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Distribution of Chlorophil-A and Sea Surface Temperature (SST) on Operation of Payang Catching Equipment in Gorontalo Bay Waters

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Abstract

This research was carried out in January - August 2020 with the aim of looking at the temporal and spatial distribution of Chlorophyll-a (CHL-a) and Sea Surface Temperature (SST) in the waters of Gorontalo Bay, their effect on payang catches. The data used in the form of field data and image data were analyzed by descriptive analysis and analysis of Geographic Information Systems (GIS). Based on the results of the study, it was found that the existence of payang fishing gear in Gorontalo Bay is in an area that has a high chlorophyll content between the West Season, West-East Transition Season and East Season. The highest average payang catch was found in the West-East transition season compared to other seasons. The West-East transition season has sea surface temperatures between 30.64°C-30.99°C while the density of chlorophyll-a is 0.1701 mg/m3-0.1925 mg/m3.

Introduction

Gorontalo Bay is a small bay in Tomini Bay which is located at the mouth of the Bone river, Gorontalo City. The waters of Tomini Bay are known to be relatively fertile and rich in marine natural potential (Yusron & Edward, 2000). The waters of Gorontalo Bay are also known as marine tourism areas and have potential pelagic fish resources (Wiadnyana, 1997). The characteristic of the waters of Gorontalo Bay is that there are river mouths that enter the waters. The flow of the river certainly brings various organic materials into the waters. Pasisingi et al. (2014) in Kadim et al (2017) stated that the river is one of the flowing water ecosystems that contributes to carrying waste from land activities that have the potential to affect and change the condition of the aquatic environment. Nybakken (1992) states that coastal waters, including estuaries, receive large amounts of important elements, namely nitrates and phosphates through inflows from the mainland. In Rahmawati's research (2014), there is a linear relationship between organic matter and nitrate and the distribution of nutrients on chlorophyll-a indicates a high gradation of chlorophyll-a concentration values in river mouths. The amount of nutrient content in a waters can be indicated that the waters are relatively fertile and fertile waters are waters that have the potential to be used as fishing grounds by various types of fishing gear. The results of the Kadim (2017) that the fertility rate of Gorontalo Bay is still relatively good.

The waters of Gorontalo Bay are waters that are used by fishermen as fishing grounds with various fishing gears such as fishing rods, gill nets, Nike trawlers, mini purse seines and payangs. Payang fishing gear is used to catch various types of fish, both pelagic fish and demersal fish and crustaceans. Fishing activities in these waters occur throughout the year and the fishing area changes based on experience. Therefore, this study aims to look at the fishing grounds in terms of the abundance of chlorophyll-a and sea surface temperature in the waters

of Gorontalo Bay for one year. The results of this study are expected to provide information about the temporal and spatial conditions of the sea surface temperature (SPL/SSH) and the distribution of chlorophyll-a in the waters of the Gulf of Gorontalo and its effect on the payang catch. With this information, it is expected to increase the development of the area and the utilization of coastal and fishery resources.

Methods

The research was carried out in January-August 2020 which included the stages of proposing, preparing research, making research designs, collecting data, analyzing data and compiling research reports. The research location was carried out in Gorontalo Bay waters using primary data and secondary data in the form of research results and satellite image data. The sampling point used is to follow the determination of fishing boat spots that move randomly throughout the seasons in the waters of Gorontalo Bay. There are 25 spot payang fishing areas for one year which are grouped into 3 fishing seasons. West season (January-February) 6 fishing spots, West-East Transition Season (March-May) 9 fishing spots and in East season (June-August) with a total of 10 fishing spots. The satellite images used are from the MODIS satellite through the website www.oceancolor.gsfc.nasa.gov. The image is in the form of monthly type SST and CHL-a data with a spatial resolution of 4 x 4 km and then extraction and processing is carried out. Satellite image data is overlaid with capture spot data for visualization in the form of a map.

Data Analysis

The analysis used in this research is descriptive analysis and GIS analysis. Descriptive analysis to see the distribution of payang fishing gear in the waters of Gorontalo Bay. As for making maps of the distribution of SST and CHL-a obtained by using the analysis of the GIS application. GIS analysis includes data extraction, interpolation, and overlays. The extracted data is saved in CSV (Comma Delimited) format for further processing in mapping software for layouting and visualization. In addition, the results of this study are presented in the form of tables and figures and are discussed descriptively.

Results and Discussion

Payang Catches by Season

Types of fish caught in the payang fishing gear in the waters of Gorontalo Bay include: kuwe fish (Caranx sp), lemuru fish (Sardinella sp), female mackerel (Rastrelliger brachysoma), male mackerel (Rastrelliger kanagurta), semar fish (Mene meculata), layur fish (Trichiurus lepturus), and red-tailed kite (Decapterus sp) (Asruddin et al, 2020). The average number of payang catches in the West-East Transition season was 55.7 kg/trip, while in the West season it was 31.7 kg/trip and in the East season it was 19.6 kg/trip. The highest catch is in the West-East Transition season, it can be seen in Figure 1.

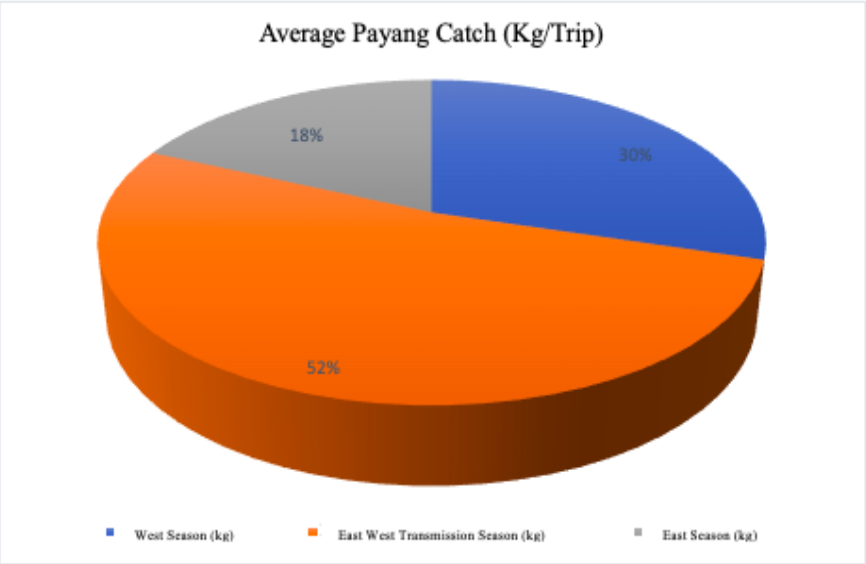

Figure 1. Percentage of Payang Catch by Fishing Season

Position of Fishing Area with Respect to SST and Chlorophyll-A

The position of the fishing area with respect to the distribution of SST and Chlorophyll-a in the waters of Gorontalo Bay.

Determination of fishing locations by fishermen is done based on experience, by randomly moving around in the waters. The location of the payang fishing area when associated with the distribution of SST and the distribution of chlorophyll-a can be seen in Figure 2. Figure 2 has shown that the payang fishing grounds are at SST 29.110C-29.6 0C and the density of chlorophyll-a is 0.1926 mg/m3 - 0.2095 mg/m3¬. The content of chlorophyll-a in the fishing spot area is relatively higher than the surrounding area.

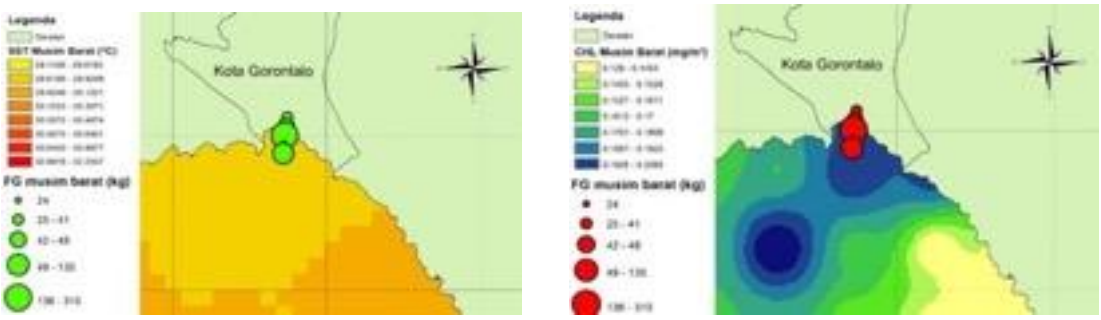

Figure 2. Distribution of Temperature and Chlorophyll-A in the West Monsoon

Position of fishing area with respect to SST and chlorophyll-a in the West-East Transition Season

Payang fishing areas in the West-East transition season have spot locations that are also relatively close together. The location of the payang fishing area when associated with the distribution of SST and the distribution of chlorophyll-a in the waters during the West-East transition season can be seen in Figure 3. Figure 3 has shown that the payang fishing location is in waters with an SST of 30.640C-30.99 0C. and the distribution of chlorophyll-a was between 0.1701 mg/m3-0.1925 mg/m3. The distribution of chlorophyll in waters shows a distribution with a relatively high density.

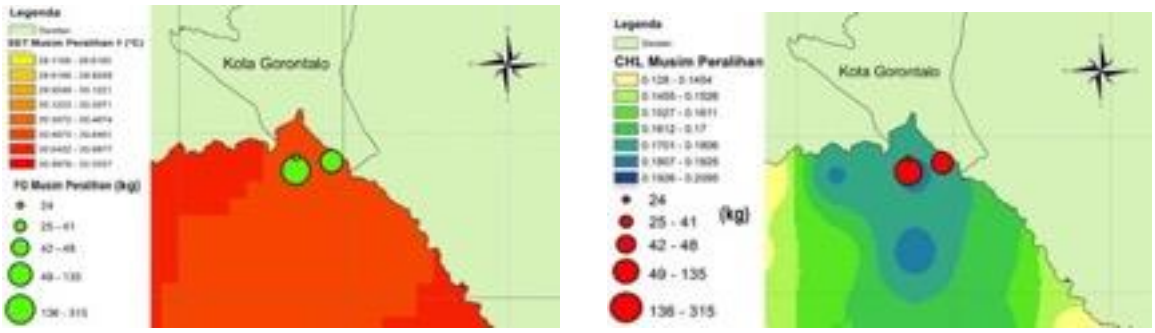

Figure 3. Distribution of Temperature and Chlorophyll-A in the West-East Transition Season

Position of Fishing Area with Respect to SST and Chlorophyll-A in the East Season

The payang fishing area in the East season has spot locations that are slightly spread into three spots but are still in the Gorontalo bay area. The location of the payang fishing area when related to the distribution of SST and the distribution of chlorophyll-a in the West season can be seen in Figure 4. Figure 4 shows that the fishing ground is at SST 29.61660C – 29.9248 0C. This SPL this season is almost evenly matched with the surrounding area. For the distribution of chlorophyll-a, it can be seen that the location of payang fishing also shows that it is in an area that has a high density of chlorophyll-a as well. The value of chlorophyll-a density at the fishing grounds was 0.352 mg/m3 -0.473 mg/m3.

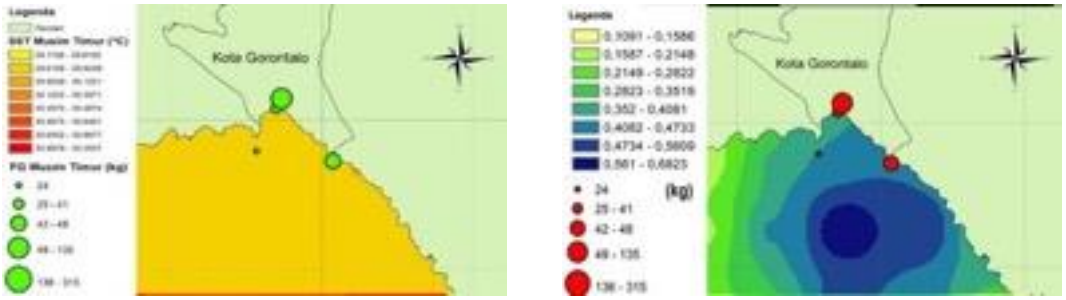

Figure 4. Distribution of SST and chlorophyll-a in the East monsoon

The fishing season is divided into four seasons, namely the West Season, the West-East Transition Season, the East Season and the East-West Transition Season. The results of the data obtained in this study only used three seasons, namely the West season, the West-East transition season and the East season. Based on the distribution map of chlorophyll-a from the three fishing seasons in the waters of Gorontalo Bay, there is no significant difference but there is a high shift in chlorophyll-a concentration every season. For the distribution of spots, the payang fishing area itself has a centralized area in Gorontalo Bay because this fishing gear is a coastal fishing gear and has a small fleet. When compared from the three seasons, it can be seen that the fishing grounds are always located in areas that have a fairly high chlorophyll-a content, including in the west season ranging from 0.1926 mg/m3-0.2095 mg/m3¬, during the West-East Transition season 0 ,1701 mg/m3-0.1925 mg/m3 and the highest concentration of chlorophyll-a in the East season was 0.352 mg/m3 -0.473 mg/m3. For SPL/SSH itself in the West season; 29.110C – 29.6 0C, the West-East transitional season is 30.640C – 30.99 0C and in the East season 29.61660C – 29.9248 0C.Of the three payang fishing seasons, the highest dominant catch was in the West-East Transition season with oceanographic conditions of sea surface temperature (SPL/SSH) of 30.640C – 30.99 0C and a density of chlorophyll-a 0.1807 mg/m3 - 0 ,2095 mg/m3. The area of Gorontalo Bay is part of Tomini Bay which has potential for catching pelagic fish. According to Azzahra, (2017) the waters of Tomini Bay are waters that have the greatest potential for catching pelagic fish because there is an abundant distribution of chlorophyll from February to October. Pelagic fish are fish that migrate in search of areas rich in food sources. One of the factors for the presence of pelagic fish is by looking

at the SST and the movement of chlorophyll. According to Kuswanto et al (2017), 37% of sea surface temperature and chlorophyll-a factors affect the catch of tuna in Lampung Bay and according to Ghufron et al (2019), 34.3% CPUE of purse seine catches in Bali is influenced by by sea surface temperature and chlorophyll-a, while according to Mursyidin et al (2015), the sea surface temperature suitable for fishing is between 26 0C - 29 0C.

Conclusion

Based on the results of the study, it can be concluded that the existence of payang fishing gear in Gorontalo Bay is in an area that has a high chlorophyll content between the West Season, West-East Transition Season and East Season. The highest average payang catch was found in the West-East transition season compared to other seasons. The west-east transition season has a sea surface temperature of 30.640C – 30.99 0C while the chlorophyll density is 0.1701 mg/m3-0.1925 mg/m3.

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