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ASSESSMENT OF THE LEVEL ENVIRONMENTAL FRIENDLINESS, COMPOSITION PURSE SEINE OPERATIONS AT HARBOR TPI, TEGAL CITY

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ABSTRACT Purse Seine fishing units are generally commercially operated. The target of Purse Seine fishing is small pelagic fish classified as migratory species. This characteristic of purse seine, Purse Seine fishing gear is classified as environmentally friendly fishing gear.. This study aims to determine the level of environmental friendliness of Purse Seine fishing gear at TPI Tegalsari. The analysis method used is quantitative descriptive method. Where this research analyzes the level of environmental friendliness of Purse Seine fishing gear based on the composition of the main catch and bycatch and determine the level of environmental friendliness of Purse Seine fishing gear by scoring method based on 9 CCRF (Code of Conduct Responsible for Fisheries) criteria. Based on the research obtained the results of the level of environmental friendliness of Purse Seine fishing gear get a value of 29.75 which indicates that Purse Seine is an environmentally friendly fishing gear. The criteria that must be considered in Purse Seine fishing gear is the size of the mesh on the body and bag to match the standard that should be.

***Keywords**: Purse Seine, Selectivity, Fish auction site Tegal.*

INTRODUCTION

Indonesia, as an archipelago with 17,504 islands, has great potential for fisheries resources with a Indonesia, as an archipelago with 17,504 islands, has great potential for fisheries resources with a fisheries area of 26,606,000 ha, in 2023 total fisheries production reached 7,373,516 tons (Ministry of Marine Affairs and Fisheries, 2024). The fishing industry has an important role in meeting the protein needs of the community and supporting the economy of fishermen and coastal areas. Tegal City, as a maritime city, has great potential in fishing with production reaching 40,086,086 kg in 2021. According to Irawan et al.'s research, several factors that become levers in the ecological dimension include the use of illegal fishing gear, selectivity of fishing gear, and the size of fish caught. Based on Multi-dimensional Scaling (MDS) analysis, mortality in the ecological dimension is only 40.25% (less effective), while in the economic dimension it reaches 54.96% (quite effective).

Awareness of the sustainability of fisheries resources is still lacking. The use of environmentally friendly fishing gear can be a solution to preserve fish. Based on KP Regulation No. 36 of 2023, fishing gear (API) in inland waters is divided into 10 groups, namely: circle nets, drag nets, helicopter nets, rakes, lift nets, tools that are dropped or spread, gill nets, traps, fishing rods, and other APIs. One of the fishing gear that is widely used in Tegal City is Purse Seine. Purse Seine fishing gear is an effective fishing gear in catching pelagic fish, Purse Seine is an active fishing gear used to catch small pelagic fish by surrounding shoals of fish until the bottom of the net forms a bowl. The mesh size affects the species composition of the main and bycatch (Aisyaroh and Zainuri, 2021). The catches using purse seine gear are diverse, including pomfret, mackerel, tuna, kite, mackerel, and mackerel.

Utilization of marine fisheries resources has only reached 38% of its sustainable potential, some densely populated and industrialized areas have experienced overfishing, causing a decline in fish stocks (Setyaningrum, 2019). There is a need for public awareness towards sustainable capture fisheries. Sustainable capture fisheries are activities to capture marine resources without disturbing the sustainability of the organisms being utilized so that fishing activities can continue.

This study was to determine the level of environmental friendliness of Purse Seine fishing gear at

Tegalsari TPI Tegal City using descriptive quantitative analysis method. This research assessed the composition of main catch and bycatch and used scoring method based on CCRF criteria. This research is expected to provide more comprehensive information on the environmental impact of Purse Seine fishing gear and policy recommendations related to its use.

METHODS

This research was conducted at Tegalsari Port TPI, Tegal City on October 11, 20204. The research method used was descriptive quantitative method. Data collected in this study consisted of primary and secondary data. Primary data was obtained through direct observation in the field, interviews with fishermen, including specifications of fishing gear and how to operate it, criteria for environmentally friendly fishing gear and fish catches obtained by filling out questionnaires. the number of samples in this study was 16 respondents of Purse Seine vessels selected using purposive sampling technique. Secondary data obtained from the Tegalsari Coastal Fishing Port (PPP) Office includes the number of fishing gear and the types of fish caught by Purse Seine. Data analysis in this study includes the calculation of the composition of the main catch and bycatch, as well as the evaluation of the level of environmental friendliness based on the scoring method. Scoring is based on 9 CCRF criteria, which include selectivity of fishing gear, impact on habitat, quality of catch, safety of fishermen, impact on biodiversity, and social aspects.

RESULTS AND DISCUSSION

Tegalsari Port TPI is located in the Pelindo II Tegal Port area, occupying an area of approximately 9,000 m². As a fish auction center, this TPI plays a vital role in supporting the fishing industry in the region. The existing facilities support the auction activities of fishermen's catches, ensuring the quality and freshness of the marketed fish. Strategically located in the harbor, Tegalsari Port TPI also contributes to the local economy, providing employment, and strengthening the fish supply chain to surrounding markets. The fishing fleet at Tegalsari Port TPI according to quarterly report data from October - December 2023 is presented in Table 5 as follows:

Table 1. Number of Vessel Fleet at Tegalsari TPI 2023

NO	Type	Total
1	Pocket Tensile Net > 30 GT	411 units
2	Bauke Ami < 30 GT	26 units
3	*Mini Purse Seine* < 30 GT	54 units
4	*Gilnet* < 30 GT	28 units
5	*Purse Seine* > 30 GT	180 units

Source: Three-month report(2023)

The leading commodities include mackerel, tuna, squid, kite and pomfret. These fish have high demand in the market, both for local and regional consumption. Supporting trading activities, the fish auction system at TPI is applied in two forms, namely pure auction and borong auction. In pure auction,

fish are sold directly to buyers at prices determined by bidding. While borong auction allows buyers to purchase in bulk at a pre-agreed price. This system not only ensures transparency in transactions, but also facilitates fishermen to get a fair price for their catch.

The functions of TPI include: Facilitate marketing activities with auction system, Facilitate fishermen's fish quality development, Facilitate statistical data collection. Based on the fish sales transaction system with the auction system, it is expected to increase the income of fishermen and fisheries companies and eventually spur and support the development of fishing activities at sea (Sinaga, 2020). The Purse Seine is one of the fishing gears widely used in the eastern harbor of Tegal city. Purse seine vessels are characterized by many lights mounted on the top, which serve to attract fish, especially at night. With this strategy, fishermen can significantly increase their catch. Fishing area and season The purse seine fleet in Tegal city port operates in the Java Sea, Makassar Strait, South China Sea, Sulawesi Strait, Bawean waters, Karimunjawa waters, Kalimantan waters, and Natuna Sea. The length of fishing operation of purse seine fleet is around 40 - 60 days every trip.

The peak fishing season occurs from August to December while the lean fishing season occurs from January to March. Vessels and Machinery Frezzer purse seine vessels have a GT size range of 50 - 90 GT. The size of the ship is a maximum length of 20 - 30 m, with a width of 5 - 7 m, and a hatch depth of 2.5 - 4 m, has 4 engines consisting of 1 main engine with a size of 8 - 10 cylinders and 3 auxiliary engines with a size of 4 - 8 cylinders. Salt and ice purse seine vessels have a GT size range of 50 to 90 GT. The size is a maximum length of 19 - 30 m, with a width of 5 - 7 m, and a hatch depth of 2.5 - 4 m. It has 3 engines consisting of 1 main engine with a size of 8 - 10 cylinders and 2 auxiliary engines with a size of 4 - 8 cylinders.

Based on observations in the field, it was found that the mesh size of the Purse Seine net was 5 cm or 1 inch. in accordance with the standards set for environmentally friendly fishing gear. In general, components and materials for Purse Seine in Tegal City Port TPI consist of:

1. The net consists of 3 parts, namely the wings, the net body and the bag which has a mesh size of 1“ - 3/4”. The bag is located in the center of the net. The net material is made of PA (Polyamide) yarn.
2. PVC (Polyvynil cloride) float.
3. Rigging Rigging on purse seine fishing gear is as follows: a. Float Line has a length of about 400 m, made from PE. b. Top Ris Rope made by PE with a length of about 400 m c. Ballast rope made of PE with a length of 450 m d. The corrugation rope has a length of about 480 m made from PE.
4. Serampat Consists of top serampat, bottom serampat and side serampat. Made from PE thread Brass-based oval-shaped ring.

Bag (Bunt) is a part of the net that functions as a bag (bunt) fish gathering point before the fish is finally lifted onto the boat during the operation of fishing gear. Generally, fishermen call the net bag the “Bago” net. The position of the bag is in the top center of the net body flanked by the right and left

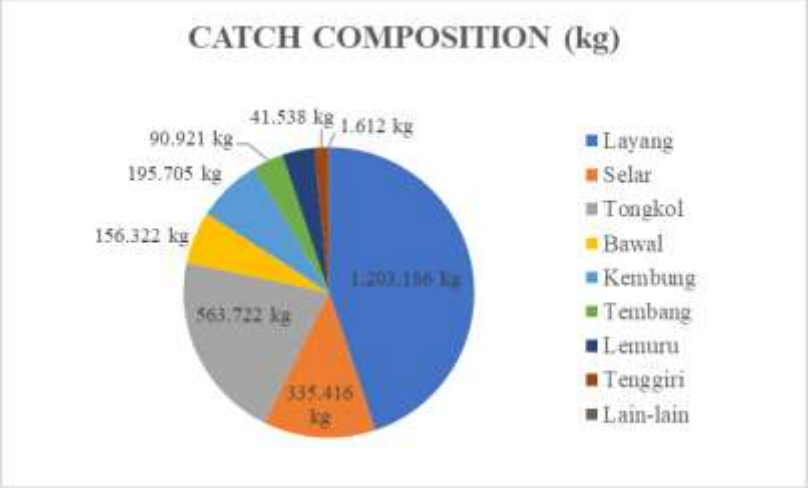
sides of the net body. Made of elastic stretchable polyester nylon material functions as the net bag with the heaviest load, because it holds fish in the fishing process, the Purse Seine bag will confine and collect fish until the hauling process is carried out (Mardiah et al., 2021). One vessel must have a mesh size of more than or equal to 1 inch.

The results of direct measurement of purse seine used by KMN fishermen. According to Ministerial Regulation No. 18 of 2021 small pelagic purse seines with one vessel must have a mesh size of more than or equal to 1 inch. The net body is the middle part of the net in fishing gear with a net depth of 30 meters in ring fishing gear which functions as a barrier to the direction of the escaping swallow. According to Rumpa (2018)

Designing the size of the depth of the net requires two factors, one of which is the maximum depth that a diving fish might reach and its diving speed, the second is the ratio of depth and length to create the necessary shape as long as the drawstring is pulled. While the wing is the front and final end of the net on the fishing gear, this part of the net functions as a barrier so that fish do not leave or escape from the cage when fishing operations are carried out (Putra, 2023).

The composition of the Purse Seine catch was found to be more than 8 species caught, namely swallowfish, pomfret, mackerel, mackerel, tembang fish, tuna, lemuru fish, mackerel, and others. Catches based on data from Tegalsari Port TPI from July to September 2024 can be seen in Figure 5 as follows:

Figure 1. Composition of Catches



Source: Secondary Data of Tegalsari TPI (2024)

Purse seines in Tegal City catch more than 8 species of fish, with the main catch consisting of kingfish, mackerel, tuna, and mackerel, while bycatch includes pomfret, tembang, lemuru, and mackerel. From July to September 2024, the total catch reached 2,684,590 kg, with kingfish as the dominant species (44%).

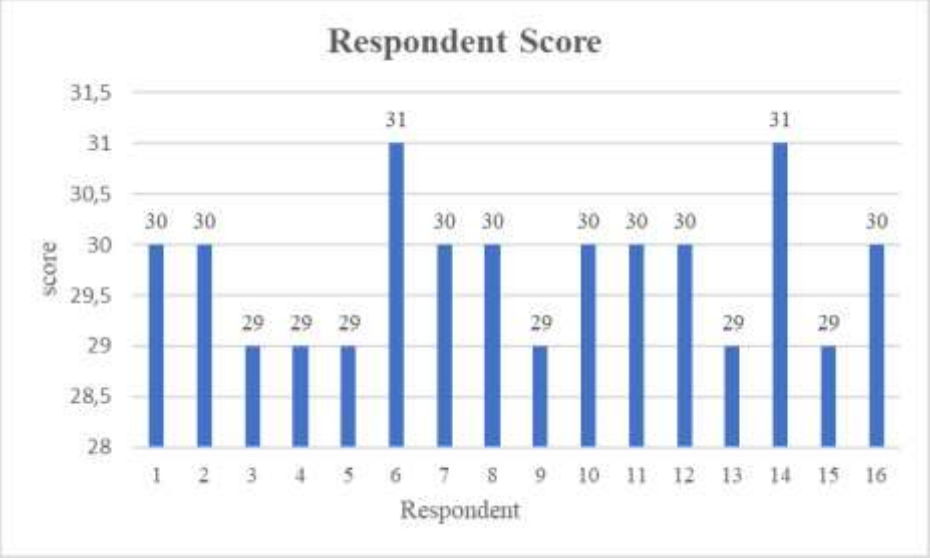
Purse seine gear selectivity at Tegalsari TPI in the last three months shows the dominance of 8 fish species. The main catches consist of kingfish, tuna, mackerel, and mackerel, while bycatches include pomfret, tembang, mackerel, and lemuru. Swordfish productivity increases in November, in line with its peak season which runs from September to November, with minimum catches in March-April. In July, the amount of swallow was less, dominating bycatch, while in August and September, the higher

presence of swallow increased the proportion of main catch. This phenomenon shows the close relationship between the food chain and the presence of target fish in determining the catch.

The catch of Purse Seine gear showed that the gear obtained 8 kinds of species. The catch is divided into two categories: main and side catches. The main catch consists of swallowfish, mackerel, tuna, and mackerel. By-catches consisted of pomfret, tembang, lemuru, and mackerel. No catches were wasted, all fish caught were sold. The total weight of the overall catch in July - September was 2,684,590 kg with the order of the total weight of the main catch of the highest Purse Seine fishing gear kite which has a total weight of 1,203,186 kg with a percentage of 44%, mackerel which has a total weight of 335,416 kg with a percentage of 12% and mackerel which has a total weight of 563,722 kg with a percentage of 21%.

The results show that the selectivity of Purse Seine fishing gear in the last three months consists of 8 species divided into 4 main catches of swallow, tuna, mackerel and mackerel. While by-catch fish are pomfret, tembang fish, mackerel and lemuru fish. The catch at Tegalsari TPI is highly dependent on the presence of target fish related to the Kite fish season. The increase in productivity of kite fish in November is also due to the fact that it is the peak season of abundance of the species which occurs in September - November and the minimum catch in March - April (Prasetyo, 2021).

This phenomenon suggests that in July, kites may be fewer or more difficult to catch, so bycatch dominates. In contrast, in August and September, the higher presence of swallow (possibly due to seasonal or migratory factors) leads to an increase in the proportion of main-catch. In addition, the capture of various types of bycatch fish has a close relationship with the food chain process, where the presence of swallowfish (Decapterus spp.) affects the presence of other species in the vicinity that are caught together as bycatch.The results of the environmental friendliness analysis based on CCRF criteria at Tegalsari Port TPI show that Purse Seine fishing gear is categorized as very environmentally friendly with a score of 29. According to Dhany et al. (2023), scores of 28-36 are grouped into the category of very environmentally friendly fishing gear. The following is the score of respondents' assessment of the Environmental Friendliness Level of Purse Seine Fishing Gear at Tegalsari Port TPI.



research results (2024)

This fishing gear is capable of capturing target species with minimal bycatch. Purse Seine fishing gear captures more than > 8 species of fish with a relatively uniform size, thus the average value

obtained is 1. Indicates that Purse Seine fishing gear has low selectivity because it captures more than 1 species with a mesh size of 1- 3/4 inch.

According to research by Asni et al. (2022). Stating that the main catch of Purse Seine is swallowfish there are other types that are caught (bycatch) and partially utilized (useable). The number of species caught by Purse Seine fishing gear can be caused by several things such as related to the nature of fisheries in the tropics (north coast) which are multi-species, namely inhabited by various types of marine biota, can be caused by the mesh (mesh size) used to catch fish with Purse Seine so that it allows catching various types of fish, and seen from the habitat that has similarities between the main catch and bycatch (Aisyaroh and Zainuri 2021).

The criterion of not damaging the habitat received an average score of 4, indicating that Purse Seine fishing gear is safe for fish habitat. Purse seine fishing gear that targets pelagic fish is operated in the surface water column, so it does not cause damage to the habitat either in a narrow, wide area or coral reef habitat at the bottom (Setyasmoko, 2015).

Producing High Quality Fish, The criteria for producing high quality fish received an average score of 3, indicating that the catch obtained was stored dead but still maintained its freshness. Good fish quality will have an impact on the price of fish. A good fish price will have an impact on the income earned by fishermen. Therefore, CCRF criterion number 3 presents the quality of the fish catch obtained by fishermen, in criterion number 3, 98% of respondents gave a score of 3. According to respondents, the catch on the Purse Seine is caught in a fresh dead fish condition because the fish caught tends to be in a fresh condition and has a high economic value. The Purse Seine catch is stored in the freezer so that the freshness of the fish is sufficiently maintained because the Purse Seine boat conducts fishing for a maximum of 2 months and can be more than 2 months if the catch has not been fulfilled. Purse Seine fishing gear is also safe for consumers because fishermen only use ice and do not use hazardous materials such as formalin and borax.

Fish catches based on CCRF are divided into four main categories:

1. Dead and Rotten Fish
   Fish in this category are of very low quality because they are already frozen. It occurs due to improper handling, such as delays in storage. Rotten fish is not suitable for consumption and causes losses to fishermen.
2. Dead, Fresh and Physically Defective Fish
   Fish that are still fresh but have defects such as wounds, broken fins, or peeled scales due to pressure during capture. This fish is still safe for consumption. In Tegalsari TPI, the number of fish with physical defects is very small.
3. Dead and Fresh Fish
   This is the most common category found in Purse Seine catches at TPI Tegalsari. Freshly dead fish is immediately processed properly and stored in cold temperature to maintain its freshness, so that it remains suitable for consumption and has good selling value.

Purse Seine fishing gear that does not endanger fishermen Criteria does not endanger fishermen and production does not endanger consumers get an average score of 4 which indicates that Purse Seine fishing gear is safe for fishermen and safe for consumers. It is said to be safe for fishermen because the operation of Purse Seine fishing gear does not cause fatal work accidents. If the weather is not favorable and the fishing gear cannot be put on the boat, then fishermen usually prefer to cut or throw the fishing gear so that the boat is not dragged by the fishing gear and no fishermen have an accident, because the operational process is quite safe compared to other more destructive fishingear.

The research of Asni et al., Purse Seine fishing gear also does not cause the death of non-target biota including fish juveniles and also the operation of the net does not reach the bottom of the waters

where there are coral reefs and other ecosystems. So purse seine can be said to be safe for biodiversity.

Purse seine gear by-catch consists of more than three species, including mackerel and pomfret. All fish caught, whether small (6-7 cm) or large (>30 cm), are sold in the market, so no catch is wasted. Bycatch occurs because tropical waters, such as the north coast, have many types of marine life with similar habitats between the main target fish and the bycatch fish. The catch is divided into two groups: the main catch, which is the main target fish, and the bycatch, which is not the main target but is still economically valuable. If the number of fish wasted is more than utilized, then the fishing gear is considered less effective for the fishermen.

Fish catches can be categorized into two groups based on the target fishing variables, namely Main Catch (HTU) and By-Catch (HTS). HTU is the main target fish from the operation of fishing gear, while HTS is fish caught other than target fish, but has economic value that can support fishermen's income. In criterion number 6, it is presented with the need for information on the presence of wasted fish. If the wasted fish is higher than the utilized fish, then the fishing gear should be avoided because it does not produce economic value for fishermen (Dhany et al., 2023).

Purse seine gear was rated as safe for biodiversity with an average score of 4 by respondents. This gear does not harm non-target species, including juvenile fish, and does not damage marine habitats because the net does not touch the bottom of the water. Based on respondents' assessment of the following criteria:

1. Does not damage habitats or cause mass mortality: Purse seines only catch pelagic fish without damaging ecosystems such as coral reefs.
2. Does not cause death of non-target species: This technology is environmentally friendly and does not adversely affect the loss of fish resources.
3. More catches in the fishery: No respondent rated Purse Seine as destroying habitats or threatening biodiversity.
4. Safe for biodiversity: It maintains the balance of the ecosystem with a disruptive catch and does not cause significant negative impacts.

Purse seine gear received an average score of 3, indicating that purse seine gear has caught protected fish. Most fishermen release protected fish back to the sea, but some still sell them at TPI. Socialization on the importance of preserving marine biota is needed so that fishermen are more aware and do not trade protected species.

This is in line with research by Fadli et al. (2020) which showed that protected fish were still found in Purse Seine catches, even though they were not intentionally caught. This category received a score of 3 in accordance with the 9 CCRF criteria, namely protected fish have been caught. This is in accordance with the statement of Fadli et al. (2020) that some protected fish species that have been caught in Purse Seine fishing gear are sharks and stingrays. Socialization of the types of protected catches is very important for fishermen so that the conservation of these biota is maintained, because sometimes it is still seen that some protected catches are still sold by fishermen to the public. criteria. Its use is accepted by the community and does not conflict with existing rules. Although there are no specific restrictions on fishing gear, some traditions are still adhered to, such as the prohibition of fishing on certain days, Fridays and holidays. Economically, the operational costs of this fishing gear are highly influenced by the price of fuel and the fishing season. Fishermen's income tends to increase during the dry season, while during the rainy season, high waves often become an obstacle for fishermen to go to sea. Seasonal changes Purse seine gear scored 3 in the social criteria because it fulfills 3 of the 4 social acceptance sub-are not always a barrier to how fishermen can increase their income, and if the season has entered the dry season, of course fishermen will find it easier to find fish to meet their needs. On the other hand, if the rainy season has entered, fishermen cannot go to sea because the sea waves will rise due to heavy rains (Lukum, 2023).

CONCLUSION

Purse seine gear is also operated on the surface of the water so that the target catch is also intended to get pelagic fishes. Weather conditions, weather conditions such as large waves, high tides, heavy currents, and high rainfall can affect the abundance of the catch. Reproduction rate, the high reproduction rate of fish can lead to high catches of these fish. Fishing techniques, fishing techniques must be adapted to the behavior of the fish. Purse Seine is a swallow fish there are other types that are caught (bycatch) and partially utilized (useable). The number of species caught by Purse Seine fishing gear can be caused by several things such as related to the nature of fisheries in the tropics (north coast) which are multi-species, namely inhabited by various types of marine biota, can be caused by the mesh (mesh size) used to catch fish with Purse Seine so that it allows catching various types of fish, as well as seen from the habitat that has similarities between the main catch and bycatch.

Based on the research results, purse seine fishing gear at Tegalsari Port TPI is an environmentally friendly fishing gear. In accordance with the Code of Conduct for Responsible Fisheries (CCRF) criteria with a total score of 29.75 (Very Environmentally Friendly). Purse seine fishing gear at Tegalsari Port TPI does not damage habitat, produces high quality fish, does not harm fishermen, production does not harm consumers, low bycatch, does not damage biodiversity, does not harm protected fish and is socially acceptable.

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