

Inventory

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Submission date: 25-May-2023 02:03PM (UTC+0700)

Submission ID: 2101448487

File name: Inventory.pdf (334.91K)

Word count: 3815

Character count: 19998

6

Ecol. Env. & Cons. 20 (Spl. Iss. Coast. Res. Manag.) : 2014; pp. (171-177)
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 ISSN - 0971-765X

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Inventory of marine Mammals in North Sulawesi, Indonesia

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ABSTRACT

Indonesian waters hold an economic potency through fisheries and tourisms because of habitat for various indigenou and protected marine species. A study was done through surveys based on a descriptive method. The data sampling technique was triangular, using various simultaneous data collecting techniques. In this study, both primary and secondary data were used. Information was obtained through direct field observations, detail interviews, questioners and documentation. Marine mammals are distributed in seven regional waters of North Sulawesi Province, i.e. Southern Minahasa, Minahasa Induk, Northern Minahasa, Sitaro, Sangihe and Talaud Rengencies and Manado bay. Based on ten days observation in Sondaken, Poopoh and Wori, dugong was found in the morning and in the afternoon, with the highest number of appearance in the morning. Dolphin's schools often appeared around Tagulandang Island and Ruang Island waters, moving from Mohong Sawang waters turning to around Pasige Island waters and then continuing to Ruang Island waters. Based on interviews to the fishermen and local communities whales were often seen in Kendahe (Maselihe) waters spreading water out of the surface in north wind season. It is evident that in 1999 a whale, called pauhe in local language, was driven ashore in Kendar beach, but it has never been seen afterwards. In 2002, there were two whales driven ashore in Naha coast, and they finally died on shore.

Key words: Mammals, North Sulawesi, Dugong's, Dolphin's, Whales.

Introduction

Indonesia waters holds an economic potency through fisheries and tourisms and becomes habitat for various endangered and protected marine species, such as turtles, marine mammals, sharks, variou coral and fish species and other marine biota. Indonesia waters functions as migratory areas for more than 30 marine mammal species, particularly in eastern Indonesia. More than one-third of whales and dolphins could be found in Indonesia waters, including the rare endangered blue whales, *Balaenoptera musculus* (Tomascik *et al.*, 1997). The

major threat to this species results from unintentional fishing, driven ashore, hunting, and habitat damages. Class Mammalia is vertebrates with clear morphological characteristics separately from other vertebrate classes. The most typical anatomical and physiological characteristic is the presence of mammal tissue to feed the baby. One of the orders known as marine cow is Sirenia. This order is one of big size cetaceans living in the tropical waters of Indian and Pacific Oceans, and one of the species is dugong (Dugong dugon, Muller 1766). The species has closer relationship with elephant than other marine mammals like whales and dolphins.

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In Indonesia, dugong population is very low. It was reported in 1970 that they were only 10,000 individuals, and in 1994 only 1,000 individuals left. The distribution of dugong in Indonesia is known in the eastern part of Indonesia waters, covering Sulawesi (Bunaken, Wakatobi Takabonerate), Eastern Nusa Tenggara (Sumba, Lembata, Flores Island, Kupang Bay, Komodo Regency), Maluccas (Aru Island, Lease Island, Seram and Halmahera), Papua waters (Biak Island, Sorong and Fakfak) and few in Sumatra waters (Riau, Bangka and Belitung Island), Java (Ujung Kulon, Cilacap, Cilegon, Labuhan and Segara Anakan) and Bali. The information on dugong occurrence was only obtained from some fishermen who incidentally caught or saw them, beside recorded by several NGOs in their surveys.

Many factors inhibiting the conservation effort in Indonesia. Low information on the ecology and biology of marine mammals in Indonesia seem to certainly leave the loss of dugong from Indonesia waters. Even now the Indonesian dugong is just like an old history obtained from listening to old fishermen's story and or looking at the pictures and photographs in the museum.

Until now, information about marine mammals is very limited. Indonesian dugong was firstly described in 1719 by VOC (Peitsch, 1992 in Tomascik *et al.*, 1997). Attention on dugong in Indonesia just started in 1980s when Kompas (1980) reported his observation in Aru Regency, followed by Salwi, *et al.* (1992) in the north part of Irian Jaya (Papua) waters. In North Sulawesi, Hendro Kusuma, *et al.* (1981) recorded the presence of dugong in the coral reefs of Arakan.

Therefore, it is necessary to do the inventaritation work on the occurrence of the sea mammals in North Sulawesi waters as a consideration in the conservation program of endangered sea mammals.

Research Methodology

This study was carried out in North Sulawesi waters covering Southern Minahasa, Minahasa Induk, Northern Minahasa, Manado Bay, Sitaro, Sangihe, and Talaud Regencies, from April to June 2011 (Figure 1).

The study was done through surveys based on a descriptive method. In order to gain detail information on the studied object, the data sampling technique was triangular, using various simultaneous data collecting techniques. In this study, both pri-

mary and secondary data were used. Informations were obtained through direct field observations, active participations, detail interviews, questioners and documentation. The latter was obtained through literature reviews.

Observations on dugong's appearance were only done in Sondaken waters (Southern Minahasa Regency), Poopoh (Minahasa Induk), Mantehage (Manado Bay), and Wori, (Northern Minahasa), while informations on dolphins and whales was only done through detail interviews using questioner's (Northern Minahasa, Sitaro, Sangihe, and Talaud regencies).

The success of this study cannot be separated from the availability of facilities used as follows; A unit of "pelang" outboard motor boat, binocular, GPS, digital camera, two sets of snorkeling gears, questioners and writing materials.

Results and Discussion

Interviews with coastal communities found that marine mammals living in North Sulawesi waters were Dugong (*Dugong dugong*), dolphins (*Lagenodelphis hosei*), other dolphin relatives such as kuhia and whales (*Balaenoptera musculus*). Table 1 shows that marine mammals are distributed in seven regional waters of North Sulawesi Province, i.e. Southern Minahasa, Minahasa Induk, Manado bay, Northern Minahasa, Sitaro, Sangihe, and Talaud regencies waters. It reflects that North Sulawesi waters have very vital position for marine mammal distribution in Indonesia. Those are dugong, dolphins, kuhia and whales (Table 1).

Dugong (*Dugong dugong*)

Interviews with the seaweed farmers in Amurang Bay area, it was known that dugongs observed in this area migrate from Pangaluang waters to Laogaseng waters and continue to Tapapaan waters where they stop for a while and then go back to Popareng waters. This migratory pattern occurs in the morning at 06.00 – 10.00 a.m. and afternoon at 13.00 – 18.00 p.m., with the highest appearance frequency at the 13th to 15th moon days.

Based on a ten day-field observation of dugong in Sondaken and Wori, the highest frequency of attendance was found in the morning while in Poopoh waters was found in afternoon time. Especially in Sondaken, within 10 times observation, of dugong appearance, were recorded as 37 appearances in the

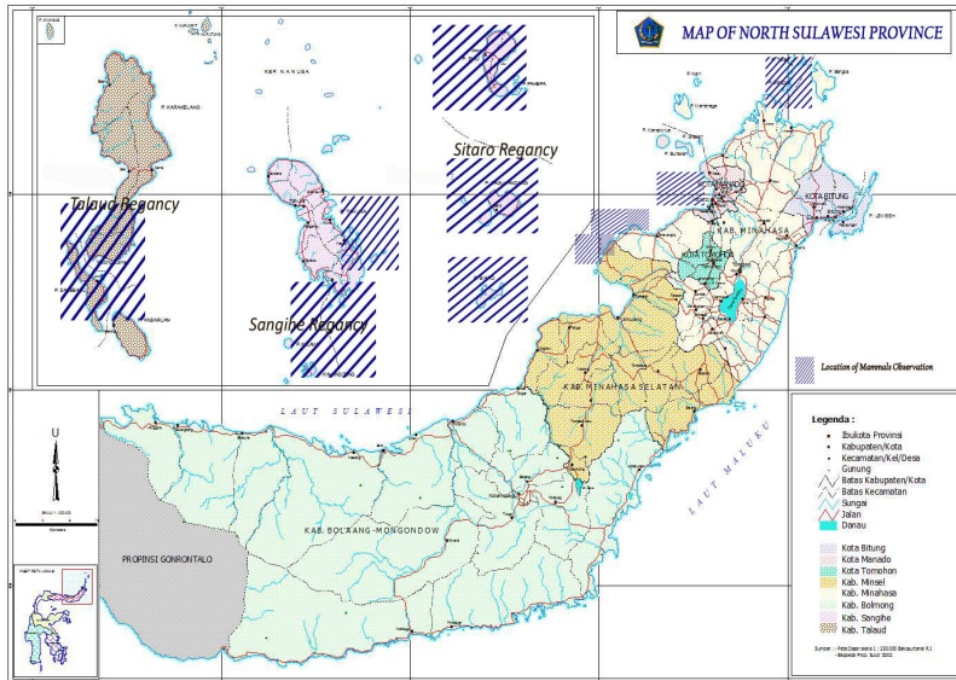


Fig. 1 Map of Research Location

morning and 36 appearances in the afternoon (Table 2).

Number of individuals dugongs at 3 locations observation varies, but the highest number individuals were found in Sondaken especially in the morning (60 individuals) followed by afternoon time (36 individuals). Thus, the highest individual number was recorded in the morning (Table 3). Air time is the time intervals spent by dugong on the surface. This study found that the air time of dugong in Sondaken coastal waters ranged from 3.943 - 4.860 seconds/appearance, Poopoh waters ranged from 3.682 to 4.112 seconds/appearance, and Kulu coastal waters, the district of Wori, ranged from 3.773 - 4.242 seconds/appearance (Table 4).

Interviews with coastal villagers in Sangihe Regency indicated that dugongs were distributed from the waters of North Tabukan, Central Tabukan, South Tabukan, Central South Tabukan to Bebalang Island.

In North Tabukan, the village of Moronge, there is a river "salu Mohonge", where is often visited by dugongs at high tide. No dugong recorded around Biaro Island waters which could be caused by

several factors, such as food availability, pollution, environmental degradation and unintentional fishing activity. Beside that, dugong's meat has been consumed by some local community in this area. For instance, since there is an easy access going to National Park of Bunaken Island, pressures on this wild animal are relatively high.

In South Tabukan, dugongs were often seen by the local people in Sapaeng waters, Tehang Island waters, Batuwingkung Island waters to Salurang waters. South Tabukan waters is very unique, located inside the bay, there are 3 islands in front of the bay i.e. Tehang, Batu Wingkung and Palareng. Bottom topography is relatively slope with seagrass growing on sandy muddy substrates. In the southern of the bay, there are mangrove forests and swamps along the beach. Water conditions, according to Azkab (1998), are highly suitable for dugong's feeding activities. Feeding activities of the dugong are often risky to get death due to the attack of manthid shrimps, called gola or bombak building their nests among the seagrass plants. Gola is a foot thumb-sized manthid shrimp, brown colored, with two sharp

claws. These claws are as sharp as a razor and capable of cutting the dugong skin into the muscular part. The lesion will get infected and rotten and could cause the death. In some cases of dugong's mortality by gola's attack, the lesions were found on the mouth or the belly parts. Their death also occurred from human activities.

This study also found that there were 2 - 4 individuals of dugong observed by the fishermen Sapaeng and Tehang waters. According to Nontji (2002), dugong's population in Indonesia is an important question, but no clear answer has been obtained. Helene Marsh, an Australian dugong expert, in 1970 estimated the Indonesian dugong's population were about 10,000 individuals and in 1994 about 1,000 individuals left. Nevertheless, this estimate is still difficult to confirm because census activities on dugongs are not easy. In Lease Islands (around Ambon), dugong census was done by aerial surveys with a light aero-plane and covering all the coastal areas in 1990 and 1992. During this survey, dugong's population varied from 22 - 37 individuals. This type of survey is not possible done for such a wide area of Nusantara waters.

The presence of dugong in this waters has long been known, but fishing technology development and high demand of the fish, have encouraged the fishermen to more intensively to catch the fish. As a consequence, netting often catches the dugong unintentionally. Dugongs are also considered as a sort of pest to seaweed farming so that they are often hunted by the seaweed farmers. Other information indicated that people of Bentung, Lesabe and Simueng have eaten dugong's meat for long time. Therefore, if this situation continually occurs, the dugong will quite possibly disappear from this area. It is clear, according to Nontji (2002), that dugongs were easily found in the entire Indonesia waters in the past, but they are difficult to find now. The decline of dugong's population in Indonesia could result from habitat loss, environmental destructions and intensive fisheries activities. Forest clear-cut, forest fire, erosion, pollution, and fast physical development in the coastal areas have also caused a decreasing in the coastal water quality. Sea bottom dredging activities in the coastal areas have taken off the sea-grass beds as a living environment of the dugong, especially in populated areas, such as Sumatra, Java and Bali. River has also brought pollutants and sediments threatening the occurrence of the sea-grass bed, and the survival of dugongs at the end. Worse situations

could also happen if oil spilling of ship accident occurs, and it can reach a tremendously wide area including the sea-grass bed areas as dugong's habitat.

Dolphins (*Lagenodelphis hosei*)

1 Dolphin's schools often appeared around Tagulandang Is. and Ruang Is. waters, moving from Mohong Sawang waters turning to around Pasige Is. waters and then continuing to Ruang Is. waters. The occurrence of dugong's school around Ruang Is. waters ranged from 5 -10 minutes, and then disappeared. The movement of dugong's school occurred in the morning from 07.00 - 10.00 a.m. and in the daytime to afternoon with a group of about 15 - 20 individuals. According to Sahria's (2000) study, cetaceans were more often observed in the morning, between 07.00 - 10.50 a.m. with the highest number of 845 individuals, since they are actively feeding in the morning. Dugongs live and work in group or known as school. They often play together ("<http://id.wikipedia.org/wiki/Lumba-lumba>).

Whales

Whales or lodan (the teethed animals and big-sized) are a group of mammals living in the ocean. Whales are the name given the big-sized cetaceans. Recently, there are two groups of whales known, the teethed one (Odontoceti) and the un-teethed one (Mysticeti). The first has one breathing hole and belongs to predator for fish, squid and other marine mammals. Teethed whales are close relative to dolphins and freshwater dolphins. The latter has bigger size than the first and possesses a structure called brush-shaped propeller. This structure is useful for filtering plankton in the water. Propeller whales have two breathing holes.

In Sitaro regency, marine mammals often seen in Biaro waters i.e. dugongs and whales. Since 2001, dugongs have not been seen in this area, but whales were in October to December. This occurrence is closely related to the presence of pelagic fish, such as *Selaroides* sp. and mackerels and squids, as whale's food components. The whales encountered by the fishermen have blackish blue color and therefore, it could be concluded that this area has become a migratory route of the whales. They appeared about 2 - 5 individuals.

1 In Kendahe waters, according to the fishermen and local community, whales were often seen in Maselihe waters spreading water out of the surface

Table 1. Marine mammal distribution in North Sulawesi waters

No.	District	Waters	Dugong	Doplhin	Kuhia	Whales
1.	Tatapaan	Sondaken	√			
		Arakan	√			
		Popareng	√			
		Pangaluhang	√			
		Tapapaan Is.	√			
2.	Tombariri	Poopoh	√			
		Kumu	√			
3.	Bunaken	Bunaken Is.	√			
		Mantehage Is.	√			
		Manado Bay		√	√	
4.	Wori	Wori	√			
5.	Likupang	Bangka Is.		√		
6.	South Tabukan	Sapaeng	√			
		Tehang Is.	√			
		Batuwingkung Is.	√			
		Palareng	√			
		Salurang	√			
7.	Central South Tabukan	Salurang	√			
8.	Central Tabukan	Petta	√			
		Sensong	√			
		Kuma	√			
9.	North Tabukan	Bengketang	√			
		Morongge	√			
		Naha			√	√
10.	Kendahe	Kendar		√	√	√
11.	Manganitu	Lebo	√		√	
12.	South Manganitu	Bebalang Is.	√		√	
13.	Biaro	Biaro Is.	√			√
14.	Tagulandang	Ruang Is.		√	√	
15.	Lirung	Liruna harbor		√		

Table 2. Dugong's appearance frequency in Sondaken, Poopoh, Wori at morning, daytime and afternoon

Days	Appearance frequency								
	Sondaken			Poopoh			Wori		
	Morning	Daytime	Afternoon	Morning	Daytime	Afternoon	Morning	Daytime	Afternoon
I	3	-	1	-	-	1	-	-	1
II	2	-	3	-	-	-	3	-	-
III	3	1	2	2	-	-	-	2	2
IV	4	-	2	-	-	1	1	-	1
V	6	-	4	1	-	2	1	-	-
VI	4	1	3	1	-	2	2	-	2
VII	3	-	2	2	-	-	-	-	-
VIII	5	-	2	-	-	1	2	-	-
IX	4	2	3	-	1	-	-	1	-
X	3	-	2	-	-	-	-	-	-
Total	37	4	24	6	1	7	9	3	6

in north wind season. It is evident that in 1999 a whale, called "pauhe" in local language, was driven ashore in Kendar beach, but it has never been seen afterwards.

In 2002, there were two whales driven ashore in Naha coast, and they finally died on shore. It proved that Indonesia waters functions as an important migratory route for more than 30 species of marine

Table 3. Dugong's number individuals in Sondaken, Poopoh, Wori at morning, daytime and afternoon

Days	No. Individuals								
	Sondaken			Poopoh			Wori		
	Morning	Daytime	Afternoon	Morning	Daytime	Afternoon	Morning	Daytime	Afternoon
I	4	-	2	-	-	-	-	-	1
II	3	-	4	-	-	-	4	-	-
III	6	1	2	3	-	-	-	3	2
IV	6	-	3	-	-	2	2	-	2
V	10	-	6	1	-	2	1	-	-
VI	7	2	6	2	-	4	3	-	3
VII	4	-	3	2	-	-	-	-	-
VIII	9	-	2	-	-	1	2	-	-
IX	6	3	4	-	1	-	-	1	-
X	5	-	4	-	-	-	-	-	-
Total	60	6	36	8	1	9	12	4	8

Table 4. Individual number and the air time of dugong recorded in Sondaken, Poopoh, Wori

Observation	Sondaken		Poopoh		Wori	
	Number Individuals	Air-Time (Second)	Number Individuals	Air-Time (Second)	Number Individuals	Air-Time (Second)
1	4	4.267	3	3.789	2	3.773
2	5	4.860	2	4.112	2	3.935
3	4	3.942	2	3.682	3	4.242
4	3	4.153	4	3.824	2	3.856

mammals, particularly the eastern part of Indonesia. More than one-third the entire species of whales and dolphins (belonging to cetacean) can be found in Indonesia waters, including rare and endangered species, the blue whale (*Balaenoptera musculus*). Major threats on this species are unintentional fishing, driven ashore, hunting and habitat destructions (<http://www.wwf.or.id> Satwa Laut yang Terancam Punal³). Other evidence is the effect of sonar produced (Vonk and Martin, 1989; Simmonds and Lopez-Jurado, 1991; Frantzis, 1998 and Frantzis and Cebrian, 1999). They assumed that loud sound produced by military activities drove the beaked whales ashore in Canary Island and Ionia Sea. Besides that, the sperm whales had behavioral changes in vocalization to respond to this sonar (Supangat, 2011).

Marine mammals are endangered animals and therefore, it is important to protect them. In marine mammal conservation program, it is not enough to protect the species without considering their environment. Diana (2007) proposed a model of marine mammal conservation program considering three major management aspects to be sustainable, ecologi-

cal, socio-cultural and economic aspects.

Conclusion and Suggestions

Several points can be concluded from this research activities, in bio-ecological and management aspects as follows:

- The position of North Sulawesi waters is very strategic to marine mammal distribution in Indonesia, such as dugong, dolphins, and whales;
- The distribution of marine mammals in Sangihe regency was in the district of North Tabukan, Nusa Tabukan, Central Tabukan, South Tabukan, and Central South to Bebalang Island waters.
- The appearance of dugong in Sondaken coastal waters was recorded in the morning (60 individuals) and the afternoon (36 individuals), with the air time range of 3.942 – 4.860 seconds/appearance; in Poopoh, the highest number was found 8 individuals in the morning and 9 individuals in the afternoon, with the air time range of 3.682 – 4.112 seconds/appearance; and in

Wori relatively high number in the full moon, particularly in the morning (2 individuals) and the afternoon (8 individuals), with the air time range of 3.773 – 4.242 seconds/appearance;

- Seagrasses recorded were 9 species in Bunaken Island waters, 6 species in Poopoh waters, 8 species in Sondaken waters, and 7 species in Wori waters.
- The presence of marine mammals was scarcely. This situation is supported by the list of Red Book of IUCN that put the marine mammals to the category of vulnerable to extinct. Hence, it is necessary to do the conservation program to support their survival.
- The conservation model of marine mammals should cover three aspects, ecological, socio-cultural and economic aspects in association with local conditions.

Acknowledgement

⁵ This research was supported by United Board for Christian Higher Education in Asia (UBCHEA) – Hongkong.

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