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# Corelation Between Sea Surface Temperature And Chlorophyll-A On Results Of Fishing Catch (*Scomberomorus* sp) In Pangandaran District

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KeyWords
Mackerel fish catch, Chlorophyll-a, Pangandaran waters, Sea Surface Temperature



ABSTRACT

This study aimed to determine the corelation between sea surface temperature and chlorophyll-a to the catch of mackerel in Pangandaran Regency waters. The method used in this research was a survey method and tested with correlation analysis and discussed descriptively. The research data included sea surface temperature and chlorophyll-a, which were obtained from satellite images as well as catches and capture coordinates obtained from direct trips. The results showed that the temporal distribution of the highest sea surface temperature tends to occur in the Transition season 1 (March-May) while for the highest distribution of chlorophyll-a in the East season (June-August). Sea surface temperature distribution tends to have a colder pattern towards offshore waters and warmer towards coastal waters. Spatial distribution of chlorophyll-a concentrations has a tendency to be smaller in offshore waters and increasing towards the coast.Generally, the correlation between sea surface temperature and chlorophyll-a on the catch of Tenggiri fish was very low. The correlation between sea surface temperature and chlorophyll-a to the catch of mackerel was 0.075.

## INTRODUCTION

Pangandaran Regency is one of the regencies in West Java Province, this region has a coastline with a length of 91 km and sea area reaches 67,340 ha. This geographical condition makes some of the community work as fishermen, based on the number of fishing cards in service applications until 2016, the number of fishermen in Pangandaran Regency is 996 people spread in 8 districts, namely Cimerak, Cijulang, Parigi, Sidamulih, Pangandaran, Kalipucang, Mangunjaya, and Padaherang. (Profile of Pangandaran Regency in 2017).

Mackerel fish is a species that is targeted by fishermen throughout the Indo - Pacific region. The size of this mackerel species can reach up to 45 kg in weight and can reach a length of 3.4 meters and these mackerel species will reach abundant conditions in certain seasons (Mackie et al 2005 in Jumsurizal et al 2014).

The potential of mackerel (Scomberomorus commerson) in Pangandaran Regency needs to be optimized in order to be able to be utilized sustainably. Optimal fish catch can be known through information on fishing grounds. One way to find out information about fishing areas, can be known through oceanographic parameters. This oceanographic parameter is one of the factors that has a considerable influence on catches such as chlorophyll-a and sea surface temperature which influence the determination of fishing grounds, especially pelagic fish (Putra 2012). Pangandaran waters have vast marine resource potential. Therefore, fish resources in Pangandaran waters must be utilized

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optimally. Optimal fisheries resources must be supported by fishing activities so that they will continue to be sustainable and increase Pangandaran fishery production (Apriliani 2019).

One of the oceanographic factors that influence pelagic fish catches is chlorophyll-a. Chlorophyll-a will be utilized by phytoplankton in the waters which subsequently become the main base of the food chain and the main support for the life of other biota. Phytoplankton as primary producers are eaten by first consumers and subsequent eaters. The large value of chlorophyll-a concentration used as a natural food for fish causes fish to occupy areas rich in chlorophyll-a as a source of fish food (Nontji 2007).

Another oceanographic factor that affecting the distribution of pelagic fish is sea surface temperature. Temperature is a physical quantity that states the amount of heat contained in an object. Sea water temperature, especially in the surface layer is very dependent on the amount of sunlight received (Almuthahar 2005). Changes in temperature can cause water circulation and stratification which directly and indirectly affect the distribution of aquatic organisms (Almuthahar 2005).

## MATERIALS AND METHODS

### Tools and Materials

### Tools

The tools used in this study were stationery, cameras, meters, scales, GPS, software and laptops

### Material

Materials used were chlorophyll-a distribution data and sea surface temperature data in Pangandaran Regency waters previously obtained from from the Aqua-MODIS satellite imagery previously downloaded, Pangandaran Regency's mackerel fish production data from 2016 to 2018 and finally is a questionnaire to find out fishing activities

### Research Procedures

1. Data Collection

Data was obtained either directly or indirectly obtained from interviews, surveys and continuation of data obtained from downloads at *http://esceancolor.gsfc.nasa.gov* in a vulnerable period of three year.

2. Data Processing

Data on sea surface temperature and chlorophyll-a that had been downloaded from the website http://ocean-color.gsfc.nasa.gov/cms, then processed using argchis software to retrieve the area to be processed and analyzed. Furthermore, it was processed using mapping software to obtain sea surface temperature and chlorophyll-a. Mackerel fish production data that had been obtained were processed in graphical form and analyzed in correlation and regression and discussed descriptively.

a. Analysis of Capture Relating with SPL and Chlorophyll-a

Analysis of the correlation between catches with sea surface temperature and chlorophyll-a was carried out by correlation analysis between chlorophyll-a with catches and sea surface temperature with catches. Determination of the correlation between the catch variable with chlorophyll-a and surface temperature using correlation analysis with the help of Microsoft Excel. The degree of the relationship was expressed by the correlation coefficient (r). The higher the value of r indicates that the relationship is getting closer (Walpole 1995), presented in Table 1

Table 1. Range of correlation coefficients *

| R | Correlation |
|---|---|
| r = 0 | There is no correlation |
| 0 <r <0.2 | Very low correlation |
| 0.2 <r < 0,4 | Low correlation |
| 0,4 <r <0,7 | Significant correlation |
| 0,7 <r <0,9 | High correlation, strong |
| 0,9 <r <1,0 | High correlation |
| r = 1 | Perfect Correlation |

* Source: Hasan (2003)

### Methods

The method used was a survey method. The survey method is described as collecting information from a portion of the population that is considered to represent a certain population. Research by survey method has the quality of verification of existing theories and tend to be descriptive. Research data were presented in the form of figures and tables as well as collected data analyzed descriptively (Azwar 2010). The data needed in the form of primary data and secondary data. Primary data included length and weight of catching mackerel, number of caught

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mackerel, and position of the vessel conducting fishing operations. Secondary data included sea surface temperature, chlorophyll-a and mackerel fish production data in Pangandaran Regency.

## RESULTS AND DISCUSSION

### General Conditions of Catching Fisheries in Pangandaran Regency

Pangandaran Regency is one of the areas included in the Fisheries Management Area IX whose scope covers the waters of the western tip of the island of Sumatra and the southern coast of Java. The condition of the fishing fleet in Pangandaran Regency is dominated by outboard motorboats. Fishing activities are influenced by fishing season, which is west season and east season. The fishing activities in Pangandaran Regency were carried out in the waters of Pananjung Bay, Parigi Bay, Karapyak, Nusakambangan and Cilacap (the 2016 Pangandaran Regency Marine and Fisheries Service).

### Tenggiri Fish Production in Pangandaran Regency

Based on data obtained from the Department of Fisheries and Maritime Affairs of Pangandaran Regency in 2016-2018 the production of mackerel in Pangandaran Regency experienced various fluctuations and could reach the highest production of 76,045.75 kg in 2017 and the lowest production in 2016 as many as 16,263.65 kg. Data on mackerel fish catches during the period 2016-2018 are presented in Table 2

Table 2 . Mackerel Fish Production in 2016-2018 *

| Year | Mackerel Fish Production (kg) |
|---|---|
| 2016 | 16,273.65 |
| 2017 | 76,045.75 |
| 2018 | 37,828.70 |

* Source: Pangandaran Regency Fisheries Service in 2019

A. Monthly Catch Results and Average Mackerel Fish

Catches of average Mackerel fish the average of each month in the period 2016-2018 is presented in Figure 1.

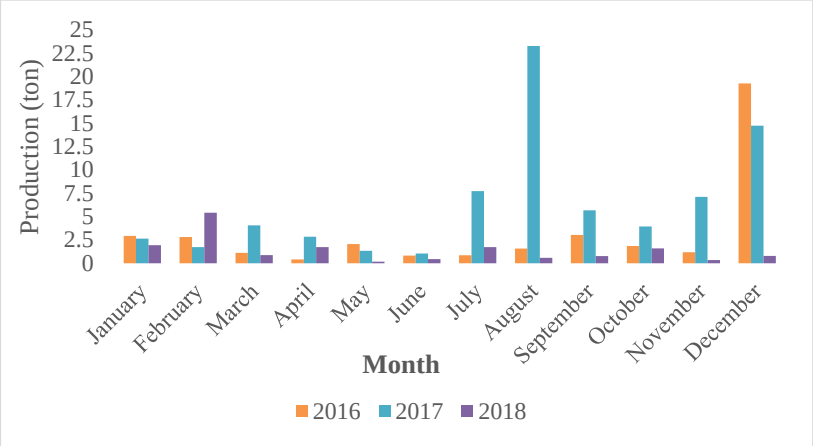


Figure 1. Monthly Production of Tenggiri Fish in Pangandaran Regency in 2016-2018

Based on data of mackerel fish production it can be seen that overall, in a vulnerable period of 2016-2018 production of mackerel fish in the Regency Pangandaran experiences fluctuations every month. The highest catches in August 2017 were 23.27 tons and the lowest amount of catches was 0.16 tons in May 2018. The catch of mackerel in a vulnerable period of three years namely 2016-2018 broadly shows that in 2017 Mackerel fish catch has the biggest catch compared to other years.

The catch of mackerel in Pangandaran Regency has fluctuated every month which can be caused by several factors including ocean-ographic factors in the waters that affect the spread of mackerel fish. That was consistent with the statement of Tangke (2012) which states that the distribution of mackerel fish in the waters of Maluku is influenced by oceanographic factors, one of which is sea surface temperature. Changes in fish catch every month in 2016-2018 are illustrated on the average catch graph Figure 2.

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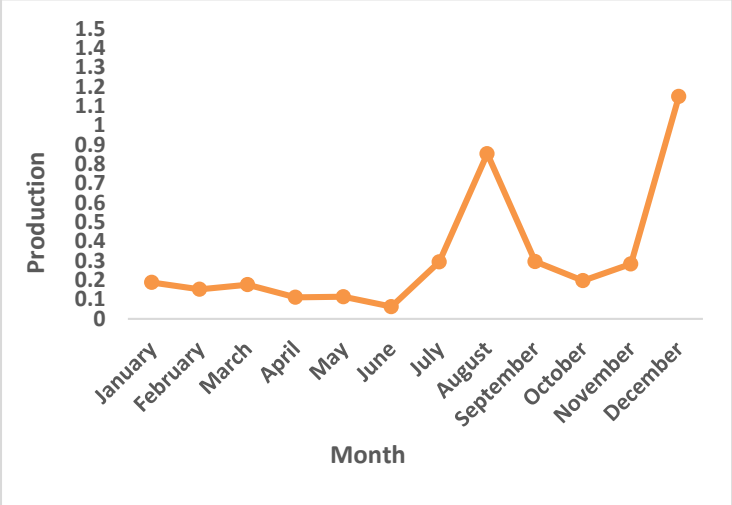


Figure 2. Average monthly production of mackerel in 2016-2018

Based on the monthly average data of mackerel fish production in / 2016-2018 in Pangandaran Regency from January to May or in the western season until the transition season I the catch of mackerel fish tends to be stable and did not fluctuate, but in July to August the catch of mackerel has experienced a significant increase and dropped again in September or in the transition season II. Based on the monthly catch of mackerel fish over a period of three years shows that the fishing season accompanied by the distribution of oceanography in supporting waters such as sea surface temperature and chlorophyll-a could affect the catch of mackerel.

C. Seasonal Catches of Mackerel Fish

Production of fish catches in Pangandaran Regency according to catching season is illustrated in Figure 3.

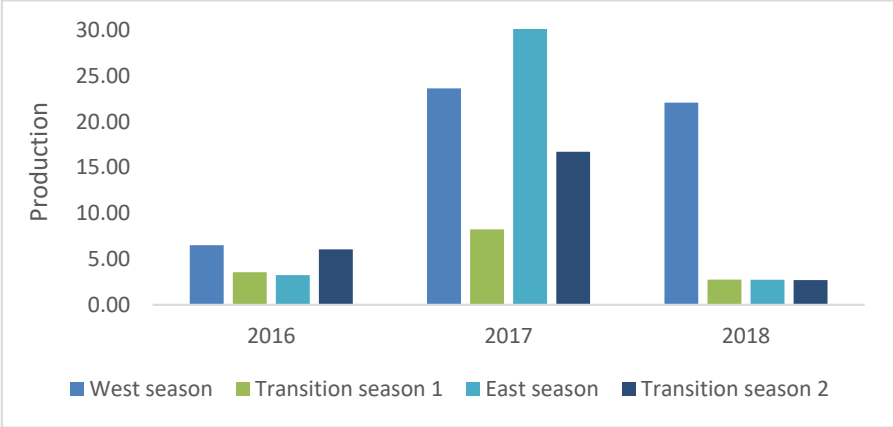


Figure 3. Seasonal Production of Mackerel Fish in 2016-2018

Based on data on seasonal production of mackerel in 2016-2018 in Pangandaran Regency it can be seen that within a period of three years from 2016-2018 the peak fishing season for mackerel in Pangandaran Regency is in the western or deep season ranges from December to February and the east season or within the period June-August. This statement is in accordance with the statement of Mutakin (2001) which states that the fishing season which is the best time to catch mackerel in Pangandaran is the east monsoon period and reaches its peak in July to August. From the seasonal data of mackerel fish production in the vulnerable period of three years, it is also known that in 2017 the production of mackerel tuna yields has more catch compared to other years this could be caused by factors that exist in the waters of Pangandaran Regency such as wave height, temperature, chlorophyll-a and so on.

## Sea Surface Temperature Distribution in Pangandaran

The value of vulnerable sea surface temperature within three years, namely 2016-2018 in Pangandaran Waters is presented in Figure 4.

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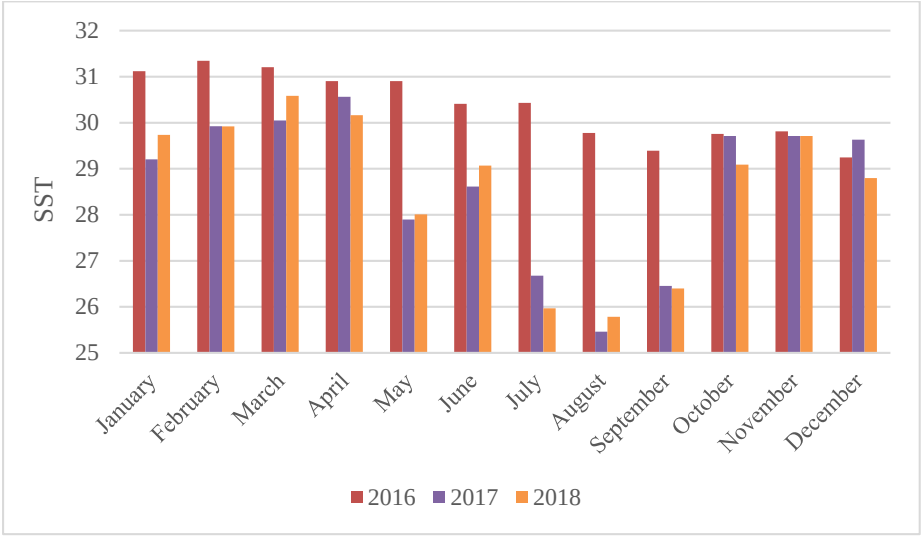


**Figure 4**. Distribution of SST in Pangandaran Regency in 2016-2018

Based on monthly sea surface temperature graphs in 2016 until 2018 in Pangandaran Regency, sea surface temperature reached the highest value in February to April or in the western and transition I seasons while sea surface temperature values reached the smallest values in August to September or in the east and transition seasons II. In addition, the magnitude of temperature in Pangandaran Regency during the period 2016-2018 ranged from 250 C to 320 C, at this temperature vulnerable, mackerel fish can still live in Pangandaran waters this is in accordance with Nahib et al (2010) which states that Mackerel fish can live in vulnerable temperatures ranging from 25° C to 31° C.

The stable level of sea surface temperature in the Pangandaran waters throughout the season greatly affects the number of mackerel fish in this water area, as conveyed by Rizkawati (2009). influence on the life of fish in existing waters and used as several indicators in determining ecological changes, metabolic activities and fish distribution. This relates to sea surface temperature, fish are very sensitive to changes in temperature even though it is only 0.03 ° C.

## Chlorophyll-a in Pangandaran Distribution

Chlorophyll-a distribution values in the monthly period from 2016 to 2018 are presented in Figure 5.

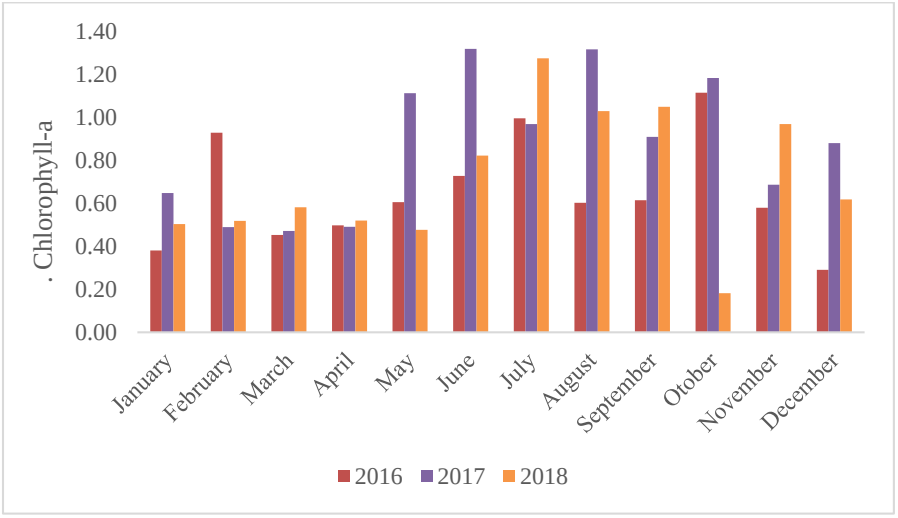


**Figure** 5. Chlorophyll-a Monthly Distribution in Pangandaran Regency in 2016-2018

Based on the graph of the average monthly chlorophyll-a concentration in Pangandaran Waters in the period of 2016 to 2018 the value of chlorophyll-a concentration reached the highest value in July and August in the year 2017 with a chlorophyll-a value reaching 1.20 mg / m3

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while the lowest chlorophyll-a value in October 2018 with a chlorophyll-a value of 0.18 mg / m3. The amount of chlorophyll-a in the coastal area has a greater value of chlorophyll-a than the value of chlorophyll-a in the open ocean, this is due to the process of nutrient input from the mainland which empties into the coastal area (Bukhari et al , 2017). The difference in the distribution value of chlorophyll-a in Pangandaran waters in each season can be influenced by several factors, one of which is wind. Strong winds can help the process of movement of currents and help the process of stirring nutrients vertically in waters that can increase the concentration of chlorophyll-a in waters (Nababan et al, 2010).

## Correlation between Sea Surface Temperature and Chlorophyll-a with Catching Rate of Mackerel Fish

The results of the regression analysis in this study, it can be seen that the correlation value shows an r value of 0.075 or 0 <r <0.2 or a very low correlation, so it can be stated that the temperature on the surface has an influence on the catch of mackerel but the effect is very low or small (Hasan 2007) while for the R square value (R2) obtained from the excel calculation of 0.11 so it can be concluded that sea surface temperature and chlorophyll-a affect the results of mackerel fish catch in Pangandaran waters by 11% while the rest is influenced by other factors that influence the catch of mackerel. The regression equation for the relationship of sea surface temperature and chlorophyll-a to the catch of mackerel is

$$Y = a + X\_1 + X\_2$$

$$Y = -169{,}9 + 7{,}036X\_1 - 0{,}492X\_2$$

Although the sea surface temperature has a low correlation with the catch of mackerel in Pangandaran Regency waters, it indirectly affects the movement of fish and pelagic fish production in the waters. According Nahib et al (2010) the appropriate temperature range for the distribution of mackerel fish is 24° C - 30,1 ° C and fluctuations in the catch of mackerel are caused by vertical migration so that some pelagic fish species will swim deeper when the surface temperature of warm waters ( 28 ° C). Temperature is one of the limiting factors for biota life, including phytoplankton. In addition, temperature affects the increase of nutrients indirectly in the ocean such as chlorophyll-a which tends to increase when the temperature decreases which can cause upwelling conditions where nutrients will be raised to the surface (Mahdiana et al 2018)

The concentration of chlorophyll-a in indirect waters affect the number of fish in the area. There is a timelag in or which phytoplankton contained in waters were eaten by the structure of herbivorous organisms first, for example zooplankton, or crustaceans small(juveniles), and subsequently eaten by trophic levels above them (Girsa 2008 in Mujib et al 2013). So that phytoplankton in the waters will not be directly utilized by mackerel fish, but will take about three months or one season to be fully utilized. Some factors that influence the formation of chlorophyll include genetic factors, light, oxygen, nutrients and water. (Zahidah 2017)

## .CONCLUSIONS

Based on the results of the research that has been done, it can be concluded that the result of mackerel fish catch has a correlation value of 0.075 for sea surface temperature and chlorophyll-a parameters, so it can be stated that the sea surface temperature parameters and chlorophyll-a have an influence on the catch mackerel fish but the effect is very low or small.

## REFERENCES

[1] Almuthahar, A. 2005. Analysis of Sea Surface Temperature and Chlorophyll-a from Satellite Data and Its Relationship to the Catches of Mackerel (*Rastrelliger* sp) in the Natuna-South China Sea. *Thesis.* Bogor: Graduate School, Bogor Agricultural University

[2] Apriliani IM, Nurrahman YA, Dewanti LP, & Herawati H. 2018. Determination of potential fishing areas for tail fishing (Trichiurus sp.) Based on the distribution of chlorophyll-a and sea surface temperature in Pangandaran waters, West Java, Indonesia. *AACL Bioflux*, 11 (4), 1047-1054

[3] Apriliani IM, Dwipayana MF, Sunarto, Rostini I. 2019. Capture Comparison and Flonet Lifting Levels at Various Transportation Times in Pangandaran, West Java, Indonesia. *World News of Natural Sciences* 22: 168-173

[4] Azwar, S. 2010. *Research Methods*. Student Library. Yogyakarta

[5] Bukhari, W. Adi and Kurniawan.2017. Estimation of Mackerel Fishing Areas Based on Sea Surface Temperature and Chlorophyll-a Distribution in Bangka Waters. *Journal of Aquatic Resources*. 11 (1): 26-47

[6] Pangandaran Regency Marine and Fisheries Service 2017.Pangandaran Regency *Annual Report Fisheries and Maritime Services.* Pangandaran Fisheries and Maritime Agency. Pangandaran

[7] Hasan I. 2003. *Analysis of Research Data with Statistics*. Earth Literacy. Jakarta

[8] Jumsurizal, A. Nelwan and M.Kurnia. 2014. Productivity of Catching Mackerel (*Scomberomorus commerson*) Using Fishing Rods in the Waters of Bintar Regency. *PSP Science and Technology Journal:* 1 (2) : 165-173

[9] Mujib.Z., H. Boesono, and D. Aristi. 2013. Mapping Distribution of Tuna (*Euthynnus* Sp) with Chlorophyll-a Modical Image Data on Payang Fishing

GSJ: Volume 8, Issue 1, January 2020
ISSN 2320-9186
Gear (Danish Seine) in the Waters of Palabuhanratu Bay, Sukabumi, West Java. *Journal of Fisheries Resources Utilization Management and Technology*. Vol 2 (2): 150-160.

[10] Mutakin, Jenal. 2001. Analysis of Potential and Season of Mackerel Fish (*Scomberomorus* sp) in Pangandaran, Ciamis Regency, West Java. *Skipsi*. Faculty of Fisheries and Marine Science. Bogor Agricultural University

[11] Nababan., B. Zulkarnaen., And Gaol .2010. Variability of Chlorophyll-a Concentration in North Sumbawa Waters Based on Seawift Satellite Data. *Journal of Tropical Marine and Science*. 1 (2): 72-83

[12] Nahib, D. Sutrisno, AD Suriadi, Niendyawati and Rahadiati. 2010. *Prediction of the Distribution of Fishing Ground Using Modical Data Multitemporal, Oceanographic and Local Wisdom Validated with Spatial Planned Real Catches*. Bogor (ID): Bakosurtanal

[13] Nontji, A. 2007. *Biomass and Productivity of Phytoplankton in Jakarta Bay Waters and Their Relationship with Environmental Factors*. Bogor: Research Report of the Faculty of Fisheries of IPB.

[14] Putra, E. 2012. *Variability of Chlorophyll-a Concentration and Sea Surface Temperature From Modical Satellite Imagery and Its Relationship with the Results of Pelagic Fish Catches in the Java Sea Waters*. Bogor: FPIK, IPB.

[15] Restianingsih, H.Yoke., T, Noegroho and K, Wagiyo. 2016. Some Biological Aspects of Tenggiri Papan Fish (*Scomberomorus guttatus*) in Cilacap and Surrounding Waters. *Ejournal Balitbang*, 8 (3): 191 - 198

[16] Rizkawati, Rika. 2009. Effect of Sea Surface Temperature on Catches of Mackerel Fish in Indramayu Waters of West Java. *Skipsi*. Faculty of Fisheries and Marine Science. Bogor Agricultural University

[17] Tangke, Umar., JC Karuwal., M. Zainuddin and A. Mallawa. 2012. Analysis of Relationship between Oceanographic Factors and Catches of Mackerel Fish *(Scomberamorus* sp) in the Leihitu District Waters. Central Maluku. *Agribusiness and Fisheries Scientific Journal*, 5 (2): 2

[18] Walpole E. 1995. *Introduction to Statistics. 3rd edition*. Bambang Sumantri, translator. Jakarta: Gramedia Main Library. Translation from: *Introduction to statistics 3rd edition*. 45 pages

[19] Zahidah, 2017. *Aquatic Productivity*. Faculty of Fisheries and Marine Sciences, Padjadjaran University: Sumedang.