



Characterization of Beach Seine Operations in Pangandaran Beach, Indonesia

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Authors' contributions

This work was carried out in collaboration among all authors. Author MFA designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Authors HH and LPD managed the analyses of the study. Author IM managed the literature searches. All authors read and approved the final manuscript.

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ABSTRACT

The coastal area in Pangandaran Regency, in general, has been developed as an area for tourism conservation and fisheries activities. Pangandaran beach which facing the oceans has potential in the fisheries sector which is quite potential so that Pangandaran regency is one of the regions in Indonesia that has potential in capture fisheries. There are various types of fishing gear used in fishing activities in Pangandaran, one of them is beach seine. Beach seine is local wisdom that is still maintained in Pangandaran so that this fishing gear is still operated. The purpose of this research is to investigate the operation of beach seine in Pangandaran water. The research was carried out in August 2018 on the East Coast of Pangandaran. The method used in this research is a survey method and analyzed descriptively. The beach seine operation phase is divided into three stages, preparation, stocking nets, and catching catches. The main catches of beach seine in Pangandaran consist of hairtail fish (*Trichiurus* spp) with an average of 172 fish and white pomfret (*Pampus argenteus*) with an average of 99 fish. The bycatch is 7 species of fish with a total average of 1990 fish. The beach seine in Pangandaran has an average catch rate of 31.05 km/hour.

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1. INTRODUCTION

Pangandaran is a sub-district that has a coastal area and is the southernmost in Pangandaran Regency, West Java. Pangandaran Regency is bordered by Ciamis Regency and Banjar City in the north, Cilacap Regency in the east, the Indian Ocean in the south, and Tasikmalaya Regency in the west. The coastal area in Pangandaran Regency, in general, has been developed as an area for tourism conservation and fisheries activities [1]. Pangandaran Beach which facing the oceans has potential in the fisheries sector which is quite potential so that Pangandaran Regency is one of the regions in Indonesia that has potential in capture fisheries. There are various types of fishing gear used in fishing activities in Pangandaran Regency [2].

One of the fishing gear used to catch demersal fish is beach seine [3,4,5]. Based on the Regulation of the Minister of Maritime Affairs and Fisheries Number 2 the Year 2015 concerning the prohibition of the use of trawls and seine nets in the fisheries management area of Republic of

Indonesia State fishing trawlers are forbidden to operate because they are included in trawlers and can cause ecosystem degradation. The beach seine fishing operation is assisted by a boat to get a net is circling the target and then be pulled to shore. Boats used in seine trawlers must have appropriate vessel dimension standards to support successful fishing operations (Apriliani et al. 2017). Beach trawling fishing gear is local wisdom that is still maintained in Pangandaran Regency so that this fishing gear is still operated in Pangandaran Regency. The catches obtained from trawlers are demersal fish [6]. The current study was aimed to understand the Beach Seine activities in Pangandaran Beach, Indonesia.

2. MATERIALS AND METHODS

This research was conducted in August 2018 in the Pangandaran water. The research station is the east coast of Pangandaran. The selection of that station is based on the consideration that the station is a beach seine operation area and represents all research sites (Fig. 1).

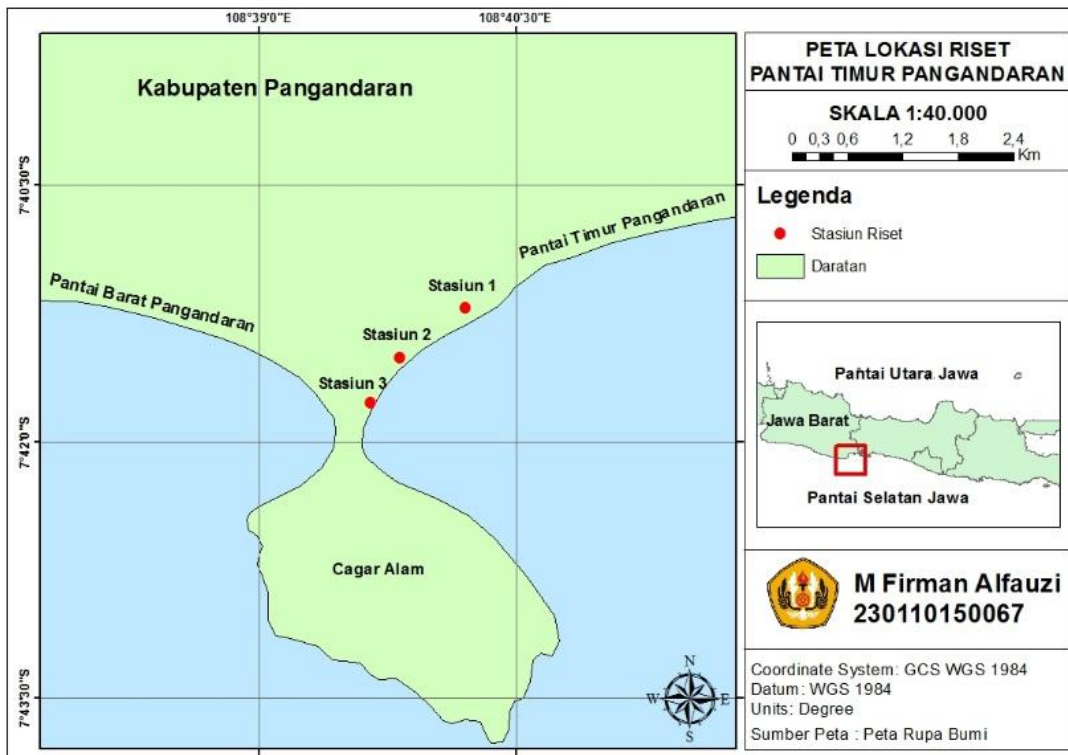


Fig. 1. Research location map

2.1 Research Procedure

2.1.1 Preparation

Collection of literature that contains fishing gear information.

Identify areas and field surveys.

check all equipment needed during the research.

2.1.2 Trip

The data was collected by researchers by operating the beach seine with the fisherman.

3. RESULTS AND DISCUSSION

3.1 Catch Production of Pangandaran Regency

Fishery activities in Pangandaran are dominated by capture fisheries. The value of capture fisheries production in the last 3 years continues to increase. Based on data obtained from the Dinas Kelautan, Perikanan, dan Ketahanan Pangan, Pangandaran Regency, capture fisheries in 2016 production reached 1,049,492.37 kg with a production value of Rp. 39,006,465,186.00, in 2017 reached 2,830,114.45 kg with a value of production of Rp. 68,937,50,676.00, and in 2018 production will reach 2,336,949.59 kg with a value of Rp. 72,298,162.105.00. This value shows how important this sector is to regional income and the people of Pangandaran. There are 10 important commodities with the highest production value, especially in 2017, 2018, and

early 2019, including shrimp, red snapper, white snapper, grouper, black pomfret, white pomfret, mackerel, hairtail fish, crackle and cobs (2019 DKPKP).

Based on Java Capture Fisheries Statistics data for 2009-2014 the production of beach seine catches fluctuates from year to year, this is caused by the fluctuating number of beach seine trips. The highest production was in 2010 of 126.9 tons and the lowest in 2011 of 6.8 tons. Based on these data, beach seine contributes an average of 1% to total production each year. (Fig. 2).

Based on statistical data on capture fisheries in West Java Province in 2009-2016, the number of beach seine units in Pangandaran did not change until 2013 which amounted to 27 units and decreased in 2014 to 15 units, whereas in 2015 and thereafter there were no trawl fishing gear the beach listed because when the seine trawler was registered the other fishing gear that it owned, this was done by the fisherman because the Permen KP number 2, 2015 was applied concerning the prohibition of fishing equipment for trawlers and seiners (Fig. 3).

3.2 Beach Seine Performance

3.2.1 Construction

Beach seine is a trawl shaped fishing gear whose operation is looped around the beach and pulls it towards the beach through both wingtips. This fishing gear is included in the type of trawl bag that is pulled by a human. Pangandaran fishermen usually call this fishing gear by the name of the *arad*.

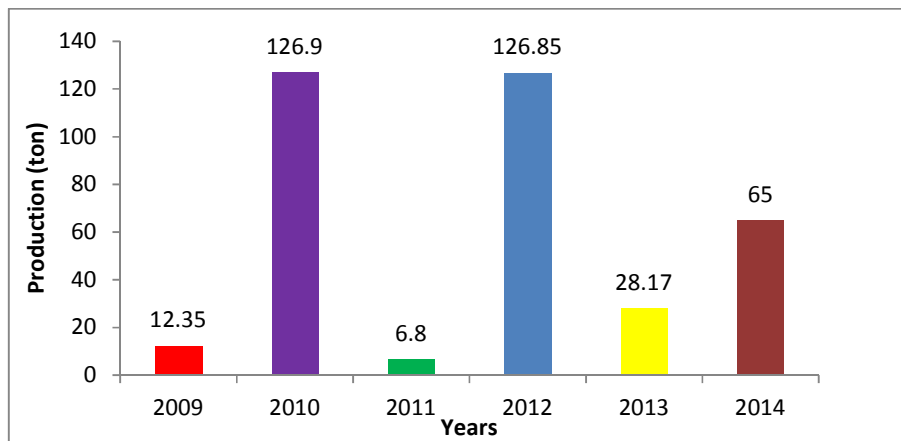


Fig. 2. Catch production of beach seine
(Source: West Java Statistic Data 2009-2014)

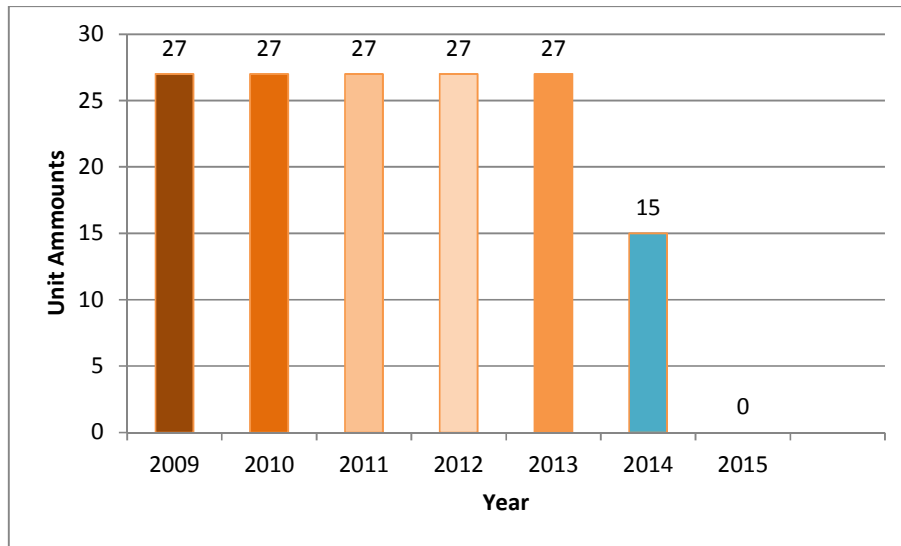


Fig. 3. Total unit of beach seine in Pangandaran
(Source: West Java Statistic Data 2009-2014)

The beach seine used to catch demersal fish during the study consisted of 3 ships, with different net size specifications. The size of the mesh in the pocket is smallest so it will be trapped bycatch a catches targets of a size that is not feasible to catch. Specifications of beach trawl units can be seen in Table 1.

Based on data from the Department of Marine Fisheries and Food Security Pangandaran Regency in 2019, fishing gear that operates in Pangandaran Regency consists of 3 types of operating methods, which is static gear that includes gillnet and fishing rod with a total of

1,728 units (90%), encircling gear that includes mini purse seine with a total of 31 units (2%), and towed/dragged gear that includes dogol and trawl with a total of 160 units (8%) (Fig. 4).

Minister of Maritime Affairs and Fisheries Regulation No. 2 of 2015 concerning the prohibition of using trawls and seine nets in the territory of the Republic of Indonesia fisheries management is a form of government efforts to anticipate destructive fishing [7]. Beach seine in Pangandaran is included in trawlers so they are prohibited from fishing.

Table 1. Specifications of beach seine in Pangandaran

Parameters	Information
Net Size	Total net length: 7080 m Wings length: 1671 m Net body length: 1264 m Bag length: 10 m Mesh size : a. Wings : 5,1 cm b. Body : 2,54 cm c. Bag : 1,34 cm Net materials: PE multifilament and PA multifilament
Type of boats	Motorboat with size 1-3 GT
Boat dimension	LOA : 8,2-12,1 meters B : 1,05-1,57 meters D : 0,78-1,05 meters
Fishing Ground	East Coast of Pangandaran
Operation Time	Daytime, between 9:00 AM till 2:00 PM
Catches	Hairtail fish, yellowtail, white pomfret, <i>pepetek</i> , black pomfret, squid, <i>kuniran</i> , <i>manyung</i> , and <i>montok</i> .

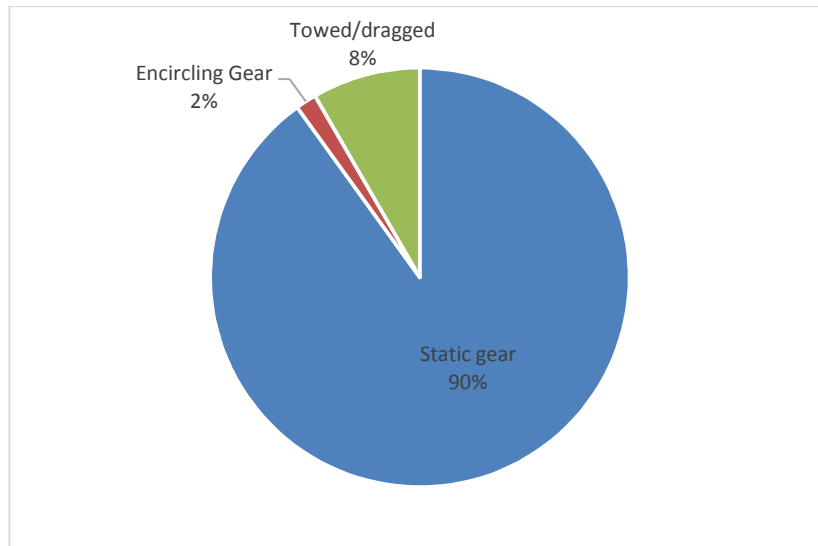


Fig. 4. Presentation of fishing gear based on operating methods in Pangandaran
(Source: DKPKP 2019)

A beach seine is a fishing gear that is operated at the bottom of nets formed by pockets to collect the catch with long-bandage and wing construction. The beach seine is operated at the bottom of the water by circling fish schooling and then pulled by a human. Beach seine net construction consists of bags (cod end), body, and wings. The size of the beach seine mesh varies in each part, the 1st and 2nd wings have a mesh size of 4.25 and 5.9 cm, the 1st and 2nd body parts have a mesh size of 3.04 and 2.04 cm, and the bag has a mesh size of 1.34 cm so that it has bycatch a high and captures targets with a size that is not feasible to capture, on this basis it is considered to have low selectivity. Beach seine is included in boat or vessel seines and is prohibited from operating because besides having low selectivity it also has the potential to damage the swept area in its path. The fact on the ground shows that the use of seine trawlers is still rife by fishermen in Indonesian waters. Based on 2016 KKP data, the number of fishing gear including trawlers and seines (including beach trawlers) in Indonesia is 79,018 units. The still widespread use of beach seine because it has become a source of life for fishermen and local wisdom in Pangandaran so that this prohibition policy cannot be accepted by fishermen [8]. Since 2015 the number of beach seine in Pangandaran Regency has decreased due to the enactment of Permen KP number. 2 of 2015 concerning the prohibition of fishing gear for trawlers and seines in the Indonesian fisheries management area, so that the

recollection of fishing gear in Pangandaran is carried out.

3.2.2 Operation Method

The beach seine operation stage is divided into three stages. There is preparation, stocking nets, and catching catches.

The preparation process begins with preparing fishing gear and boat.

After everything is ready, three fishermen move to the fishing area while lowering the towing rope which is first moored at the beach. After arriving at the wingtip, 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 are pulled by two groups of fishermen to the net bag section after the net bag section is pulled then the end of the bag strap is opened to take the catch into the basket. After everything is finished, some fishermen rearrange the ropes and nets onto the ship for the next stocking stage. Usually in Pangandaran fishermen do 4 to 5 times of spreading nets.

The beach seine is operated by circling the fishing area where the fishing gear wing is left on the beach with a sheet held by one of the

Table 2. Catch of beach seine in Pangandaran

No	Local name	Scientific name	Famili	Average	Catch
1	Hairtail fish	<i>Trichiurus</i> spp.	Trichiuridae	172	Main Catch
2	White pomfret	<i>Pampus argentus</i>	Bramidae	99	
3	Pepetek Fish	<i>Leiognathus equulus</i>	Leiognathidae	1964	By Catch
4	Squid	<i>Loligo</i> sp	Loligonidae	5	
5	Manyung fish	<i>Arius thalassinus</i>	Ariidae	1	
6	Montok fish	<i>Otolithes</i> spp.	Sciaenidae	2	
7	Ponggek fish	<i>Caesio erythrogaster</i>	Caesionidae	14	
8	Kuniran fish	<i>Upeneus moluccensis</i>	Mullidae	2	
9	Black promfet	<i>Parastromateus niger</i>	Stromateidae	2	

fishermen and the body and other net wings are carried around the fishing area to form 180o, or until the next beach. After all the wing straps are on the beach then they are pulled together at the same speed so that the gear remains in normal condition until the entire body of the net lands on the beach. Beach seine is operated in coastal waters or areas that have muddy and sandy characteristic, and are avoided in operation in rocky waters or coral reefs with catches of demersal fish and some small pelagic fish. Based on the operation of the beach seine does not damage the aquatic environment, but this net mesh size on the pocket that is equal to 1.34 cm so that every time it is operated always caught species of fish that are not targeted or by catch [9].

3.3 Catches of Beach Seine

The composition of the main catches of beach seine consists of 2 types of demersal fish namely hairtail fish (*Trichiurus* spp.) and white pomfret (*Pampus argentus*). 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, kuniran fish and black pomfret. Broadly speaking, the catch of beach seine consists of 9 species (Table 2). Commodities captured by beach seine in Pangandaran consist of hairtail fish, yellowtail, white pomfret, pepetek, black pomfret, squid, turmeric, manyung, and plump. The types of fish that are predominantly caught by fishermen using trawlers on the coast of the Gulf City of Palu, Central Sulawesi include pompano, bijinangka fish, peperek, mullet fish, baronang, cendro fish, stingrays, hairtail fish, tembang fish, buntel, aloe fish, sea milkfish, lencam, pestle, kerongkerong, chip, shrimp and squid [9].

Demersal fish catches at the sampling location during the study took place, the composition is not much different. This proves that the waters of Pangandaran are a community that is supported

by the behaviour of demersal fish that have low motion activity and are not too far from the coastline with a depth that is not much different. 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.

3.4 Catch Rate

According to Firdaus [10], the capture rate illustrates the ability to catch 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. The beach seine in Pangandaran has an average catch rate of 31.05 km/hour.

4. CONCLUSION

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. The beach seine in Pangandaran has an average catch rate of 31.05 km/hour.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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