Community Structure Of Three-Layer Net Catches (Trammel Net) In Nipah Panjang Waters. East Tanjung Jabung Regency

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Abstract: Nipah Panjang District is one of the sub-districts in East Tanjung Jabung Regency. Most of the sub-district is on the seafront, so the main livelihood of the people is fishermen. Community structures can determine the diversity and composition of fish populations in waters. The more different members or types of fish are found, the higher the diversity in a community. This study aims to determine the Community Structure of three-layer net catches (*trammel nets*) in Nipah Panjang Waters, East Tanjung Jabung Regency. This research has been conducted from April 10 to May 7, 2025 using the survey method. The variables observed in this study are the composition of catches, diversity index, uniformity index, and dominance index. Data analysis is carried out through descriptive analysis to describe, summarize, and display the data that has been collected. The main catch was agogo shrimp (*Penaeus indicus*) with a weight of 2,466 kg (51.51%) and a total of 58,767 fish (64.88%). The bycatch consists of 13 other species, with the kurisi fish (*Nemipterus hexadon*) being the most. The value of the diversity index (H') is 1.4 (medium category), the uniformity index (E) is 0.53 (medium category), and the dominance index (C) is 0.43 (low category). The community structure of catches with *trammel net* fishing gear in the waters of Nipah Panjang, East Tanjung Jabung Regency is in a condition of moderate diversity and uniformity with low dominance, and is dominated by the main catch in the form of agogo shrimp.
Keywords: Nipah Panjang Waters, Community Structure, Trammel net

I,Introduction

East Tanjung Jabung Regency is a potential fishery production center, because it has a very strategic geographical area in the fisheries and trade sectors. This area is close to the Sijori area (Singapore, Johor, Riau) and the Sibajo area (Singapore, Batam, Johor). East Tanjung Jabung Regency has a relatively large fishing area, covering marine waters, swamps and tidal areas. With an area of 77,752 hectares, in 2022 the total fish production in the East Tanjung Jabung area will reach 26,541 tons. The main producers of the fisheries sector in East Tanjung Jabung Regency are Kuala Jambi, Mendahara, Nipah Panjang, Sadu and East Muara Sabak Districts (East Tanjung Jabung Regency Marine and Fisheries Service, 2022).

Nipah Panjang District is one of the sub-districts in East Tanjung Jabung Regency. Most of the sub-district is on the seafront, so the main livelihood of the people is fishermen. This is especially true for residents in Nipah Panjang 1 Village, where the sea is their main source of livelihood. Fishermen in this area use various kinds of fishing gear, including 67 units of drift gill nets, 80 units of trawls, 4 units of peci nets, 10 units of pocket nets, 6 units of sondong, 12 units of rawai, 2 units of splints and 10 units of three-layer nets (*trammell* nets).

Trammel net fishing gear in its classification is still included in the type of gill net. The use of trammel nets in the waters of Nipah Panjang is still relatively limited. This is due to several factors, such as limited capital, technical knowledge, and water conditions that are not all suitable for the fishing gear. A three-layer net (*trammel net*) is a fishing gear formed from 3 arrangements

of nets that are assembled lengthwise like gill nets in general. The inner net is flanked by two sheets of outer *net* with larger mesh eyes and functions as a frame. Fishermen with three-layer nets ((Hufiadi, 2008) *trammel nets*) in Nipah Panjang operate more of this fishing gear at the bottom of the waters with the main purpose of catching shrimp. According to Trammel, a net is a gill net that is operated on the bottom of the water. The main target of the catch is various types of demersal organisms, such as shrimp, demersal fish, crabs and crabs. The principle of its operation is to be washed away with the current. (Rihmi et al., 2017)

Community structure is a concept that studies the arrangement or species and abundance in a community. The structure of this community determines the diversity and composition of fish populations in these waters. A community is declared to have high diversity if it is composed of many members of different types. On the other hand, the community is stated to have low species diversity if it only consists of certain organisms that are abundant in number (Alfihandarin, 2012).

According to Latuconsina (2016), in a community that has a high diversity of species, it certainly does not rule out the possibility of interactions between species that can trigger the process of energy transfer or food networking, predation and competition. This has a positive impact on ecosystem stability because the equality of species is also high. On the other hand, those that have high dominance will have negative impacts such as ecosystem instability because a species will only transfer energy through the network of fellow species that dominates. These conditions are arranged in components that build the community structure.

Based on the description above, the author has conducted research on "The community structure of three-layer net catches (*trammel nets*) in the waters of Nipah Panjang, East Tanjung Jabung Regency.

II. Research Methods

This research was carried out in the waters of Nipah Panjang, East Tanjung Jabung Regency from April 10, 2025 to May 7, 2025.
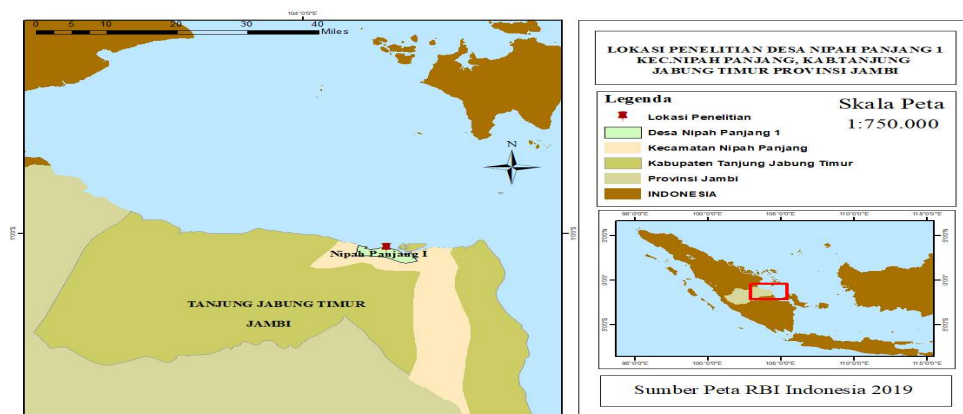

Figure 1. Map of the Research Location

Materials and Equipment

The material used in this study is fish caught using *Trammel Net*, and the equipment used includes *Trammel Net* fishing gear with an inch *inner net* size and an inch *outer net* used to catch a scale, a scale whose function is to weigh the weight of fish caught *by Trammel Net*, cameras to retrieve documentation during research, stationery and Ms. Excel to process research data.

Research Methods

The method used in this study is the survey method, where direct observation is carried out in the field by conducting interviews with fishermen and recording the catch obtained from trammel net fishing gear. The data obtained was obtained from 10 fishermen which was carried out 3 times, so that the total data obtained was 30 data.

Table. 1 Trammel net size

Deep net	Outer net	Number of fishermen
13/4 inch	5 inches	3
2 inches	5 inches	4
1.5 inches	5 inches	3

Working Procedure

The steps or also referred to as work procedures carried out in this study include the following:

1. Conducting surveys or observations directly to the research site

2. Asking for permission from fishermen to be able to collect data on their catches

3. Prepare all necessary equipment for data collection in the field. The main equipment that must be prepared includes questionnaires, notebooks, pens, scales, and cameras (in this case you can use a mobile phone)

4. Direct interviews with fishermen to collect more detailed data on the fishing process. This interview aims to obtain information about the types of fish that have been successfully caught. The collection of data on the catch of trammel nets was carried out when the fishing boat landed in the ward, which was around 16.00 WIB

5. Then separate or sort the species that are caught. Continue to record the composition of the catch, the weight of the fish and the number of fish.

6. After sorting and grouping the catches, the data obtained from the field is then tabulated in the form of a table. Tables are used to facilitate data recording, such as the number and type of fish caught.

Data Analysis

The variables observed to determine the structure of the community were by obtaining the value of the composition of the catch (K), the diversity index (H'), the uniformity index (E), and the dominance index (C).

1. Composition of the catch

The composition of the catch type (KJ) is the number of i-species per the total number of individuals caught. The composition of the catch according to , can be calculated with the formula: Hadi et al., (2022)

$$KJ = \times \frac{ni}{N} 100\%$$

Information:

KJ = Type Composition (%)

ni = Number of individuals of the i-i species

N = Total number of individuals of all species

2. Proportion of Catch

The calculation of the composition of the catch aims to determine the level of selectivity of the fishing gear used by looking at the HTU and HTS of trammel net fishing gear. The composition of the catch is calculated using the formulation of Akiyama (1997):

Main *Catch*

$$HTU\ (\%) = \frac{HTU}{Total\ hasil\ tangkapan} \times 100\%$$

Bycatch

$$\text{HTS (\%)} = \frac{HTS}{Total\ hasil\ tangkapan} \times 100\%$$

3. Diversity Index

Based on the diversity index, it is used to determine the diversity of species types. The equation used to calculate this index is the Shanon-Wiener equation as follows (Odum, 1993).

$$H' = \times \ln \sum \frac{ni}{N} \frac{ni}{N}$$

Information:

H' = Shanon–Wiener Diversity Index

ni = Number of Individual Fish

N = Total number of all fish

The category of the Diversity Index according to Brower and Zar (1990) in Coheny et al. 2018 can be seen in Table 2.

Table. 2 Diversity Index Criteria

Diversity Index Value	Category
H'< 1	Low
1 < H' ≤ 3	Keep
H'> 3	Tall

4. Uniformity Index

As an index of uniformity, it can be said to be the balance of each individual type of fish found in a community. The formula for the uniformity index according to Odum (1993) is as follows:

$$E = \frac{H'}{\ln S}$$

Information:

E = Index of uniformity of fish species

H' = Index of fish species diversity

S = Total types of fish caught

The category of aquatic biota uniformity index according to Krebs (1972) ranges from 0-1 with the following criteria:

Table. 3 Uniformity Index Criteria

Uniformity Index Value	Category
E < 0.4	Low
0.4 ≤ AND ≤ 0.6	Keep
E > 0.6	Tall

The difference in the value of E between 0 and 1, the smaller the value of E, the smaller the uniformity of a population, meaning that the distribution of the number of individuals of each genus is not the same and there is a tendency that a genus dominates the population.

5. Dominance Index

The dominance index is calculated using the formula "*Index of Dominance*" from Simpson (Odum, 1996):

$$C = \sum \left(\frac{ni}{n}\right)^2$$

Information:

C = Simpson Dominance

ni = Number of Fish Individuals

N = Total Number of Individual Fish

The criteria for the value of the dominance index according to Legendre (1983) in Coheny et al. 2018 can be seen in table 3.

Table. 4 Dominance Index Criteria

Dominance Index Value	Category
C0.5<	Low
C0.5>	Tall

III. Results and Discussion

3.1 Composition of Three-Layer Net Catch (*Trammel Net*)

Table. 5 Composition of Catch (*Trammel Net*)

Yes	Local name	Latin Names	Weight (kg)	Composition of Catch Weight (%)	Quantity (Tail)	Composition of Total Catch (%)
1.	Agogo shrimp***	*Penaeus indicus*	2,466	51,51%	58,767	64,88%
2.	Shrimp swallow**	*Penaeus merguiensis*	135	2,81%	6,645	7,34%
3.	Windu Shrimp**	*Penaeus monodon*	68	1,41%	2,668	2,95%
4.	Malong**	*Muraenesox typio*	232	4,85%	1,137	1,26%
5.	Thornfish**	*São Paulo São Paulo São Paulo*	157	3,28%	1,422	1,57%
6.	Fish Next Door**	*Pardachirus marmoratus*	112	2,34%	141	0,16%
7.	Kurisi Fish**	*Nemipterus hexadon*	477	9,96%	8,537	9,43%
8.	Puput Fish**	*Ilisha elongata*	93	1,94%	1,822	2,01%
9.	Crab**	*Brachyura*	208	4,34%	1,005	1,11%
10.	Tongue**	*São Paulo São Paulo*	164	3,43%	2,002	2,21%
11.	Pari**	*Dasyatis sp*	235	4,90%	1,485	1,64%
12.	Grouper**	*Epinephelus sexfasciatus*	77	1,60%	771	0,85%
13.	Baung**	*Hemibagrus nemurus*	186	3,88%	3,891	4,30%
14.	Selangat**	*Leiognathus brevirostris*	179	3,75%	285	0,31%
	Sum		4,786	100%	90,578	100%

Description: *** Main Catch (HTU)

      ** Bycatch (HTS)

There are 14 species of three-layer fishing gear (Trammel net) in Nipah Panjang, East Tanjung Jabung. In table 5 of the composition of the catch of three-layer net fishing gear, there are agogo shrimp as the main catch with a weight of 2,466 kg (51.51%), and 58,767 fish (64.88%). In addition, there were 13 bycatch of which kurisi fish was the most bycatch with a total of 474 kg (9.96%), and 8,537 fish (9.43%).

In addition to agogo shrimp and kurisi fish, there are other species, namely swallow shrimp 1345 kg (2.81%) and 6,645 (7.34%), Windu shrimp 68 kg (1.41%) and 2.668 fish (2.95%), malung 232 kg (4.85%) and 1,137 fish (1.26%), thorn fish 157 kg (3.28%) and 1,422 fish (1.57%), next door fish 112 kg (2.34%) and 141 fish (0.16%), Puput fish 93 kg (1.94%) and 1,822 fish (2.01%), crab 208 kg (4.34%) and 1,005 fish (1.11%), tongue 164 kg (3.43%) and 2,002 fish (2.21%), stingray 235 kg (4.90%) and

1,485 fish (1.64%), grouper fish 77 kg (1.60%) and 771 fish (0.85%), baung fish 186 kg (3.88%) and 3.891 fish (4.30%), selangat fish 179 kg (3.75%) and 285 fish (0.31%).

The high number of agogo shrimp catches (*Penaeus indicus*) in the waters of Nipah Panjang is caused by several ecological factors. Agogo shrimp is one of the species of penaeid shrimp that is known to have a high abundance in coastal waters with a muddy-sandy substrate. The condition of the waters of Nipah Panjang which is dominated by sandy muddy sediments and high organic matter content make this area a suitable habitat for the growth and development of penaeid shrimp. According to Purwiyanto et al. (2018), penaeid shrimp are demersal and more active at night so they are vulnerable to being caught by basic fishing gear such as trammel nets. Based on the results of a study conducted by , the effectiveness of trammel nets for fishing or shrimp is greatly influenced by the size of the nets ((Wudianto & Harifin, 1995) *Mesh size*) and the inner layer on the mesh (*Inner Net*) because it is related to selectivity. Meanwhile, according to fishing gear used by fishermen, there are differences in the size of the nets ((Hufiadi, 2008) *Mesh size*), precisely the inner layer net (*Inner Net*). This is also suspected to affect the composition of the catch obtained.

3.2 Proportion of Catch

3.2.1 Main Catch and Bycatch

Table. 6 Main and Side Catches

Yes	Species	HTU	HTS
1	Agogo Shrimp	2,466	-
2	Swalow Shrimp		135
3	Windu Shrimp		68
4	Squirt		232
5	thorn		157
6	Side		112
7	Kurisi		477
8	Squirt		93
9	Crab		208
10	Tongue		164
11	Pari		235
12	Grouper		77
13	Selangat		186
14	Squirt		179
	Quantity (kg)	2,466	2,320
	Percentage	51,51%	48,49%

The main catch (HTU) or maincatch is the catch that is the main target of catch. Meanwhile, bycatch is a catch caught in addition to the main catch and is not a target species for the fishing gear used (Fauzi et al., 2022)

In table 6. It can be explained that the catch in trammel net fishing gear obtained agogo shrimp is the only main catch with a total of 2,466 kg or 51.51%. This shows that agogo shrimp is the most abundant species compared to other species. According to Jaureguizar and Milessi (2008), the distribution of penaeid shrimp species is greatly influenced by the type of substrate, where muddy habitats provide abundant organic matter as a source of feed. This condition makes agogo shrimp more widely found.

The proportion of bycatch is also quite large, which is almost equivalent to the main catch, namely HTU 51.51% and HTS 48.49%. This condition is in line with the research of Purwiyanto et al. (2018) in the waters of Banyuasin, South Sumatra, which reported that trammel nets not only catch the target product (penaeid shrimp), but also produce a significant amount of by-catch.

Bycatch (HTS) which accounted for almost half of the total catch (48.49%) showed that the selectivity of the trammel net was still low. Trammel nets work with the principle of layered traps, so that not only target shrimp are caught, but also various demersal and benthik fish such as kurisi, baung, selangat, and crab. This is in accordance with the findings of Sardo et al. (2021), that the use of trammel nets in coastal waters generally results in by-catches ranging from 40–55% of the total catch

3.3 Diversity, Uniformity, Dominance of Catch

The Diversity Index (H') is a description of the structure of a community, in addition to that diversity and uniformity are highly dependent on the number of species in the community. The uniformity index (E) is the composition of each individual in a species found in a community, the more evenly distributed individuals between species, the more the balance of the ecosystem will increase. Dominance (C) is the ratio of the number of individuals in a type to the total number of individuals of the entire type (Mandolang et al., 2021)

Diversity (H'), Uniformity (E), and Dominance (C) Indices Catch that used trammel net fishing gear during the study obtained 14 species of fish. The Diversity Index (H'), Uniformity Index (E), and Dominance Index (C) can be seen in table 7.

Table. 7 Values of Diversity, Uniformity, Dominance

Index	Value	Category
H'	1,4	Keep
E	0,53	Keep
C	0,43	Low

Information:

H' = Diversity Index

E = Uniformity Index

C = Dominance Index

3.3.1 Diversity Index (H')

Based on table 7. It can be seen that the diversity index (H') in the waters of Nipah Panjang is in the medium category with a diversity index value of 1.4. This is in accordance with the diversity of $1 < H' \leq 3$ classified as moderate. This means that the diversity that exists in these waters is still in fairly good condition, with the number of individuals of various species fairly even, although there are some more dominant species. This result is in line with the research conducted by Nurfadillah et al., (2012) in the Tawar Sea lake found that the value of the fish diversity index ranged from 1.63-1.99, meaning that the value of the diversity index was included in the medium category. These results show that the distribution of the number of individuals of each type is moderate and the community stability is medium means that neither dominant species nor minority species are found in observations. The medium diversity index obtained means that the species is in stable conditions in its habitat (Wijayanti et al., 2018).

According to Iswanti et al., (2012), the value of the diversity index can be used as an estimate of aquatic environmental conditions. The diversity of an ecosystem is medium with a low dominance index value, meaning that the condition of the ecosystem tends to be stable. On the other hand, if diversity is low and dominance is high, then the ecosystem conditions are unstable and the fishing locations are less effective. It can be said that the water conditions in the area are still good as a breeding ground for fish species.

3.3.2 Uniformity Index (E)

The uniformity index is a value to determine the balance in an area or population. Based on the results of the study, it can be seen in table 7. That the uniformity index in the waters of Nipah Panjang is included in the medium category where the uniformity index value is 0.53. The uniformity index is indicating that the distribution of individuals between species within a community is

not very even, but it is also not dominated by one or more species. This result is not much different from the research conducted by Anggrita et al., (2021) in Rawa Pening Lake that the uniformity index value is 0.51, which means that the uniformity index value is in the medium category. This moderate uniformity index value indicates a sufficient but not optimal ecosystem balance. According to (Insafitri, 2010), the uniformity index is the composition of each individual in a species found in a community. The uniformity index is an estimate in determining dominance in an area. If one or several types are more abundant than the others, then the uniformity index will be low.

3.3.3 Dominance Index (C)

The dominance index is a value that can be used to see and determine the dominance of species in a community. The dominance index is a value that indicates whether or not a species is dominant in a community. Based on the results of the study, it can be seen in table 7. That the dominance index level in the waters of Nipah Panjang is 0.43 included in the low category. Research related to the value of the dominance index has been conducted by Santoso who found that the value of the dominance index ranges from 0.17-0.39, indicating a low level of dominance. Low dominance values can be interpreted as that there are no dominant species in the area. These results show that the value of the dominance index is always inversely proportional to the value of the diversity index (Nasir et al., 2017). According to Jumariah et al. (2015), the low dominance index value indicates that the distribution of species is fairly even and that no one species dominates the community excessively, which supports a healthy and sustainable ecosystem.

Conclusion

The community structure of catches with *trammel net* fishing gear in the waters of Nipah Panjang, East Tanjung Jabung Regency is in a condition of moderate diversity and uniformity with low dominance, and is dominated by the main catch in the form of agogo shrimp.

References

[1]. Afihandarin, D. 2012.Keanekaragaman Komunitas Plankton di Telaga Sarangan dan Telaga Wahyu Kabupaten Magetan Provinsi Jawa Timur. Skripsi. Program Studi Biologi Fakultas Sains Dan Teknologi. Universitas Airlangga, Surabaya.

[2]. Ananda, R. 2017. Kabupaten Tanjung Jabung Timur Dalam Angka 2017. Penerbit BPS Kabupaten Tanjung Jabung Timur. Muara Sabak.

[3]. Anggrita, F. P., Siti Rudiyanti, dan W. T. Taufani. 2021. Analisis kelimpahan dan keanekaragaman gastropoda sebagai indikator kualitas perairan di Rawa Pening. Skripsi. Fakultas Perikanan dan Ilmu Kelautan. Universitas Diponegoro. Semarang.

[4]. Ariyasmanto. 2017. Kecamatan Nipah Panjang Dalam Angka 2017. Penerbit BPS Kabupaten Tanjung Jabung Timur. Muara Sabak.

[5]. Akiyama, S. 1997. *Discarded Catch of Setnet Fisheries In Tateyama Bay. Journal of The Tokyo University Of Fisheries.*

[6]. Fauzi, A., Syahrir, M. R., & Nurfadillah. (2022). Perbandingan Hasil Tangkapan Utama Dan Sampingan Alat Tangkap Trawl pada Malam Hari di Perairan Samboja Kuala Kabupaten Kutai Kartanegara. *Tropical Aquatic Sciences*, *1*(2), 60–66.

[7]. Hadi, A., Putri, A. D., & Fitrahsaeri, L. (2022). Analisis Identifikasi Komposisi Hasil tangkapan Bubu Naga yang di oprasikan di perairan tambak cangkring kabupaten indramayu, jawa barat. Barakuda, 45(2), 281–289.

https://doi.org/10.47685/barakuda45.v4i2.316

[8]. Hufiadi. (2008). Proporsi Dan Komposisi Hasil Tangkapan Jaring Tika Lapis (Trammel Net) Di Pelabuhan Ratu. *BAWAL*, *2*(2), 69–74.

[9]. Hufiadi. (2008). Proporsi Dan Komposisi Hasil Tangkapan Jaring Tika Lapis (Trammel Net) Di Pelabuhan Ratu. *BAWAL*, *2*(2), 69–74.

[10]. Iswanti S., S. Ngabekti, dan N. K. T. Martuti. 2012. Distribusi dan keanekaragaman jenis makrozoobentos weleri Kabupaten Kendal. Unnes Journal of Life Science. 1 (2): 86-93.

[11]. Jaureguizar dan Milessi, 2008. Komposisi dan model kelimpahan udang di perairan sungai Ciliwung Jakarta. Jurnal Biodiversitas. 9 (4) : 296-300.

[12]. Mandolang, M., Kusen, J. D., Warouw, V., Kaligis, E. Y., Paulus, J. H., & Rembet, U. N. W. J. (2021). Struktur Komunitas Ikan Trget di Ekosistem Terumbu Karang pada Zona Tradisional pulau Bunaken, Taman Nasional Bunaken. *Jurnal Pesisir Dan Laut Tropis*, *9*(3), 104–110.

[13]. Nasir, M., Zuhal, M., & Ulfah, M. (2017). Struktur komunitas ikan karang di perairan Pulau Batee Kecamatan Peukan Bada Kabupaten Aceh Besar. Bioleuser, 1(2), 76–85.

[14]. Nurfadillah, Ario Damar, Enan M.Adiwilaga. 2012. Komunitas fitoplankton di perairan Danau Laut Tawar Kabupaten Aceh Tengah, Provinsi Aceh .FPIK Institut Pertanian Bogor. Bogor.

[15]. Odum, E. P. (1993b). Dasar-Dasar Ekologi. Penerjemahan: Samingan, T dan B. Srigandono. Gajahmada University Press, Yogyakarta. Pribadi, R., R. Hartati, Dan CA Suryono, 20010, 102–111.

[16]. Purwiyanto, A.I.S., Fahrudin, A., Boer, M., & Kamal, M.M. (2018). Catch compos and sustainability status of trammel net fisheries in Banyuasin waters, South S AACL Bioflux, 11(5): 1515-1524.

[17]. Rihmi, M. K., Puspito, G., & Wahyu, I. R. (2017). Modifikasi Kontruksi Trammel Net upaya untuk meningkatkan hasil tangkapan. *Jurnal Teknologi Perikanan Dan Kelautan*, *8*(2), 169–178.

[18]. Sardo, G., Grati, F., & Polidori, P. (2021). Reducing bycatch in Mediterranean trammel nets using guarding nets. Frontiers in Marine Science, 8: 1011630.

[19]. Wudianto, & Harifin, H. (1995). Pengaruh Ukuran Benang Dan Lebar Mata Jaring Tangkapan ikan Dermersal. *Balai Penelitian Perikanan Laut*, 35–43.