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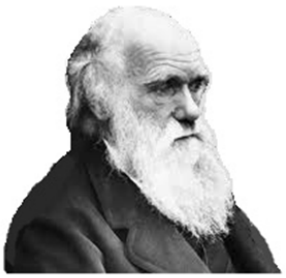

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Quantitative Evaluation of Shark Fisheries from *Cantrang* Fishing Gear In Mayangan Coastal Fishery Port, Probolinggo, Indonesia

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ABSTRACT

Sharks are marine animals that play an important role in marine ecosystems especially as the main predator, thus controlling the dynamics of populations of other organisms at lower trophic levels. Sharks are often caught as a byproduct of capture fisheries in Indonesia, making Indonesia one of the five largest shark contributing countries in the world according to the FAO. A study of shark populations needs to be done to evaluate its stock in nature. The Mayangan Coastal Fishery Port, Probolinggo is one of the largest fishing ports in East Java with the majority of fishing gear used being *cantrang*. This study will discuss the shark bycatch volume in fishing activities using *cantrang* fishing gear at PPP Mayangan, Probolinggo. The use of *cantrang* fishing gear in Mayangan Port Probolinggo has produced around 6242.9 kg of shark production each year for the past 10 years. The highest production was found in 2011 which reached 10980 kg while the lowest was in 2019 with a total production of 412 kg. The pattern of the development of shark catches at PPP Mayangan Probolinggo showed a decrease in the number of catches, indicating the enforcement of law regarding *cantrang* usage has been well adapted.

***Keywords*:** *Cantrang,* Capture Fisheries, Sharks, Mayangan

1. INTRODUCTION

Sharks are known to have an important ecological role in waters as a counterweight to the structure of community of organisms in the sea. They are generally labelled as *apex predators* (the highest predators) in aquatic environments, but several species also identified as *mesopredator* (intermediate predators) [1-4]. The physiological characteristics of sharks that

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have relatively long reproductive cycle, making sharks as an organism that is vulnerable to environmental pressure, particularly capture fisheries activities [5,6]. Based on the FAO, Indonesia is one of the countries with the highest rates of sharks exploitation in the world along with other countries such as India, Spain, Taiwan and Mexico [7]. Although not all shark species are protected, still valued economically, some species have been designated as near-threatened species and endangered in the red list of IUCN.

Over exploitation of sharks resources carried out over the last few decades can lead to balance disruption of the marine food network, thereby affecting the abundance of species at each trophic level. One of the impacts from loss of *apex predators* in aquatic environment is the occurrence of *trophic cascade*, which is an increase in prey population abundance due to declining predator populations [8, 9]. This happens because of a *direct effect*, namely the loss of direct predation, and also indirect effects such as competition. Other ecological and biological impacts due to the loss of sharks as *apex predators* are widely unknown and need further exploration [10].

Most sharks in Indonesia were a *by catch* from other commercial fishing activities such as tuna, swordfish and others [11-13]. The fishing gear commonly used varies from gillnet, longline, *cantrang* (*seine-net*) and trawl [14]. Tuna fishery usually produces shark *bycatch* that is quite large, both using longline and gillnet. 27% of all tuna catches in Australia were sharks and 16-18% of pelagic catches using longlines in Hawaii, South Africa and Italy were also sharks [15]. In Indonesia, the policy on sharks fishery has not been studied further and until now there is only one species of shark that is protected by the government which is whale shark (*Rhincodon typus*), some have been banned for export with the issuance of Regulation of Ministry of Fisheries and Marine Affair No. 18 of 2018 for hammerhead sharks while there are still very few comprehensive study regarding its implementation.

The Mayangan Probolinggo Coastal Fisheries Port (PPP) is one of the major ports with a high production yield of 12,698.42 tons in 2014, occupying the sixth largest position in East Java. Most fishing gear used in PPI mayangan include *cantrang* (155 units), basic longline (93 units) and *purse seine* (60 units) [16]. The use of *cantrang*. A traditional form of seine-net, is high enough to be a big potential income for the port. The fishing area of *cantrang* covers probolinggo waters to Kangean Island (Madura Strait) at the bottom of the waters, so that the types of fish caught were mainly demersal fish.

The habitat and distribution of shark distribution depends on species and species, some of which are distributed in the bottom waters. This causes the possibility of catching sharks in *cantrang* fishing activities is quite high. As many as 40.19% of the total *cantrang* catches in Batang, Central Java were sharks and rays [17]. Sharks were also often reportedly caught as a *bycatch* of *cantrang* catches in Rembang Regency [18]. Research on shark catch volume in Mayangan Port Probolinggo as a *bycatch* from *cantrang* fisheries is still not widely reported so it needs to be done to evaluate and illustrate the *cantrang* fishing activity towards sharks fishery.

2. MATERIALS AND METHODS

The research was carried out quantitatively in two stages, survey and data collection then proceed with the stages of data analysis and processing. The data source used in this study is an *logbook* arrest that is routinely recapitulated by the port. Field observations were carried out by means of a survey to the fishermen by a small focus groud discusion to get an actual

condition of the port as well as the composition of the catch. Collected data will be analyzed quantitatively by comparing the proportion of shark catches every year for a decade. The shark quantified as a whole which may include two or more species thus this results will give a general pattern of shark fishery activity in the port.

3. RESULTS AND DISCUSSION

3. 1. *Cantrang* Catch Composition

Mayangan Coastal Fishery Port (PPP) is one of the Port that has high fisheries production in East Java Province. The volume and value of catch production in this port is relatively high and occupies the top six positions in the East Java region based on the Fisheries and Maritime Official (Diskanlut) capture fisheries statistics report in East Java province 2014. Based on the 2016 Mayangan Coastal Port annual report published in 2017 the production of captured fish is dominated by Basic longline ships, *cantrang* vessels, and *purse seine* with the highest proportion were the use of *cantrang* fishing gear.

The amount of production and the value of production every year is always increasing, this is due to the potential of fishing and resources in the abundant fishing area, the higher fishing activity and the increasing number of ships operating, and the wider *fishing ground* achieved by fishermen. Based on the Fisheries and Maritime Official (Diskanlut) capture fisheries statistics report in East Java province in 2014, PPP Mayangan had a total production of 12,698.42 tons and a production value of Rp 225,249,742,400. This causes Mayangan Coastal Port to become a center for fishery product production, especially for the City of Probolinggo [16].

Based on data recorded in PPP Mayangan in 2019, *cantrang* fishing gear gener ally catches fish commodities such as Squids (*Loligo* sp.), Grouper (*Epinephelinae*), White Pomfret (*Pampus argenteus*), Anchovy (*Stelophorus* sp.), Dorab Wolf-Herring (*Chirocentrus dorab*), Threadfin Bream (*Nemipterus japonicus*), Barracuda (*Sphyraena genie*), Black-Tipped Silver Biddy (*Geres oyena*), Cobia (*Rachycentron candum*), Crabs (*Scylla serrata*) and other types of fish*cantrang*. The data obtained in 2019 were data collected until September showing that the *cantrang* catch composition is 440,685 tons with species composition as shown in the following pie chart (Figure 1).

Cantrang catches for 7 years starting from 2013 to 2019 have consistently decreased (Figure 2), especially when the application of law restricting fishing activities using *cantrang* fishing gear came into force in 2015. The adoption of this law has a significant effect on reducing the number of catches produced, around 90% of catches decreased from 2013 to 2019. The decrease in the number of fishing gear (Figure 3) used also looked significant if compared to 2013 which was before the prohibition law came into force and with 2019 after the law came into force. The average *cantrang* fishing gear operating in 2013 was around 13 ships with the highest number reaching 39 ships in one day. But in 2019 the average *cantrang* fishing gear that decreases by 86% to around 2 per day with the highest number reaching only 7 vessels in one day.

Cantrang is a fishing gear that is effective enough for demersal fish resources catchment [19]. Ships operating *cantrang* originally generally sized below 10 GT, the current condition has grown to a size of more than 50 GT. *Cantrang* fishing gear in Mayangan Port itself was generally operated with an average ship size of 23 GT. *Cantrang* catches generally type of fish

that are relatively small in size. Junus *et al.* [20] explains that *cantrang* fishing gear is very effective for catching small sized demersal fish species.

The general description of the composition and number of catches of *Cantrang* fishing gear in Mayangan Coastal Port, Probolinggo for 7 years shows that although *cantrang* usage activities decreased significantly, however, the catches of *cantrang* in Mayangan Coastal Port were still quite high compared to other regions. As a comparison at Tegalsari Tegal Port, the *cantrang* catches were only around 27.3 tons/ship [21]. This relatively high amount of catches were in line with the total bycatch produced, including sharks

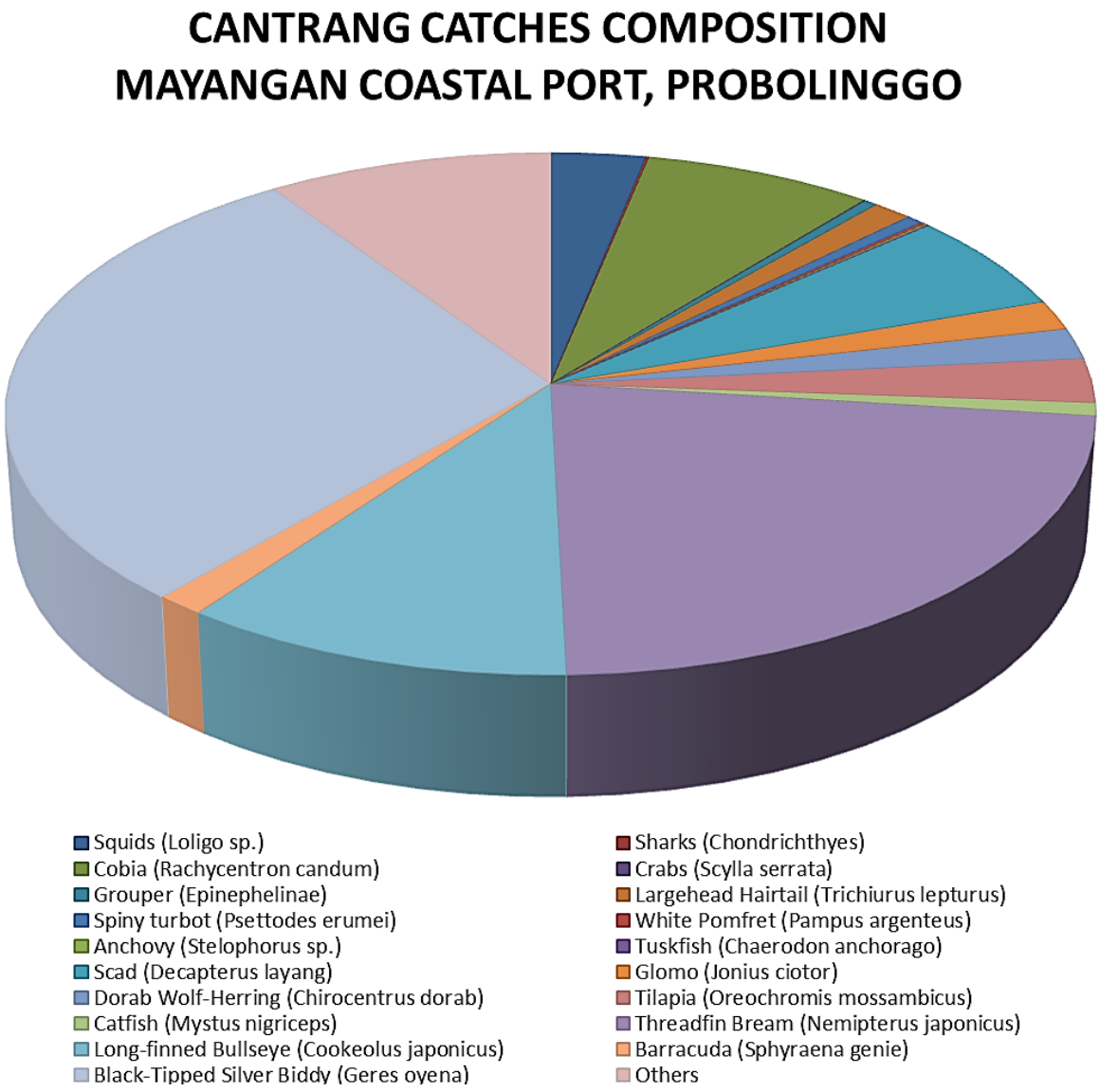

Figure 1. Composition of *Cantrang*Catches in the Mayangan Coastal Port as per September 2019

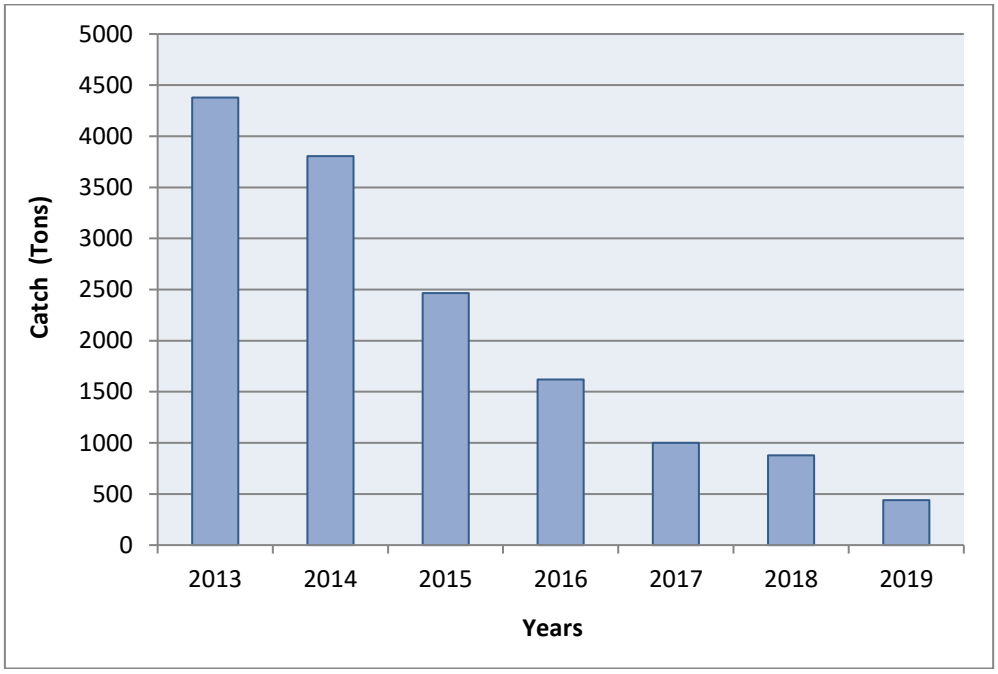

Figure 2. Total *Cantrang* Catches in 2013 – 2019

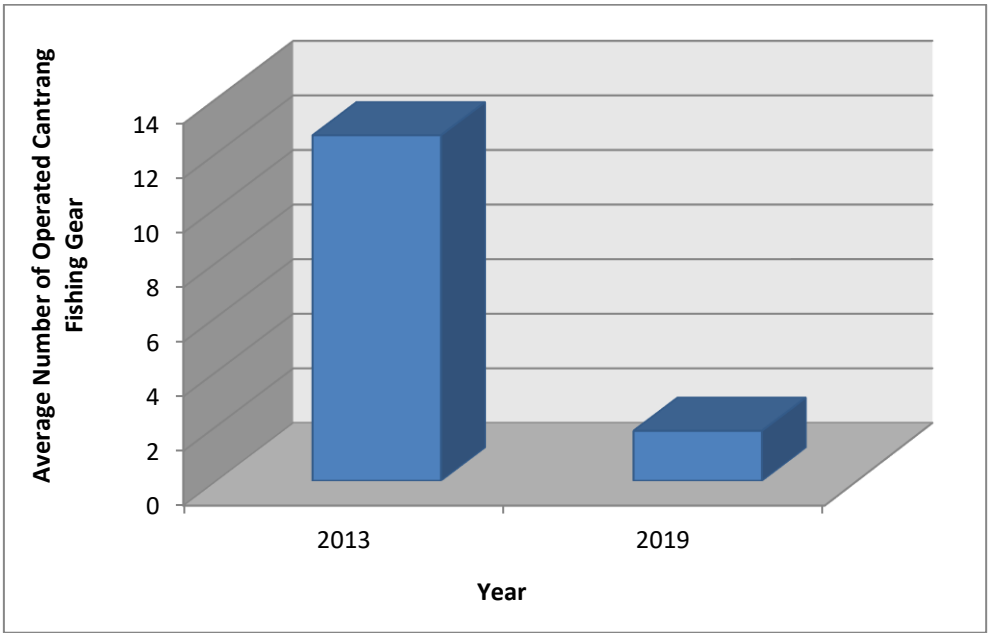

Figure 3. Average Number of *Cantrang* Fishing Devices Operating in PPP Mayangan

3. 2. Sharks Catch Volume

Sharks catching at Mayangan Port Probolinggo especially from the use of *cantrang* fishing gear followed the trend of total fish production, which were experiencing a decrease

each year although there were a slight fluctuation. The biological of the group *characteristics elasmobranchii rendek* such as fecundity, slow growth with a long enough age and high risk of death at all age levels make it the group of fish that has the fastest risk of extinction compared to other groups [22].

The shark fishery has been practiced for years in Indonesia but this was only via the incidental catchment. These days, ufortunately the norm has gradually changed which was originally an incidental catch into an expected bycatch. Although most fishing activities do not catch sharks as their target, these commodities were an important component of their catch. This condition has increased the level of exploitation of shark resources in Indonesian waters [23].

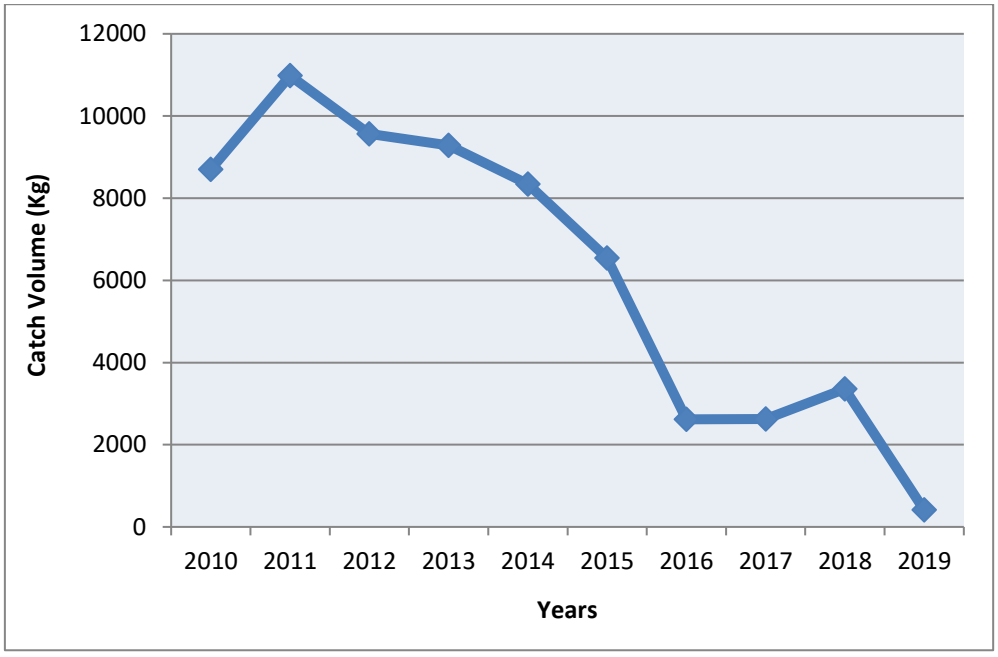

Figure 4. Number of Sharks Catched in Mayangan Coastal Port 2010 - 2019

Based on data obtained from the PPP management of Mayangan, the dynamic pattern of Sharks catchment during the past 10 years can be seen in Figure 4. The highest production was obtained in 2011 which was around 10980 kg or 10,98 tons while the lowest in 2019 that is equal to 412 kg or only 0,41 tons. It can be clearly seen that a significant decrease of 95% has occurred from 2010 to 2019. This is in line with the reduced use of *cantrang* due to the implementation of the Law on the use of *cantrang*.

The total catch of Elasmobranchii fishes in Indonesia reached 121,750 tons in 2004, which consisted of 59,230 tons of sharks (Shark) and 62,520 tons of rays (Elamobranchii). On average, the annual catch for sharks (Shark) has decreased by 0.96%, but there has been an increase in the catch for rays (Elamobranchii) on average 6.94% annually [24]. More exploitation is believed to have occurred in some territorial waters in Asian countries. The South China Sea Region and several territorial waters in Indonesia have a relative production index for Elasmobranchii fishes above 10, which indicates highly exploited conditions or in other words overexploitation [25].

Based on IUCN data, overall chondrichthyans are the lowest group amongst other vertebrate in terms of total number associated with Least Concern (LC) status, around 23,2% [26]. The rest were attributed to threatened (17,4%), Critically Endangered (2.4%), Endangered (4.1%), and Vulnerable (10.9%) [27]. Several types of pelagic sharks that are threatened include: great whale shark, blue shark, long fin mako, short fin mako, basking shark, whale shark, tiger shark, and thresher shark. Almost all of these species can be found in Indonesia. *Cantrang* is a fishing gear that operates in the bottom waters so that most of the sharks caught by *cantrang* in PPP mayangan are relatively small species of sharks that live on the bottom of the waters such as from the Squalidae, Hexanchidae, Centrophoridae, and juvenile sharks from the Carcharhinidae tribe. The development of capture fisheries business, especially the increasing prospective shark fisheries in Indonesia, makes the value of production continue to increase from year to year. In 1987, shark fisheries production in Indonesia was recorded at 36,884 tons, then in 2000 the production increased to almost double, which amounted to 68,366 tons [28]. Even according to FAO data, Indonesia ranks as the country that catches the most sharks and rays every year [29]. FAO recorded shark catches of 109,489 tons per year where this amount is the largest catch reported to the FAO and constitutes 13% of the total world catch in the period 2000-2010 [7, 30, 31].

4. CONCLUSIONS

Based on the results of the research that has been done, it can be concluded that the use of *cantrang* fishing gear in the Mayangan Coastal Port Probolinggo has produced around 6242.9 kg of shark production each year for the past 10 years. The highest production was found in 2011 which reached 10980 kg while the lowest was in 2019 with a total production of 412 kg. The pattern of development of shark catches in the Mayangan Coastal Port Probolinggo shows a decrease in the number of catches suspected to be strong as a result of reduced use of *cantrang* fishing gear as a result of the enactment of a law restricting the use of *cantrang* fishing gear by the ministry of maritime affairs and fisheries.

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