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OCEANOGRAPHIC PARAMETERS OF THE FISHING GROUND AND CATCH RESULTS OF SODO' (SCOOP NET) IN MALLUSETASI WATERS, BARRU REGENCY

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Abstract
The scoop net, also known as Sodo', is a type of fishing gear commonly used by fishermen in the waters of Mallusetasi, Barru Regency. Unlike commercial fishing gear, the scoop net is an alternative method of fishing. This study aims to analyze the oceanographic parameters of the fishing area and the composition of the catch obtained using the scoop net in the Mallusetasi waters of Barru Regency. The research was conducted from May to September 2021, using survey methods such as observation, interviews, and documentation. Data on oceanographic parameters of the fishing area, catch composition, gear construction, and operational stages of the scoop net were collected and analyzed using descriptive methods. The findings were then tabulated to facilitate data interpretation. The results of the study showed that the oceanographic parameters in Mallusetasi waters, including temperature, salinity, current velocity, and depth, were suitable for operating the scoop net, particularly for targeting the primary catch of anchovies (Stolephorus Sp.) that can be caught at any time. However, the peak season for catching Medan anchovies (Stolephorus waitei) and Nasi anchovies (Stolephorus commersoni) occurs during the eastern season, specifically in July to August. As for the rebon shrimp (Acetes sp.), the catching season occurs in May.

Keywords: Catch, oceanographic, Sodo' (Scoop net).

Introduction

Knowledge about scoop nets, which are one of the light fishing gear, is still limited as a primary fishing tool, as scoop nets are considered an alternative fishing gear rather than a commercial fishing gear. However, in the waters of Mallusetasi Subdistrict, Barru Regency, the scoop net, locally known as Sodo', is the main fishing tool used by fishermen. With the advancement of science and technology, fishermen have started to develop the use of auxiliary tools for the scoop net by incorporating LED lights (Light Emitting Diode), arranged in such a way that fish are attracted to gather around the fishing tool (catchable area).

The operating technique is relatively easy, and the operation time is simple, but the results obtained are highly beneficial. This is the reason why some fishermen in Mallusetasi Subdistrict have switched to using the scoop net as their fishing gear. The catch results also greatly depend on the oceanographic factors in the waters, as stated by Cahya et al. (2016) that several oceanographic parameters can affect the distribution of fish in a particular water area.

Therefore, this research aims to analyze the oceanographic parameters of the fishing area and the catch composition of the scoop net operated in Mallusetasi Subdistrict, Barru Regency. It is hoped that this research can provide information regarding the suitable oceanographic parameters for operating the scoop net and also serve as a valuable reference for future

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researchers.

Research Method

This research was conducted for a period of 4 (four) months, starting from May to September 2021. The research took place in the waters of Mallusetasi, Barru Regency, South Sulawesi Province.

The method used in this research was a survey method (Sugiyono, 2016) with purposive sampling, targeting 1 unit of scoop net fishing with 5 years of experience as scoop net fishermen, assuming that they represented the total number of active fishermen. The data collection techniques used were observation, interviews, and documentation. The primary data collected for this study consisted of oceanographic parameter data from the fishing area, including sea surface temperature, current velocity, salinity, and water depth, as well as data on the catch composition during the research period. Secondary data were obtained by collecting information and conducting a literature review from various journals and research reports related to the research topic.

The data obtained from the measurements of oceanographic parameters in the fishing area, catch data, scoop net construction data, and the stages of scoop net operation were analyzed using descriptive methods. The data were then tabulated in tables to facilitate the interpretation of the collected data.

Results and Discussion

Scoop Net Construction

The scoop net used in the waters of Mallusetasi, Barru Regency, has a triangular shape consisting of a frame, handle, and net. The total length of the net, from the end of the frame to the bag, is 9 meters. The scoop net frame is made of bamboo, measuring 2.5 meters in length and 30 mm in diameter. The net and net bag are made of Polyamide (PA) material, while the handle is made of bamboo. The scoop net can be seen in Figure 1 below:

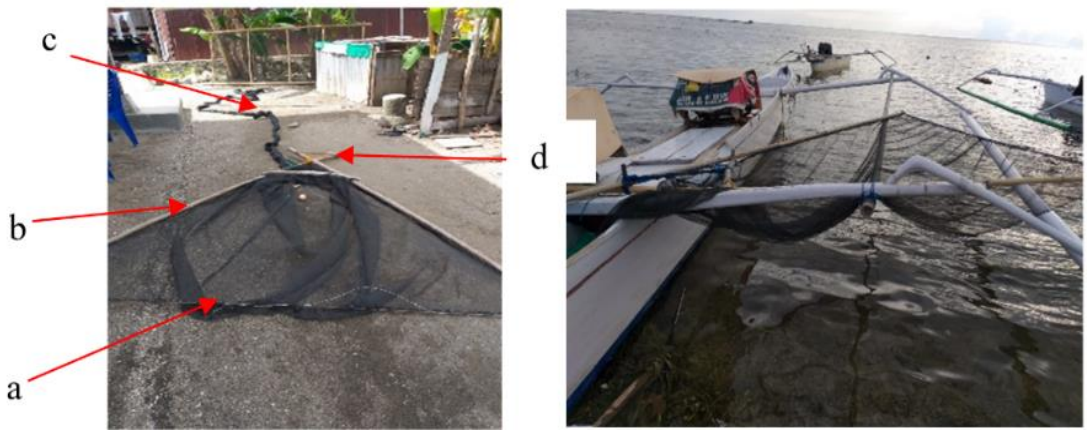
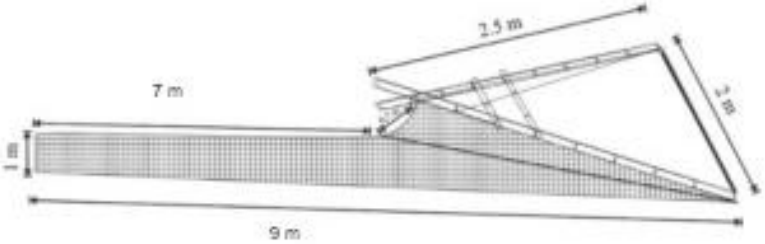


Figure 1. (a) Net Mouth; (b) Frame; (c) Bag; (d) Handle



Fisherr LED lights

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(Light Emitting Diode) with a total of 150 lights, each with a light intensity of 16-20 watts. The main target of the catch is anchovies, which exhibit positive phototaxis. The use of light-assisted tools in fish capture has been used by fishermen for a long time, from traditional fishing methods to modern fishing techniques. However, the exact origin of using light-assisted tools for fishing is not known (Yami, 1987 in Sudirman, 2019). The LED lights are assembled in a box, with the light bulbs removed so that only the LED chips (Emitter LED) are visible, creating a more focused light that does not scatter. The light-assisted tools in the scoop net can be seen in Figure 2. According to research, white LED lights are more effective in attracting anchovies to gather in the illuminated area. The optimum intensity for white LED lights is 42-96 lux, providing an optimal retina adaptation between 64.86% and 73.33% (Susanto et al., 2017).

Operation of the Scoop Net

The operation of the scoop net involves several stages, including:

a) Preparation stage:

This stage is conducted before heading out to sea and involves preparing supplies (fuel, food, and cigarettes), checking the condition of the fishing gear, generator, and lights. The boat departs from the fishing base at 17:00 local time. The distance from the fishing base to the fishing ground is approximately 1-3 miles, with a travel time of 10 minutes.

b) Searching for fish schooling:

The process of searching for fish schooling still relies on the fishermen's instincts. They pause momentarily to observe the natural conditions, such as wind direction, current strength, water conditions, and water clarity. If the current is calm, fishermen search for fish schools in the middle of the waters. However, if the current is strong, they search for areas near the coast or in bays. This is done because in bay areas, the ocean currents are not as strong, allowing anchovies to be caught. When a school of fish is hit by the boat's wake, they jump to the surface, providing information to the fishermen about the fish's location.

c) Herding fish into the catchable area of the scoop net:

The technique used by scoop net fishermen to herd fish is by dimming the lights. The lights are dimmed by reducing the gas or voltage of the generator. The lights are dimmed until they emit an orange to fiery-red glow. This causes the target fish to gather beneath the light. However, if the target fish are already gathered when the lights are turned on, there is no need to dim the lights.

d) Hauling process:

The hauling process is carried out when the target fish have gathered in the catchable area of the purse seine net. The Sodo' nets is pushed or swung to block the school of fish. Once the schooling of fish enters the net's pocket, the sodo' net is lifted.

Oceanographic Parameters of Sodo' Fishing Grounds

The success of fishing activities is influenced by several factors, including oceanographic factors. These factors, such as temperature, salinity, current velocity, water clarity, depth, and chlorophyll-a content, can affect the presence of target species (Sahidi et al., 2015; Umar et al., 2016; Saputra, 2018). The range and average values of oceanographic parameters measured in the Sodo' fishing grounds are shown in Table 1 below:

Table 1. Range and Average Values of Oceanographic Conditions in the Sodo' Fishing Grounds

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No.	Oceanographic Parameter	Measurement Range	Average Value
1	Temperature (°C)	29 - 31	29.8
2	Salinity (ppt)	35 - 38	35.8
3	Current Velocity (m/s)	0.11 – 0.24	0.16
4	Depth (m)	15 - 20	16.9

Source: Primary data (2021).

Temperature is one of the factors that influence the life of organisms in the ocean. The temperature conditions of a water body can affect the metabolic activities and reproduction of organisms (Karuwal, 2020 in Imran Abu Ziyad, et al., 2022). Therefore, each organism in the ocean has a tolerance range for water temperature, including small pelagic fish. This, in turn, affects the distribution of small pelagic fish capture areas, as these fish will constantly swim (migrate) to find water temperatures that their bodies can tolerate. In their migratory activities for various life needs, small pelagic fish often form schools or shoals. The optimal sea surface temperature for the capture of small pelagic fish, based on research by Safruddin et al. (2018) in the Bone Bay Waters, is in the range of 29-33°C. Another study conducted in the waters around Ternate Island reported that the sea surface temperature in the small pelagic fish capture area ranged from 25 to 33°C (Naim et al., 2019).

The target catch of Sodo' fishermen is *Stolephorus* spp., commonly known as anchovies, which is a small pelagic fish abundant in the waters of Barru Regency. Anchovies exhibit positive phototaxis, making the Sodo' fishing method effective for their capture. The Sodo' method is a passive fishing gear operated at night using light as an attractor. One of the oceanographic factors that significantly influence the presence of fish is the sea surface temperature. Based on the research presented in Table 2, the Sodo' fishing gear is suitable for operation in the waters of Barru Regency, as it aligns with the findings of Syafruddin (2014) in Rosyid et al. (2018), which indicate that anchovies tend to gather in the temperature range of 29-30°C. The abundance of anchovies is closely related to the presence of chlorophyll-a in a water body, which indicates high productivity. Water productivity is essential for the primary trophic level in the food chain. According to Fauzan (2011), chlorophyll-a is closely related to productivity, which serves as the first link in the food chain for small fish and subsequently becomes food for larger fish. Therefore, the Sodo' fishing method, with its target catch of anchovies, is well-suited for operation in the Mallusetasi waters of Barru Regency, where the oceanographic conditions, including temperature and chlorophyll-a content, are favorable for the presence and abundance of anchovies.

Salinity is closely related to the physiological life of fish in terms of their osmotic pressure adjustment (Sugiyono, 2009). Karuwal (2020) in Imran Abu Ziyad, et al. (2022) stated that salinity affects the metabolic system of fish, playing a role in gas and fluid exchange within the fish's body. According to Naim et al. (2019), small pelagic fish are often caught at salinity levels of 32.7 to 33.7 ppt. Similarly, a study by Kusuma Pradika Candra M, et al. (2014) conducted in Morodemak waters found that catches of Stolephorus spp. ranged from salinity levels of 29 ppt to 33 ppt using purse seine nets. Based on salinity measurements in the catchment area of the purse seine nets in Barru Regency, the salinity ranges from 35 to 38 ppt. Similar findings were obtained in a study by Fijwal P, et al. (2021), which reported that the highest catches of small pelagic fish occurred at a salinity level of 35 ppt. Kalangi et al. (2013) stated that the horizontal salinity variation in a water body is influenced by water circulation patterns, evaporation, rainfall,

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and input from rivers. It is further mentioned that river water input leads to greater salinity variation in coastal waters compared to open seas. Based on previous studies, it can be concluded that the salinity conditions in the purse seine net fishing area are suitable for catching Stolephorus spp., as stated by Gunarso (1985) that Stolephorus spp. live in salinity ranging from 32 to 35 ppt, while their food source is plankton. Supported by Supryadi (2008), who stated that Stolephorus spp. are organisms with stenohaline characteristics that can thrive in relatively stable salinity conditions. When salinity changes, Stolephorus spp. migrate to environments with salinity levels suitable for their tolerance.

Water current velocity is one of the limiting factors in operating the purse seine net. Currents have an impact on two aspects: small pelagic fish and the stability of the fishing gear used. Small pelagic fish will exhibit passive responses when in a moderately flowing current, whereas in low current velocities, they will actively react against the current (Jalil, 2013). However, if the current velocity is high, small pelagic fish tend to avoid it (Cahya et al., 2016). The current velocity in the purse seine net fishing area during data collection ranged from 0.11 to 0.24 m/s. At this current velocity, the operation of the purse seine net will not be disrupted.

Water depth is an environmental factor that influences water temperature. Generally, as the water gets deeper, the temperature tends to be lower. This is due to the absorption of sunlight by water and its propagation into the depths. Changes in water temperature can affect fish metabolism.

In a study conducted by Haruna (2010) cited in Guntur et al. (2015), it was revealed that fish tend to prefer water depths ranging from 9.2 to 27.0 meters in the operation of purse seine nets. Fish will gather and spread around the light source when the water temperature is low, leading to an increase in their metabolism. This means that fish require more energy to maintain their body temperature and continue their activities. As a result, fish will feel hungry more quickly and actively search for food. They will move more actively in search of food sources and tend to approach the light sources present in the water. In Table 2, we can see that the range of water depth for operating the purse seine net is between 15 and 20 meters, with an average of 16.5 meters. Based on this data and previous research, it can be concluded that the operation of the purse seine net in Barru Regency is suitable for catching Stolephorus spp. as the target catch. This is further supported by the statement by Gunarso (1985) that Stolephorus spp. prefer water depths of 10 to 60 meters with temperatures ranging from 26°C to 32°C.

Catch Composition

The types and quantities of catches obtained from the purse seine net during the study are presented in Table 2 below:

Table 2. Types and quantities of catches from the purse seine net in Mallusetasi Waters, Barru Regency

No.	Indonesian Name	Latin Name	Quantity (Kg)	Percentage (%)
1	Udang Rebon	*Acetes Sp*	56	22
2	Teri putih	*Stelophorus insularis*	66	26
3	Teri medan	*Stolephorus waitei*	56	22
4	Teri nasi	*Stolephorus commersonii*	34	13
5	Teri Batu	*Encrassicholina sp*	40	16
		Total	**252**	**100**

Source: Primary data (2021).

Based on Table 2, it can be observed that the catches are dominated by different species of

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Stolephorus spp., commonly known as anchovies. The highest percentage of catches, accounting for 26%, is attributed to Stolephorus insularis, also known as white anchovies. This finding aligns with the interviews conducted with scoop net fishermen, who mentioned that *Stolephorus* spp. are consistently available, but species with significant economic value, such as S*tolephorus waitei* and *Stolephorus commersonii*, are less abundant due to their peak catching season during the eastern monsoon, specifically in July and August. This is supported by the findings of Rosyid *et al*. (2018), who conducted a study on mapping the anchovy fishing areas based on satellite data and stated that anchovies are abundant in the waters of Batang Regency during the eastern monsoon, from June to August. Pranggono (2003) *cited in* Rahmawati *et al*. (2013) also mentioned that anchovies can be caught throughout the year but are most abundant from April to October. Catch volumes are typically low at the beginning and end of the year. The abundance of anchovy catches during these months is likely related to the abundance of plankton, which serves as their food source in the coastal waters where anchovy fishing operations take place.In a study conducted by Rumpa *et al*. (2021) in the Bone Bay, it was found that the anchovy fishing season occurs at the end of the west monsoon (January-February) until the beginning of the first transition season (March-April). The peak of anchovy fishing activity is in February. Anchovies are again caught at the end of the eastern monsoon (August) until the beginning of the second transition season (September).

During this study, shrimp Rebon (Acetes sp) was also found in May, but it was not observed in subsequent months until the end of the study. This could be due to different water conditions, as mentioned by Dsikowitzkya *et al*. (2011) cited in Kurniawan *et al*. (2020), stating that the oceanographic conditions of the water are sensitive to the presence of shrimp and the catch volumes obtained by fishermen during fishing operations. The development of shrimp habitats is greatly influenced by the availability of food sources. According to Mustaruddin *et al*. (2016), factors such as salinity, temperature, dissolved oxygen, sedimentation, turbidity, lunar phase, and daily conditions (day or night) also affect shrimp development and the potential of a fishing area for shrimp. Based on interviews with fishermen, May is the season for catching shrimp (Acetes sp), The study conducted in Toboali District, South Bangka Regency, as mentioned by Kurniawan *et al*. (2020), states that the fishing season for Acetes shrimp specifically occurs during the rainy season or when the west monsoon winds blow. The data shows that the Acetes shrimp fishing season starts from May to November. The optimal time for catching Acetes shrimp is when the seawater is turbid, the sea waves are calm, the tide is receding towards high tide, and on the night before catching Acetes shrimp, there is a storm/strong winds, followed by calm seas the next day. The storm/strong winds cause the process of mixing in the seawater. This mixing process affects the fertility of the waters and the circulation of seawater. It causes the plankton located at the bottom of the water to disperse evenly throughout the water column, creating a feeding ground for Acetes shrimp.

Conclusion

Based on the research findings, it can be concluded that the oceanographic parameters of the Mallusetasi Waters in Barru Regency, such as temperature, salinity, current velocity, and depth, are suitable for operating the scoop net fishing gear, with the main target being Stolephorus Sp. (anchovies), which can be caught at any time. However, the peak season for catching Stolephorus waitei and Stolephorus commersoni is during the east monsoon season, specifically from July to August. As for Acetes shrimp (Acetes sp.), the fishing season occurs in May.

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References

Cahya, C. N., Setyohadi, D., & Surinati, D. (2016). The Influence of Oceanographic Parameters on Fish Distribution. Oseana, XLI(4), 1–14.

Fajar A, Kukuh Ekorihantoko, Herry Boesono. 2018. Composition of Fish Caught by Scoop Net Fishing Gear in Cilacap Waters. Jurnal Perikanan Tangkap: Indonesian Journal of Capture Fisheries, vol. 2, no. 3, pp. 14-20, Jan. 2018. [Online].

Fauzan. 2011. Mapping Potential Tuna (Katsuwonus pelamis) Fishing Zones Based on Geographic Information System in the Tomini Gulf Waters, Gorontalo Province. [Undergraduate thesis]. Faculty of Fisheries and Marine Sciences, Hasanuddin University. Makassar. DOI: https://doi.org/10.20956/jipsp.v5i10.6272

Fijwal Patangngari, Siti Khadijah Srioktoviana, Mutma'innah Hasan. 2021. Analysis of the Relationship between Oceanographic Parameters and Fishing Catches in Bag Net Fishing Gear in Matene Waters, Tanete Village, Barru Regency. Jurnal ABDI Volume 3 No. 2 July 2021 | UKM KPI Unhas

Gunarso, W.1985. Fish Behavior in Relation to Capture Methods and Techniques. Department of Fisheries Resource Utilization, Faculty of Fisheries and Marine Sciences, IPB University. Bogor.

Guntur, Fuad, Ali Muntaha, 2015. Effect of Underwater Lamp Intensity on The Lift Net's Fishing Catches. Marine Fisheries Vol. 6, No. 2, November 2015, pp. 195-202.

Jalil, A. R. (2013). Distribution of Tidal Current Velocity during the West-East Monsoon Transition in Relation to Small Pelagic Fish Catches in the Spermonde Waters. Depik, 2(April), 26–32.

Kalangi, P. N., Mandagi, A., Masengi, K. W., Luasunaung, A., Pangalila, F. P., & Iwata, M. 2013. Distribution of Temperature and Salinity in Manado Bay. Jurnal Perikanan Dan Kelautan Tropis, 9(2), 71–75. https://doi.org/10.35800/jpkt.9.2.2013.4179.

Pradhika Candra Mulya Kusuma, Herry Boesono, Aristi Dian Purnama Fitri. 2014. Analysis of Anchovy (Stolephorus sp.) Catch Using Boat Lift Net Fishing Gear Based on Depth Differences in Morodemak Waters. Journal of Fisheries Resources Utilization Management and Technology Volume 3, Number 4, 2014, pp. 102-110.

Imran Abu Ziyad, Toni Ruchimad, Ita Junita Puspa Dewi, 2022. Oceanographic Conditions of Fishing Ground and Composition of Boat Lift Net Catch in Bone Regency, South Sulawesi Province. Aurelia Journal Vol. 4 (2) October 2022: 173-182.

Kurniawan et al. (2020). Shrimp (Acetes sp.) Capture Method Using Sungkur Gear as Raw Material for Terasi Production in Toboali District, South Bangka Regency. Aquatic Science. Journal of Aquatic Science, Volume 2, Number 2, October 2020.

ttp://journal.ubb.ac.id/index.php/aquaticscience

Mustaruddin, Simbolon, D., Khotib, M. (2016). Dynamic Patterns of Declining Shrimp Catches Due to Sedimentation and Industrial Waste in the Segara Anakan Area. Marine Fisheries, Vol. 7, No. 2, November 2016, pp. 125-136.

Naim, A., Sultan, M. H., & Tangke, U. (2019). Relationship between Biophysical Parameters of Waters and Small Pelagic Fish Catches in Ternate Island Waters. Indonesian Journal of Fundamental Sciences (IJFS), 5(2), 73–80.

Rahmawati et al. (2013). Analysis of Catch per Unit Effort and Seasonal Patterns of Anchovy (Stolephorus spp.) Fishing in Pemalang Waters. Journal of Fisheries Resources Utilization Management and Technology, Volume 2, Number 3. Online at: http://www.ejournal-s1.undip.ac.id/index.php/jfrumt

Rosyid Paundra Gamawan, Suryanti Suryanti, Teja Arief Wibawa (2018). Mapping of Anchovy (Stolephorus sp.) Fishing Ground based on Ocean Color Satellite Data in Batang Regency Waters. Indonesian Journal of Fisheries Science and Technology (IJFST), Website: http://ejournal.undip.ac.id/index.php/saintek. Saintek Perikanan, Vol. 13, No. 2, pp. 133-142.

Rumpa et al. (2021). Mapping Fishing Zones with Cungkil Boat Lift Nets Based on Time Series in the Waters of Teluk Bone. Jurnal Airaha, 10(01), 56–67.

Safruddin, Hidayat, R., & Zainuddin, M. (2018). Oceanographic Conditions in Small Pelagic Fisheries in Teluk Bone Waters. Jurnal Torani, 1(2), 48–58.

Sahidi et al. (2015). Relationship between Oceanographic Factors and Catches of Large Pelagic Fish in Batang Dua Waters, North Maluku Province. Agrikan: Jurnal Agribisnis Perikanan, 8(2), 53–63. https://doi.org/10.29239/j.agrikan.8.2.53-63.

Saputra, C. (2018). Influence of Oceanography on Fish Catch in Tancap Nets in Muncar Waters, Banyuwangi. Jurnal TECHNO - FISH, 2(2), 84–90.

Susanto, A., Aristi Dian Purnama Fitri, Yuhelsa Putra, Heri Susanto, Tuti Alawiah (2017). Response and Adaptation of Anchovy (Stolephorus sp.) to Light Emitting Diode (LED) Lamps. Journal of Marine Fisheries, Vol. 8, No. 1. DOI: https://doi.org/10.29244/jmf.8.1.39-49.

Sudirman (2019). Development of Sustainable Light Fishing Technology. Proceedings of the 6th National Symposium on Marine and Fisheries, Hasanuddin University, Makassar, June 21 2019. ISBN 978-602-71759-6-9.

Sugiyono (2016). Quantitative, Qualitative, and R&D Research Methods. Bandung: PT Alfabet. pp. 82-85.

Supryadi (2008). Impact of Payang Fishing on the Sustainability of Teri Nasi (Stolephorus spp.) Fish Stocks in Cirebon Regency Waters and Alternative Management. [Undergraduate thesis]. Bogor Agricultural University. Bogor. 121 pages.

Umar, T., Karuwal, J. W. C., Mallawa, A., & Zainuddin, M. (2016). Analysis of Oceanographic Parameters in Relation to Yellowfin Tuna Catches in North Maluku Waters. Amanisal, 5(1), 1–9.