STATUS OF TORPEDO SCAD (MEGALASPIS CORDYLA) FISHERIES IN THE PALABUHANRATU BAY

Status Perikanan Tetengkek (*Megalaspis Cordyla*) Di Teluk Palabuhanratu

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ABSTRACT

Data and information explain that the catch of small pelagic species including Tetengkek in the waters of the Indian Ocean has decreased (Sadhotomo & Atmaja, 2012), the total catch of Tetengkek in 2023 is 1,126 tons, down 60% compared to the total catch in 2019 (BPS, 2024). This information is an early indication that small pelagic fishery resources are getting closer to over-fishing and in the future will become a problem for the livelihoods of fishermen, including fishermen in Palabuhanratu Bay. This study aims to determine the status of Torpedo Scad fish (Megalaspis cordyla) in Palabuhanratu Bay based on catches landed at the Palabuhanratu Nusantara Fisheries Port and to recommend the management of Torpedo Scad fish resources with an ecosystem approach. The ecosystem approach is based on two of the six domains of the Ecosystem Approach to Fisheries Management (EAFM), namely the domains of fish resources, and fishing technology. A multi-criteria analysis was performed on the composite index for each of EAFM indicators. Furthermore, measures and recommendations for resource management are formulated based on the objectives of the EAFM. The results of the study show that the status of Scad torpedo fish management in Palabuhanratu Bay is generally "Good", where in the Fish Resources domain the status is "Good" (70.33), and in the Fishing Technology domain is 'Very Good' (83.33). Recommendations for the management of Tetengkek fisheries in Palabuhanratu Bay are: 1) the use of information technology to ensure fishing ground; and 2) certification of fishing vessel crews.

Keywords: Megalaspis cordyla, Nusantara Fishing Port, Torpedo Scad fish

ABSTRAK

Data dan informasi menjelaskan bahwa hasil tangkapan jenis pelagis kecil termasuk Tetengkek di perairan Samudra Hindia mengalami penurunan (Sadhotomo & Atmaja, 2012), total tangkapan Tetengkek tahun 2023 sebesar 1.126 ton, turun 60% dibandingkan total tangkapan pada tahun 2019 (BPS, 2024). Informasi ini merupakan indikasi awal bahwa sumber daya perikanan pelagis kecil semakin mendekati lebih tangkap (*over-fishing*) dan kedepannya akan menjadi masalah bagi mata pencaharian nelayan, termasuk nelayan di Teluk Palabuhanratu. Penelitian ini bertujuan untuk mengetahui status perikanan Tetengkek (*Megalaspis cordyla*) di

Teluk Palabuhanratu berdasarkan hasil tangkapan yang didaratkan di Pelabuhan Perikanan Nusantara (PPN) Palabuhanratu dan untuk merekomendasikan pengelolaan sumber daya ikan Tetengkek dengan pendekatan ekosistem. Pendekatan ekosistem dilakukan berdasarkan dua dari enam domain *Ecosystem Approach to Fisheries Management* (EAFM), yaitu domain sumber daya ikan, dan teknologi penangkapan. Analisis multi-kriteria dilakukan pada indeks komposit untuk setiap indikator EAFM. Selanjutnya, langkah-langkah dan rekomendasi bagi pengelolaan sumber daya dirumuskan berdasarkan tujuan EAFM tersebut. Hasil penelitian menunjukkan bahwa status pengelolaan ikan Tetengkek di Teluk Palabuhanratu secara umum "Baik", dimana pada domain Sumber Daya Ikan statusnya "Baik" (70,33), dan pada domain Teknologi Penangkapan Ikan 'Sangat Baik' (83,33). Rekomendasi untuk pengelolaan perikanan Tetengkek di Teluk Palabuhanratu adalah: 1) penggunaan teknologi informasi untuk pemastian daerah penangkapan ikan; dan 2) sertifikasi awak kapal penangkap ikan.

Kata Kunci: ikan Tetengkek, *Megalaspis cordyla*, Pelabuhan Perikanan Nusantara

INTRODUCTION

Tetengkek (*Megalaspis cordyla*) is a group of small pelagic fish, its habitat is in coastal areas in the Indo-Pacific region, generally caught in sea and offshore waters at a depth of 20-100 m (Al-Sakaff & Esseen, 1999). Tetengkek is abundant in tropical and subtropical waters and is distributed from East Africa, Japan, to Australia (Das *et al*., 2014), in the Indian Ocean, from Japan to Australia (Froese & Pauly, 2021). Buttercups are also found in the Persian Gulf (Hakimelahi *et al*., 2018), Pakistan (Asif *et al*., 2019), Tanzania (Sekadende *et al*., 2020), Madagascar (Kielpinski *et al*., 2014), Australia (Griffiths *et al*., 2017), the Philippines (Gomez *et al*., 2020), Vietnam (Kielpinski *et al*., 2014), Myanmar (Aye & Tint 2020), Malaysia (Amin *et al*., 2014) and Indonesia. In Indonesian waters, Tetengkek is spread almost throughout the waters (Oktaviani *et al*., 2014; Arrafi *et al*., 2016; Faizah *et al*., 2017; Panggabean *et al*., 2023; Panggabean *et al*., 2023; Panggabean *et al*., 2024).

Palabuhanratu Bay is part of Sukabumi Regency, West Java Province. In 2023, the production of captured fisheries landed at the Palabuhanratu Archipelago Fisheries Port (PPN) reached 20,814 tons (BPS, 2024). The catches were mainly mackerel, anchovies, shrimp, bivalves and squid. Tetengkek is one of the catches caught using purse seine and gillnet with fishing vessels <30 GT (Kurnia *et al*., 2021; Panggabean & Nazzla, 2020; Panggabean & Nazzla, 2022).

The catch of small pelagic in the Indian Ocean shows a decline (Sadhotomo & Atmaja, 2012), including Tetengkek. The total catch of Tetengkek in 2023 was 1126 tons, down 60% compared to the total catch in 2019 (BPS, 2024). This decline can be an indicator that small pelagic fishery resources including Tetengkek are approaching overfishing and can cause problems for the livelihoods of local fishermen. In addition to stock availability, assessment of reproductive biology aspects such as gonad maturation index and sex ratio can also be used as indicators of the spawning period and recommend a ban on fishing during the spawning period. This study aims to determine the management status of Tetengkek (*Megalaspis cordyla*) in Palabuhanratu Bay which is landed at the Palabuhanratu Archipelago Fisheries Port (PPN) and to recommend the management of Tetengkek resources with an ecosystem approach. The ecosystem approach is carried out based on two of the six Ecosystem Approach to Fisheries Management (EAFM) domains, where the management status is carried out with multi-criteria analysis through the development of a composite index for each EAFM indicator.

RESEARCH METHODS

This study was conducted in March 2023 at the largest fishing port in Sukabumi Regency, namely PPN Palabuhanratu. A total of 150 samples were collected and measured to determine the total length (TL) and total weight (W) of Tetengkek.

The data collected included primary data and secondary data, primary data was collected in-situ in the field through observation, discussion, FGD, and interviews with 66 respondents, while secondary data was obtained from PPN Palabuhanratu, the Sukabumi Regency Fisheries Service, and literature from various sources. Primary data was collected through field surveys, interviews, and questionnaires to 66 respondents. Secondary data was obtained from literature studies. The distribution of respondents according to the main fishing gear is purse seine fishing gear with a fleet of <30 GT. Interviews with stakeholders were also conducted, namely PSDKP Sukabumi Regency, PPN Palabuhanratu, and the Sukabumi Regency Fisheries Service. The data collected is as presented in Table 1.

Table 1. Data Requirements and Data Collection Methods in 2 EAFM Domains

Domain	Data Requirements	Method of collecting data
Fish Resources	Primary data: total length of tengkek (cm), catch trend, fish size trend, fishing area, and ETP species Secondary data: Total tengkek catch (tons), number of fishing trips (trips), number of fishing gear (units)	- Survey: sampling and measurement of sample fish, fishermen interviews - Observation of fishery activities - Tracing of capture fisheries statistics in Sukabumi Regency
Fishing Techniques	Primary data: <30 GT purse seine fishing gear, types and locations of destructive fishing, types of fishing gear modifications, ship documents, types of ships, types of training Secondary data: Number and type of selective fishing gear, number of trips, number of fleets, number of fishing gear	- Survey: fisherman interview - Observation: field observation - Tracking of the capture fisheries statistical report of the Palabuhanratu Nusantara Fishing Port and the Sukabumi Regency Fisheries Office.

Analysis of fisheries management status using indicators in each EAFM domain (KKP, 2014). Analysis of fisheries EAFM prevalence using a composite index. The analysis stage refers to Ninef *et al*. (2019):
1. Scoring each indicator in the ordinal-based Likert scale 1,2,3.
2. Composite index: $CA_i = f (CA_{ni}....n=1,2,3.....m)$.
3. Composite index of the whole population: $C\text{-}EAFM = f (Ca_i.. i = 1,2,3..j; j = 6)$.

The results of the assessment of each domain are presented in the form of a flag model (KKP, 2014). The value criteria used in the composite assessment matrix and fisheries management status are presented in Table 2.

Table 2. EAFM Dominant and Aggregate Value Limits

Value range			
Low	High	Flag model	Status
1,00	20,99		Poor in implementing EAFM
21,00	40,99		Lack of implementation of EAFM
41,00	60,99		In the process of implementing EAFM
61,00	80,99		Good in implementing EAFM
81,00	100,00		Very good in implementing EAFM

RESULT

Fish Resources Domain
In this study, the results of the analysis and assessment of the six main indicators are presented in Table 3.

Table 3. Assessment of the Fish Resources Domain

Indicators	Assessment Results	Skor	Weight	Values Indeks
CPUE	CPUE increases	3	40	12500
Fish size	Torpedo scad fish increased by 1.89%	3	15	3500
Juvenile proportions	Juvenil Torpedo scad fish 36.8%	3	15	2500
Species Composition	Gillnet and Purse Seine yields 63.2% of fish target	3	15	1550
Range Collapse	70% of fishermen say it is increasingly difficult to find fishing grounds	1	10	500
ETP species	Turtles, Sharks, and Rays are caught in small numbers	2	5	550
	Total		100	21100
	Domain maximum value			30000
	Total composite values			70,33

The CPUE indicator shows an increase in pelagic catches including Tetengkek fish (Figure 1).

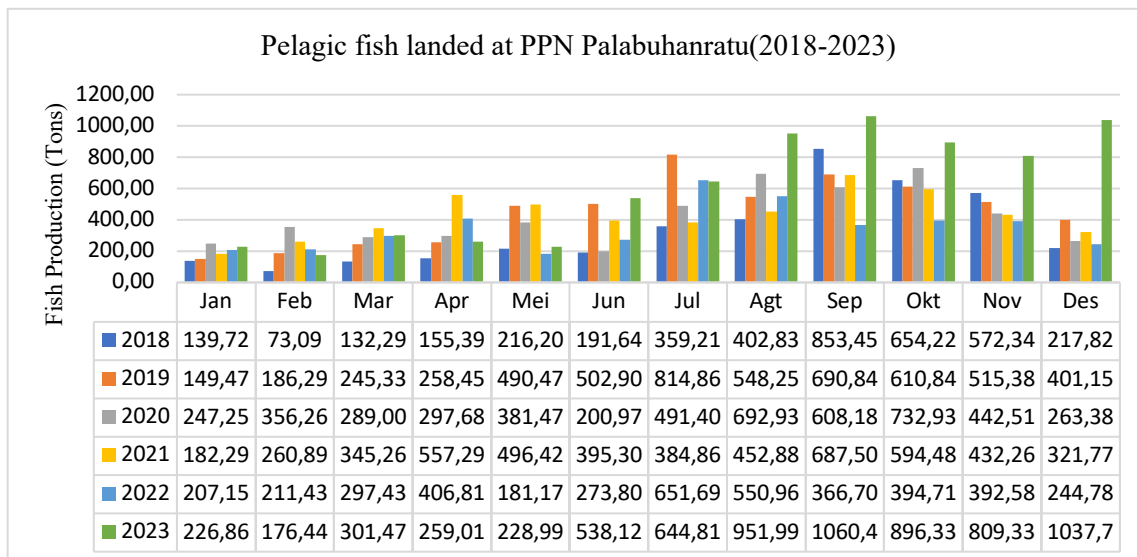Figure 1. Pelagic Production Landed at PPN Palabuhanratu

	Jan	Feb	Mar	Apr	Mei	Jun	Jul	Agt	Sep	Okt	Nov	Des
2018	139,72	73,09	132,29	155,39	216,20	191,64	359,21	402,83	853,45	654,22	572,34	217,82
2019	149,47	186,29	245,33	258,45	490,47	502,90	814,86	548,25	690,84	610,84	515,38	401,15
2020	247,25	356,26	289,00	297,68	381,47	200,97	491,40	692,93	608,18	732,93	442,51	263,38
2021	182,29	260,89	345,26	557,29	496,42	395,30	384,86	452,88	687,50	594,48	432,26	321,77
2022	207,15	211,43	297,43	406,81	181,17	273,80	651,69	550,96	366,70	394,71	392,58	244,78
2023	226,86	176,44	301,47	259,01	228,99	538,12	644,81	951,99	1060,4	896,33	809,33	1037,7

The results of the analysis and calculations of the Maximum Sustainable Yield (MSY) value and the number of fish that can be caught (TAC) are presented in Figures 2 and 3.
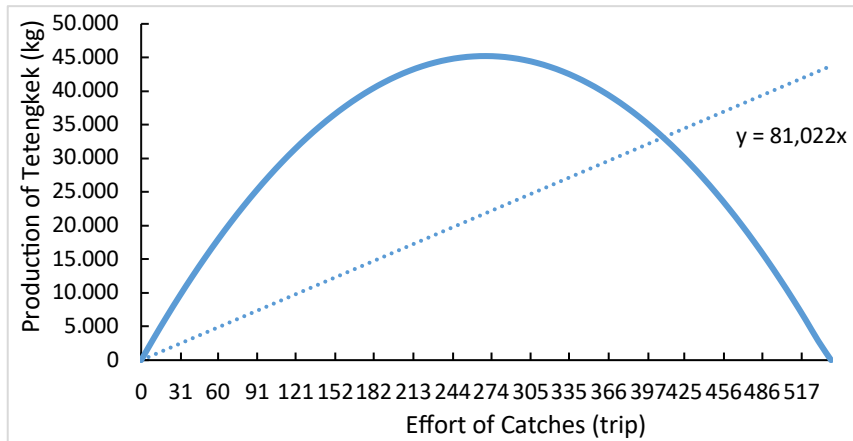
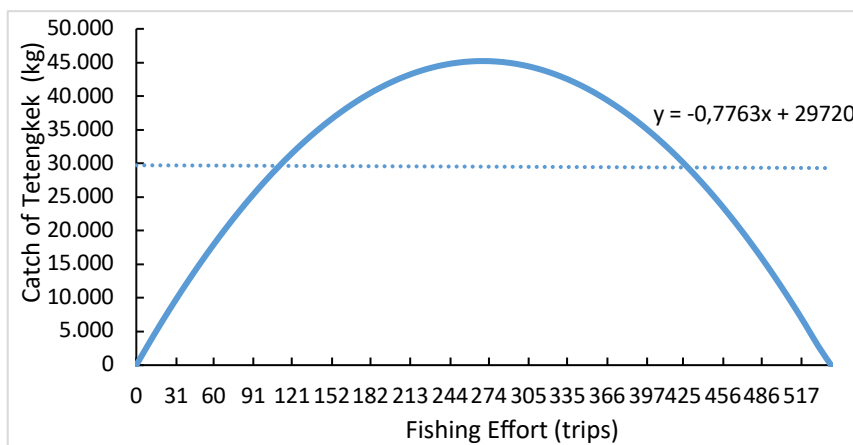Figure 2. Maximum Sustainable Yield (MSY) of Tetengkek Fish

Figure 3. Total Allowed Catches (TAC) of Tetengkek

The graphs in Figure 2 (MSY) and Figure 3 (TAC) explain the existing conditions of the utilization of Tetengkek fish resources in the waters of Palabuharatu Bay, and from the graph it is known that the MSY value is 45.2 tons (or 45,212 kg). The biomass of Tetengkek fish resources at MSY conditions of 45.2 tons is an ideal biological condition in utilizing resources by maximizing the amount of catch to the limit of the amount that can be utilized or captured (TAC) which is 36.2 tons (or 36,170 kg), so that the availability of fish resources in the waters of Palabuhanratu Bay remains sustainable. It should be noted that the MSY and TAC values are supported by optimum efforts in utilization (effort) of 269 trips.

Fishing Techniques Domain
The results of the analysis and assessment of the five main indicators are presented in Table 4.

Table 4. Assessment of the Fishing Technology Domain

Indicator	Assessment Results	Score	Weight	Index Value
Destructive and illegal fishing methods	There is no fishing activity using bombs and potassium	3	30	9000
Modification of fishing gear and fishing aids	There is no significant modification of fishing gear, but there are still small Tetengkek fish catches (immature)	2	25	5500

Fishing capacity	The fishing capacity ratio is > 1, this is reflected in the fishing capacity in 2018 which is greater than in 2023, so that RK > 1	3	15	4500
Level of fishing selectivity	Purse seine and gillnet fishing gear are environmentally friendly fishing gear, but produce more than 3 types of species caught	2	15	3000
Suitability of vessel function and size with legal documents	The entire fishing fleet (purse seine and gillnet) have complete legal documents	3	10	2500
Fishing vessel crew certificates in accordance with regulations	Almost all fishermen who were respondents did not have a fishing vessel crew competency certificate	1	5	500
	Total		100	25000
	Domain maximum value			30000
	Total composite values			83,33

Based on the analysis of the two domains, the status of the Tetengkek fish resource domain is presented in Table 5.

Table 5. EAFM Assessment of Tetengkek Fish

No	Domain	Total composite values	Status
1	Fish resources	70,33	Good
2	Fishing technology	83,33	Very Good

DISCUSSION

Fish Resources Domain

The assessment of the Fish Resources domain was carried out on six indicators, namely: (1) CPUE; (2) Fish size; (3) Yuan proportion; (4) Species composition; (5) Range Collapse; and (6) ETP species (see Table 3). The results of the CPUE indicator assessment show that there has been an increase in pelagic catches including Tetengkek (see Figure 1). The increase occurred from 2018 to 2023. This is clearly illustrated by the total number of catches landed at PPN Palabuhanratu.

Based on Figure 1, the total pelagic catch in the 2019-2023 period shows an increasing trend. The overall composition of the purse seine catch obtained target fish of 86% which was dominated by Skipjack Tuna (594,076 kg), followed by Yellowfin Tuna (204,616 kg), Layang (395,864 kg), Tetengkek (64,374 kg) and 1% non-target fish consisting of thresher sharks and goatfish. Similar conditions occurred in a study conducted by Anwar et al. (2017), which stated that Skipjack tuna dominated compared to other fish landed at PPN Palabuhanratu, followed by Layang, Tetengkek, and Sunglir fish. Differences in the number of catches can be caused by differences in fishing seasons, but can also be caused by different fishing grounds for each fishing vessel (Devina & Panggabean, 2024; Nazzla *et al*., 2024; Panggabean *et al*., 2023a; Panggabean *et al*., 2024).

Furthermore, based on fisheries statistics data from 2019 to 2023 from UPTD PPN Palabuhanratu (2024), Tetengkek production fluctuated but tended to increase, fishing efforts also continued to increase in 2022 to 2023, and decreased slightly in 2020. Based on CPUE analysis, Tetengkek's CPUE value increased from 2019 to 2023, decreased slightly in 2020-2021 but increased again in 2022-2023. Tetengkek's CPUE continued to increase from 2022 to 2023. The Maximum Sustainable Yield (MSY) value of Tetengkek was 45,212 kg, where

Optimal Effort was 269 trips, and Total Allowed Catches (TAC) was 36,170 kg (see Figures 2 and 3).

Overall, the CPUE trend of Tetengkek tends to increase by 13.4% per year (Figure 1). The increase in CPUE is suspected to be due to the impact of Covid-19 starting to end in 2022. The decrease in CPUE is actually seen in other types of pelagic fish, namely the type of tuna which is suspected to be due to increasingly limited stocks due to pressure, namely continuous fishing by fishermen. This can also be used as an indicator that there has been degradation of fish resources. Suryaman, (2017) explains that when fish resources are abundant and fishing efforts also increase, the catch per trip will be high, conversely when fish resources experience degradation, even though fishing efforts are increased, it can actually reduce the catch per trip.

The average trend of changes in fish size was obtained from the results of the assessment of fish size indicators, from the first observation (March) and the last observation (June), where it was seen that the size of fish landed at PPN Palabuhanratu experienced a significant increase, namely +80.18% from its initial length. This is thought to be because the observation time was the fishing season period. The results of the observation showed that there was an increase in the size of the Tetengkek fish by 1.89%, this can explain that the size of the fish is still in the good category (score 3).

In the assessment of the juvenile fish proportion indicator, an average of 36.8% of the catch landed at PPN Palabuhanratu was juvenile fish (immature gonads). This can be interpreted that 36.8% of the catch is fish that should not be suitable for catching, but in general the catch of fishermen in the waters of Palabuhanratu Bay is dominated by fish that have mature gonads, which is 63.2% of the total catch. This can be used as an indicator that there are more adult fish than juvenile fish (score 3). In the assessment of the species composition indicator, an average of 86% of the catch landed at PPN Palabuhanratu is target fish, non-target fish only 1%. This can be interpreted that the fishing gear used in Palabuhanratu Bay is appropriate and effective (score 3). This is in line with what was explained by Kurnia *et al.*, (2021); NWG EAFM (2014); and Ninef (2019) that a fishing gear can be said to be selective if the catch is dominated by target fish and is of a suitable size for catching (score 3).

In the assessment of the range collapse indicator from the results of interviews with respondents (fishermen), it was found that 70% of fishermen said that the location of the fishing area is currently very difficult to find (score 1).

In the assessment of the ETP indicator, respondents explained that protected biota, namely turtles, sharks, and rays, were still being caught, but in small numbers (score 2).

Based on the results of the composite analysis of 6 indicators in the Fish Resources domain, it can be concluded that the status of the resources landed at PPN Palabuhanratu is still in the good category with a composite value of 70.33.

Fishing Techniques Domain

In the Fishing Technique Domain, five indicators were assessed, namely: (1) destructive and illegal fishing methods; (2) modification of fishing gear and fishing aids; (3) fishing capacity; (4) level of fishing selectivity; (5) suitability of vessel function and size with legal documents; and (6) crew certificate (see Table 4).

Based on Table 4, the composite value of the fishing technique domain is very good (83.33). All six indicators obtained good scores except for the crew certificate. Purse seine fishermen based in PPN Palabuhanratu generally do not have a crew certificate of expertise or skills. The certificate of expertise that is still used is a 60-mile Certificate of Proficiency (SKK), which has not been transferred to a Fishing Vessel Nautical Expert Certificate (ANKAPIN). Based on the Regulation of the Minister of Transportation Number KM 9 of 2005 Article 26 concerning Education and Training, Examinations and Certification of Fishing Vessel Sailors, the SKK must be transferred to an ANKAPIN Certificate or ATKAPIN Certificate. A crew

certificate is one of the important requirements for working on a ship that must be met. A crew certificate also reflects compliance with responsible fishing principles. Based on Government Regulation of the Republic of Indonesia No. 7/2000 concerning Maritime Affairs, the types of crew certificates consist of a fishing vessel sailor's expertise certificate and a fishing vessel sailor's skills certificate. A fishing vessel sailor's expertise certificate consists of ANKAPIN (Fishing Vessel Nautical Expert) levels (I, II, and III), ATKAPIN (Fishing Vessel Technical Expert) levels (I, II and III) and Fishing Vessel Rating. Meanwhile, a fishing vessel's skills certificate consists of basic fishing vessel crew safety (Basic Safety Training), fire fighting (Advanced Fire Fighting), emergency medical assistance (Medical Emergency First Aid), medical care on board (Medical Care on Board), radar simulation, ARPA simulation, general radio operator, limited radio operator, survival craft and lifeboat skills, and ship security officer. The assessment of the fishing technique domain also evaluates indicators of destructive and illegal fishing methods and modifications to fishing gear and fishing aids. Both indicators have an important role in describing the condition of environmentally friendly fishing techniques so that they have a high score.

The fishing method is still in good condition, seen from the violations occurring less than 5 times per year, while 66% of the Tetengkek caught are not yet suitable for fishing, meaning that the use of fishing gear and aids needs to be viewed carefully, because the increasing dominance of fish that are less suitable for fishing.

According to NWG EAFM (2014), the value of the fishing capacity ratio below 1 (one), then it can be suspected that there is a tendency for over-capacity which will have an impact on overfishing, and vice versa if it has a ratio value above 1 (one) then it can prevent the occurrence of over-capacity. In addition, the level of fishing selectivity and the suitability of the function and size of the vessel in the legal document are also benchmarks for the use of environmentally friendly fishing techniques. Based on the analysis of the types and sizes of fish caught, 66% of the fish caught were still juvenile in size and the proportion of the catch was dominated by target fish of 86%. This value illustrates that the level of fishing selectivity used is not yet in a critical condition. Likewise with the survey results, the overall function and size of the vessel are in accordance with the legal documents.

Based on the analysis of the domains described above, the status of the fish resources domain is in the good category (70.33), and the fishing technique domain is included in the very good category (83.33). Therefore, priority for improvement is given to the habitat and ecosystem domains (see Table 5). The aggregate composite value of EAFM with the flag model shows that fisheries management in this area is classified as "Good".".

CONCLUSION

In general, the status of Tetengkek fisheries in Palabuhanratu Bay is Good, where the Fish Resources domain shows the status of "Good" and the Fishing Technology domain 'Very Good'. The proposed recommendations for the management of Tetengkek fisheries in Palabuhanratu Bay are 1) the use of information technology to ensure fishing areas; and 2) certification of fishing vessel crews.

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