

The Relationship of Oceanographic Factors to The Presence Of Marine Resources In The Area of Installation of Fish Apartments In Takalar Waters

Arwin Adi Wahyudi^a, Wayan Kantun^a, Rahmat Januar Noor^c

^aInstitut Teknologi dan Bisnis Maritim Balik Diwa

^bUniversitas Sulawesi Barat

Correspondent Author*: aryakantun@gmail.com

Abstract

Oceanographic parameters are a benchmark to determine the existence and presence of marine resources in a water. This study aims to analyze oceanographic parameters with the presence of marine resources around installing fish apartments. This research is classified as quantitative research with data collection through observation, by conducting objective observations, and visually through underwater cameras. The results of the study showed that the value of oceanographic parameters had a positive correlation with the presence of marine resources in the fish apartment area. The presence of marine resources is 725 with 11 species, the proportion of the presence of resources is seen from the division of morning and evening time of 643 fish (88.69%) and 82 fish (11.31%) respectively and is dominated by flying fish (*Decapterus* sp). Based on oceanographic factors, the parameters of temperature, current speed, pH, and salinity and brightness have the most influential correlation values on the presence of marine resources in the fish apartment area. Oceanographic factors greatly determine the presence of fish in installing fish apartments.

Keywords: fish apartments, oceanographic factors, the presence of resources

Abstrak

Parameter oseanografi merupakan tolak ukur untuk menentukan keberadaan dan kehadiran sumber daya laut pada suatu perairan. Penelitian ini bertujuan untuk menganalisis parameter oseanografi dengan kehadiran sumberdaya laut pada kawasan pemasangan apartemen ikan. Penelitian ini tergolong penelitian kuantitatif dengan pengumpulan data melalui observasi, dengan melakukan pengamatan yang objektif, dan secara visual melalui kamera bawah laut. Hasil penelitian menunjukkan bahwa nilai parameter oseanografi memiliki korelasi positif terhadap kehadiran sumber daya laut pada kawasan apartemen ikan. Kehadiran sumberdaya laut sebanyak 725 ekor dengan 11 spesies, proporsi kehadiran sumber daya dilihat dari pembagian waktu pagi dan sore hari masing-masing sebesar 643 ekor (88,69%) dan 82 ekor (11,31%) dan didominasi oleh ikan layang (*Decapterus* sp). Berdasarkan faktor oseanografi parameter suhu, kecepatan arus, pH, dan salinitas serta kecerahan memiliki nilai korelasi yang paling berpengaruh terhadap kehadiran sumberdaya laut pada kawasan apartemen ikan. Faktor oseanografi sangat menentukan kehadiran ikan pada daerah pemasangan apartemen ikan.

Kata Kunci: apartemen ikan, faktor oseanografi, kehadiran sumberdaya

Manuscript received June; revised June; accepted July, Date of publication Agust 2025 IJCMS is licensed under a [Creative Commons Attribution-Share Alike 4.0 International License](https://creativecommons.org/licenses/by-sa/4.0/)



INTRODUCTION

In the Ministerial Decree of the Republic of Indonesia no. 19 of 2022 concerning the estimated potential of fish resources in the Makassar Strait, namely the number of small pelagic fish 157,151 tons, large pelagic fish 75,095 tons, demersal fish 230,000 tons, coral fish 34,518 tons, penaeid shrimp 47,610 tons, lobster 477 tons, crab 10,870 tons, crab 2,906 tons, and squid 32,511 tons. The production potential from marine fisheries in 2020 in South Sulawesi Province reached 635,115,800 Kg with a production value of 1,488 billion rupiah, (BPS Sul-Sel, 2020).

Various problems that arise in the fisheries sector are long-term, one of which is the destruction of coral reefs, which is an important component of marine ecology. The damage to coral reefs in Indonesia is getting worse every year. According to research by the Indonesian Institute of Sciences

(LIPI) in 2011, 30.76 percent of coral reefs are unhealthy or damaged. Only 5.58 percent of corals are in very good condition, 26.95 percent are good, and the remaining 36.90 percent are quite good, this data was collected from 1,076 monitoring locations, (Coremap-CTI, 2012).

To anticipate the unexpected impacts, the use of fish apartments is one of several initiatives to restore the ecosystem in hopes of restoring fish populations in damaged waters. Fish apartments are engineering fishing technology made using components with a partition arrangement of Polypropylene plastic that is safe for the environment. Fish apartments or artificial fish houses function to increase fishing productivity, increase natural productivity by creating new habitats for organisms that contribute to food composition, create new habitats for target species, protect small or juvenile organisms, and serve as a nursery ground, protect beaches from waves, and provide a place for organisms to reproduce. (McLean et al, 2014; Rendle dan Rodwell, 2014; Wu et al, 2015). The purpose of this study is to examine the relationship between oceanographic factors (temperature, salinity, pH, current speed and brightness) and the presence of marine resources in the fish apartment area in the waters of Takalar.

METHOD

This research was conducted for 2 months starting from April to May 2023. The research location is in Aeng Batu-Batu Village, North Galesong district, Takalar Regency. The equipment used in this study is in the form of identification books, underwater cameras, handrefractometers, pH meters, thermometers, secchi discs and stopwatches. The measurement of oceanographic factors is as follows: 1) Preparation and Location Determination, which is research begins with planning and location determination, namely at the point of installation of fish apartments that have been installed in September 2022 in the waters of Sampulungan Village as many as three points; 2) Measurement of Physics and Chemical Parameters, namely physical and chemical measurements and at the same time as the installation of underwater cameras. To get accurate results, measurements are carried out with 2-3 repetitions.

The measurement method is carried out: 1) The current speed is measured using a current kite that drifts at the same time as starting the stopwatch following the direction of the current, until the rope on the current kite stretches perfectly and then stops the stopwatch; 2) Water temperature measurement using thermometers carried out directly in the field at each data collection point. The thermometer is dipped in the water and then the value indicated by the thermometer is recorded the result; 3) The measurement of the sanitation of the waters is measured using a handrefractometer which is carried out at the research location at three predetermined points by taking seawater and then the handrefractometer is dripped with the water and then the resulting value is recorded; 4) Aquatic pH measurement is carried out using a pH meter that is dipped directly in the field, then the results that are shown are recorded as results; and 5) The brightness of the water is measured using a secchi disc by submerging the device in the water and measuring the rope with 2 benchmarks, namely when the white side of the secchi is not visible for the first time and when the white side of the secchi disc is visible from the surface of the water.

Observation of the presence of resources with procedures, namely 1) Underwater Camera Lowering, namely underwater cameras installed in the morning from 06.00 – 09.00 and in the afternoon installed at 15.00-18.00 WITA at three locations to install fish apartments with consideration of adjusting to the time of eating fish; 2) The installation of underwater cameras is carried out twice a week for a period of one month, namely the removal of underwater cameras and the identification (using an identification book) of marine resources that are recorded to be present in the area of installation of fish apartments, then recording the types of marine resources that capture underwater cameras; and 3) Identify the results of the measurement of physical and chemical parameters, connecting with the results of underwater camera recordings.

Data Analysis, which is data analyzed related to the composition of aquatic resource types and oceanographic factors to the existence of aquatic resources around installing fish apartments as shown in the table below:



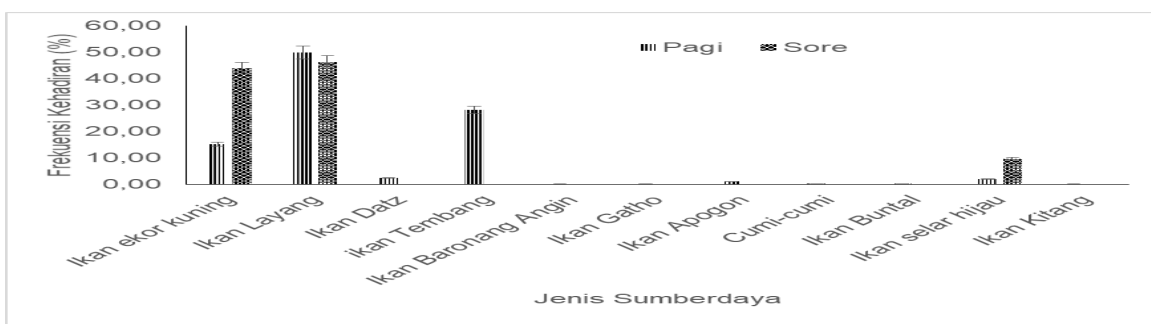
Table1.1
Research Data Analysis

No	Data Analysis	Rumus	Information
1	Type Composition	$Kj = ni/N \times 100\%$	Kj = Composition of marine resource types ni = Number of individuals of the i-i species N = Number of individuals of the entire species
2	Frequency of Attendance	$FA = Ji/JNS$	FA = Frekuensi Absolute Ji = Number of types of individuals present JNS= Number of all stations
		$Fr = fj/fN \times 100\%$	Fr = Relative Frequency Fi = Frequency of presence of a type of individual Fn = Frequency of attendance of all types
3	The Relationship between the Presence of Resources and Oceanographic Factors	"Y = A + BX"	Y = Dependent variables (physical, chemical, and biological factors). X = Independent variables (presence of marine resources). A = Constant (value of Y when X = 0). B = Regression coefficient (positive or negative influence)

RESULT AND DISCUSSION

Based on the observation results, the temperature in the fish apartment area in the morning ranges from 27-31°C and in the afternoon it ranges from 27-31°C. Sanitivity values range from 28-31‰ with details of 26-30‰ in the morning and 27-30‰ in the afternoon. Brightness ranges from 2.03-6.53 m with details in the morning ranging from 2.32-6.53 m and in the afternoon ranging from 2.03-4.25 m. The current velocity ranges from 0.11-0.29 m/s with details of the current velocity in the morning ranging from 0.1-0.23 m/s and in the afternoon ranging from 0.2-0.29 m/s. pH is in the range of 6.43 - 7.94, with details in the morning ranging from 6.43-7.94 and in the afternoon ranging from 6.67-7.92. Visual observations using underwater cameras showed that there were 11 species of resources with a total of 725 individuals. The proportion of resource attendance is seen from the division of morning and evening time of 643 (88.69%) and 82 (11.31%) respectively (Figure) below:

Gambar 1:
Resource prevalence (presence) graph



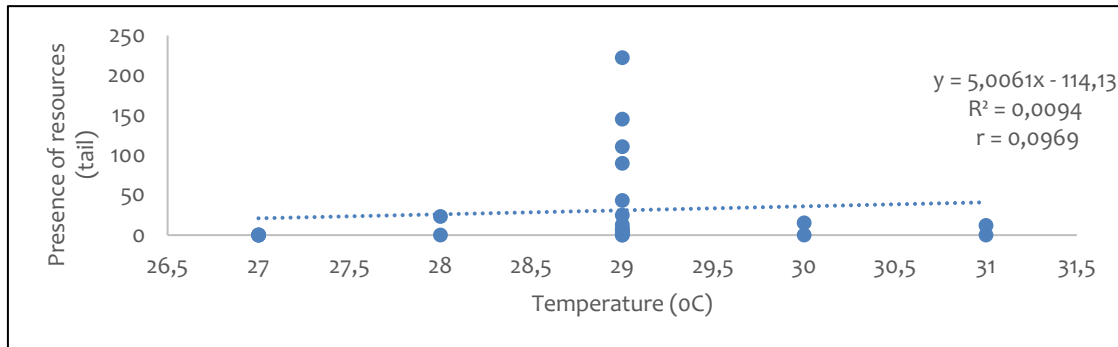
Source: research results

The results of the analysis of the relationship between oceanographic factors and the presence of marine resources are as follows; Temperature in the presence of marine resources resulted in a value of $y = 5.0061x - 114.13$, $R^2 = 0.0094$, $r = 0.0969$ and a very weak determinant coefficient value (influence on resources) of 0.94% (Figure 3). The relationship between current velocity and the presence of marine resources showed a value of $y = -381.08x + 95.31$, $R^2 = 0.1894$, $r = 0.4352$ and a weak determinant coefficient value of 18.94% (Figure 4). The relationship between brightness and the

presence of marine resources resulted in a value of $y = 34.983x - 103.76$, $R^2 = 0.6545$, $r = 0.8090$ and a determinant coefficient value (influence on resources) of 65.45% (Gambar 5). Hubungan pH dengan kehadiran sumberdaya laut menghasilkan nilai $y = 30,588x - 202,15$, $R^2 = 0,0721$, $r = 0,2685$ dan nilai koefisien determinan (pengaruh terhadap sumberdaya) 7,21%(Gambar 6). Hubungan salinitas dengan kehadiran sumberdaya laut menghasilkan nilai $y = 12,31x - 324,23$, $R^2 = 0,071$, $r = 0,2664$ dan nilai koefisien determinan (pengaruh terhadap sumberdaya) 7,10%.

Picture 2:

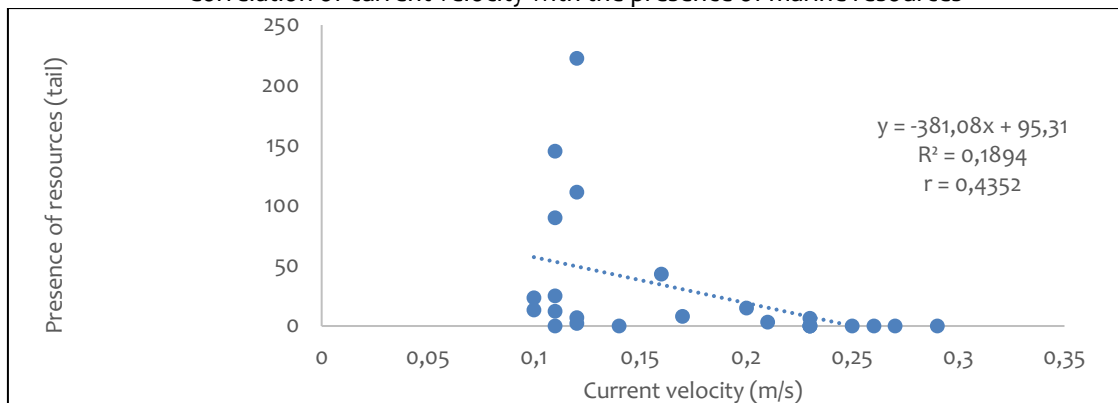
Correlation of temperature with the presence of marine resources



Source: research results

Picture 3:

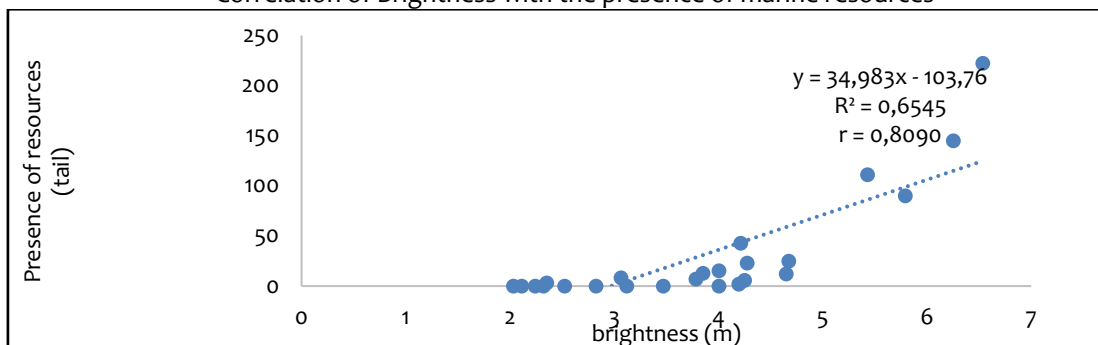
Correlation of current velocity with the presence of marine resources



Source: research results

Picture 4:

Correlation of Brightness with the presence of marine resources

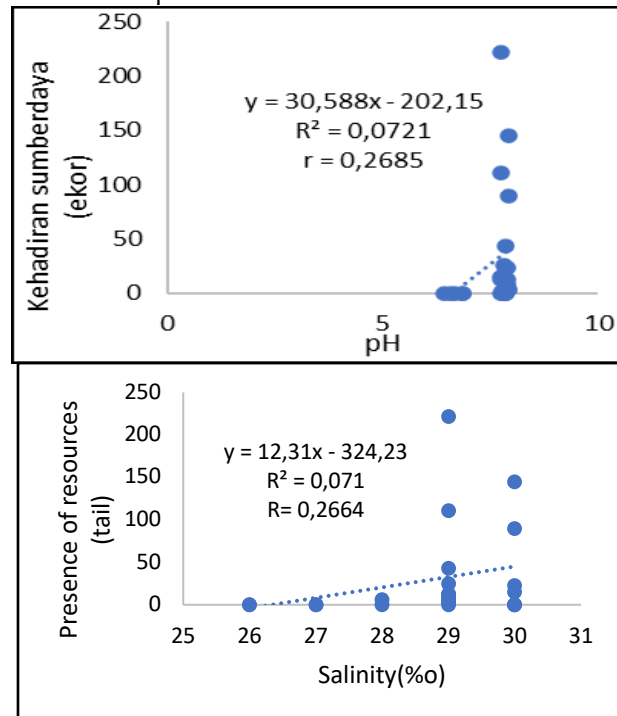


Source: research results



Picture 5:

Correlation of Brightness with the presence of marine resources & Correlation of salinity with the presence of marine resources



Temperature is one of the important factors for the life of resources in the ocean, as temperature affects both the metabolic activity and the reproduction of marine resources, (Dwi et al., 2011). The intensity of the temperature of the waters of takalar with an average value of 28.58oC in the morning and 29.08oC in the afternoon. The average temperature value of Takalar waters is higher in the afternoon than in the morning, indicating that the temperature is influenced by several external factors, namely based on the geographical location of the research area in a tropical climate area that gets very high intensity of sunlight. Seawater can absorb and store heat from sunlight during the day to evening.

Salinity is the total concentration of ions found in water. Salinity describes the total solids in the water, once all carbonates have been converted to oxides, all bromides and ions have been replaced by chlorides, and all organic matter has been oxidized. Salinity is expressed in units of g/kg or per mille (‰) (Khairunnas and Mulya 2018). Based on the results of measurements using refractometers in Takalar waters, an average value of 28.58 ‰ in the morning and 29 ‰ in the afternoon was obtained, with an interval value of 28-31 ‰. Factors that cause low salinity values of Takalar waters include rainfall at the time of the study affecting the low sea surface salinity of Takalar waters, indications of freshwater volume from the mouth of the Jeneberang river, sea currents that move seawater and freshwater from the river mouth moving from one point to another so that it is suspended into one in Takalar waters. The sea current factor in the fish apartment area can also increase salinity if in the afternoon the current is stronger and indicates that salt levels from other places can move to the fish apartment area.

Brightness is a measure of the transparency of the waters that can be visually observed with a secchi disk. With this parameter we can see the possibility of an assimilation process in water, waters that are classified as cloudy and not cloudy, and can be suspected of the number of suspended particles in these waters, (Hamuna et al., 2018). The brightness level of Takalar waters in the morning is at an average value of 4.39 m and 3.27 m in the afternoon, with interval values ranging from 2.03-

6.53 m. Turbidity is the main factor in the low brightness level in Takalar waters. The suspension of particles from the mouth of the Jeneberang river, marine debris particles on the coast, the alleged impact of post-sand mining, muddy water bottoms, and the activities of fishermen passing through the fish apartment area made the existing particles even more suspended.

According to Hadi and Radjawane (2009), Currents have an important role in determining the condition of a water. The flow speed in the fish apartment area in the morning with an average of 0.12 m/s tends to be slower than in the afternoon with an average value of 0.22 m/s. This is caused by several factors including the wind and the topography of the seabed of the waters of Takalar. The wind blew quite strong in the waters of Takalar in the afternoon at around 15.00-20.00 WITA. The topographic shape of takalar waters that is deep enough due to sand dredging that affects the current distribution pattern and current velocity that adjusts the topographic shape.

pH is the number of H⁺ ions contained in the aquatic system or commonly known as the acidity level of water. Based on the results of the pH measurement, the average value was 7.53 in the morning and evening 7.66. With an interval value of 6.43 - 7.94. The average pH value at the research site is fairly normal for the sustainability of marine resources with the influence of temperature levels that are at the quality standard, so this implies that it can supply enough dissolved oxygen for the resource. Likewise, if the temperature/dissolved oxygen experiences massive fluctuations, it will cause marine resources to not be at the point of the research location.

The results of observation of the presence of marine resources in the area of installing fish apartments in the waters of Takalar using underwater cameras, there are 11 species of resources and a total of 725 individuals. The proportion of resource attendance is seen from the division of morning and evening time of 643 heads (88.69%), and 82 heads (11.31%) respectively. The presence of more and varied resources was recorded around the fish apartment area in the morning than in the afternoon. This is suspected to be the speed of the current that tends to be weak so that the fish apartment is the right place to forage and shelter from predators. Marine resources present in the morning and evening in the fish apartment area are dominated by 321 fly fish in the morning and 38 in the afternoon. This is suspected because the abundance of zooplankton (4.47%) is one of the food sources for flying fish. The abundance of zooplankton is present along the coastline of Takalar waters with a type of rebon shrimp at the end of the rainy season at the end of March, making the flying fish in shallow waters (in the area of the fish apartment) which is suspected to be in search of an abundance of food sources.

The value of the temperature determinant coefficient is very weak and is the parameter that has the least relationship value compared to other parameters. This is suspected because the main factor of temperature is the intensity of sunlight, while during the study the sun is often covered by clouds due to the end of the rainy season. Temperature requires other parameters (salinity, pH, dissolved oxygen) to react normally according to quality standards so that it can affect the presence of marine resources in the fish apartment area in Takalar waters.

The coefficient value of a weak determinant indicates that the flow is not a determining factor of the presence of resources in the fish apartment area in Takalar waters. It is suspected that the current speed in the waters of Takalar can carry two elements, namely it can bring dissolved oxygen levels and salinity to the fish apartment area which is good for marine resources, but on the other hand, the current speed can also carry inorganic particles in the form of suspended mud or sand which can have a bad impact on marine resources. Brightness refers to the penetration of light in a body of water. This factor is closely related to the availability of light and water clarity in the Takalar aquatic fish apartment area. According to Daniel and Langgeng (2013), the higher the level of materials and sediments in the waters, the lower the penetration of incoming light so that the brightness level will be reduced. In addition, the influence of ocean currents that stir and disperse the content of dissolved materials and sediments plays a role in increasing brightness. According to Alfikri *et al.*, (2016) in waters that are still natural, brightness is very important because it has a role for photosynthetic activities. Brightness is an important factor for the process of photosynthesis and primary production in a body of water.

The coefficient value of the pH determinant is very low because pH fluctuations have a bad impact on the life of marine resources in the fish apartment area. Significant pH fluctuations are suspected to be caused by fluctuations in temperature and salinity parameters, which when the temperature and salinity values are low, they will produce low pH values as well, so that phytoplankton



as a determinant of the primary productivity level of the waters will be reduced, which is an indicator of marine resources will also be reduced.

The result of very low coefficient values is suspected to be because salinity can change temporally as well as spatially, changes occur all the time based on changes in water conditions, cloud cover, and distance from the sun. Salinity is related to the parameters of temperature and dissolved oxygen, which if the temperature increases, salinity will also increase and affect the lack of dissolved oxygen supply so that the presence of marine resources will also decrease in the Takalar aquatic fish apartment area.

CONCLUSION

Physical and chemical parameters (temperature, current velocity, brightness, pH, and salinity) in the morning and evening, have a correlation with the presence of aquatic resources in installing fish apartments. However, brightness is the parameter that has the strongest relationship with fish appearance. The marine resources present in the fish apartment area observed through underwater cameras amounted to 725 fish with 11 different species. The proportion of resource attendance is seen from the distribution of morning and evening time of 643 heads (88.69%), and 82 heads (11.31%) respectively.

REFERENCES

- Alfikri, M., Usman, & Pareng, R. (2016). Studi Parameter Fisika Dan Kimia Daerah Penangkapan Ikan Di Perairan Pulau Halang Kecamatan Kubu Babussalam Kabupaten Rokan Hilir Propinsi Riau (Studi Kasus Pada Penangkapan Ikan Dengan Bubu Tiang).
- Badan Pusat Statistik Provinsi Sulawesi Selatan. (2020). Badan Pusat Statistik Provinsi Sulawesi Selatan. <https://sulsel.bps.go.id/pressrelease/2020/02/05/569/ekonomi-sulawesi-selatan-2020-kontraksi-0-70-persen-.html>.
- COREMAP-CTI. (2012). Sepertiga Terumbu Karang Di Indonesia Rusak. Coral Reef Rehabilitation and Managment Program–Coral Triangle Initiative. Coremap. Jakarta.
- Daniel, D., & Santosa, L. W. (2013). Karakteristik oseanografis dan pengaruhnya terhadap distribusi dan tutupan terumbu karang di wilayah Gugusan Pulau Pari, Kabupaten Kep. Seribu, DKI Jakarta. Jurnal Bumi Indonesia.
- Dwi,A.R.A., Bangun, M.S., & Jaelani, M. (2011). Studi Perubahan Suhu Permukaan Laut Menggunakan Satelit Aqua Modis. GEOID Vol. 07, No. 01, Februari 2011 (073-078).
- Hadi, S & Radjawane, L. (2009). Arus Laut. Institut Teknologi Bandung. Bandung.
- Hamuna, B., Tanjung, R. H., & MAury, H. (2018). Kajian kualitas air laut dan indeks pencemaran berdasarkan parameter fisika-kimia di perairan Distrik Depapre, Jayapura.
- Khairunnas & Mulya Gusman. (2018). Analisis Pengaruh Parameter Konduktivitas, Resistivitas dan TDS Terhadap Salinitas Air Tanah Dangkal pada Kondisi Air Laut Pasang dan Air Laut Surut di Daerah Pesisir Pantai Kota Padang. Jurnal Bina Tambang, Vol.3, No.4.
- LIPI. (2011). Sepertiga terumbu karang di indonesia rusak. Liputan Media Terumbu-Karang-diIndonesia-Rusak.
- McLean, M., Roseman, E.F., Pritt, J.J., Kennedy, G., Bruce, A., & Manny, B.A. (2014). Review: Artificial reefs and reef restoration in the Laurentian Great Lakes. Journal of Great Lakes Reseach.
- Menteri Kelautan dan Perikanan Republik Indonesia. (2022). Keputusan Menteri Kelautan dan Perikanan Republik Indonesia nomor 19 tahun 2022 tentang estimasi potensi sumber daya ikan, jumlah tangkapan yang diperbolehkan, dan tingkat pemanfaatan sumber daya ikan di Wilayah Pengelolaan Perikanan Negara Republik Indon. Keputusan Menteri Kelautan Dan Perikanan Republik Indonesia, 3, 1–7.

