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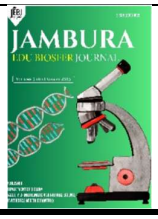

OCCURRENCE AND PHOTO-IDENTIFICATION OF KILLER WHALE IN THE GULF OF TOMINI

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ABSTRAK

Penelitian ini bertujuan untuk melaporkan kemunculan dan mempresentasikan foto-identifikasi paus pembunuh (*Orcinus orca*) di Teluk Tomini. Artikel ini merupakan upaya untuk memberikan data dasar untuk penelitian lebih lanjut tentang cetacea di Indonesia. Penelitian dilakukan pada bulan Februari 2017 hingga Februari 2019 di perairan sepanjang pantai Provinsi Gorontalo di Teluk Tomini. Rekaman video dan foto dikumpulkan, dan wawancara dilakukan dengan nelayan dan pemandu wisata. Pengamatan dilakukan di perairan pantai dekat desa-desa di mana pernah dilaporkan adanya paus pembunuh. Diskusi kelompok terfokus diadakan di sejumlah tempat di wilayah studi dengan memanfaatkan pengetahuan ekologi tradisional setempat. Data dianalisis dengan pendekatan deskriptif-kualitatif. Tanggal kejadian diurutkan secara kronologis di setiap lokasi. Foto atau video dikutip untuk foto-identifikasi. Hasil penelitian menunjukkan bahwa kemunculan paus pembunuh hampir merata sepanjang tahun terlepas dari musim. Paus pembunuh biasanya muncul dalam kelompok hingga lima individu, dengan beberapa pengecualian kemunculan tunggal. Foto-identifikasi yang dihasilkan menampilkan empat individu dari empat pod yang berbeda.

Kata kunci: Paus pembunuh, Orcinus orca, kemunculan, foto-identifikasi

ABSTRACT

The study aims to report the occurrence and to present photo-identification of killer whales (Orcinus orca) in the Gulf of Tomini. This article is an attempt to provide basic data for further research on cetacean in Indonesia. The study was conducted from February 2017 to February 2019 in waters along the coast of Gorontalo Province in the Gulf of Tomini. Recorded videos and photos were collected, and interviews were conducted with fishers and tour guides. Observations were made at coastal waters near the villages where the occurrence of killer whales has been reported. Focus group discussions were held in a number of places in the study area by utilizing local traditional ecological knowledge. Data were analyzed in a descriptive-qualitative approach. The date of occurrence is sorted chronologically at each location. Photographs or videos were captured for photo-identification. The results showed that the occurrence of killer whales are almost evenly distributed throughout the year regardless of the monsoons. Killer whales usually appear in pods of up to five individuals, with a few exceptions of solo appearances. The resulting photo-identification displays four individuals from four different pods.

Keywords: Killer whale, *Orcinus orca*, occurrence, photo-identification

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1. Introduction

Research on cetacean has not gained major interest in Indonesia (Dermawan et al. (ed), 2015) although there are at least 33 species of cetacean in Indonesian waters, from a total of 89 species in the world. Distribution of killer whale (*Orcinus orca*) has been analyzed, but its status of population is not known with certainty as well as other cetacean species. Nevertheless, in recent years, information regarding killer whale presence in tropical regions has been increasing (Weir et al., 2010; Rankin et al., 2013; Pitman et al., 2015) and provides new insights into its ecology.

This species has different behavior in different places and unique language in each group. Different populations have different prey, such as killer whales that live around Vancouver Island, specifically hunting Chinook salmon. Other killer whales, which migrate as transients, prey on marine mammals, sharks and other fish species (Ferguson et al. 2012). Killer whales are reported to prey on Gray Whales (*Eschrichtius robustus*) (Burnham and Duffus, 2019) and Gervais' Beaked Whale (*Mesoplodon europaeus*) (Gualtieri and Pitman, 2019). Ford et al. (2010) state that there is a tendency for changes in survival and that survival rates of killer whales are highly correlated with the availability of major prey species.

The occurrence of killer whales in the Gulf of Tomini recorded by the community such as fishers and tour guides projects only scattered hazy pictures. A good example of occurrence recording had been done in Papua New Guinea where lack of data on killer whale was overcame by collection of anecdotal information from the community, and even more the information were useful for management and conservation efforts (Visser and Bonoccorso, 2003). Likewise, the local ecological knowledge of the Inuit in Canada has provided the information needed in modeling predation, management and conservation (Ferguson et al., 2012).

There are several species of cetacean usually seen by people of Gorontalo in the Gulf of Tomini. In local language, the word *paupau* forms the root word used for all types of large marine mammals for both whales and killer whales. Specifically, *Paupau* is only used for the short finned pilot whales (*Globicephala macrorhynchus*) which has black-mixed-with-gray or brindle colors. *Paupause* is the name used for all other than the killer whale: Sperm whale (*Physeter microcephalus*), melon-headed whale (*Peponocephala electra*), pigmy killer whale (*Feresa attenuate*), Mike whale (*Balaenoptera acutorostrata*), and blue whale (*Balaenoptera musculus*). The killer whale is specifically referred to as *Paupausu* which has black, dark brown and gray with white color variations on its lower body. The dolphins are called *Timenguto* including Bottlenose and Risso's dolphins (*Tursiops truncates* and *Grampus griseus*). Whale shark (*Rhincodon typus*) which is traditionally considered to be in the same group with whales is called *Munggiyango Hulalo*.

Certain species such as pilot whale and killer whale sometimes feeding on tuna caught by fishers and may cause damage to the fishing gear. Although considered to be a nuisance pest in fishing activities, Gorontalo fishers do not hunt cetacean, neither to kill, to eat or for sale, rather they tend to provide protection with care and respectful assistance. The protection also applies to dolphins and whale sharks who are often trapped in fishing gears due to common games they share with fishers.

This conservative attitude seems to be in compliment with Government Regulation (1999) and Ministerial Regulation (2018) on the protection of flora and fauna. However, the conservative behavior is merely part of the tradition passed down for generations, it is not intended to comply with any regulations. There has been a belief in protecting these exotic marine animals for several reasons. The appearance of cetacean and whale sharks has been used as one of the signs for the emergence of large and small pelagic fishes. Dolphins and whales are believed as creatures ready to help fishermen when facing disaster at sea. Anecdotes about crashed fishers at sea assisted by dolphins or whales can still be heard in coastal villages.

In most regions of the world, little is known about the ecology, life-history, and population status of killer whales (Forney and Wade, 2006). One of these areas is the Gulf of Tomini, where there has been no directed research on killer whale until recently. The occurrence of killer whale and other large cetacean indicates that the Gulf of Tomini is a suitable habitat as it has high productive marine ecosystems (Häussermann et al., 2013). Known as the heart of the world's coral triangle, numerous species of fish, marine mammals, turtles, corals, sponges, and other organisms live along the coastline of the gulf (Block, 2009).

The study aims to report the occurrence and to present photo-identification of killer whales. Since there is no prior research on killer whale in the Gulf of Tomini, this study is important as an initiative to lure enthusiasm in research on various aspects of killer whale and other cetacean. This article is an attempt to provide basic data for further research on cetacean in Indonesia.

2. Methodology

Study Area

Initial data collection began in February 2017, followed by the implementation of fieldworks in September 2017 to February 2019. The study site was located along the coast of Gorontalo Province in the Gulf of Tomini which is on the equator, engulfed by the north and east peninsula of Sulawesi Island (Figure 1).

U.S. Navy Hydrographic Office (1962) published a sailing direction over all corners of this gulf and presented detailed climate descriptions: Monsoons are weak and variable, with large percentages of circulating and varying winds. The north monsoon lasts from December to March, with winds principally from northwest to northeast, but also from the west. The north monsoon slackens in April and the northeast wind returns. The south monsoon lasts from July to October with south-southeast to south-southwest winds prevail, while in May, June, and November no predominant direction can be noted.

Tomini is a deep sea, an average depth of 1500 meters with high marine biodiversity, open to the east with direct interchange water mass circulation to the Maluku Sea, hence to the region. This region is a migration route for large marine mammals, such as several species of whales. Salm and Halim (1984) reported that humpback, blue and sperm whales regularly pass through the Halmahera Sea and the Maluku Sea.

Procedures

Fieldworks were carried out by tracing locations that had reported the occurrence of killer whales and the surrounding coastal areas. Video recordings and photos were collected for the purpose of photo identification. Respondents were determined by purposive sampling and further picked by snow ball sampling technique (Lavrakas, 2008). Interviewed respondents were from 14 coastal villages in Bone Bolango Regency, Gorontalo City, Gorontalo Regency, Boalemo Regency and Pohuwato Regency. Respondents were 38 fishers and seven tour guides. The choice of observation and interview locations focuses on the location of occurrence and the activities of fishers: especially pelagic fishers and guardians of FADs. Focus group discussions (FGD) were also held in a number of places to make use of local ecological knowledge.

The data from occurrence reports were analyzed and then developed into a map. Photos and videos from the reports were analyzed for photo-identification. In order to dig deeper information from local knowledge and wisdom about marine mammals, videos and photographs were shown at the time of interviews and in FGDs. The photo-identification contains data about pods name, number of individuals, and age, and gender, relationship between individuals, date and location of occurrence. Then name of individual is followed by information about sex, age, eye patch and saddle patch, photo of individual killer whales, and names of people entitled to photo credit.

Data Analysis

Data on the occurrence of killer whales in the Gulf of Tomini is based on community reports from 2015 to early 2019. Some of occurrences report are accompanied with photos or videos of individual killer whales recorded during the period of 2016 - 2018. The dates of occurrences were sorted chronologically at each location along with the number of group members. Individuals recorded with photos or videos in the occurrence report are identified. The results of interviews and direct observations were analyzed in a descriptive-qualitative approach.

Marine mammals are identified by looking at some of the signs or characteristics that exist, including body size, shape, head, snout and tail shape, dorsal fins, color and markings, as well as bodily patterns, water burst characteristics, surface behavior, dive time, and breaching. Pictures and videos are taken for further identification (Cawardine, 1995; Dharmadi et al., 2010). Rake marks is another way to identify a killer whale by comparing its occurrence with existing photo-identification catalog (Robeck et al., 2019).

Photo identification or photo-id technique has been used in many countries and most often applied in identifying killer whales. Photo-id is one way to trace innate identification marks through photography and is a very effective method for increasing understanding of certain species or populations (Young et al., 2011). Through photo-id analysis, shapes and markings, such as dorsal fin, size or estimated age, sex, eye patch and saddle patch are obtained. The sex can be identified from the shape of the dorsal fin. Higher dorsal fins, upright and straight indicate male, while shorter dorsal fins, inclined toward the back and curved indicate female. According to Morin et al. (2010) there are some differences in ecotypes mark by body size, morphology, habitat, prey preferences, behavior, and genetics. The photos collected were compared with photos that have been published online by the National Oceanic and Atmospheric Administration (NOAA) and Whale Research.com.

3. Result and Discussion

3.1 Occurrences

Occurrence is a technical term used to indicate the existence of killer whales that are witnessed by humans at a certain time and place. Incident observations of killer whales are reported by the public in the form of anecdotes, with or without photographic or video evidence. During 2015 to 2019, 19 occurrences of killer whales were reported along the coast of Gorontalo Province. An example of anecdotes extracted from respondents, related to the GT1 Pod (Figure 2) in the photo-id catalog, is as follows:

"On November 20, 2016, two killer whales entered the purse-seine net set by the Putra Laut (a fishing boat based in the village of Bilolantunga) around a *rumpon* (FAD) in the waters of the Taludaa District. At 5:00 a.m., one large killer whale (GT12) entered the net while another was outside. After this killer whale comes out pass the bottom of the ship, a smaller killer whale (GT11) enters the net which is then helped to escape by fishers by tearing their nets".

People witnessed the presence of this large mammal in the villages of Bilolantunga, Olele, Molotabu and Botubarani in Bone Bolango Regency; Tanjung Keramat in Gorontalo City and Biluhu in Gorontalo Regency. The occurrence of killer whales in the Gulf of Tomini is thought to correlate with the growth of pelagic fish both in north and south monsoon.

Fishers have witnessed killer whale prey on baby tuna, turtles and small pelagic fish especially mackerel. Killer whales sweep the seashore near coral reefs to prey on specific mackerel that have a shiny body that quickly grow big in the rainy season. In addition, killer whales in the Gulf of Tomini also prey on tuna just like in several other waters, such as in Brazilian waters (Rosa and Secchi, 2007), in Gibraltar Strait (Esteban et al., 2016) and elsewhere. Depredation by marine mammals on fish caught on long line fishing gear has been reported for decades (Hamer, Childerhouse & Gales, 2012).

Killer whales usually appear in pods with a few exceptions of solo occurrences. Solitary killer whale are mostly males that leave their pod for a long period of time or permanently and occasionally join another pod (Lodi & Farias-Júnior, 2011; Pilot et al., 2010). The occurrence of pairs is the most common, followed by the occurrence of a pair of adults accompanied by one child (3 individuals). The group with the largest number of 5 individuals occurred only once. All the reports of occurrences covered approximately 30 to 40 individual killer whales. This range of number is roughly estimated based on the assumption that there are several observations that refer to the same individual or group. For example, the individual appeared on February 7, 2018 in Botubarani might be the same individual seen on February 23, 2018 in Biluhu. Couples seen by public on September 1 and 4, 2017 around Botubarani, are likely to be the same pod. Likewise, the pair that appeared in January 2018 in Bilalontunga and Olele may also be the same pod (Figure 1).

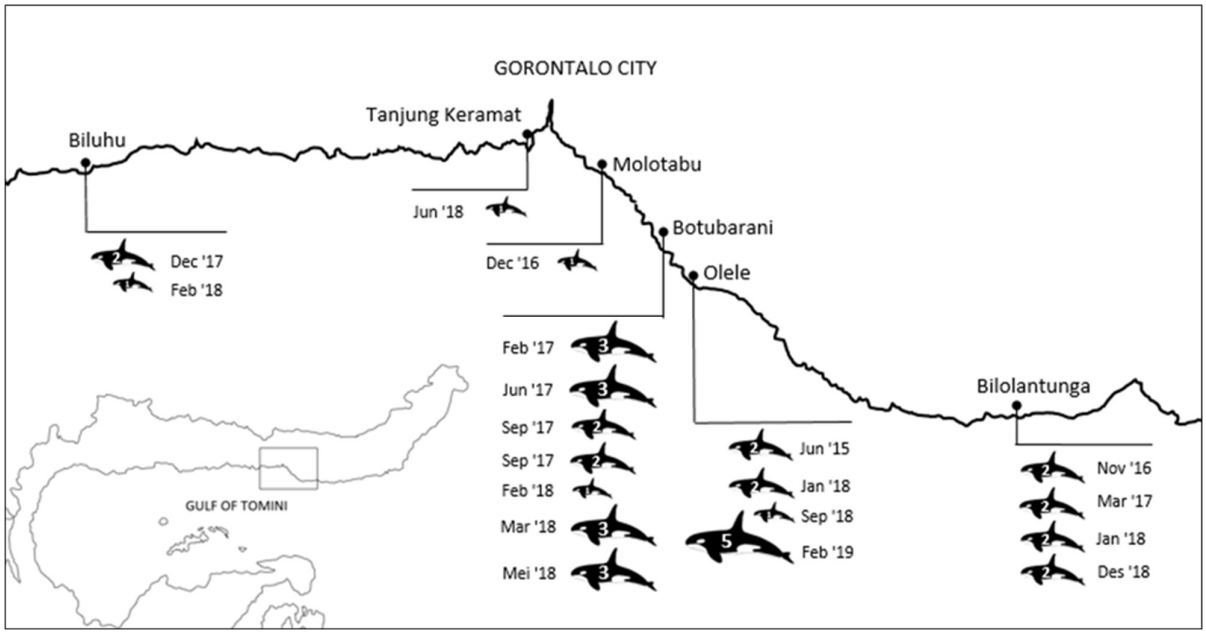

Figure 1 Occurrences of killer whale along the coast of Gorontalo in the Gulf of Tomini during 2015-2019.
Remarks: Numbers in the body of the killer whale's caricatures indicate number of pod member.
Nov'16: GT1 Pod; Feb '17: GT2 Pod; Jun '17: GT3 Pod; Des '17: GT4 Pod. See photo-identification.

3.2 Photo-identification

There were 19 occurrences reported. Four occurrences from different pods recorded with videos and photos. Only four individuals from the four pods could be photo-captured. The format of photo-identification presentation was inspired by the photo-identification as part of the killer whale catalog developed by Towers et al. (2015). The photo-identifications of killer whales in the Gulf of Tomini are in Figures 2, 3, 4 and 5.

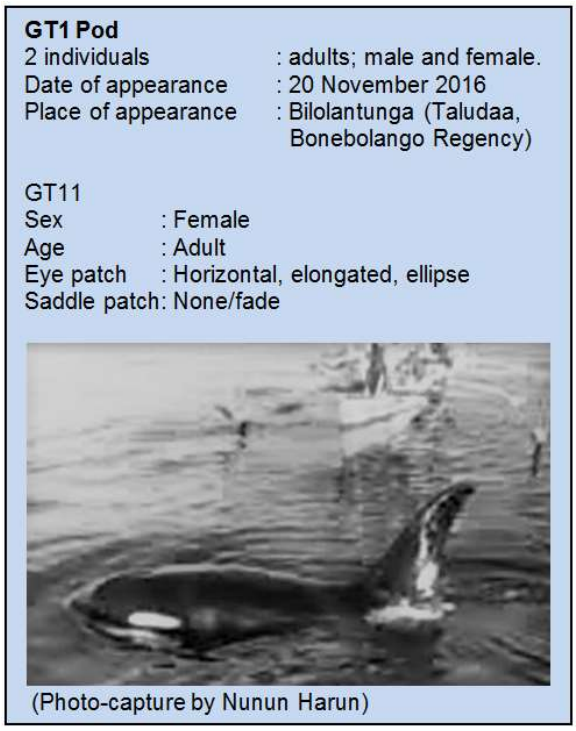

Figure 2 Photo-identification of individual GT11, member of GT1 Pod.

Figure 3 Photo-identification of individual GT23, member of GT2 Pod

Figure 4 Photo-identification of individual GT33, member of GT3 Pod

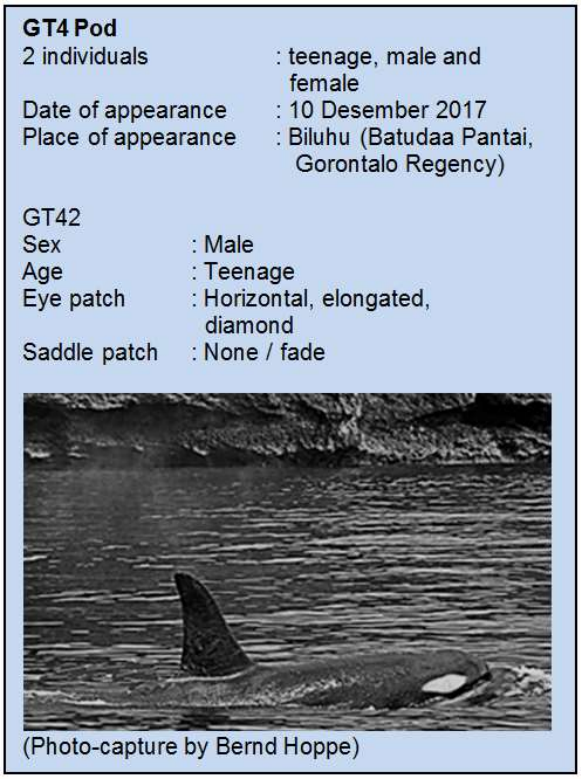

Figure 5 Photo-identification of individual GT42, member of GT4 Pod

To determine the difference in gender among killer whales, one can observe the dorsal fin. A straight dorsal fin indicates a male, while a curved, crescent-shaped dorsal fin indicates a female. Male killer whales have a tall, triangular dorsal fin that can reach heights of up to 1.8 meters (6 feet), while females possess a smaller, falcate (curved) dorsal fin that is typically about 0.9 to 1.2 meters (3 to 4 feet) tall. This significant difference in dorsal fin size is a primary method for distinguishing between genders in these cetaceans (Seaworld.org).

The sexual dimorphism observed in killer whales includes not only the size of the dorsal fin but also overall body size, with males generally being larger than females. Males can grow to about 9 meters (29.5 feet), while females reach about 7.9 meters (25.9 feet). This physical difference is crucial for understanding their mating systems and social structures (Wright at al., 2023).

Discussion

4. Conclusion

The occurrences of killer whales are almost evenly distributed throughout the year regardless of the monsoons. Killer whales mostly appear in pairs and in pods up to five individuals, with a few exceptions of solo appearances. The resulting photo-identification displays four individuals from four different pods. However limited as they are, this results are important as basic data to lure enthusiasm in research on various aspects of killer whale and other cetacean in Indonesia.

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