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# A survey of marine turtles found in Davao Oriental, Philippines

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**ABSTRACT.** Marine turtles are enlisted as critically endangered marine animals vulnerable to extinction. In Mayo Bay, Davao Oriental, the data on marine turtles' status is deficient. Land-based monitoring from 2014 to 2016 was dedicated to filling in the gaps in the knowledge and status of marine turtles in Mayo Bay. Four species, namely, *Chelonia mydas*, *Eretmochelys imbricata*, *Lepidochelys olivacea*, and *Dermochelys coriacea*, were identified as being present in the bay. Commonly sighted species is *Chelonia mydas* (N=121), it is also the most frequently counted species for stranding incidences (N=9), due to by-catch using hook and line. Nesting activities recorded includes *Lepidochelys olivacea* as the prominent nester, with a total of 5,926 eggs laid and 4,956 eggs hatched and released with a hatching percentage of 84.03%. *Chelonia mydas* was observed to nest previously in 2014; however, it was found to be inactive after nesting in 2015 and 2016. Mayo Bay is found to be home to four species of marine turtles, although common challenges in conservation efforts were stranding incidences, beach encroachment, and intensive lighting due to beach resorts found in the area. An intensive education campaign drive should be done, and the institutionalization of the protection of marine turtles should also be considered.

**Keywords:** *Hatching, marine turtles, Mayo Bay, nesting, stranding*

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## INTRODUCTION

Marine turtles have lived in this world for over 100 million years, relatively unchanged through the mass extinction several species related to them about 230 million years ago (Al Mealla, 2011). They are considered some of the oldest living reptiles and one of the most critically endangered species in the world. From 1990 up to 2008, there were about 85,000 people in their population recorded as by-catch using fishing gear (Wallace et al., 2010) and continuously increasing through incidences of hunting and slaughtering in the Philippines (Bagarinao, 2011). Although the population of marine turtles is categorized as both threatened and endangered throughout its range by the International Union for Conservation of Nature's (IUCN) Red List, information on their nesting, sightings, and stranding incidences in the eastern part of the Philippines (Assessment, 2013), specifically in Mayo Bay, is still lacking. In general, there were a total of 663 species recorded to be impacted by anthropogenic activities, and almost 40%, or 247 species, were documented as entanglement and ingestion of marine debris. One of these marine organisms was the marine turtle (Laist, 1997).

Marine turtle populations are now susceptible to human infrastructure, such as beachfronting and beach lighting, depriving them of available space for nesting (Choi and Eckert, 2009). The impact of marine debris was responsible for multiple deaths, with studies indicating that all known species of marine turtles were damaged by accidental entanglement or ingestion (Bugoni et al., 2001). Even though research studies have contributed to mitigation measures for their conservation and protection, apparently these focused only on issues involving direct human intervention and placed the greatest value of research on increasing their remaining population. In addition, this study aims to determine the impact of anthropogenic marine debris on marine turtles.

## MATERIALS AND METHODS

### *Study site*

Mayo Bay is located in the southeastern part of the Philippines. It is

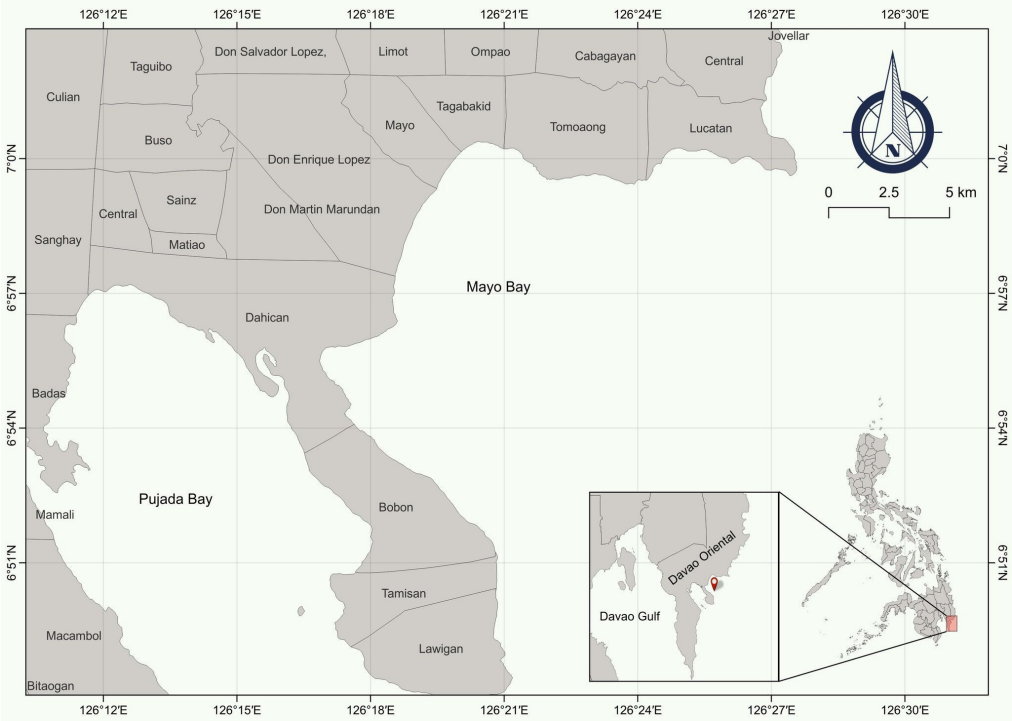


**Figure 1.** Map of study area showing Mayo Bay.

an embayment that is frequently used for tourism and commercial fishing operations by municipal and commercial fishers in Mati City (Macusi et al., 2017). The monitoring for this study was conducted over the last three years, starting in January 2014 and ending in December 2016. The study sites in Mayo Bay were Sitios Bangunay, Bobon, and Lawigan in the western peninsula, and Sitios Cadanlaan, Panombon, and Barangay Mayo in the eastern peninsula of the bay. Data gathering on sightings was strategically done through a series of dedicated land-based surveys. Nesting validation and data collection were made through daily monitoring of the nesting activities of marine turtles throughout their nesting season. and recording of stranding incidences, recorded morphometric data, and ground site verification. Descriptive statistics were employed for this study, and the collected data were presented using figures and tables.

## RESULTS

### *Sightings*

There were a total of four species of marine turtles sighted in Mayo Bay. The species list includes the green sea turtle *Chelonia mydas*, the Hawksbill turtle *Eretmochelys imbricata*, the olive ridley *Lepidochelys olivacea*, and the leatherback turtle *Dermochelys coriacea*, as shown in Table 1. From 2014 up to 2016, the most frequently sighted species was *Chelonia mydas*, with 121 sighting occurrences and a mean of 40.3%. The lowest frequency of sightings recorded for *Chelonia mydas* was in 2014 with only 13 sightings for the whole year. *Lepidochelys olivacea* species ranked second with a total sightings of 105 (mean = 35); the species identified with the lowest frequency of sightings was *Dermochelys coriacea* (n = 1) with a mean of 0.3, wherein it was sighted only once during the whole study indicated in Table 1.

**Table 1.** List of species of marine turtles and there frequency of sightings in Mayo Bay, Davao Oriental, Philippines for the period 2014-2016.

| Common name | Species name | Species count/year | | | | |
|---|---|---|---|---|---|---|
| | | 2014 | 2015 | 2016 | Total | Mean |
| Green sea turtle | *Chelonia mydas* | 13 | 25 | 83 | 121 | 40.3 |
| Olive ridley Turtle | *Lepidochely imbricata* | 13 | 27 | 65 | 105 | 35 |
| Hawksbill turtle | *Eretmochely imbricata* | 0 | 1 | 34 | 35 | 11.6 |
| Leatherback urtle | *Dermochelys coriacea* | 1 | 0 | 0 | 1 | 0.3 |
| **Total** | | 27 | 53 | 182 | 262 | 87.3 |

### *Nesting*

This study also recorded the nesting activities of marine turtles, and location of their nesting areas were also profiled within Mayo Bay. Seventeen nesting areas were identified in Barangay Dahican, stretching up to Barangay Mayo. Green sea turtles and olive ridleys were identified as the prominent nesters in the area, while Hawksbill turtles recorded only two nesting sites (Fig. 2). In 2014, the species *Chelonia mydas* laid a total of 376 eggs, of which 292 were hatched and released with a successful hatching rate of 77.70%. *Lepidochelys olivacea* had the highest nesting record with a total of 2,967 eggs laid, of which 2,486 were hatched and released with a hatching percentage of 83.18%. However, from 2015 to 2016, only the species *Lepidochelys olivacea* was recorded to nest throughout the season. *Lepidochelys olivacea* laid a total of 1,892


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**Table 2.** Record of nesting and hatching rate on marine turtle in Mayo Bay, Davao Oriental, Philippines from 2014-2016.

| Species ID | Year | N of eggs laid | N of eggs hatched | Mortality | Hatching rate | Mean |
|---|---|---|---|---|---|---|
| *Chelonia mydas* | 2014 | 376 | 292 | 84 | 77.70% | 334 |
| *Lepidochelys olivacea* | 2014 | 2967 | 2468 | 499 | 83.18% | 2717.5 |
| *Lepidochelys olivacea* | 2015 | 1892 | 1611 | 281 | 85.14% | 1751.5 |
| *Lepidochelys olivacea* | 2016 | 691 | 585 | 106 | 84.65% | 638 |
| **Total** | | 5926 | 4956 | 970 | | |

eggs in 2015, and 691 were recorded in 2016, with the highest successful hatching rate of 85.14%, as shown in Table 3.

Nesting marine turtles in Mayo Bay were also assessed in terms of their morphometric development. *Lepidochelys olivacea,* which was the prominent nester recorded, has a curve carapace length (CCL) range of 60–66 cm and a body width (CCW) range of 59–66 cm. *Chelonia mydas* had the largest body length range of 71–72 cm and body width range of 70–71 cm. Tagged information was also taken before releasing the animal into the open sea (see Table 4).

**Table 3.** Morphometric measurement recorded for nesting marine turtle in Mayo Bay, Davao Oriental, Philippines from 2014-2016.

| Species ID | CCL (cm) | CCW (cm) | Mean | Tag ID |
|---|---|---|---|---|
| *Lepidochelys olivacea* | 67 | 66 | 66.5 | PH0950I |
| *Lepidochelys olivacea* | 62 | 61 | 61.5 | PH0933I |
| *Chelonia mydas* | 71 | 70 | 70.5 | PH0949 |
| *Lepidochelys olivacea* | 66 | 65 | 65.5 | PH 0947I |
| *Chelonia mydas* | 72 | 71 | 71.5 | PH0948I |
| *Lepidochelys olivacea* | 62 | 61 | 61.5 | PH0943I |
| *Lepidochelys olivacea* | 60 | 59 | 59.5 | PH0944I |
| *Lepidochelys olivacea* | 63 | 62 | 62.5 | PH0942 |
| *Lepidochelys olivacea* | 64 | 63 | 63.5 | PH0938I |
| *Lepidochelys olivacea* | 62 | 61 | 61.5 | PH0937I |
| *Lepidochelys olivacea* | 65 | 64 | 64.5 | PH0936 |
| *Lepidochelys olivacea* | 64 | 63 | 63.5 | PH0935I |
| *Lepidochelys olivacea* | 63 | | 62.5 | PH0934I |

***Stranding***

Morphometric data in Table 5 showed *Chelonia mydas* to have the greatest number of stranding incidences in Mayo Bay. The majority of them were female, and their curve carapace length (CCL) ranged from 41 to 46 cm. Curve carapace width (CCW) measures 40–45 cm. *Eretmochely imbricata* recorded 2 strandings with a CCL range of 44–45 cm and a CCW width of 43–44 cm. Of the six strandings recorded, five individual marine turtles were tagged at the right flipper.

**Table 4.** Morphometric measurement of curve carapace length (CCL) and curve carapace width (CCW) of marine turtle stranded in Mayo Bay, Davao Oriental, Philippines for 2014.

| Species ID | Sex | CCL cm | CCW cm | Mean | Tag ID | Date tagged |
|---|---|---|---|---|---|---|
| *Eretmochely imbricata* | F | 44 | 43 | 43.5 | _____ | _____ |
| *Chelonia mydas* | M | 56 | 55 | 43.5 | PH0946 | 28/03/2014 |
| *Chelonia mydas* | F | 44 | 43 | 43.5 | PH 0945I | 26/03/2014 |
| *Chelonia mydas* | F | 46 | 45 | 45.5 | PH0940 | 20/05/2014 |
| *Eretmochely imbricata* | M | 45 | 44 | 44.5 | PH0941I | 20/05/2014 |
| *Chelonia mydas* | F | 41 | 40 | 40.5 | PH0949 | 20/06/2014 |

The location and causes of marine turtle strandings in Mayo Bay were also recorded in the study. Most of the stranding cases happened at Amihan sa Dahican. The causes of stranding were also noted, from which five stranding incidences were accounted for as by-catch, mostly through hook and line fishing. Other strandings were recorded as live strandings, which were rehabilitated and then released (Table 5).

**Table 5.** Record of stranding location and caused of stranding of marine turtles in Mayo, Davao Oriental, Philippines.

| Location | Species | | | Date | Type of stranding |
|---|---|---|---|---|---|
| | *Chelonia mydas* | *Eretmochely imbricata* | *Lepidochelys olivacea* | | |
| Amihan | 2 | | | Feb-14 | caught by hook & line |
| Amihan | | | 1 | Feb-14 | beached alive |
| Amihan | 2 | | | Mar-14 | caught by hook & line |
| Amihan | 1 | | | Apr-14 | caught by hook & line |
| Amihan | | | 1 | Sep-14 | beached alive |
| Amihan | 2 | | | Oct-14 | caught by hook & line |
| St. Joseph | 2 | | | Nov-14 | caught by hook & line |
| Kubo Beach | | | 1 | Nov-14 | beached alive |
| Amihan | | 1 | | Mar-15 | beached dead |
| **Total** | 9 | 1 | 3 | | |

## DISCUSSION

This study confirmed the presence of marine turtles in Mayo Bay. The results also confirmed the year-round presence of marine turtles in the coastal waters and on the near shore of Mayo Bay. Although turtles were present year-round, their increased abundance around the summer months could represent an influx to the area for the mating and nesting seasons (Williams et al., 2017). The high number of sightings of C. mydas in shallow coastal waters indicates that *Chelonia mydas* prefers seagrass beds where food is abundant (Ballorain et al., 2010; Meylan et al., 2011; Scott et al., 2012).

Marine turtle nesting activity revealed two prominent nesters in Mayo Bay, *Chelonia mydas* and *Lepidochelys olivacea*, throughout the nesting season of 2014. However, *Chelonia mydas* was observed to have become inactive during the nesting season in 2015 and 2016. This might be due to recent anthropogenic activities, such as the construction of resort owners for additional lodging houses and beach structures, that may have affected the preference of *Chelonia*


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*mydas* to nest in the bay. Studies by Choi and Eckert in 2009 showed marine turtles were affected by infrastructure in foreshore areas, which was detrimental to hatchlings. In the survey conducted for the nesting activity of marine turtles in 1998 and 1999, results indicated the small population identified for the nesting species of Green Sea Turtle and Loggerhead Turtle as well as the decline of nestingactivity of Eretmochely imbricata on Caymans Island (Moncada et al., 2012). Illegal activities such as poaching of sea turtle eggs added to the mortality of hatchlings and the continuous decrease of marine turtles in Panay and Guimaras Islands (Bagarinao, 2011; Spotila et al., 1996; Abreu-Grobois et al., 2000). Morphometric measurement revealed the species recorded to nest in the bay were all adult sizes and mature enough to reproduce. Strandings of marine turtles were noted to be frequent within juvenile *Chelonia mydas* indicating an alarming state that can lead to the species loss of marine turtles in Mayo Bay. There is high hope that, given the unwavering efforts and support of local conservationists, these will help sustain the remaining numbers of marine turtles in Mayo Bay.

## CONCLUSION

Mayo Bay is identified as a critical habitat for marine turtles. Although this is the case, the marine turtle population remains threatened by anthropogenic activities (tourism and fishing activities) that affect their survival. The high species diversity of the bay sustained their remaining population; however, infrastructure and on-going development have impacted their frequency and imposed a great. Despite having a higher nesting and hatching rate, there is still a problem that needs to be addressed. Strong management intervention is needed to institutionalize the protection and conservation of these marine organisms.

## RECOMMENDATION

This study is highly recommended for in-depth examination of marine turtles in Mayo Bay and the surrounding coastal areas. It aids in identifying other nesting locations and establishing close coordination to sustain nesting activity in the area; information dissemination should be carried out to raise awareness on marine turtles and their significance in the marine ecosystem. Furthermore, including locals in initiatives aimed at protecting and conserving these species, such as technology transfer in response to strandings, nesting sea turtles, hatching release, and monitoring, will assure their survival for future generations.

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