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THE OCCURRENCE OF JELLYFISH IN COASTAL WATERS OF MAKASSAR, SOUTH SULAWESI, INDONESIA

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ABSTRACT

Jellyfish can be found in most coastal waters and their occurrence can be frequent during the day. This study aimed to detect the occurrence of jellyfish based on the oceanographic condition in the coastal waters of Makassar. Observations were conducted in July-September 2018 at three stations namely Port of Soekarno Hatta (Station 1), Port of Paotere (Station 2), and Port of Untia (Station 3). Jellyfish sampling was conducted in the morning, noon and afternoon, from three stations as aforementioned. Jellyfish samples were taken and identified at the Laboratory of Marine Biology, Faculty of Marine Science and Fisheries, Universitas Hasanuddin. Oceanographic conditions, i.e. temperature, salinity, transparency, and current velocity, were measured. All data were analyzed descriptively. It showed that the oceanographical conditions were in the suitable range for supporting jellyfish growth. Three genera of jellyfish were found, namely Aurelia, Porpita, and Aequorea. Aurelia was abundant in Station 1 and 2, whereas Porpita in Station 3. It also showed that during the afternoon, the jellyfish occurred more frequently.

Keywords: Jellyfish, Makassar, Port of Makassar

INTRODUCTION

Jellyfish or most commonly-known as *Scyphozoa* are Coelenterata which are mostly found in marine waters (Sink*et al.*,2017 dan Remigante *et al.*,2018). They are soft-bodied animals like gelatin with a high percentage of water content (Pitt *et al.*, 2013). They are easily identified from other animals since they have a very contrasting and unique body shape (Noriyo *et al.*, 2018). In marine water, this fauna is categorized as pests (Condon et al., 2011; Brotz et al., 2012). When stung by this animal, it may result in itchy skin. This is due to the nematocysts that this animal has which spread to the epidermis in their tentacle, as well as to all parts of the body (Manuputty, 1988; Wiebring et al., 2010).

Jellyfish in Indonesian waters is relatively abundant. However, they are less studied hence information on this organism is relatively very little (Rahmah dan Zakaria, 2017). The limiting knowledge and information on the potentials of this fauna resulting this animal being disregarded. Whereas in some countries such as Japan, Hongkong, and Korea, jellyfish are considered as highly nutritious food since they contain high protein (Murniyati, 2009). In marine waters, the occurrence of jellyfish is influenced by oceanographic conditions, as well as pollutions and overfishing (Parsons and Lalli, 2002). This may include the warming of marine waters. The increasing temperature due to global warming trigger the growth and development of jellyfish resulting in this fauna proceed to the coastal waters (Boero *et al.*, 2016). In reality, jellyfish is an organism that positively adapted to the increasing temperature (Purcell, 2005).

On the other hand, jellyfish predators are decreasing in number, hence jellyfish are increasing (Mills, 2001). This is probably due to the increasing water pollution

due to agriculture activities on the mainland and pond development which all trigger a high concentration of pollution to the coastal waters. This leads to the decreasing number of jellyfish predators where they migrate to safer and cleaner locations (Parsons and Lalli 2002). When water pollution is high, the jellyfish tend to adapt to these conditions and does not affected by the water pollution.

Like many other coastal cities, the waters of Makassar are receiving high pollutants from the land. Apart from the fisherman activities such as fish loadings, fish transaction, and boat cleaning in Paotere fish landing (PPI) in the port of Paotere, may increase pollutants concentrations in the waters. The water condition in the fish auction area was relatively black due to the diesel fuel spills during boat-tank filling, which may pollute the waters. This was also occurred in the Port of Makassar city and Port of Untia, which were also busy with boat loadings (for cargos and commercial transportation) and careless use of diesel fuel that may create spills, and will affect the quality of the surrounding waters.

As aforementioned information, this research was conducted to detect the occurrence of jellyfish relating to the oceanographic condition in the coastal waters of Makassar. This research is expected to provide information concerning jellyfish species and their potentials in Makassar coastal waters.

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MATERIALS AND METHODS

This study was conducted in July- September 2018 in Makassar coastal waters at Makassar Soekarno Hatta Port (a commercial port) (Station 1), Paotere Harbour (Station 2), and the Port of Untia (Station 3) (Figure 1).

Figure 1. Research Location

An observational method was used in this study, which was observing and detecting jellyfish occurrence and counted them directly. Jellyfish sampling was conducted in the morning, noon, and afternoon. Represented sampleswere caught by using a net, put in jars, and conserved in 4% formaldehyde then brought to the marine laboratory for identification. Identification was referring to *Occhio Alla Medusa* (Ruseel, 1970). Oceanographic parameters such as temperature, salinity, water transparency, and current velocity were also measured at the three locations. Data was then descriptively analyzed.

RESULTS AND DISCUSSION

Oceanographic conditions

The average temperature recorded was slightly similar in all stations, i.e. 29 ºC (Station 1), 30.67 ºC (Station 2), and 30ºC (Station 3). Whilst the temperature range in all stations was 29-30.67 ºC. The average salinity recorded was 31.67 ppt (Station1), 34.67 ppt (Station2), and 30 ppt (station 3), and ranged from 30-34.67 ppt. The current velocity showed a slightly higher value in Port of Makassar (0.094 m/s, station 1), and followed by Port of Paotere (station 2; 0.070 m/s), and the lowest was in station Port of Untia (Station 3; 0.012 m/s). Overall, the current velocity during the study ranged from 0.012 m/s – 0.95 m/s.

Jellyfish Species Abundance

There were 3 genera of jellyfish found, namely Aurelia, Porpita, and Aequorea. Aurelia was the most abundant jellyfish in Station 1 (80%) and Station 2 (68%). Whilst in Station 3, the most abundance was Porpita (61%) and there was no occurrence of Aequorea (Figure 2).

Based on the total abundance, Aurelia showed the highest number of individuals (215), followed by Porpita (64) and Aequorea (32)

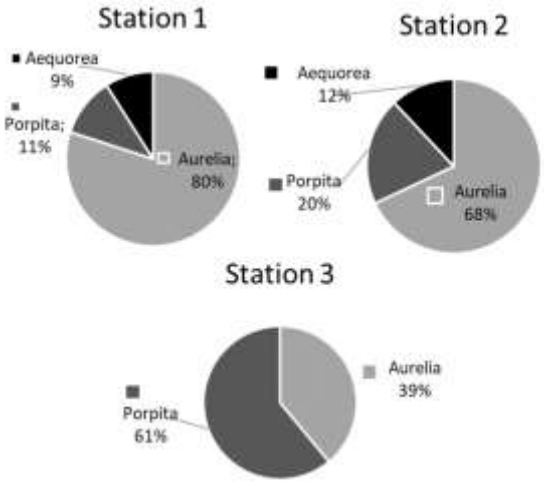

Figure 2. Jellyfish Species Composition in each station (Station 1 = Port of Soekarno Hatta; Station 2 = Port of Paotere; Station3 = Port of Untia)

(Figure 3). These results follow Barz dan Hans-Jürgen (2006) and Omori dan Nakano (2001), that Aurelia prefers shallow water closer to the mainland and the further from the coast, the lower the abundance.

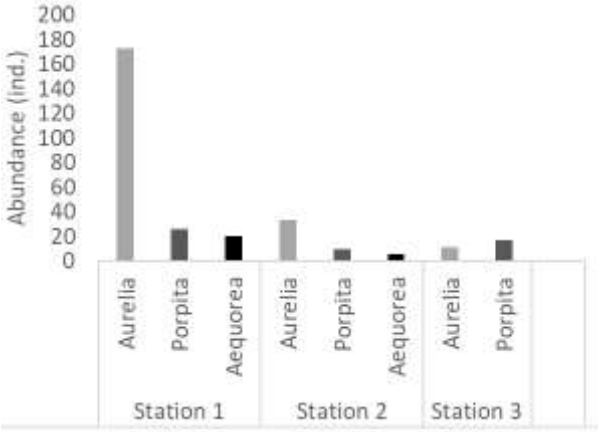

Figure 3. Jellyfish abundance (ind.) in each station (Station 1 = Port of Soekarno Hatta; Station 2 = Port of Paotere; Station3 = Port of Untia)

Jellyfish Species Abundance According to Sampling Time

According to the sampling time, it showed that all jellyfish (Aurelia, Porpita, Aequorea) occurred more frequently during the afternoon (Tabel 1). This was due to the sunlight that had started to dim.

During noontime when there was intense sunlight, jellyfish avoided the sunlight and preferred to go into deeper water and will appear on the surface when the sunlight was relatively reduced

Tabel 1. Jellyfish occurrence in each station according to sampling period

Stations	Genera	Sampling time		
		Morning	**Noon**	**Afternoon**
Port of Soekarno Hatta	*Aurelia*	56	4	113
	Porpita	10	3	13
	Aequorea	11	9	-
Sub-Total		77	16	126
Port of Paotere	*Aurelia*	7	8	18
	Porpita	-	5	5
	Aequorea	-	2	4
Sub-Total		7	15	27
Port of Untia	*Aurelia*	-	1	10
	Porpita	-	8	9
Sub-Total		-	9	19
Total		84	40	181

Jellyfish tend to avoid intense sunlight as well as relatively dark conditions (Manuputty, 1988). Jellyfish occurrence was influenced by sunlight (Zakaria and Rahmah (2017) and occurred in great abundance when sunlight was decreasing

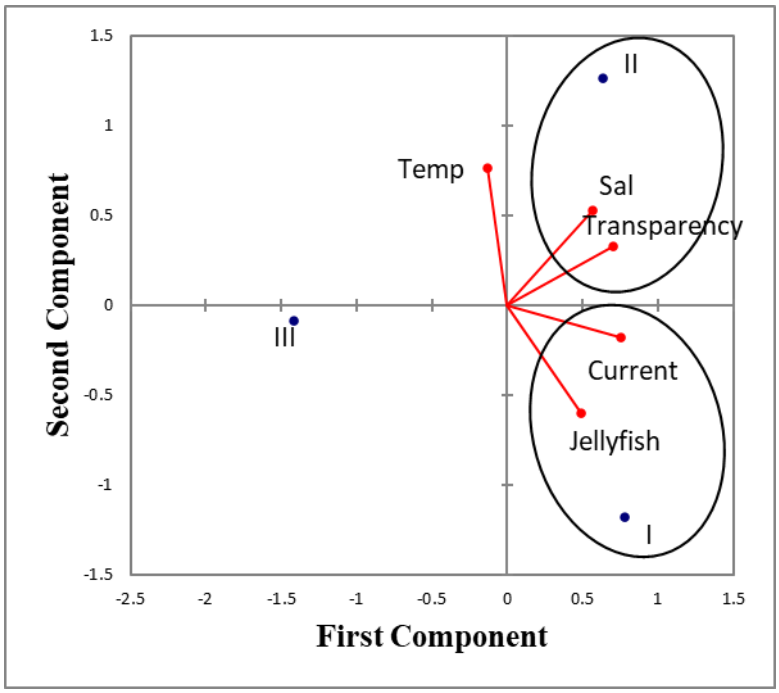

Figure 4. Principal Component Analysis (PCA) of Sampling stations (Station I = Port of Soekarno Hatta; Station II = Port of Paotere; Station III = Port of Untia) to Oceanographic Parameters (Sal = Salinity; Temp = Temperature; Transparency = Water Transparency; Current = current velocity; Jellyfish = jellyfish abundance

he Principal Component Analysis (Figure 4) showed two main groups of stations (stations 1 and 2). Station 1 corresponded to the current velocity and temperature. In station 2, it was characterized by salinity and high water transparency. In station 3, however, showed the opposite results from station 2. In station 1, the average current velocity was 0.09 m/s, even though not in the range for the jellyfish optimum growth (0.15-0.165 m/s) (Ario et al, 1997; Yulianda et al, 1994), however, it was still suitable for their development. The average temperature (29 ^{o}C) was still in the range of suitable

temperature for jellyfish growth, i.e., 28-30^{o}C (Zakaria dan Rahman (2017). In station 2, the average salinity was 34.67ppt which was still in the range of suitable conditions for jellyfish (26-35ppt) (Zakaria and Rahman, 2017). Also, the average water transparency was 116.9 m which showed that the jellyfish could still grow and develop.

Based on the PCA results, it showed that in Station 1 the jellyfish's high abundance corresponded to the characteristic of the environment. It showed that the relatively high current velocity may indicated a movement of the water mass from offshore to the Port of Soekarno-Hatta. Hence, that may imply that the jellyfish were brought along with the water mass headed to the shore. Apart from that, the relatively high temperature in station 1 may indicate a movement of the water mass from offshore into Station 1.

CONCLUSION

There were three genera of jellyfish found in research locations, where *Aurelia* was the most abundant, followed by Porpita then Aequorea. The occurrence of these jellyfish was more frequent during the afternoon period.

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