Global Scientific JOURNALS

GSJ: Volume 8, Issue 4, April 2020, Online: ISSN 2320-9186
www.globalscientificjournal.com

THE SUITABILITY OF THE LOCATION FOR FISH APARTMENT PLACEMENT AROUND THE NATIONAL PARK OF CONSERVATION IN WEST JAVA, PANGANDARAN

Andri Yanuari[1], Alexander M.A. Khan[2], Lantun Paradhita Dewanti[3], Izza Mahdiana Apriliani[4]

[1]Student at Faculty of Fisheries and Marine Science, Padjadjaran University, Bandung – Sumedang KM. 21 Jatinangor 45363, Indonesia E- mail address: andriyanuari2@gmail.com

[2]Lecturer at Faculty of Fisheries and Marine Science, Padjadjaran University, Bandung – Sumedang KM. 21 Jatinangor 45363, Indonesia

KeyWords
Coral reef, Fish Apartment, Mapping, The National Park of Conservation , The Suitability of The Location.

ABSTRACT

The condition of coral reefs in Pangandaran Beach, West Java is in bad condition and there is a decline in fish resources. Necessary to attempt to restore the condition of coral reefs in the waters of Pangandaran, one of which is the presence of a *fish apartment.*The placement or installation of a *fish apartment* must have several technical criteria that need to be considered in relation to the environmental conditions of the water. This research aims to determine the appropriate location for the placement of a *fish apartment*. This research was conducted in January 2018 to January 2019 in the vicinity of the National Park Nature Reserve, Pangandaran Regency. This research method is a survey method with data analysis using the analysis of suitability criteria in determining the location for the placement of *fish apartment*, then interpreted into a map of the suitability of the location using the *Arcmap* device. Primary data used are depth, salinity. Secondary data used are temperature data, substrate waters and currents. The results obtained are that the location around the National Park National Reserve has appropriate criteria for the placement of a *fish apartment*. In addition to the research location, Pangandaran Waters as far as 12 miles also have appropriate criteria for the placement of a *fish apartment*.

INTRODUCTION

One of the territorial waters in Indonesia that are classified as poor coral reef conditions is the Pangandaran Waters, West Java. According to Hartati and Rahman (2016), the condition of coral reefs in Pangandaran coastal waters, West Java is in bad condition and there is a decline in fish resources. The decrease in fish resources was not only due to the impact of the tsunami disaster that occurred in 2006 also due to the interaction between increasingly intensive fishing activities. Some other causes are the use of fishing gear that is not environmentally friendly, violation of the fishing lane and decreased water carrying capacity due to the degradation of important fisheries habitat. Ecologically, coral reef habitat is very important for the sustainability of fish resource reproduction because it functions as a spawning ground and feeding ground (Bambang, et al . 2011).

Efforts are needed to restore the condition of coral reefs, one of which is the placement of Fish Apartment. According to El-Maltien (2016), a new Fish Apartment was introduced by the Indonesian Center for Fishing Development (BBPPI) in 2011, expected to help restore damaged aquatic resources especially to restore fish habitat. the fish apartment Fish Apartment can act as a substitute for the function of coral reefs where it can be a spawning ground for adult fish, nursery and nursery grounds for fish eggs (Bambang, et al . 2016 *in* Fuad, et al. 2016). Placement or installation of Fish Apartment must have several technical criteria that need to be considered about the environmental conditions of the water (Bambang, et al. 2011). In the placement of a Fish Apartment there needs to be several aspects needed, such as oceanographic aspects, namely depth, temperature, salinity, accessibility aspects, namely the distance of the port to the research location and aspects of public perception, namely knowledge, community participation so that the placement of the Fish Apartment in accordance with the purpose and function of the placement of a Fish Apartment.

Based on this, it is necessary to study the suitability of the location for the placement of Fish Apartment around the National Park Nature Reserve, Pangandaran Regency, West Java to sustainably manage fisheries resources.

MATERIAL AND METHODS

The research was carried out in Pangandaran waters around Pangandaran National Park from January 7 to January 14, 2019. The research location (figure 1) around Pangandaran National Park, there are 10 stations precisely, which are located at:
Stasiun 1: 7°41’53,83” SL; 108°39’0,74” BT
Stasiun 2: 7°41’58,74” SL; 108°38’56,82” BT
Stasiun 3: 7°42’1” SL ; 108°39’1,87” BT
Stasiun 4: 7°41’3,88” SL ; 108°38’56,52” BT
Stasiun 5: 7°42’5,79” SL ; 108°39’2,58” BT
Stasiun 6: 7°42’8,72” SL ; 108°38’57,08” BT
Stasiun 7: 7°42’10,55” SL; 108°39’2,89” BT
Stasiun 8: 7°42’13,44” LS; 108°38’57,83” BT
Stasiun 9: 7°42’15,12” LS; 108°39’3,37” BT
Stasiun 10: 7°42’16,65” LS; 108°38’58,52” BT

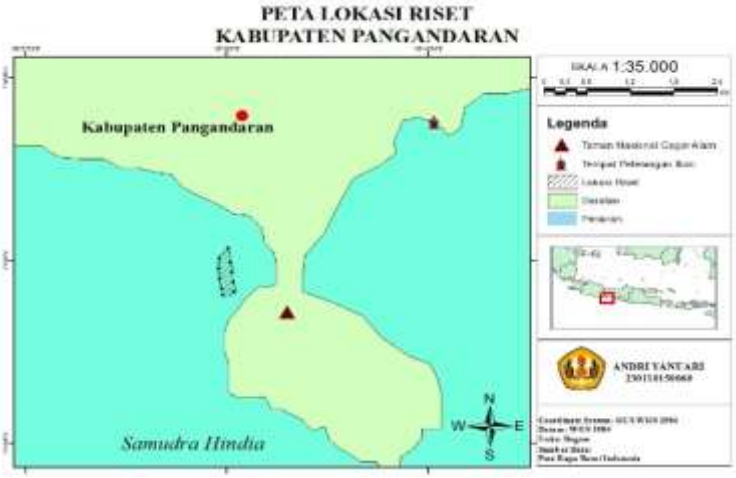

Figure 1. Research Location of Pangandaran Regency

The method used in this research is the method of direct observation in the field. The data used in this research are primary data, namely depth with measurements using echosounder and secondary data, namely temperature obtained from imagery Aqua-MODIS satellite. For temperature, current and salinity data, the depth of the GEBCO satellite imagery. Water substrate data obtained from literature studies.

The research procedure divided into 2 parts, namely the stage of data collection and data processing. Data collection phase was the stage of making a map of the study area using mapping software, taking data of the depth of the area measured directly using zigzag systematic sampling techniques using echosounder, salinity using refractometer and secondary data in the form of temperature through Aqua-MODIS imagery, flows and salinity through Marine Copernicus and depth data through GEBCO. While the data processing stage used some software (Microsoft Excel and ODV) which later overlaid into a map of suitability using the Arcmap.

After conducting all calculations on the observed parameters, the data are then analyzed using the criteria analysis used in determining the location for the placement of the fish apartment which refers to the technical guidelines for determining the location of the fish apartment (Wibowo et al. 2016), criteria for determining the location of a fish house (fish apartment) are presented as in table 1.

No	Parameter	Assessment Criteria (Value)			Bobot
		3	2	1	
A	**Oceanographic Aspects**				
1.	Depth (meters)	15-30	<15	>30	3
2.	Temperature (^{o}C)	28-30	25 - 27	<25 ; >30	3
3.	Salinity (mg/l)	30-35	25 - 29	<25 ; >35	3
4.	Current (m/s)	0,05-0,5	0,5-1	>1	3
5.	Watershed substrate	Sand	Muddy Sand	Mud	3
B.	**Accessibility Aspects**				
1.	Distance from Harbor (km)	<18	19-27	>28	4
2.	Distance from Cruise Lines (km)	>0,5	0,2 - 0,5	<0,2	1
C.	**Community Aspects**				
1.	Community Knowledge about Fish Apartement	>60	30-60	<30	3
2.	Commucity Participation	>20	10-20	<10	3

Table 1. Scoring Compliance Placement Location of Fish Apartement
*Source : Wibowo *et al.* (2016) *modified by* Fuad *et al*. (2016)

According to Wibowo et al. (2016) to determine the final value (score) of these parameters, weight multiplication is done with the rating scale (rating). Analysis by quantitative used to determine the suitability class of fish house location using the scoring method with the following approach:

$$Y = \sum_{i=1}^{n} ai.Xn$$

Information :
Y = Final score;
ai = Weight value;
Xn = Value of the criteria for determining the location of each parameter

Then, as the scores obtained final value, it can be determined whether the site can be used for the installation of a Fish Apartment as presented in Table 2.

Total Score	Conformity Level	Information
>53	In accordance (S1)	This area has the potential to install fish houses, because it can meet the minimum requirements for living marine organisms
27-53	Suitable with condi-otion (S2)	This area is quite useful for the installation of fish hous-es. However, this area has a limiting factor
<27	Not Suitable (S3)	Areas that fall into this category cannot be recommended for installation of fish houses

Tabel 2. Matrix Conformity Placement Location of Fish Apartment
* Source : Wibowo *et al.* (2016) *modified by* Fuad *et al.* (2016)

RESULTS

Water Depth

Depth is a very important factor in the placement of a fish apartment because if placed in shallow waters can be affected by tidal fluctuations so that it can damage and change the position of the fish house (Bambang et al. 2011). Based on the research results obtained in-depth data at the sampling location that is as presented in Figure 2.

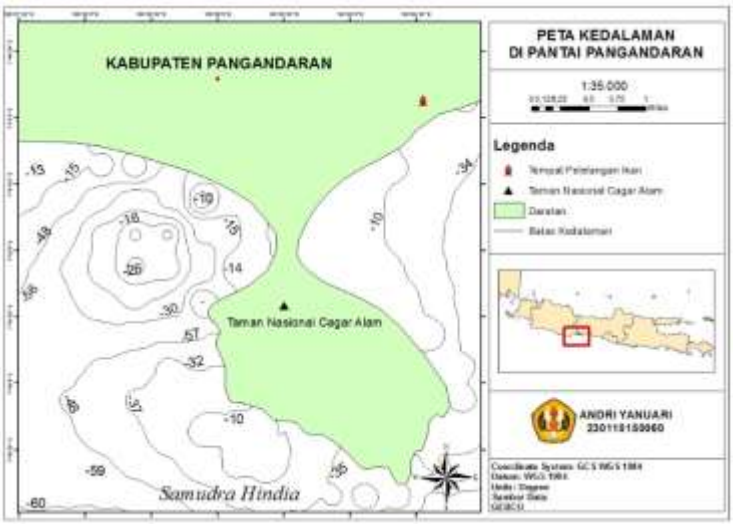

Figure 2. Depth of Pangandaran Waters

The depth of the waters at the sampling location ranges from 14-16 meters. The shallowest depth of 14 meters is at stations 5, 7, 9. While the deepest depth is at station 10 which is a depth of 16 meters. Based on the data obtained the depth of Pangandaran Waters shows different variations, but not significant for each station that is only around 2-3 meters, it is because according to Firmansyah (2012) states that the depth of bathymetry in Pangandaran Waters shows that getting closer to the coast then Bathymetry conditions are increasingly shallow and almost homogeneous, so that the bathymetry of the depth of the beach is lower than the bathymetry in the middle of the sea. Bathymetry conditions on the West Coast are relatively shallower compared to the East Coast. In addition, based on Aqua-MODIS satellite image data the results of the bathymetry mapping of the Pangandaran region show that the depth of the Pangandaran Waters has the deepest depth of 60 meters and the bathymetry results show that the beaches are generally shallower and deeper into the sea the depths of the waters are deeper.

Referring to the bathymetry results as presented in Figure 2 , the best depth or classified into the appropriate category that is at stations 1, 2, 3, 4, 6, 8 and 10. While for other stations included in the moderate category, which means it has a depth value of <15 meters. Fish Apartment in waters too deep will affect where the penetration of sunlight so that light can not penetrate into the waters optimal and organisms such as plankton for fish can not photosynthesize optimally. Therefore according to Bambang *et al.* (2011), a great depth of water for Fish Apartment is in the range between 10-30 meters. According to Fuad *et al*. (2016) home Fish Apartment in shallow waters will be affected by fluctuations in the tide. The existence of a *fish apartment* in shallow water will affect fishing vessels. Fish Apartment arising to the surface will interfere with the cruise line ship. The vessel will be increasingly difficult to move, besides the vessel can also be damaged by exposure to order home fish Fish Apartment. Vice versa, the framework of a Fish Apartment can be damaged if hit by a ship.

Temperature

Temperature values obtained in Pangandaran Waters based on Aqua-MODIS satellite image data from August 2018 to November 2019, with monthly average data that has been processed using ArcGIS 10.3 during the research, as presented in Figure 3.

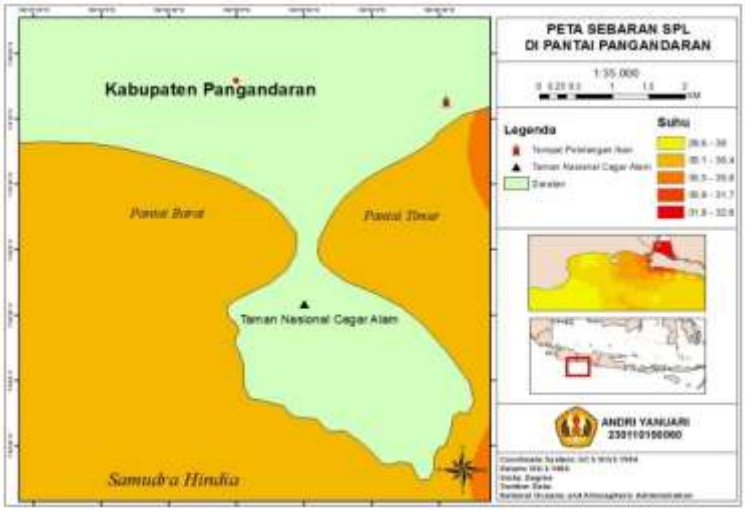

Figure 3. Sea Surface Temperature Distribution in Pangandaran Waters

Analysis of sea surface temperature (SPL) gets results that ranged from 29.6 to 32.8 ^{o}C. This is in accordance with research Akhbar et al. (2017) which states that the SPL value in the South Java Waters which has a different pattern in each season, namely in the west season, the transition season I (transitioning early in the year) sea surface temperature tends to be high, around 30 ^{o}C. The high sea surface temperature found in the west season - the transitional season I is caused by the position of the sun in this season moving closer to the equator region (the area that is on the equator) so that the solar radiation received by the South Java Waters will be greater than the east season - the transition season II. According to Akhbar et al. (2017) states that the high SST in the west season - the transition season I is estimated due to the movement of water mass from the waters of the Indian Ocean near the equator to the western waters of Sumatra, known as the Indian Ocean Equatorial Sacred Current (AHS).

Referring to sea surface temperature (Figure 12), shows that the research location belongs to the appropriate category for the placement of the fish apartment because it refers to the suitability table for the placement of the fish house (Table 1) the temperature suitable for the placement of the fish apartment which is around 29.7-30 ^{o}C. Based on the Ministry of Environment Decree No.51 of 2004, the standard quality of seawater for coral reefs is 24 ^{o}C-32 ^{o}C. The temperature shows that water will be maximal for the life of a coral reef so that it will increase the number of fish stocks in the waters. In addition, temperature is one of the important factors for the life of organisms in the ocean because the temperature will affect the metabolic activities and the proliferation of these organisms. Based on KEPMEN KP No. 53 of 2014 good temperature for the growth of reef fish is around 28.9 ^{o}C-31.5 ^{o}C and reef fish have a minimum limit for breeding fish that is at temperatures ranging from 16 ^{o}C-17 ^{o}C and the maximum limit is 36 ^{o}C. Temperature which is suitable for the placement of fish houses will help maximize the role of fish houses to increase the number of fish stocks.

Salinity

Salinity data obtained at the research location are presented in Figure 4.

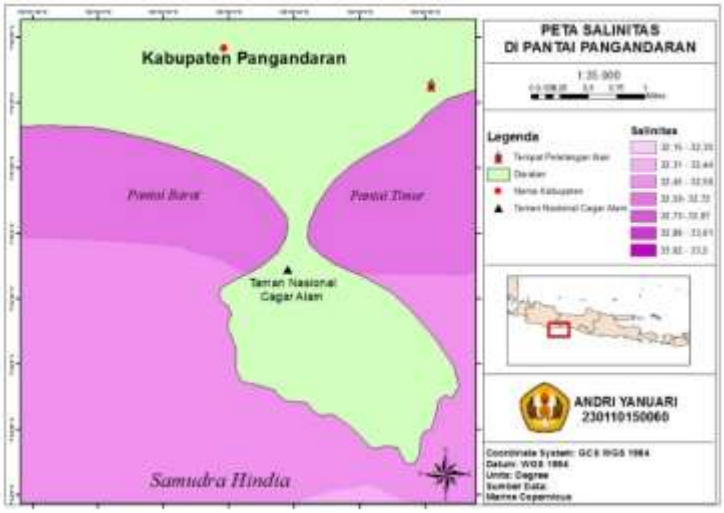

Figure 4. Distribution of Salinity in Pangandaran Waters

Salinity is also known to be a limiting factor for reef fish life. According to Romimohtarto and Thayib (1982) in Patty (2013) states that salinity levels in Indonesian waters generally range between 30-35 mg/L for coastal areas (coastal water and mixed water) salinity ranges from 32-34 mg/L for the open sea salinity generally ranges between 33-37 mg/L with an average of 35 mg/L. Based on the data obtained the average salinity value is around 30.1 mg/L, with the highest value of 33.01 mg/L at stations 1, 2, 3, 4, 5, 6, 7, while the lowest value is 32, 3 mg/L, ie at stations 8, 9 and 10. The difference in salinity value obtained is not significantly different due to differences in evaporation and precipitation. Patty (2013) states that differences in the salinity value of seawater can also be caused by the occurrence of disturbance (mixing) due to sea waves or the mass movement of water caused by the wind. The salinity value obtained at Pangandaran Waters at all research stations is included in the category according to the average salinity value of 30.1 mg/L. This is appropriate because it refers to the table suitability for the placement of the fish house (Table 1) that a body of water that has a salinity values ranging from 30-35 mg/L including into the appropriate category or ideal for Fish Apartment, on the outside the range of hermatypic corals cannot grow. According to Paty (2013) salinity is one of the important factors in the ecological conditions of water, salinity will affect the osmotic pressure in the body of the organism so that the organism will release energy to be able to adapt to its environment through osmoregulation mechanism.

Watershed Subtrate

Subtrat data obtained at the research location based on literature studies are as presented in (Table 3).

Research Locations	Parameter		
	Basic Elemental Sub-strate	Conformity Level	Weight
Pangandaran Waters (East Pananjung)	Berpasir	3	3

Table 3. Basic Subtrate at Research Location
*Source: Nurfajrin dan Rosada 2018

According to Kadi (2004) that coral substrate can be found on islands that have heavy currents and large waves and function indirectly to resist coastal erosion. Nurfajrin and Rosada (2018) stated that the Bulaksetra, Batukaras and Pangandaran areas were dominated by sand substrates. In addition, according to Firmansyah (2012) Pangandaran Beach in the Pananjung region precisely has sandy substrate characteristics. Thus, the substrate at the location in question is included in the category suitable for placement of fish houses because of the characteristics of the research area. According to Bambang *et al.* (2011), the type of substrate suitable for the placement of the Fish Apartment is a sandy substrate. Sandy substrate type is a good substrate type for placement Fish Apart-

ment because the type of sand substrate has a high stability and has a low turbidity level when compared with the mud substrate. Sandy substrate type has a high oxygen content because the pores are quite large. Sandy substrate has very low or no organic content. This is supported by the statement of Ersa *et al.* (2004) that sandy substrate does not contain much organic matter. Sandy substrate is not inhabited by macroscopic life, besides that most benthos on sandy beaches bury themselves in the substrate.

Location Suitability for Fish Apartment Placement

Data obtained on all aspects, namely on oceanographic aspects, accessibility aspects and aspects of the community that have been analyzed quantitatively to determine the suitability of the location of fish house locations using the s *coring* method . Score the final value to determine the appropriate location in the placement of fish houses (*fish apartment*). Data that has been processed using the *scoring* method is then interpreted into a map that is processed using ArcMap *software* . The results of *the overlay* shows a suitable location in the home penemapatan fish (*fish apartment*) . The data interpreted in the map aims to facilitate the process of reading the location that is suitable for the collection of fish houses (*fish apartment*) based on parameters that have been determined as in Figure 5.

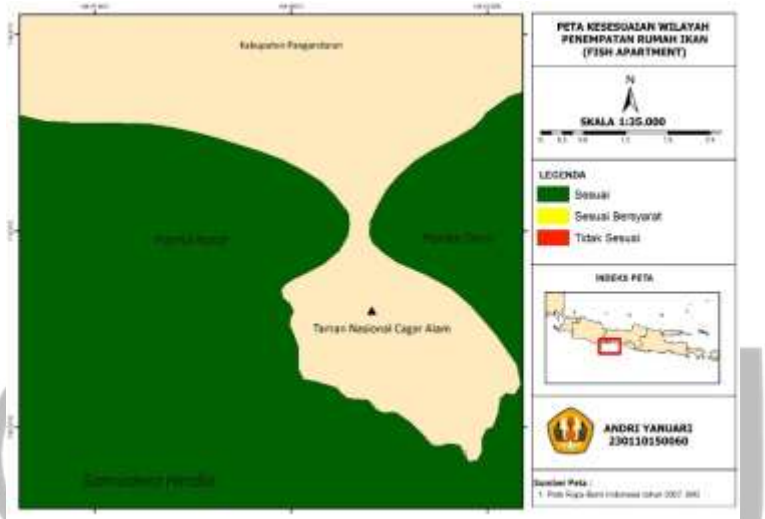

Figure 5. Location Suitability Map *for Fish Apartment* Placement in Research Location

Data obtained at the research location that has been interpreted on the map shows that all research locations are included in the ideal category or suitable for placement of *fish apartment locations* with a final score at each of the various research sites. In addition, it relates to the area of provincial authority regarding territorial waters. So it was also carried out, also carried out the suitability of the location for the placement of the fish apartment in the Pangandaran Waters as far as 12 miles by using satellite imagery data from each of its parameters to find out the appropriate or unsuitable location in Pangandaran Waters.

The results obtained based on satellite image data from each parameter shows Pangandaran Waters included in the category of locations suitable for placement of fish house fish apartment. However, based on the results of scoring, it is necessary to have some parameters that must be improved, such as parameters of depth. In Figure 2, the bathymetry of the depth of Pangandaran Waters shows that the depths of Pangandaran waters reach 60 meters depth. It is when referring to Table 1, it is included into the category that is not appropriate for fish apartment. However, because the methods used *scoring* that takes into account other parameters to determine the suitability of the location of the fish apartment, then the area of Pangandaran included into the category corresponding to the parameters of depth although not appropriate.

Fish apartment which will be placed in Pangandaran waters is the right solution in rehabilitating aquatic ecosystems, precisely replacing damaged coral reef function and increasing the amount of fish stocks in a waters. According to Fuad *et al.* (2017) that artificial coral reefs have almost the same function as coral reefs, because it can attract and collect fish and other marine life by providing shelter and additional food sources with a broad substrate. In addition, Salsabiela *et al* (2014) stated that to manage and rehabilitate aquatic ecosystems, it is necessary to place a *fish apartment* as an artificial coral reef so that it can increase marine biological resources and become a coastal protection structure. In addition, the *fish apartment* also succeeded in providing habitat for benthic organisms such as shrimp, oysters, crab and other benthic organisms.

CONCLUSIONS

The conclusions obtained are that the location around the National Park National Reserve has appropriate criteria for the placement of a fish apartment. In addition to the research location, Pangandaran Waters as far as 12 miles also have appropriate criteria for the placement of a fish fish apartment.

REFERENCES

[1] Akhbar, I. A., Jaya, Y.V., Febrianto, T. (2017). Kajian Suhu Permukaan Laut Berdasarkan Data Citra Satelit NOAA-AVHRR dan Data Argo Float di Perairan Selatan Jawa. *Skripsi*. Umiversitas Maritim Raja Ali Haji.

[2] Bambang, N., Suryadi, A. W. (2011). *Apartemen Ikan (Fish Apartment) Sebagai Pilar Pelestarian Sumberdaya Ikan.* Balai Besar Pengembangan Penangkapan Ikan, Direktoral Jendral Perikanan Tangkap.

[3] El-Matien, M. W. K. (2016). Rumah Ikan (*Fish Apartment*) sebagai Alternatif Mendukung Pengkayaan Sumberdaya Ikan. *Skripsi*. Institut Pertanian Bogor.

[4] Ersa, S.M. M. M., Suryanto A., Suryanti. (2004). Analisa Status Pencemaran dengan Indeks Saprobitas di Sungai Klampisan Kawasan Industri Candi, Semarang. *Diponegoro J Maquares Manag Aquat Resour*. 3 (4). 216-224.

[5] Firmansyah, S. (2012). Indeks Kerentanan Pantai Pangandaran Akibat Bencana tsunami. *Skripsi*. Departemen Ilmu dan Teknologi Kelautan. Institut Pertanian Bogor. Bogor.

[6] Fuad, M. A., Vitasari, E., Dewi, C. S., Sambah, A. B., Isdianto, A. (2016). Analisis Kesesuaian Lokasi Penempatan Rumah Ikan (Fish Apartment) Di Perairan Muncar, Banyuwangi. *Seminar Nasional Pengelolaan Perikanan Pelagis* (p. SP15). Malang: Marine Resources Exploration and Management (MEXMA) Research Group.

[7] Hartati, T., Rahman, A. (2016). Kesehatan Terumbu Karang dan Struktur Komunitas Ikan di Perairan Pantai Pangandaran. *Bawal*, 37-48.

[8] Muflihati. (2012). Prakiraan Dampak Pemindahan Lokasi Pelabuhan Perikanan Terhadap Aktivitas Nelayan dan Pedagang Ikan (Studi Kasus PPI Pangandaran Kabupaten Ciamis). *Skripsi*. Institut Pertanian Bogor

[9] Nurfajrin, A. K. dan Rosada, K. K. 2018. Keanekaragaman Hayati Makrozoobenthos di Kawasan Mangrove Bulaksetra dan Batukaras, Pangandaran, Jawa Barat. *Pros SemNas Masy Biodiv Indon*. 4(2): 248-253.

[10] Patty, S. I. (2013). Distribusi Suhu, Salinitas dan Oksigen Terlarut di Perairan Kema, Sulawesi Utara. *Jurnal Ilmiah Planax*. 1(3).

[11] Wibowo, T. W., Khasanah, N., Maksum, K. (2016). Penentuan Lokasi Rumah Ikan. *Petunjuk Perikanan Tangkap*. Balaii Besar Penangkapan Ikan. Semarang.