Marine Eco-Climatological Conditions Captured in the West Waters of North Sumatra

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ABSTRACT

Fishery resources in Indonesia, especially in the waters of the Western part of North Sumatra, are closely related to the oceanographic dynamics. Knowledge is needed about the conditions of Marine Eco-Climatology in fishing areas rich in fishery resources. This research was conducted in January-April 2021 at the Sibolga Archipelago Fisheries Port, Sibolga Fisheries and Marine Resources Supervisory Post, and College of Fisheries and Marine Science in Pandan Central Tapanuli. The research method was a survey method with a simple regression statistical test. Based on the results of this study, it was slowed that the air temperature in Sibolga City from 2010-2019 ranged between 23-28⁰C and was categorized as normal. The rainfall in Sibolga City in 2010-2019 ranged from 100-600 mm per month, and the wind speed value was 6-12 knots. The effect of these parameters on the catch showed a weak status. It was known that the best time to carry out the fishing is at average temperatures of 24-27⁰C, rainfall less than 3000 m^3 /day, and wind speeds of 6-8 knots.

1. INTRODUCTION

The western waters of North Sumatra are directly adjacent to the Indian Ocean. Sibolga City and Central Tapanuli Regency are the two main regions that play a central role in high-seas fishing. The sea area of Sibolga City is 2,171.6 ha. With a sea area bordering the Indian Ocean, Sibolga City has enormous potential for marine fisheries resources.

The types of fishery resources found in the sea waters of Sibolga City are skipjack, tuna, lencam, ekor kuning, lemuru, white pomfret, black pomfret, swanggi, squid, kapas-kapas, kuwe, and others. The oceanographic dynamics of a sea area are closely related to the characteristics of the marine and fisheries resources contained therein.

Changes strongly influence fishermen's catches in Eco-climatology (Tjasyono, 2006). In conducting voyages, fishermen pay close attention to weather conditions to get much fish and not face storms / lousy weather while at sea. As a result of increasing global warming, the pattern of changes in Eco-climatology has become erratic, making it difficult for fishermen to catch fish (Wahyudi, 2010).

Weather knowledge is vital because it can affect fishermen's catch and economic conditions (Sultan, 2018). The influence of Eco-climatology on fisheries is not yet fully understood. The results of this study are expected to determine the effect of wind, temperature, and rainfall on fisheries' catches in Sibolga City and Tapanuli Tengah Regency by comparing climate data and fisheries' catches over the last ten years.

2. RESEARCH METHOD

Time and Place

This research was conducted from January to April 2021 at Sibolga Nusantara Fishing Port, Sibolga Fisheries and Marine Resources Supervisory Post Tapanuli Tengah and Matauli College of Fisheries and Marine (STPK). Data analysis was conducted at the Physical Oceanography Laboratory of the Department of Marine Science, Faculty of Fisheries and Marine Sciences, Universitas Riau.

Method

This research is descriptive research with a survey method. This study collected primary and secondary data and then analyzed descriptively and statistically. The statistical analysis used is a simple regression test. Primary data comes from the visit survey results and interviews with several sources,

while secondary data comes from previous researchers' data collected and then presented in tables and graphs.

Procedures

The stages that must be passed in conducting research this time are determining the research location first. After the location has been determined, data collection uses several techniques, including observation, interviews, documentation, and questionnaires.

The observation data collection technique was carried out by directly observing the eco-climatology at the Sibolga Perikanan Nusantara Port (PPN), DKP Tapanuli Tengah, and BPS Tapanuli Tengah. After that, face-to-face interviews were conducted directly with several sources on the staff of the Sibolgs VAT, DKP, and BPS Tapanuli Tengah. Then, documentation was carried out as data collection through written and electronic documents, and data collection was done using open questionnaire techniques to collect data on the characteristics of fishing areas.

Data Analysis

Statistical methods were used to test the research hypothesis using simple regression tests. To facilitate the process of analyzing wind, temperature, and rainfall data and making graphs, Microsoft Excel 2010 software was used. After the primary and secondary data are processed, the data are connected and discussed to determine the relationship of wind, temperature, and rainfall parameters to fishermen's catch in the last ten years.

The dynamic profiles of changes in wind speed, temperature, and rainfall were analyzed descriptively by presenting figures and graphs in the last ten years. Criteria for good or bad wind speed were analyzed using the Beaufort scale to determine the description of nature occurring and the monthly scale for rainfall. A simple regression test was conducted to determine the relationship of wind, temperature, and rainfall to the catch, which will be discussed descriptively (Tjasyono, 2006).

3. RESULT AND DISCUSSION

Location Overview

Sibolga City is located at 1o44' north latitude and 98^o47 east longitude. Central Tapanuli Regency borders the north, east, south, and west. The area of Sibolga City is 10.77 km^2 or 1,077 ha, which consists of the mainland of Sumatra, which is 889.16 ha, and the archipelago, which is 187.84 ha.

The total population of Sibolga City in 2020 was 87,626 people. So, it can be seen that the average population growth rate per year is 1.99 percent. When compared to the area of Sibolga City (10.77 km^2). This proves that the average population density reaches 8,785 people per km^2 and an average of 5 people in each household. Sibolga City's economic conditions come from several sectors, including agriculture, forestry, and fisheries, the highest among other sectors, with a total of 4,930.

Patterns of Change in Wind, Temperature, and Rainfall

Based on the data, the temperature change from 2010-2019 averages $26.143\,^o$ C. At the same time, the highest temperature was in 2019, with a value of $26.81\,^o$ C. 2016 had the highest rain intensity, with an average value of 408.44 mm. Meanwhile, 2013 had the lowest average rain intensity of only 291.27 mm. On average, from 2010 to 2019, the amount of rain available was 364.23 mm. The year with the highest wind speed was 2016, with a value of 8.16 knots. In comparison, the year with the lowest wind speed was 7.8 knots in 2018. The average wind speed is 8.13 knots. This proves that from 2010 to 2019, Sibolga City had low wind speed conditions (Figure 1).
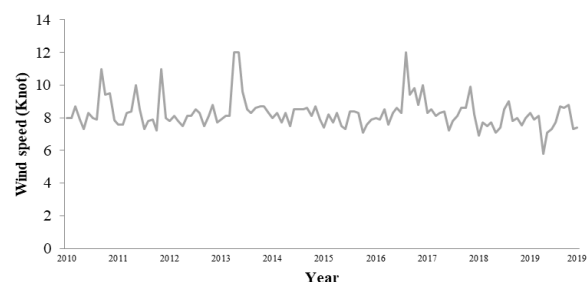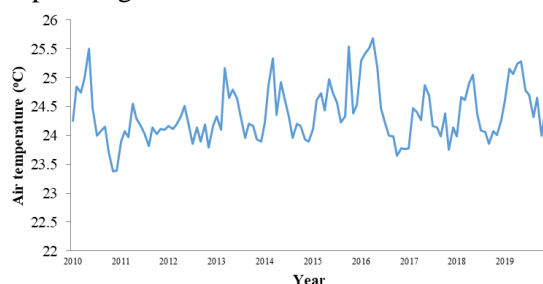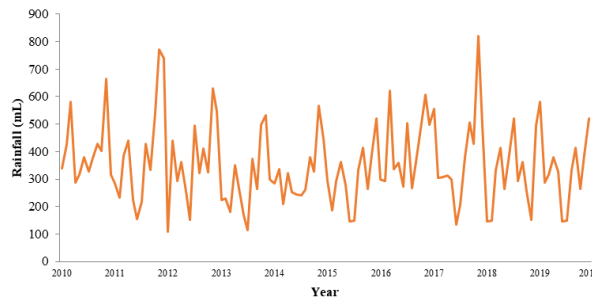
Figure 1. Patterns of Change in Temperature, Rainfall and Wind in 2010-2019

Fish Catch Results

Looking at the pattern of temperature changes and conducting simple regression statistical analysis, it is concluded that temperature positively influences fish catches, where if the temperature increases, it will cause an increase in fish catches in Sibolga City. The temperature variable is indicated by (X) with a value of 12.356. The meaning is that if there is an increase in temperature of 1°C, it will cause an increase in fish catch to 12,356 kg. So, it can be concluded that if there is a hotter temperature, the number of fish caught by fishermen will increase (Nugraheni, 2015).

Unlike the temperature parameter, the results of simple regression statistical analysis on the wind parameter show a negative effect on fish catch, where an increase in wind speed will cause a decrease in fish catch in Sibolga City. The variable wind speed value is indicated by (X) with a value of -1,629.1. The meaning is that if there is an increase in wind of 1 knot, it will cause a decrease in fish catch to 1,629.1 kg.

The effect of rainfall on fish catch is a positive influence; if rainfall increases, it will cause an increase in fish catch in Sibolga City.

Time of Capture

Looking at the data collected from 2015-2019, the most significant number of fish obtained was in 2018, with a total of 30,044. Temperatures, rainfall, and wind speed in 2018 were 26.81^{o}C, 4578.6 mm^{3,} and 7.8 knots.

Information obtained from an interview with one of the BMKG staff shows that air temperature and rainfall in Sibolga City tend to be expected. However, the wind speed is relatively high. This is due to the condition of Sibolga City, which is on the sea's edge and faces the Indian Ocean. The results of interviews with BMKG show that the best time for fishing is when the temperature is normal. This average temperature is around 24-27°C. Good rainfall is low rainfall, less than 3,000m^{3}/day. In terms of wind speed, the wind conditions are also not too big, around 6-8 knots (BMKG, 2018).

4. CONCLUSION

Berdasarkan The effect of temperature on catch is weak, with an R2 of 18.385%. This figure provides information on temperature, which has a weak influence. The effect of wind speed on fish catch in Sibolga City at an R2 value of 0.1586 shows that the effect given by wind speed on fish catch is 15.86% and is a weak influence. The effect of rainfall on fish catch is 30.13% and is a weak influence.

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