*
Taga (hook and line)	*Tabagak, Tuloy, Balantyong, Dalinuan, Puhaw*
Nylon net	*Lukos, Kasag, Tabagak, Guma-a, Pasayan*
Trawl	*Lokus, Pasayan, Kasag, Tagabak, Lagaw, Salmonite, Muong, Palad , Sunog, Abo, Guno*
Puna (purse seiner)	*Tagabak, Gumaa, Tuloy, Lagaw, Lokus, Punat, Talang-talang, Luna-a*
Bubu (pots)	*Lokus*
Panggal (fish / crab pots)	*Lokus*

further confirming their presence around Guimaras Strait. In 2015, a male *Kogia* sp. was also stranded in the coastal waters of Pulupandan.

Bottlenose dolphin sightings in Panay Gulf by Dolar et al. (2006) were only identified to the genus level, whereas previous marine mammal surveys in the Philippines (Dolar et al. 2006; Leatherwood et al. 1992) identified them simply as *Tursiops truncatus* due to the previously monospecific nature of the genus *Tursiops* (Tiongson and Karczmarski 2016; Rice 1998).

Developments in the genus's taxonomy have resulted in the diversification of the *Tursiops* genus (Wang and Yang 2009; Wang et al. 2000; Wang et al. 1999). Recent surveys in Tañon Strait, Philippines, by Tiongson and Karczmarski (2016) and Callanta (2009) suggest that bottlenose dolphins previously identified as *T. truncatus* may actually be *T. aduncus*. These claims were based on photographs of bottlenose dolphins that showed morphological features that distinguish them from *T. truncatus* (i.e., speckles on the ventral side and a much longer snout than *T. truncatus*). For this survey, photographs taken of the dolphins show similar characteristics, suggesting them to be *T. aduncus*. Indo-Pacific bottlenose dolphins have been known to occupy a wide range of different depths and can be both coastal and oceanic (Wang and Yang 2009). Our sighting depth is within the range of sightings of *T. aduncus* in Tañon Strait and the Sulu Sea. In Tañon Strait, *T. aduncus* were sighted in depth ranges of 4-668 m by Tiongson and Karczmarski (2016) and 24-328 m by Dolar et al. (2006). The sighting range was even broader in the Sulu Sea with 19-2,381 m (Dolar et al., 2006). The presence of calves is an indication that the dolphins are reproducing. However, cutaneous nodules suggestive of lobomycosis present among the dolphins are similar to those observed in *T. aduncus* in Tañon Strait, indicating signs of degrading habitat quality (Tiongson *personal communication*).

Long-snouted spinner dolphins are among the most common species of dolphins found throughout Philippine waters (Dolar et al. 2012c). They have been recorded in the Eastern Sulu Sea, Tañon Strait (Dolar et al. 2006), Tubattaha Reef (Aquino and Calderon 2004), around Northwest Palawan (Aquino 2006), Bohol Sea (Sabater 2008), the Babuyan Channel (Acebes et al. 2013; Acebes 2002), Davao Gulf (Barcelona et al. 2016), Cebu Strait, Ticao Pass, the Sulawesi Sea, Verde Pass, and Southern Mindoro (Dolar at al. 2012c). Sightings of spinner dolphins occur in a wide range of distances from shore; most of them are near shelf breaks or in deeper areas where they are known to feed on mesopelagic prey (Dolar et al. 2003).

Both sightings of the long-snouted spinner and bottlenose dolphins occurred near shrimp trawlers, operating near the shelf break. This is similar to Dolar et al. (2006) when they found bottlenose dolphins following the shrimp trawler. Feeding behavior was observed during this survey's sighting, but it was not clear if this was directly related to the shrimp trawler. Other studies have documented bottlenose dolphins feeding with shrimp trawls (Ansmann et al. 2012) and may suggest dependence on these fishing gears. In Hinigaran, fishers claim the need to cover their trawl nets with canvas to keep dolphins from feeding on their catch. This type of exploitive behavior often puts dolphins at risk of accidental entanglement (Dolar 1994). The stomach of a dead *T. aduncus* which was stranded in Binalbagan in January 2020, was examined by one of the authors (MELP). A piece of nylon net attached to one of its fish prey was discovered, a possible

indication of net depredation. Although fishing gear was not quantified in this study, the apparent frequency of encounters during the transect survey showed how these could pose a potential threat to marine mammals' movement in their habitat.

Sightings of Irrawaddy dolphins were limited to nearshore (< 2 km) and estuarine waters of Bago River (Bago City and Pulupandan), where they have been studied since the population's discovery in 2010 (Dolar 2012; de la Paz et al. 2020). Irrawaddy dolphins were not sighted in the survey of Dolar et al. (2006) because their transect was limited to the northern reaches of Panay Gulf and did not reach Guimaras Strait. While several rivers and creeks make up the NOCWCA, the Irrawaddy dolphins were only sighted in the Bago-Pulupandan-Valladolid area. This is similar to the results of Dolar (2012) during her investigations in 2011 and de la Paz et al. (2020). Fishers also confirm that Irrawaddy dolphins are rarely seen outside of this area. Fishers from San Lorenzo of Guimaras Island also claim that Irrawaddy dolphins do not cross to their side of Guimaras Strait, and they only see the dolphins in Pulupandan waters. Irrawaddy dolphins in other parts of the Indo-Pacific can occupy coastal areas as big as 246 km² (Peter et al. 2016). However, the area occupied by this population in Guimaras Strait is one of the smallest to be recorded (de la Paz et al. 2020).

Limited effort time spent for this survey and rough sea conditions may have played a significant role in the poor sightings resulting in the survey. However, Guimaras Strait is relatively shallower than other surrounding seas (i.e., Panay Gulf, Tañon Strait, Sulu Sea), making it a more suitable habitat for coastal and shallow water specialist species. The highly turbid waters of the NOCWCA are characteristic of the habitat of several coastal species found in Southeast Asia, such as the finless porpoise (*Neophocaena phocaenoides*), Indo-Pacific humpback dolphin (*Sousa chinensis*), Irrawaddy dolphins, and Indo-Pacific bottlenose dolphins. However, there is no recent evidence to confirm the finless porpoise and Indo-Pacific humpback dolphins in the Philippines.

Interview surveys and stranding records appeared to be good supplementary sources of data on other species' occurrence in the area. Fishers spend a tremendous amount of time at sea and are more likely to encounter more animals than can be covered in a limited time allotted for transect surveys. However, data from interviews must be carefully interpreted because people are prone to misidentification of species (false positives) and are likely to affect data reliability. For example, a small number of fishers have claimed to see Indo-Pacific humpback dolphins (*Sousa chinensis*), which have never been seen in Philippine waters except for a single stranding reported in the Turtle Islands in Tawi-tawi (Alava et al. 2012). Similarly, while some fishers have supposedly reported seeing Irrawaddy dolphins in Silay and Talisay, stranding records of Irrawaddy dolphins, which appear to be very frequent, are all limited within Bago and Pulupandan only. Similarly, humpback whales, which were also reported, have not been recorded within the Visayan seas and are presently limited within the northern Philippines (Acebes and Aca 2012; Acebes et al. 2007). While we do not necessarily discredit these species' possible occurrence, interview surveys should only be used to strategize areas where there is a need to investigate further. Empirical data is still necessary to confirm these claims.

Interview surveys can also be used to confirm species' presence in areas that have not been studied for some time. For example, three fishers who have experienced fishing around the Sulu Sea reported sightings of killer whales. Although sightings of this species are rare in the Philippines, killer whales were among those encountered by Dolar et al. (2006) in the Sulu Sea. Presently, there is limited data on the distribution and ecology of killer whales in the Philippines (Dolar et al. 2012b).

Stranding events have been reported better with the aid of mobile phones with cameras and social media. It has also aided in the spreading of awareness of the presence of marine mammals in the Philippines. Strandings also offer an opportunity to study animals that are otherwise difficult to find in the field. However, these opportunities can easily be wasted if data collection during stranding events is not maximized. While it is beneficial to record marine mammal biodiversity in the area through stranding data, there is still a need to conduct necropsies and further investigation on why these strandings occur in the first place as it can provide information on factors that threaten marine mammal populations.

Fishers from San Lorenzo, Guimaras and in Manapla and EB Magalona, Negros Occidental have confirmed the presence of dugongs still occurring in their municipal waters. A dugong stranding in EB Magalona in 2014 also validates these claims. It is important to note that dugongs were reportedly sighted in protected areas in San Lorenzo and Manapla. In San Lorenzo, they were most frequently reported in a seagrass sanctuary, while in Manapla, they are also most commonly seen within the marine protected area, where fishers recounted stories of

dugongs and their pups getting very near shore and children could playfully touch them. Another dugong was stranded in Pulupandan in February 2019. The occurrence of dugongs in Guimaras Strait is significant, as there is presently limited data on their distribution in the Philippines (Dolar et al. 2005; Yaptinchay 1994).

The presence of any dugongs in San Lorenzo should be verified with empirical data as soon as possible. Government plans to construct an inter-island bridge that will connect Negros and Guimaras Islands will most likely involve habitat alterations in San Lorenzo, which is the possible site where the bridge will start (CCCC Highway Consultants 2019). It is predicted that both the Irrawaddy dolphins in Pulupandan and the dugongs in San Lorenzo will be severely affected by habitat alterations, boat traffic, noise pollution, and chemical wastes involved in the construction of this bridge (Tiongson et al. 2020). Developers and construction engineers should work closely with the biologists to look for ways to mitigate the bridge construction's impact on these critically endangered species.

5. CONCLUSION

This research presents at least three cetacean species and possibly the dugong as part of the biodiversity that inhabits the coastal wetlands of Negros Occidental. Other species have been documented through stranding records as well. These marine mammals regularly interact with a myriad of structures and human activities that can compete and even threaten their survival. Further studies are needed to investigate their historical presence and habitat use. The presence of the critically endangered Irrawaddy dolphin and dugong merits that these wetlands count as essential conservation areas that need immediate attention from both local and national agencies of government. Likewise, their presence can also be a source of inspiration for the coastal communities, which are known to take pride in their combined efforts to conserve their coastal wetlands.

ACKNOWLEDGMENTS

This study was funded through the Commission on Higher Education Discovery and Applied Research Trans/Inter-disciplinary Opportunities (CHED DARE-TO) Program awarded to the University of St. La Salle. The authors would like to thank the following: UNIVERSITY OF ST. LA SALLE: Dr. Romeo Teruel, Jessica Pacalioga, Angelica Pedrosa, Grace Magbanua, Robert Desusa, Karl Ta-Octa, Aicee Alonsabe, Sayed Al-Attas, Erica Aragon, Kimberly Casipe and Glib Lirazan; Negros Occidental Coastal Wetland Area Management Alliance (NOCWAMA) through Atty. Wilmon Penalosa, Retired Judge Danilo Amisola, and Ms. Maria Elena San Jose; Kabankalan-Hinigaran-Ilog Integrated Coastal Area Management Council (KAHIL-ICAMC) through Ms. Armela Waldato, Ms. Rusiel Placio, and Mr. Reynante Aplice, Central Negros Council for Coastal Resource Development (CENECCORD) through Ms. Marilou Penafiel; PULUPANDAN: Mayor Miguel Peña, Mr. Federico Infante Jr., Demetrio Yanson, Malenche Yanson, Mr. Jospeh Arlos; BAGO: Mayor Nicholas Yulo, Mr. Vicente Mesias, Ms. Esther Flavio, Mr. Rex Magbanua; VALLADOLID: Mayor Enrique Miravalles, Ms. Rosella Bagaborda, and Mr. George Elemento; SAN ENRIQUE: Mayor Jilson Tubillara, Mr. Leo Vergara, and Ms. Elenita Amen; HINIGARAN: Mayor Jose Nadie Arceo, Ms. Leizl Namo and Ms. Gladys; BINALBAGAN: Mayor Emmanuel Aranda, Mr. Zerxies Carian, Ms. Hedeliza Alarcon, Mr. Caesar Gayen; SAN LORENZO: Mayor Ninfa Gajo Mr. Remajen Galia, Ms. Caroline Bracileno, and Mr.Ibany Borilla; ILOG: Mayor Genaro Alvarez and Mr. Rodante Perez, Bantay Dagat crew Mr. Goody Urbanozo, Mr. Oscar, and Mrs. Francisca Urbanozo-Montelibano ; SILAY: Mayor Mark Golez, Ms. Conchita Ledesma, and Mr. Eulegio Empio; TALISAY: Mayor Neil Lizares, Engr. Warren Paduano, and Ms. Ma. Cristina Diaz; E.B. MAGALONA: Mayor Marvin Malacon, Mr. Jojo Vargas, Mr. Ruben Denaga and Mr. Don Salvador Salcedo, PENRO through Mr. Ericson Vince Ray Yulo; BFAR Region VI: Ms. Marian Jill Sajo-Abeto, Mr. Arlan Mirambel, Mr. Roy de la Peña, Mr. Cristian Cario. MELP would like to thank Mr. Hermogenes Gacho, Mr. Angelico Tiongson and Ms. Jean Utzurrum; The authors would also like to thank Dr. Jo Marie Acebes for reviewing this paper.

AUTHOR CONTRIBUTIONS

de la Paz ME: Project administration, Conceptualization, Supervision, Methodology, Visualization, Data curation, Writing—Original draft and review and editing, Investigation, Funding Acquisition. **Luther JN**: Investigation, Writing—Original draft, Data curation. **Espinosa SM**: Investigation, Data curation, Visualization. **Festin BC**: Investigation, Writing—Original draft, Data curation, Visualization. **Santillan RM**: Investigation, Data Curation, Visualization. **Gabriel JP**: Methodology,

Data curation, Investigation, Visualization. **Sombito LVU**: Conceptualization, Investigation, Writing—Review and editing. **Hisu-an J**: Investigation, Data curation. **Salvilla RA**: Investigation, Data curation. **Cardinal JM**: Investigation, Data curation, Visualization. **Lotayco TM**: Investigation, Data curation. **Montoya P**: Investigation, Data curation.

CONFLICT OF INTEREST

The authors declare that there was no conflict of interest with respect to the research, authorship, and publication of this article.

ETHICS STATEMENT

The authors declare that this study was conducted with the local governments' permission of the cities and municipalities involved. Participants were asked for their consent before the conduct of the interviews. No capture nor experimentation of animals was involved in this study.

REFERENCES

Acebes JMV. 2002. Occurrence of Humpback Whales (*Megaptera noaeanglidae*) and other Cetaceans in the Babuyan Islands, Northern Luzon, Philippines, Document 33. In: Perrin WF, Reeves RR, Dolar MLL, Jefferson TA, Marsh H, Wang JY, and Estacion J. Report on the Second Workshop on the Biology and Conservation of Small Cetaceans and Dugongs of South-East Asia. Germany: UNEP/CMS Secretariat.

Acebes JMV, Darling, JD, Yamaguchi M. 2007. Status and Distribution of Humpback whales (*Megaptera novaeangliae*) in northern Luzon, Philippines. Journal Cetacean Res Manag. 9(1):34-43

Acebes JMV, Aca EQ. 2012. *Megaptera novaeangliae*. In: Alava MNR, Dolar MLL, Sabater ER, Aquino MTR, Santos MD, editors. Red List Status of Marine Mammals in the Philippines. First edition. Quezon City: Bureau of Fisheries and Aquatic Resource–National Fisheries Research and Development Institute. p. 36-39

Acebes JMV, Nakagun S, Aca EQ, Dolan KC. 2013. Small cetacean diversity in the Babuyan Islands, Northern Luzon, Philippines. Poster presented at the 20th Biennial Conference on the Biology of Marine Mammals, Dunedin, New Zealand.

Alava MNR, Dolar MLL, Sabater ER, Aquino MTR, Santos MD. 2012. Marine Mammal Species Accounts. In: Alava MNR, Dolar MLL, Sabater ER, Aquino MTR, Santos MD, editors. Red List Status of Marine Mammals in the Philippines. First edition. Quezon City: Bureau of Fisheries and Aquatic Resource–National Fisheries Research and Development Institute. p 13-19.

Ansmann IC, Parra GJ, Chilvers BL, Lanyon JM. 2012.Dolphins restructure social system after reduction of commercial fisheries. Anim Behav. 84(3):575-581. https://doi.org/10.1016/j.anbehav.2012.06.009

Aquino MTR. 2006. Cetacean species inventory in the northwestern waters of Palawan, Philippines. Network of European Foundations (NEF) Newsletter.

Aquino MTR, Calderon Jr. V. 2004. Species inventory of the cetacean populations in the waters surrounding Tubattaha Reefs (23 March-3 April 2004 and 12-25 April 2004). A Report submitted to the Tubattaha Management Office.

Aquino MTR, Albasin BS, Alava MNR, Yaptinchay AASP, Cadigal MIG, Solis ED, Lucero R, Salting A, Cruz R. 2012. *Dugong dugon*. In: Alava MNR, Dolar MLL, Sabater ER, Aquino MTR, Santos MD, editors. Red List Status of Marine Mammals in the Philippines. First edition. Quezon City: Bureau of Fisheries and Aquatic Resource–National Fisheries Research and Development Institute. p. 144-152.

Baltazar AB, Jonco MJ, Fuentebella-Pomperada MJ, Querubin F, Sales MTB. 2017. Water quality assessment of rivers that drain into the Negros Occidental Coastal Wetlands Conservation Area. Technical Report submitted to the Provincial Environment Management Office of Negros Occidental, Philippines. Protected Areas Management

Enhancement Program of the Department of Environment and Natural Resources and Deutsche Gesellschaft fur Internationale Zusammenarbeit (GIZ) GmbH of the Federal Republic of Germany.

Barcelona ALB, Aca EQ, de la Paz MEL. 2016. Cetacean Survey of Davao Gulf. Report submitted to WWF-Philippines. 23 p.

Callanta LS. 2009. Residence patterns and range characteristics of Indo-Pacific bottlenose dolphins (*Tursiops aduncus*) and other small cetaceans in the southern Tañon Strait, Central Visayas, Philippines. MSc thesis. Silliman University, Philippines.

Carpenter KE, Springer VG. 2005. The center of the center of marine shorefish biodiversity: the Philippine Islands. Enviro Biol Fishes. 72:467-480. https://doi.org/10.1007/s10641-004-3154-4

CCCC Highway Consultants Co., Ltd. 2019. Feasibility Study for Panay-Guimaras-Negros Bridges Project. Sumbitted to the Department of Public Works and Highways, Republic of the Philippines. 24 p.

Dawson S, Wade P, Slooten E, Barlow J. 2008. Design and field methods for sighting survey of cetaceans in coast and riverine habitats. Mamm Rev. 38(1):19-49. https://doi.org/10.1111/j.1365-2907.2008.00119.x

de la Paz MEL, Abesamis NP, Sabater E, Señoron JA, Dolar MLL. 2020. Habitat use and site fidelity Irrawaddy Dolphins (*Orcaella brevirostris*, Gray 1886) in the coastal waters of Bago and Pulupandan, Negros Occidental, Philippines. Raffles Bull Zool. 68:562-573. https://doi.org/10.26107/RBZ-2020-0072

Dolar MLL 2012. Assessment of the Irrawaddy dolphin population and its habitat in western Negros and investigation of its occurrence in other areas in the Visayas and Mindanao, Philippines. Technical report submitted to Ocean Park Conservation Foundation, Hong Kong.

Dolar MLL 1994. Incidental takes of small cetaceans in fisheries in Palawan, Central Visayas and Northern Mindanao in the Philippines. Rep. International Whale Commission (Special issue 15). p. 355-363.

Dolar MLL, Calumpong HP, Perrin WF, Estacion J. 2005. Rediscovery of dugongs in the southern Visayan Sea. Poster presented at The 16th Biennial Conference on the Biology of Marine Mammals, San Diego, CA, USA. 12-16 December 2005.

Dolar M, de la Paz M, Sabater E. 2018. *Orcaella bevirostris* (Iloilo-Guimaras Subpopulation). The IUCN Red List of Threatened Species 2018: e.T123095978A123095988. https://doi.org/10.2305/iucn.uk.2018-2.rlts.t123095978a123095988.en

Dolar MLL, Matillano MVD, Aquino MTR, Yaptinchay AASP. 2012a. *Orcaella brevirostris.* In: Alava MNR, Dolar MLL, Sabater ER, Aquino MTR, Santos MD, editors. Red List Status of Marine Mammals in the Philippines. First edition. Quezon City: Bureau of Fisheries and Aquatic Resource–National Fisheries Research and Development Institute. p. 62-70

Dolar MLL, Perrin WF, Taylor BL, Kooyman GL, Alava MNR. 2006. Abundance and distributional ecology of cetaceans in the central Philippines. J Cetacean Res Manag. 8(1):93–111.

Dolar MLL, Sabater ER. 2011. Potential impact of climate change on marine mammal biodiversity in Southeast Asia: A Review. Silliman J. 52(1):91-113

Dolar MLL, Sabater ER, Gaudiano JPA, Bagarinao TU, Sorongon PME, Barcelona ALB, Tagarino AP, Daclan JMO, Santos MD. 2012b. *Orcinus orca*. In: Alava MNR, Dolar MLL, Sabater ER, Aquino MTR, Santos MD, editors. Red List Status of Marine Mammals in the Philippines. First edition. Quezon City: Bureau of Fisheries and Aquatic Resource–National Fisheries Research and Development Institute. p. 71-75

Dolar MLL, Sabater ER, Gaudiano JPA, Bagarinao TU, Sorongon PME, Barcelona ALB, Tagarino AP, Daclan JMO, Santos MD. 2012c. *Stenella longirostris longirostris*. In: Alava MNR, Dolar MLL, Sabater ER, Aquino MTR, Santos MD,

editors. Red List Status of Marine Mammals in the Philippines. First edition. Quezon City: Bureau of Fisheries and Aquatic Resource–National Fisheries Research and Development Institute. p. 93-97

Dolar MLL, Walker WA, Kooyman GL, Perrin WF. 2003. Comparative Feeding Ecology of Spinner Dolphins (*Stenella longirostris*) and Fraser's Dolphins (*Lagenodelphis hosei*) in the Sulu Sea. Mar Mamm Sci. 19(1):1–19. https://doi.org/10.1111/j.1748-7692.2003.tb01089.x

Hoyt E. 2005. Marine Protected Areas for Whales, Dolphins and Porpoises: A World Handbook for Cetacean Habitat Conservation. Sterling, VA: Earthscan. https://doi.org/10.4324/9781849771948

IUCN-MMPATF. 2019. 'Iloilo-Guimaras Straits IMMA', Marine Mammal Protected Areas Task Force (MMPATF); [accessed 2020 Jun 23]. https://www.marinemammalhabitat.org/portfolio-item/iloilo-guimaras-straits

Leatherwood S, Dolar MLL, Wood CJ, Aragones LV, Hill CL. 1992. Marine Mammal Species confirmed from Philippine waters. Silliman J. 36(1):65-86

Marsh H, Penrose H, Eros C, Hughes. 2002. Dugong; Status reports and action plans for countries and territories. UNEP/DEWA/RS/02-1. 85 p.

Martinez JN, Lacson PMVC, Al-Attas SAEB, Desusa RBJ. 2017. Assessment of the macrobenthic communities of Negros Occidental Coastal Wetlands Area. Technical Report submitted to the Provincial Environment Management Office of Negros Occidental, Philippines. Protected Areas Management Enhancement Program of the Department of Environment and Natural Resources and Deutsche Gesellschaft fur Internationale Zusammenarbeit (GIZ) GmbH of the Federal Republic of Germany. 20 p.

Minton G, Peter C, Poh ANZ, Ngeian L. 2011. Conservation-based Research on Coastal Dolphins in Sarawak: Report on 2011 Activities. http://www.ibec.unimas.my/SDP2008.

Minton G, Smith BD, Braulik GT, Kreb D, Sutaria D, Reeves R. 2017. *Orcaella brevirostris* (errata version published in 2018). The IUCN Red List of threatened Species 2017: e.T15419A123790805. https://doi.org/10.2305/iucn.uk.2017-3.rlts.t15419a50367860.en

Paguntalan LJ, Jakosalem PGC. 2016. Waterbirds assessment of the Negros Occidental Coastal Wetlands Conservation Area (NOCWCA). Technical Report submitted to the Provincial Environmental Management Office of Negros Occidental. 22 p.

Peter C, Poh ANZ, Ngeian J, Tuen AA, Minton G. 2016. Identifying Habitat Characteristics and Critical Areas for Irrawaddy Dolphin, *Orcaella brevirostris*: Implications for Conservation. In: Das I, Tuen A, editors. Naturalists, Explorers and Field Scientists in South-East Asia and Australasia. Topics in Biodiversity and Conservation, vol 15. Switzerland Springer International Publishing Switzerland. p. 225-238. https://doi.org/10.1007/978-3-319-26161-4_15

Ramsar. 2016. Philippines names Negros Occidental Coastal Wetlands Conservation Area as a Ramsar Site; [accessed 2016 Oct 20]. https://www.ramsar.org/news/philippines-names-negros-occidental-coastal-wetlands-conservation-area-as-a-ramsar-site.html.

Rice DW. 1998. Marine mammals of the world: Systematics and distribution, no. 4. Kansas: Special publications of the Society for Marine Mammalogy. Lawrence. 231 p.

Sabater ER. 2008. Relative Abundance, Distribution, and Species Association of Cetaceans in the Bohol Marine Triangle, Philippines. MSc Thesis. Silliman University, Dumaguete City, Philippines. 68 p.

Santos MD, Aquino MTR. 2012. Climate Change and Marine Mammals in the Philippines. In: Alava MNR, Dolar MLL, Sabater ER, Aquino MTR, Santos MD, editors. Red List Status of Marine Mammals in the Philippines. First edition. Quezon City: Bureau of Fisheries and Aquatic Resource–National Fisheries Research and Development Institute. p. 9-12.

Silvestre GT, Garces LR, Stobutzki I, Ahmed M, Valmonte-Santos RA, Luna CZ, Zhou W. 2003. South and South-East Asian coast fisheries: The status for improved management: conference synopsis and recommendation. In: Silvestre G, Garces L, Stobutzki I, Ahmed M, Valmonte-Santos RA, Luna C, Lachica-Aliño L, Munro P, Christensen V, Pauly D, editors. Assessment, Management and Future Directions for Coastal Fisheries in Asian Countries. WorldFish Center Conference Proceedings 67. p. 1-4.

Smith BD, Jefferson TA. 2002. Status and Conservation of Facultative Freshwater Cetaceans in Asia. Raffles Bull Zool. Supplement no. 10: 173-187.

Songco AM. 2012. Field Guide to the Top Predators of Tubbataha Reefs Natural Park, Cagayancillo, Palawan, Philippines. Tubbataha Management Office. 41 p.

Teruel RG, de la Paz MEL, Pacalioga JO, Quezon MS, Bañes R, Aguilar V. 2017. Conservation and Management Enhancement of Irrawaddy Dolphin Habitats in Negros Occidental. Terminal Report submitted to the Protected Areas Management Enhancement (PAME) Program of the Protected Areas Management Enhancement Program of the Department of Environment and Natural Resources and Deutsche Gesellschaft fur Internationale Zusammenarbeit (GIZ) GmbH of the Federal Republic of Germany. University of St. La Salle. 29 p.

Tiongson AJ, Karczmanski L. 2016. The Indo-Pacific bottlenose dolphin (*Tursiops aduncus*) in Tañon Strait, central Philippines. Mar Biodivers Rec. 9:85. https://doi.org/10.1186/s41200-016-0088-4

Tiongson AJ, Utzurrum J, de la Paz, MEL. 2020. Critically Endangered subpopulation of Irrawaddy dolphin in central Philippines may lose its habitat to large-scale development project. Oryx Conservation News. 54(6): 3-4. https://doi.org/10.1017/s003060532000085x

Wang JY, Chou LS, White BN. 2000. Differences in the External Morphology of Two Sympatric Species of Bottlenose Dolphins (Genus *Tursiops*) in Chinese waters. J Mammal. 81(4):1157-1165. https://doi.org/10.1644/1545-1542(2000)081<1157:DITEMO>2.0.CO;2

Wang, JY, Chou LS, White BN. 1999. Mitochondrial DNA analysis of sympatric morphotypes of bottlenose dolphins (genus: *Tursiops*) in Chinese waters. Mol Ecol. 8(10): 1603-1612. https://doi.org/10.1046/j.1365-294x.1999.00741.x

Wang JY, Yang SC. 2009. Indo-Pacific bottlenose dolphins, *Tursiops aduncus*. In: Perrin WF, Würsig B, Thewissen C, editors. Encyclopedia of marine mammals. San Diego: Academic, p. 602-608.

Whitty TS. 2016. Multi-methods approach to characterizing the magnitude, impact, and spatial risk of Irrawaddy dolphin (*Orcaella brevirostris*) bycatch in small-scale fisheries in Malampaya Sound, Philippines. Mar Mamm Sci. 32(3): 1022-1043. https://doi.org/10.1111/mms.12322

Yaptinchay AASP. 1994. Dugongs in the Philippines. Philippine Marine Mammals. Proceedings of a Symposium-Workshop on Marine Mammal Conservation. Marine Science Institute, University of the Philippines, Diliman, Quezon City, 7-8 April 1994.