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BIODIVERSITYOF DEMERSAL FISH CAPTURED BY BEACH SEINE USING SWEPT AREA METHODAT PANGANDARAN, WEST JAVA PROVINCE, INDONESIA

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ABSTRACT

Beach seine are considered to have contributed to the decline in the condition of fisheries resources in Pangandaran, especially demersal fish. Therefore, rational management is needed so that its utilization can be sustainable and sustainable. The purpose of this research is to analyze the demersal fish species diversity data based on the swept area of the trawl fishing gear which operated in Pangandaran, West Java as a baseline for sustainable and eco-friendly fisheries management. The research was carried out starting in August 2018-July 2019 on the East Coast of Pangandaran. Sampling was conducted at 3 stations with 3 replications. The method used in this research was a survey method and was analyzed descriptively quantitatively by calculating species diversity index, similarity index, swept area, catch rate, and stock density. The main catches of beach trawl fishing gear in Pangandaran consist of (*Trichiurus spp*) with an average of 172 fish and (*Pampus argentus*) with an average of 99 fish. The bycatch was 7 species of fish with a total average of 1.990 fish. The results showed that the demersal fish resources captured by trawlers in Pangandaran Regency were in the low to moderate level of diversity and had a low level of species diversity consisting of 9 species, with the most dominant family being the family Leiognathidae. The seine trawler in Pangandaran has a catch rate with an average of 31.05 km / h and stock density with an average of 453.15 kg / km^2.

Keywords**:** *Biodiversity, demersal fish, beach seine, Pangandaran, swept area, Trichiurus* spp*,Pampus argentus.*

INTRODUCTION

One of the fishing gear used in Pangandaran Regency is beach seine and also fishing gear used to catch demersal fish is beach trawl. Based on the regulation of the Minister of Maritime Affairs and Fisheries Number 2 Year 2015 concerning the prohibition of the use of trawls and seine nets in the fisheries management area of the Republic of Indonesia State fishing trawlers are prohibited from operating because they are included in trawlers and can cause degradation ecosystem.

Magurran in Sulistiono et. al. (2017) stated that information on knowledge of fish diversity levels is needed in biological studies and biodiversity conservation. Some of the methods used to estimate diversity are based on data on the presence and abundance of species. According to Blaber et. al. in Sulistiono et. al. (2017)

information on the distribution and structure of demersal fish communities is important as input for fisheries management. Linkages between the distribution of demersal fish resources and environmental factors require information on the distribution and structure of fish communities.

The index of diversity of fish species is a single value that reflects the characterization of the relationships of individual abundance between species in a fish resource community. Changes in fish resources and marine ecosystems have long occurred due to anthropogenic effects and from the effects of fishing (Suprapto 2014). Ecological, fishing technology and economic indicators are very dominant influence on fish biodiversity to map the boundaries of conservation and exploitation. According to Fahmi & Yonvitner (2016) one of the efforts developed to determine changes in fish biodiversity is by looking at changes in fish diversity index and similarity index. Diversity differences will be seen when data are collected from all types of fish by trawling techniques to groups of fish resources.

The dominance of species often occurs due to several things such as competition of natural feed by certain types accompanied by changes in environmental quality. In addition, dominance usually occurs because of the imbalance between predators and prey, resulting in competition between species. Habitat heterogeneity and water quality are also taken into account as a cause of fish diversity. Ecologically, and high species diversity is assumed to show a better ecosystem balance and have elasticity against various disasters, such as diseases, predators, and others. Conversely low diversity indicates a system that is experiencing damage (Nurudin 2013)

MATERIALS AND METHODS

The study was conducted from August 2018 to July 2019 in Pangandaran Regency, West Java. Samples were obtained from 3 different stations with 3 replications at each station.

Research Procedure Preparation

a. Collection of literature containing demersal fish species and their habitats b. Area identification and field survey

c. Check all equipment needed during the study

Sampling

a. Samples are demersal fish caught with beach seine. The seine trawling operation stage is divided into three stages, namely preparation, stocking nets, and catching catches. The preparation process begins with preparing fishing gear and ships. Fishing gear that has been prepared is placed on the ship in a neat state. After everything is ready, three fishermen move to the fishing area while lowering the tow rope which is first tethered to the beach. After arriving at the wingtips, the ship moves half a circle while lowering the net, then proceed with lowering the buoy mark. After that, the ship moves towards the beach, after the ship arrived at the beach then the towing rope was given to two groups of fishermen who had been waiting. Then the two ropes were pulled by two groups of fishermen to the net bag section after the net bag section was pulled then the end of the bag strap was opened to take the catch into the basket.

b. Taking sample documentation

Fish identification

Fishidentification was carried out at each research station by observing the morphological characteristics of fish caught at the time of the study. The identification process is as follows:

a. Identification is done by using the book Taxonomy and Key to Fish Identification (Saanin 1984) to determine the classification of fish caught.

b. The characteristics observed include body shape, length, and height, scales type, color pattern, snout shape, fin shape, number of fins and tail shape.

c. The fish caught are separated by species to find out the number of individuals and the weight

of each species. d. The identification results are presented in tabular form that displays the name of the region, scientific name, number of individuals, sample weights, and total weights.

Research Parameters

Data collected for demersal fish are then analyzed using methods to measure species diversity including species richness, diversity index, species uniformity index and species equality index (Suprapto 2014). Biodiversity data and swept area obtained were analyzed using quantitative descriptive analysis approaches. According to Syamsudin & Damaianti (2011), the quantitative descriptive method is a method that aims to explain the phenomena that exist by using numbers to model individual and group characteristics and also this method assesses the nature of the conditions that appear.

RESULTS

Beach Seine Catch

The composition of the main catch of beach trawl fishing gear consists of 2 types of demersal fish namely *layur* fish (*Trichiurus* spp*.)* And white pomfret (*Pampus rgentus*). The bycatch of beach trawl fishing gear consists of several types of demersal fish, such as pepetek fish, squid, manyung fish, plump fish, ponggek fish, turmeric fish, and black pomfret. Broadly speaking, the catches of beach seine are 9 species (Table 1). Commodities captured by beach seine in Pangandaran consist of *layur* fish, yellowtails, white pomfret, *pepetek*, black pomfret, squid, turmeric, *manyung*, and plump. The types of fish that are predominantly caught by fishermen who use beach seine on the coast of Palu City, Central Sulawesi include pompano, *bijinangka* fish, *pepetek*, mullet fish, *baronang*, *cendro* fish, stingrays, *layur*, *tembang* fish, bundles, Aloe fish, sea milkfish, lencam, pestle, *kerongkerong*, chip, shrimp and squid. (Mardjudo 2011).

Table 1. Results of Trawler Fishing Tools

No	Local name	Scientific name	Famili	Average	Catch
1	*Layur*	*Trichiurus* spp.	Trichiuridae	172	Main
2	White Pomfret	*Pampus argentus*	Bramidae	99	
3	*pepetek*	*Leiognathus equulus*	Leiognathidae	1964	
4	Squid	*Loligo* sp	Loligonidae	5	
5	*Manyung*	*Arius thalassinus*	Ariidae	1	
6	*Montok* fish	*Otolithes* spp.	Sciaenidae	2	Side
7	Ikan *Ponggek*	*Caesio erythrogaster*	Caesionidae	14	
8	*Kuniran* fish	*Upeneus moluccensis*	Mullidae	2	
9	Black pomfret	*parastromateus niger*	Stromateidae	2	

The catch of demersal fish at the sampling location during the study took place, the composition was not much different. This proves that the Pangandaran are a community that is supported by the behavior of demersal fish that have low movement activity and are not too far from the shoreline with a depth that is not much different. The main sample of the study was taken using a seine trawler using the method *swept area*. The beach trawling fishing gear in Pangandaran is a special fishing gear used to catch various types of demersal fish, such as *layur* fish, white pomfret, etc. so that the main catch of this fishing gear is some of these demersal fish.

Community Structure

An understanding of the diversity of demersal fish in the water is very important because of the characteristics of the level of biological organizations that have genetic diversity, species, or ecosystems that play an important role in sustaining life. Loss or loss of biodiversity can reduce the ability of populations to adapt to environmental changes (Badrudin *et. Al.* 2003). Therefore, the management of fish resources in the

Pangandaran Regency must be done rationally so that it can be used sustainably and remain sustainable. One important element in the management effort is the existence of data and information about the fish biodiversity index. The several indexes analyzed to support the existence of this information include the index of species diversity and index of species uniformity.

Species diversity (H '), and uniformity (E) are indices that are often used to evaluate the state of an environment including aquatic environments based on biological conditions (Suprapto 2014). A good ecosystem can be seen from the condition of its biodiversity which includes the high diversity of species and the high uniformity of the population, but conversely, the relatively low species richness and the presence of dominance of a particular type indicate a less favorable ecosystem condition. This is following the statement of Krebs (1972) which states that good ecosystems have characteristics of high species diversity and the spread of individual species that are almost evenly distributed in each water.

The highest index value of demersal fish species diversity in Pangandaran Regency is found at station 1 with a value of 1.01 and the lowest at station 2 with a value of 0.34, while at station 3 the diversity index value is 0.6. Based on this value, stations 2 and 3 are categorized as areas with low diversity, while station 1 is categorized as areas with moderate diversity. Stations 2 and 3 are categorized as areas with small population uniformity, while Station 1 is categorized as areas with high population uniformity (Table 2).

Table 2. Structure of Demersal Fish Communities

Parameters	Station1	Station 2	Station 3
H’	1,01	0,34	0,6
E	0,72	0,18	0,27

The same thing happened in the results of Hidayat and Nurulludin's research (2017) which stated that the results of the analysis of several parameters of the demersal fish community structure in the southern Java showed the Shannon Wiener (H ') diversity index value, which was 2.5 (medium) and a species evenness index of Pielou (E) of 0.30 (low). The uniformity index value depends on the diversity index value. The smaller the value of the diversity index, the uniformity index of the species is also smaller. This indicates the dominance of one type over another. As already mentioned, the Leiognathidae family dominates the composition of the catches of seine beach seine, especially (*Leiognathus equulus*), thus causing a low value of population uniformity.

Based on the community structure, the diversity of demersal fish species in the Pangandaran Regency is in the low to moderate category. This shows that the ecosystem is not good, so it is necessary to manage fisheries resources that are sustainable and environmentally friendly. The main objective of sustainable fisheries resource management can be achieved by one of them maintaining biodiversity that affects the characteristics, characteristics, and forms of life (Purwanto 2003). Based on these principles, fisheries resource management must have the following strategies:

1) Maintain productive and efficient fish species community structures to match the process of changing habitat components with dynamics between populations.
2) Reducing the rate of catching intensity to match the ability of production and power to recover fish resources, so that optimal and sustainable capacity can be guaranteed. 3) Control and prevent any fishing effort that can cause damage or pollution to the aquatic environment directly or indirectly.

Capture Rate and Stock Density

Utilization of fish resources can be carried out optimally if the stocks (stocks) and distribution of fish resources are known with certainty so that exploitation policy measures can be carried out appropriately

without endangering its sustainability (Nuruludin 2017). According to Firdaus (2010), the rate of capture illustrates the ability to capture a fishing gear per arrest attempt. The capability of a fishing gear represents the catch in grams/kilograms/ tons. The catching effort that is part of the catch rate analysis is the capture effort such as the length of the net pull, the lifting duration and the harvest duration which are converted in units of time. Stock density is calculated using the method *swept area* based on the swept area traversed, the speed of the ship when towing, the net opening width, and the catch rate (Sparre and Venema (1998). The dimensions of the fishing gear affect the size of the swept area due to several dimensions of fishing gear dimensions calculated to find out the size of the swept area. The density of demersal fish stocks in Pangandaran at the time of research was 453.15 kg / km2 with a catch rate of 31.05 kg/hour (Table 3).

Table 3. Rate and density of fish stocks demersal

Parameter	Station			Average
	1	2	3	
Catch rate (kg/hour)	32,33	14,64	46,18	31,05
Stock density(kg/km^2)	728,16	315,67	315,62	453,15

Fish stock density in Pangandaran at the time of research was 453.15 kg / km2 with a catch rate of 31.05 kg/hour (table 3) Stock density shows how much fish stock is available in nature to be utilized. beach trawling fishing gear in Pangandaran one of which is influenced by the fishing season, fishing activities are mostly carried out in the east season, while the in the western season fishermen only engage in lower-intensity fishing activities due to the large sea waves and the small catch. The west monsoon occurs from December to February which is marked by high rainfall. Catches in the wet season tend to be less when compared to catches in the east (dry) season that occurs in June to August. The difference in the number of catches shows that there is a significant difference in fish growth between the west and east seasons (Budiyanti *et. Al.* 2018)

Data on the composition of demersal fish species was taken in January 2019 (west season). Based on the data obtained, the catch caught by beach seine in the wet season tends to be less, this shows that the season affects the fishing activities in Pangandaran Regency. High rainfall in the west monsoon influences changes in the oceanographic conditions of the ocean. Oceanographic parameters that affect fish life can be physical, chemical and biological parameters. Among the three parameters that are easily observed are physical parameters such as temperature, current, wind, and waves. These parameters will affect the spread of fish, migration, aggregation, spawning and food supplies as well as fish behavior (Setyohadi, 2011).

CONCLUSION

Based on the results obtained, several things can be concluded by the authors that the demersal fish resources captured by beach seine in Pangandaran Regency are at low to moderate diversity and have a low level of uniformity of species consisting of 9 species, with families the most dominant is the family Leiognathidae Demersal fish resources captured by beach seine in Pangandaran Regency are at low to moderate diversity with a low level of species uniformity. The density of demersal fish stocks in Pangandaran at the time of the research was 453.15 kg / km2 with a catch rate of 31.05 kg/hour. The main catches of beach trawl fishing gear in Pangandaran consist of (*Trichiurus spp*) and white pomfret while the byproducts are pepetek, squid, manyung fish, plump fish, ponggek fish, turmeric fish, and black pomfret.

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