



## **Typology of Skipjack (*Katsuwonus pelamis*) Fisheries at Nizam Zachman Oceanic Fishing Port, Jakarta, Indonesia**

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### **Authors' contributions**

*This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.*

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### **ABSTRACT**

This study aims to analyze the aspects of technical, social, and economic typologies of skipjack fisheries at Nizam Zachman oceanic fishing port, Jakarta. This research expected to provide information for decision-making in formulating policies in skipjack fisheries activities, thus they remain sustainable—this research conducted at Nizam Zachman oceanic fishing port, Jakarta from August 2019 to February 2020. The method used in this research is the survey method by interviewing the respondent through questionnaires for 100 respondents. The sampling method was done randomly, and the data were analyzed by descriptive qualitative. The social typology shows the orientation of Nizam Zachman as an industrial ocean fishing port is for commercial purposes. The main productive age level of fishers ranges from 35-39 years (33%) and the last education is a primary school (46%). Regarding the work experience, 38% had been fisher between 16-20 years. The technical typology shows the fishing gear that operated to catch skipjack at Nizam Zachman are purse seine, longline, also carrier vessel. In general, 74% of the size fleets were in 100-200 GT and the length of trips in 1-2 months (48%). The fishing ground area is in 572, 711 and 712 FMA. The economic typology shows skipjack production/trip by purse seine was 54%, longline (1%) and carrier vessel (57%).

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## 1. INTRODUCTION

Indonesia is an archipelago country that has enormous potential for fisheries and marine resources. The catch fisheries resources based on maximum sustainable yield (MSY) in 2017 was estimated at 12,54 million tons per year, while that can be used (allowable catch) is 80% of MSY which is 10,03 million tons per year [1]. Indonesia has a central role in the global tuna fisheries sector [2]. Skipjack (*Katsuwonus pelamis*) is one of the fishery commodities in Indonesia, which has significant economic value [3]. The average contribution of skipjack tuna to the total production of Indonesian capture fisheries reaches 6.04%, and total global skipjack production reaches 12.8% in the period 2000-2016.

The fishing port plays a significant role in the fishing industry. It is the economic centre of fisheries and an essential component in fishing catch system [4]. They give vessels and crews access to essential service and supplies, also enable vessel operators to land their catch [5]. Nizam Zachman oceanic fishing port as the largest fishing port is prioritized to be a marketing centre for fishery product and fisheries industry. Fishery production, which landed at Nizam Zachman is allocated for local need supplies (DKI Jakarta) of 39,26%, inter-island distribution of 35,83% and export of 24,91%. Skipjack occupies the first position in the fish production in Nizam Zachman. The skipjack fishing industry in Nizam Zachman is a large scale industry that has a vital role in the Indonesian economy [6].

Fishery resource is a common property that leads to an open-access fishery [7]. The characteristics of public property and open access often involve some issues such as depletion, overfishing, and overcapacity in consequence of people competing to get as much fish as they can produce. Fisheries activities are complex economic and involve various input production. A large number of inputs production does not always increase the amount of fisheries production and rent, but also results in a decrease (depletion) of good quality and the supply of fisheries resources rest in the long term.

Fisheries data and information system plays a central role in management. It aimed at ensuring a correct balance between fishery resource conservation, and the economic benefits arising

from exploiting resources. The more complete and accurate data, thus the higher quality of the information system will be. Therefore, this research aims to see the typology of skipjack fisheries at Nizam Zachman ocean fishing port, Jakarta.

## 2. MATERIALS AND METHODS

### 2.1 Sites and Times

This research was conducted at Nizam Zachman ocean fishing port, Jakarta in August 2019 to February 2020. Data and information related to this research were collected through observation and interview with the fishers who catch skipjack.

### 2.2 Method Research

The method used in this research is the survey method by using questionnaires as an instrument for data collection. The purpose was to obtain information about the respondent that is considered to represent a particular population.

### 2.3 Data Collection Method

The method used in this research was conducted in threeway, that is an interview with questionnaires to fishers who catch skipjack, direct observation and study of literature.

### 2.4 Respondent's Data Collection Techniques

This research settled by using accidental sampling. Accidental sampling is taking respondents as a sample based on coincidence, i.e. anyone who accidentally meets a researcher and can be used as a sample if the person found is suitable as a source of data [8]. Criteria for respondents to be interviewed and given questionnaires, respondents who catch skipjack and land in Nizam Zachman ocean fishing port.

### 2.5 Data Analysis

The analytical method used in this research is descriptive qualitative to determine the variables independently [8,9]. Data analysis is visualized by grouping and tabulating data based on variables. Analysis of social typology is based on the fisher's sociodemographic conditions like age level, education level, and level of experiences. Technical typology analysis was done by

grouping data based on fishing gear (purse seine, longline and carrier vessel), size of the vessel (50-100 GT, 100-200 GT, > 200 GT), several trips and the fishing ground area which used to catch skipjack. Then economics typology was done by formed on production and value production of skipjack.

### 3. RESULTS AND DISCUSSION

#### 3.1 Social Typology

Sociodemographic is an individual characteristic that shows the condition of the population in an area. Sociodemographic can be measured through several indicators like age level, education, and work experience. In general, the skipjack fishers live on a fleet and have no DKI Jakarta ID card. The percentage of whom do not have a Jakarta ID card was 97% while those with the card, 3% (Fig. 1). This study showed that the skipjack fisher was in the productive age (15-64 years). The majority of fishers interviewed in the age class 35-39 years (33%) (Fig. 2). Another study from different places shows the predominant of age level in Gampong pusong, Aceh in the age class 22-35 years (53,1%) [10]. The age levels can affect productivity. The fisher with productive age level has intense physical and energy. The differences in the age level of fishers in some areas can influence motivation. The fishers in the age of 30-44 years motivated to compete in fishing competitions, while in 45-59 years and ≥ 60 years were significantly more motivated to catch fish for food. It could happen as Nizam Zachman as the large-scale industry,

and the marketing activities are oriented to international, national, and local market demand.

The education level of the fisher is relatively low. A total of 46% of fisher interviewed passed the primary school, 28% passed junior high school, 15% have not education formal, and 11% passed senior high school (Fig. 3). The result of this study is the same as that of [11], the general level of education of fishers in Sukabumi, West Java were graduated from primary school (51%), also in Gampong pusong, Aceh where 87,5% of the fishers have no formal education [10]. According to the skipjack fisher, the level of education does not affect their activities as a fisher. They assume their job only relies on energy and physical strength. Their skills are acquired through experience, relatives, and also had guidance and training.

Level of experience is a determining factor in the success of fishing activities. The more extensive experience of fishing; thus, they will have expertise in this field [12]. The main of fishers have experiences in fishing during 16-20 years (38%) (Fig. 4). Only a small proportion of fishers have between 1-5 years (5%). Other studies in different places show that the general level experiences in East Pahuwato, North Sulawesi in between 11-20 years (53,95%) [13], in Gampong pusong, Aceh in a span of >4 years [10], and in Morodemak, Demak through 20-40 years [14]. Based on this condition, it can be stated that skipjack fisher in Nizam Zachman has long relied on the fisheries sector.

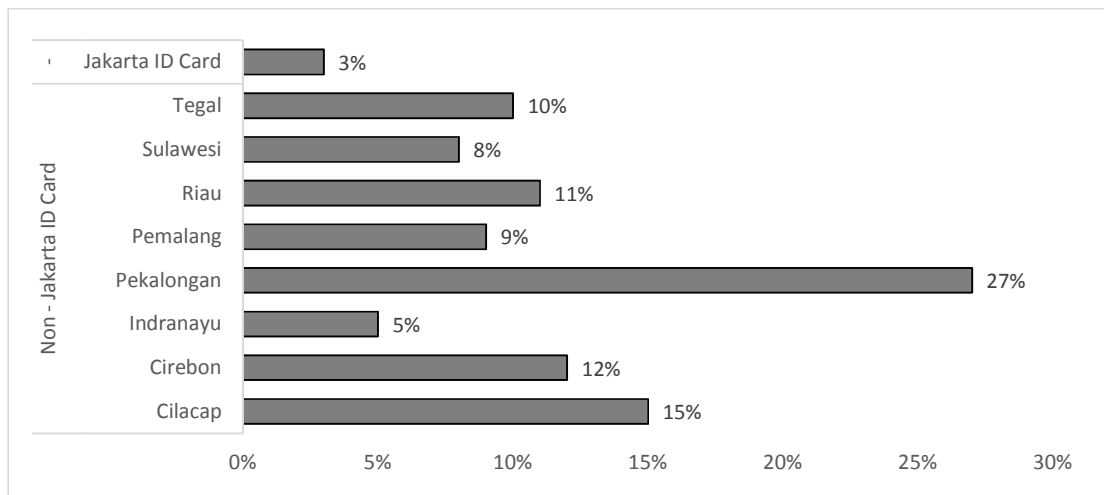
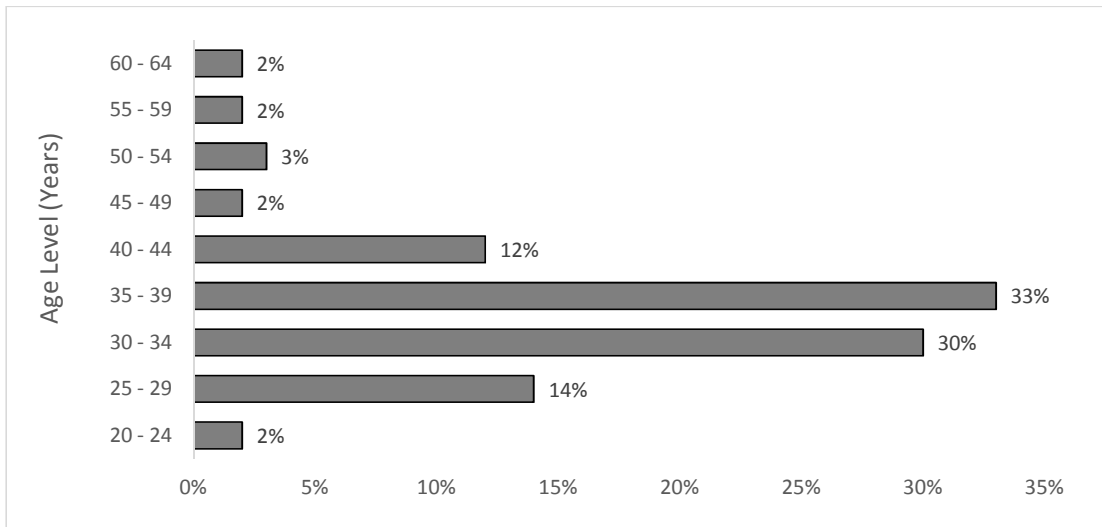
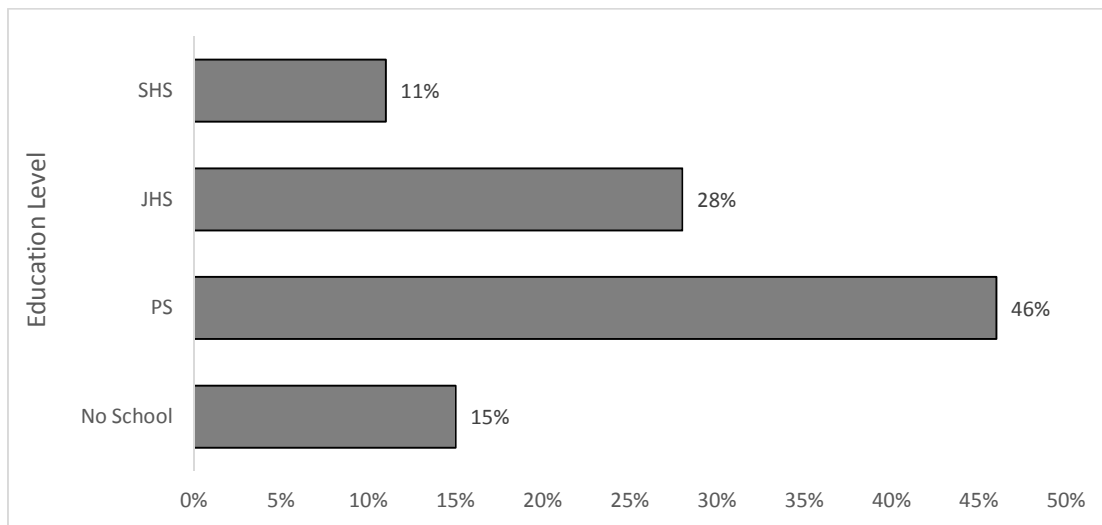


Fig. 1. Origin of skipjack fisher



**Fig. 2. Age level of skipjack fisher**



**Fig. 3. The education level of skipjack fisher**

Based on the ownership status of fishing gear, the fishers that found in the field are labour fishers. They do not own fishing gear and only contribute their strength in fishing activity. Generally, they are around 20 to 40 people per fleet which has a captain, navigation expert, chef, engineer and others who are working in a team. Based on the background of fishing activity, the fishers belong to the category of commercial fisher since the fish are distributed to several industries with local and international markets. Upon arrival at Nizam Zachman, loading and unloading activities are carried out between 3 to 7 days. Furthermore, based at the time spent in fishing, the fishers belong to the category of full-

time fisher as they have not side jobs. They said, working as a fisher is more profitable than farming, construction labourers, and factory workers.

### 3.2 Technical Typology

Fishing gear that usually operated to catch skipjack tuna is commonly purse seine, longline [15] also pole and line [16]. Based on fish production data at Nizam Zachman, the main fishing gear used in skipjack fishing is purse seine. Also, it obtained by carrier vessels and longline fishing gear despite in small amounts (Fig. 5). In 2009 – 2018, the number of vessels

by purse seine and carrier vessel were fluctuated, while longline decreased. The decrease of the number fishing fleet is indicated due to the banned of transshipment that began in December 2014. This condition also occurs in Bitung [17].

In general, the larger dimension of the fishing vessel will have an ability to carry a bigger net, and fishing aids, thus, the range of catching will

be more extensive [18]. The size fleet expresses in Gross tonnage (GT), is used for subdividing vessel type into classes. Based on Permen-KP No.36 2015, the size of fishing vessel divided into three types; they are a small scale (30-60 GT), medium-scale (60-200 GT), and large scale (>200 GT). According to that category, the vessels that catch skipjack is medium scales, where 74% of the total vessels were in 100-200 GT (Fig. 6). The category of size in a fishing

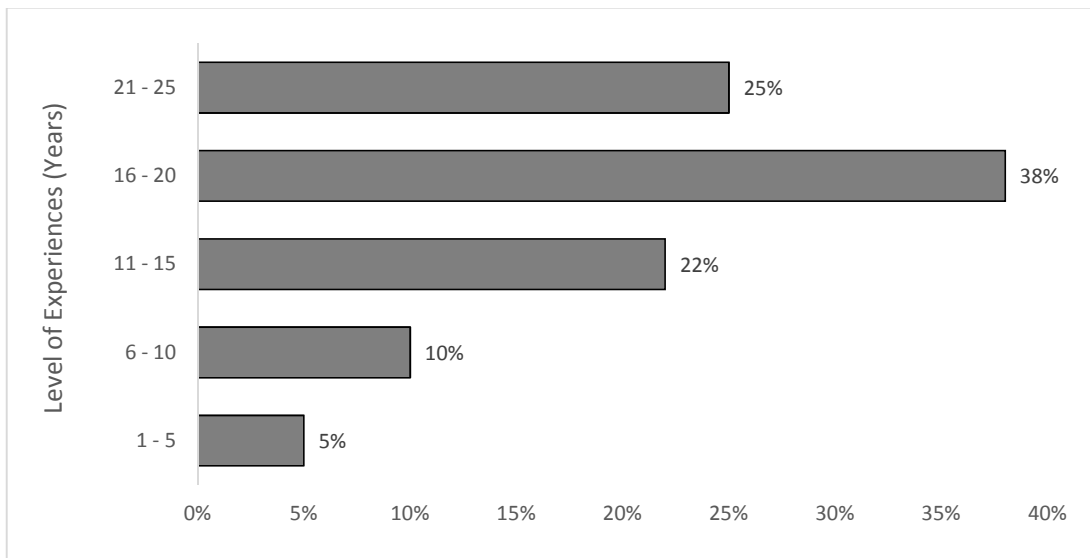


Fig. 4. Level of experiences of skipjack fisher

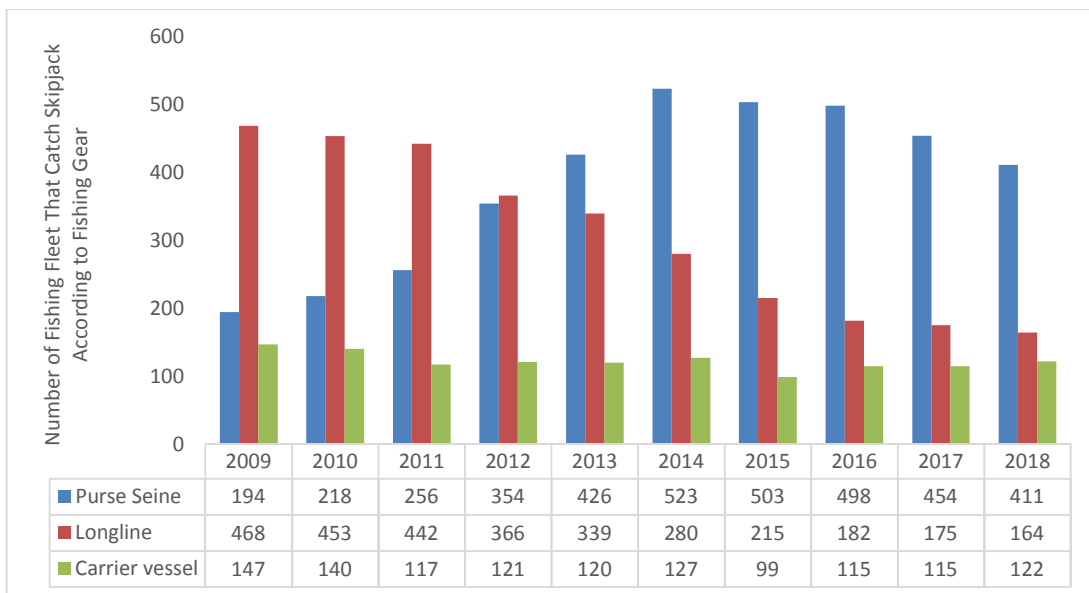
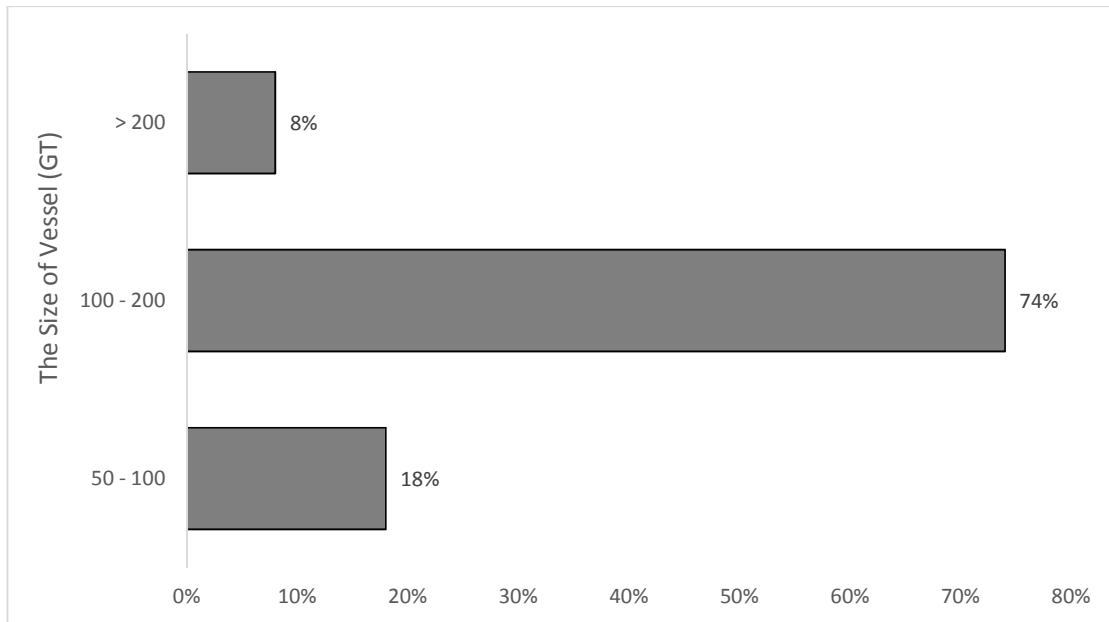
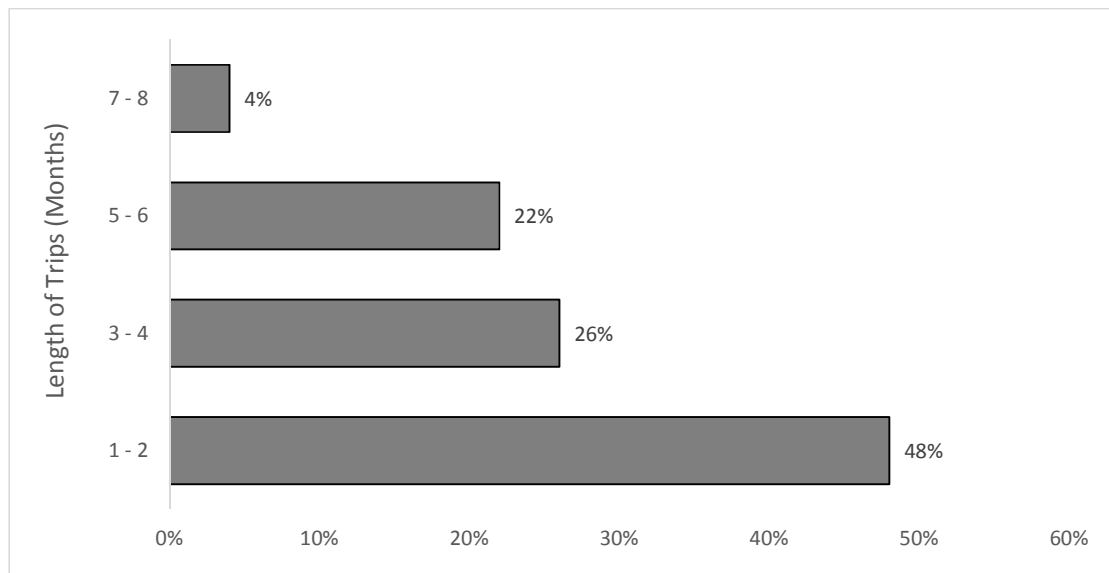


Fig. 5. Number of the fishing fleet that catches skipjack according to fishing gear



**Fig. 6. The size of the vessel**



**Fig. 7. Length of trips**

vessel also used to determine the permit in fishing operation A fishing trip is the length of time in fishing operation that counts since the vessel leaves the port to the fishing area, catches fish, and return to the port. In general, fishers (48%) have the length of the trip in between 1-2 months (Fig. 7). Then, 34% of them have several trips in between 5-6 times a year (Fig. 8). According to information on the field, before the

prohibition of transshipment, the vessel that using purse seine and longline fishing gear have a trip in 2 to 8 months. When the carrier vessel collects catches from fishing vessels in fishing ground, the fishing fleet receives additional supplies like fuel and foods. Thus they can extend the length of the trip. After a ban of transshipment, the fishing vessels have to reduce the number of trips in 2 to 4 months to ensure the freshness of fish.

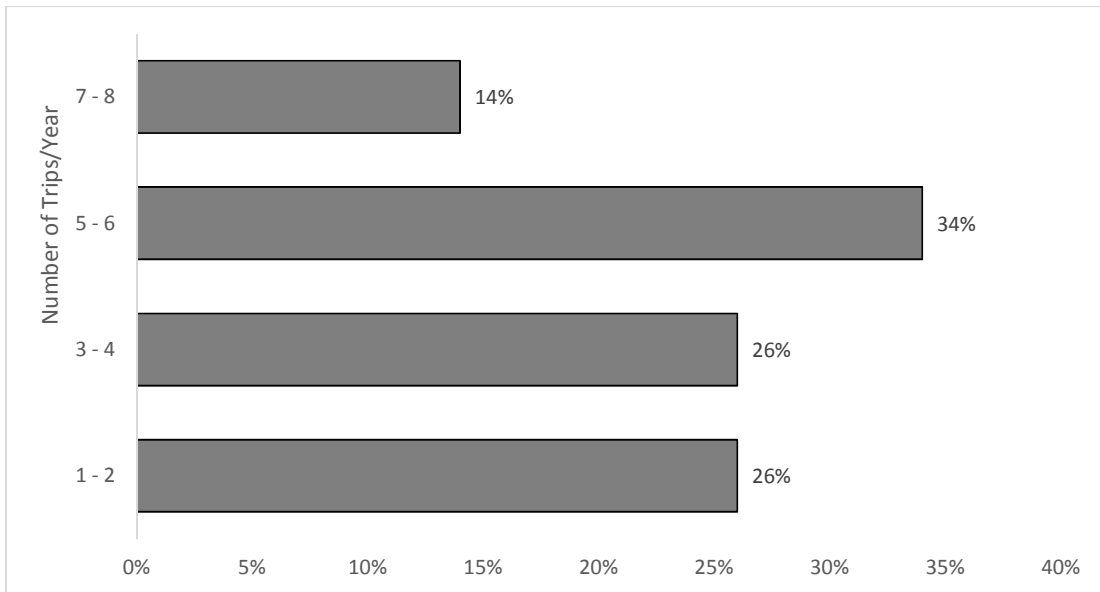


Fig. 8. Number of trips a year

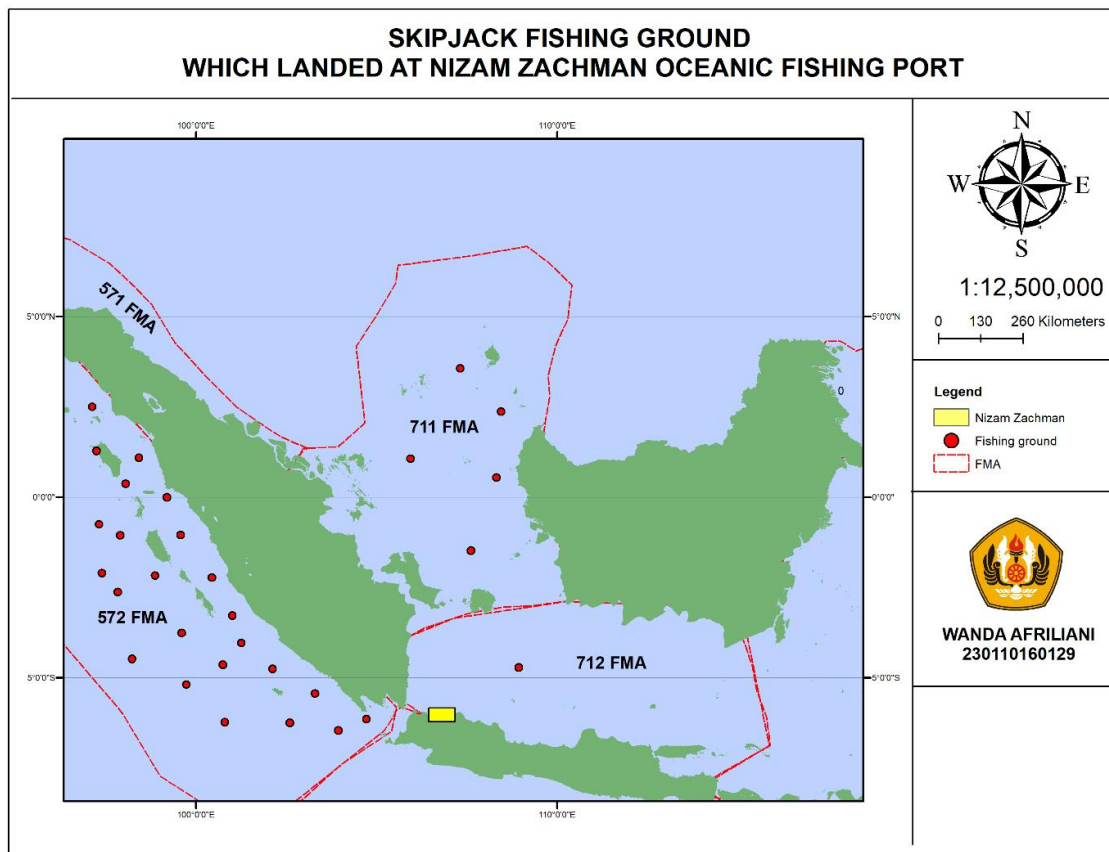
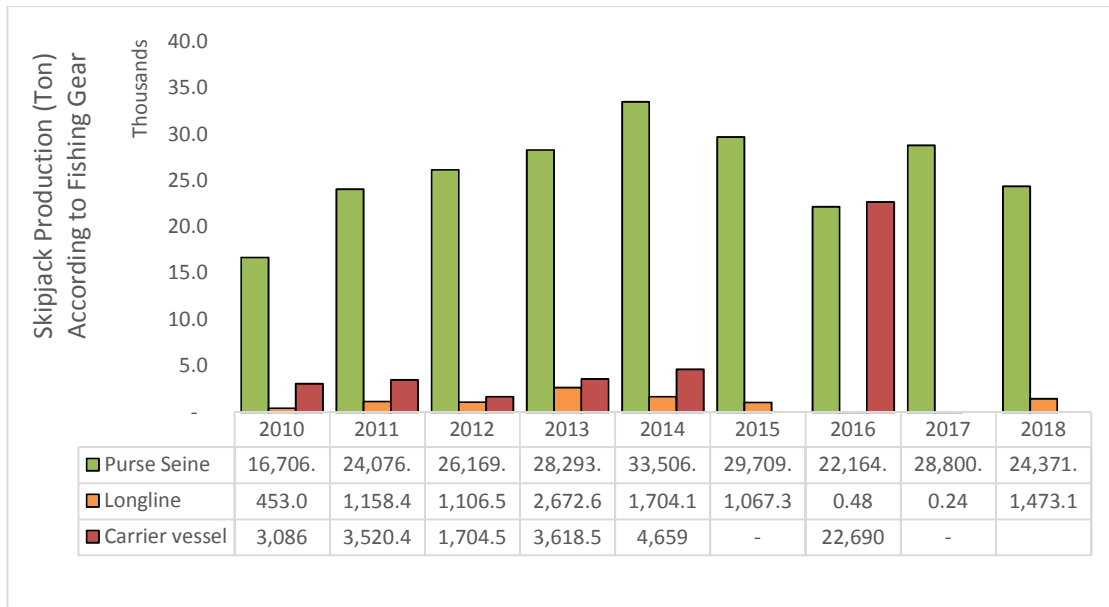


Fig. 9. Skipjack fishing ground area



**Fig. 10. Skipjack production according to fishing gear**

The skipjack fishing ground which landed at Nizam Zachman derives from line II and line III since the vessels were in 100-200 GT. The size of <30 GT can operate in line II (4-12 miles) and line III (>12 miles), while the size of >30 GT only allowed operating in line III. According to the information of fisher, the skipjack fishing ground is in 572, 711, and 712 Fisheries Management Area (FMA) (Fig. 9). The length of time to the fishing ground is about 5-10 days. The fishing vessel is given fishing ground area as much as one FMA or two adjoint FMA (572 and 573) either (716 and 717) or else in the high seas managed by RFMO, including the high seas of Indian and Pacific Oceans.

### 3.3 Economic Typology

Skipjack is one of the primary commodities which is landed in frozen form. It is distributed to both the local and international markets. The leading export destination is Japan. During 2010-2018, the skipjack production by purse seine, longline, and carrier vessel fluctuated. The highest production by purse seine was in 2014 (33,506 tons), longline in 2013 (2,672 tons), and carrier vessel in 2014 (4,659 tons) (Fig. 10). The lowest production by purse seine was in 2010 (16,706 tons), longline in 2012 (2,672 tons) and carrier vessel was in 2015, 2017, 2018 due to having no fishing operations. The decline of skipjack production that occurs after 2014 was the impact of transshipment ban. To avoid the collapse of the

capture fisheries industry, the Ministry of Maritime and Fisheries Affairs excreted a regulation and create the new concept of carrier vessel. The carrier vessel is carrying the fish through 2 or 3 catcher vessels that have been determined by its fishing ground area [19]. The scheme is port to port and different with transshipment. In the scheme of carrier vessel, there is a regulation about what fleet that allowed to carry the fish production [20]. Also, fishing vessels and carrier vessels have a cooperation agreement and do not to take IUU fishing actions. The permit of fishing operation revoked if rules are disobeyed.

The average skipjack production/trip by purse seine was 33,962,07 kg, longline 103.64 kg, and carrier vessel 60,822 kg (Fig. 11). The catch composition of different species in a trip based on fishing gear is shown for purse seine (Fig. 12), longline (Fig. 13) and carrier vessel (Fig. 14). The percentage of skipjack production/trip by purse seine is 54%, longline 1%, and carrier vessel 57%. According to the fisher, the main target of purse seine is skipjack, while the main target of longline is albacore, big eye, and yellowfin tuna. Hence, we can presume if purse seine is the main fishing gear to catch skipjack.

In contrast, skipjack was incidentally caught by longline. In the case of the carrier vessel, they relocate the fish to support fishing activity. They also have to transcribe the fish production from each fishing fleet and bring it to the fishing port.



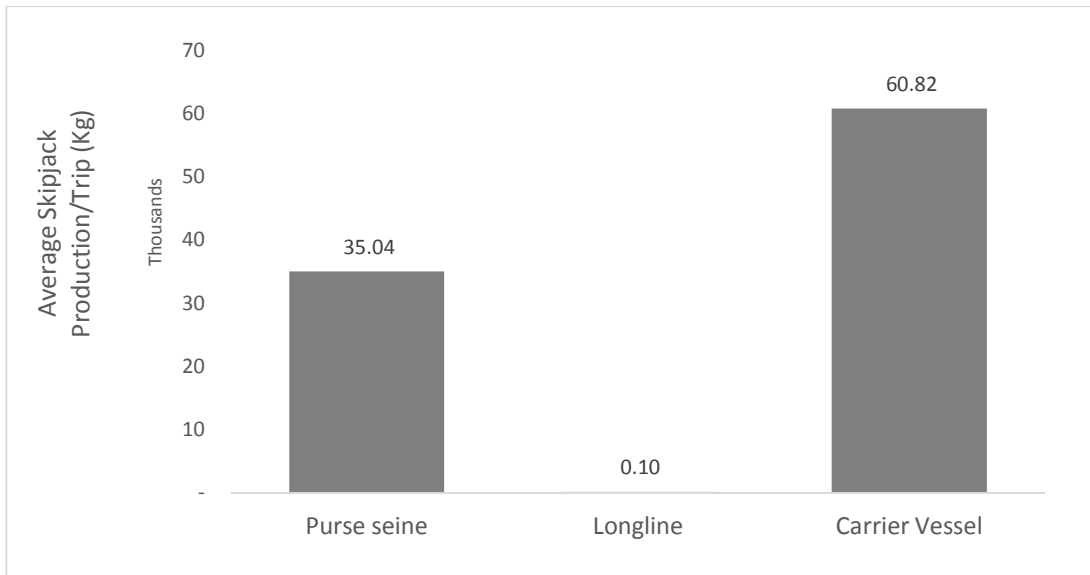


Fig. 11. Average skipjack production/trip

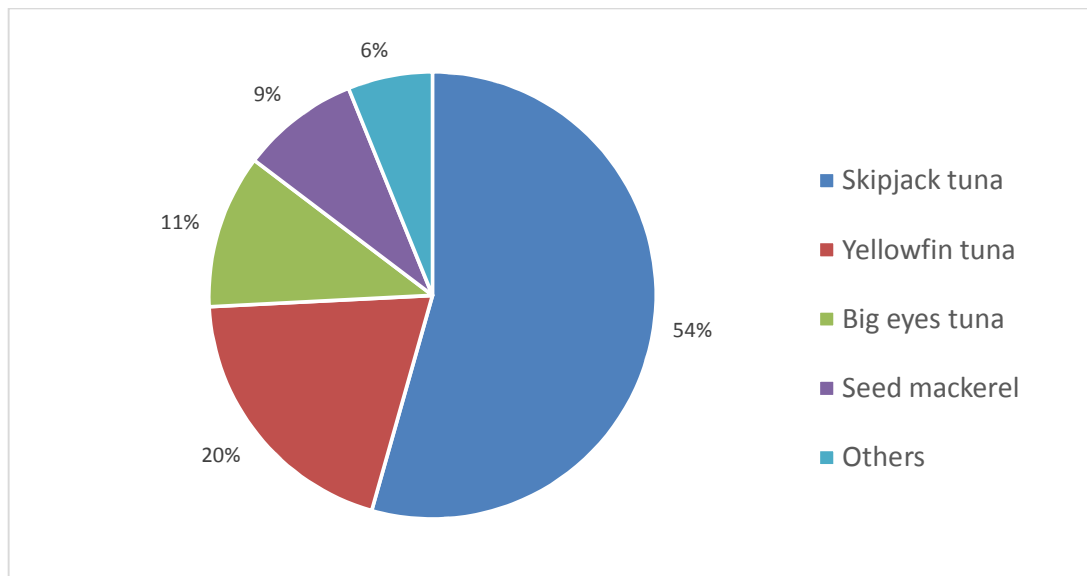
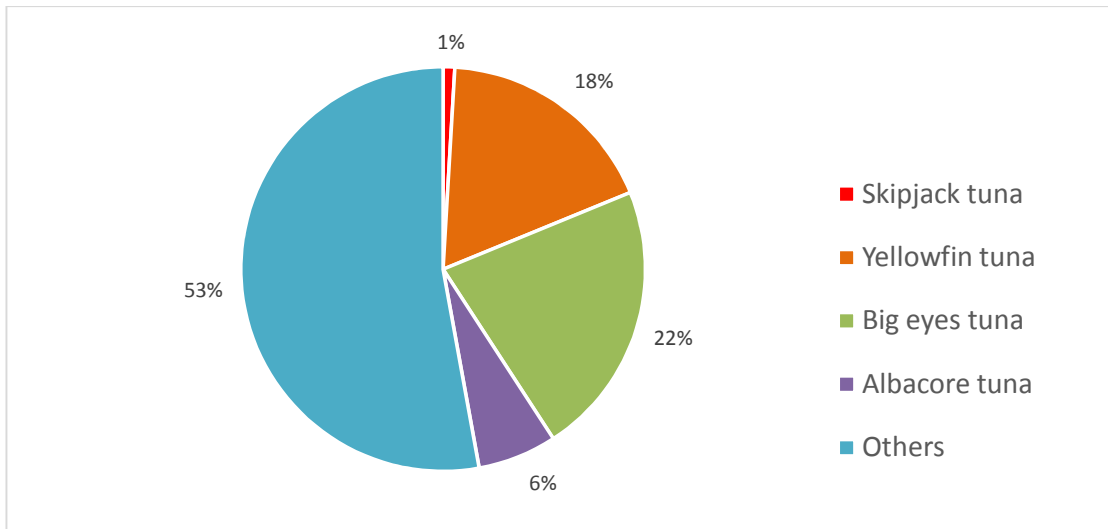


Fig. 12. Production/trip by purse seine fishing gear

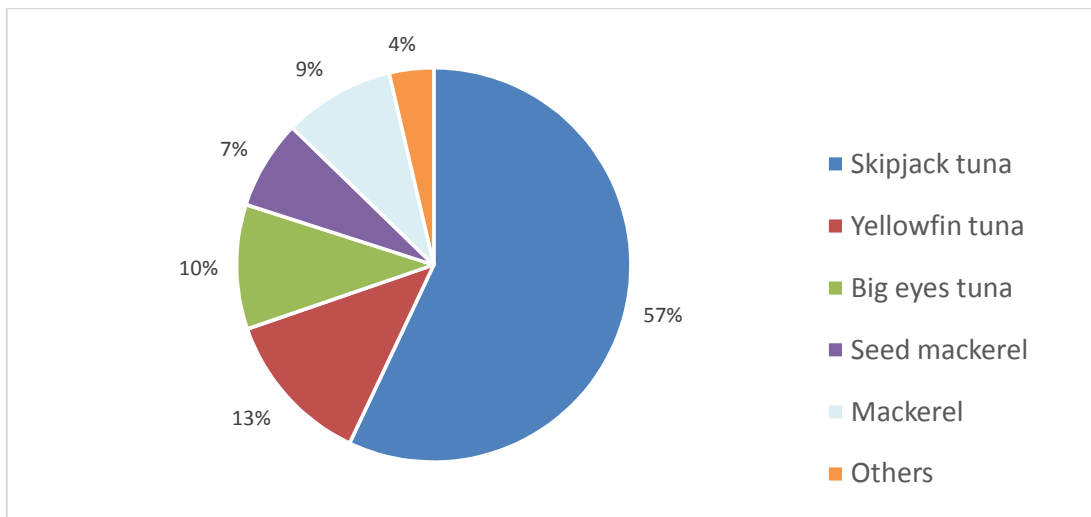
### 3.4 Fishermen's Perception of Skipjack Fishing Activities

As 88% of the total respondents that catch skipjack as the primary target. According to the fisher, skipjack is in demand by consumers and 87% stated that the price of skipjack fish is high. However, the price of skipjack is fluctuating, depending on the amount of catch obtained. If the catches obtained are

small, the selling price will be higher and vice versa. Based on the opinion of a fisher on purse seine fishing gear, they have adjusted the mesh size according to the rules, which are 2-4 inches and do not use destructive tools as an effort to participate in preserving skipjack. They also cannot operate without licensing such as SIPI (Fishing License) and SLO (Operational Worthiness) which must be renewed once a year.



**Fig. 13. Production trip by longline fishing gear**



**Fig. 14. Production/trip of carrier vessel**

The fishing activity in Nizam Zachman as the industrial fishing port [6] has intermediaries known as "*pengurus*" or "*calo*" to handle the fleet administration, repairing, and other things that support the fishing operation. *Calo* is similar to those who are known as brokers in other economic sectors [21]. The intermediaries also use in Benoa, Ambon, and Bitung [22]. Regarding administrative documents, according to them, it takes a long time and the process of licensing is considered complicated. The time needed for processing documents is around ten days, and for licensing, it is around 7-14 days. However, the length of time required to obtain a permit depends on the length of time the

document is complete. If the document is incomplete and incompatible, the file is returned to be completed again. Even though three months before the permit letter expires, the shipowner is obliged to extend the permit letter.

#### 4. CONCLUSION

Based on social typology, the majority of the productive age level of the fisher is 35-39 years (33%), and their last education in elementary school (46%). Generally, the work experience of the fisher is in 16-20 years (38%). The technical typology shows the fishing gear that used to catch skipjack at Nizam Zachman are purse

seine, longline tuna, and carrier vessel. The size of the vessels used ranges from 100 to 200 GT (74%), and the number of trips is 1-2 months (48%). The catching areas are located in 572, 711 and 712 FMA. The economic typology shows the skipjack fisher at the Nizam Zachman as the large scale, have orientation for commercial purposes. Percentage of skipjack production on purse seine fishing gear is 54%, longline, 1%, and carrier vessels, 57%.

Further information is needed regarding the licensing document requirements that must be completed. It can be done in the form of a checklist or illustrated images to facilitate understanding in completing the files that must be submitted. Then further research is needed on skipjack depletion to find out how the decline in the quality of skipjack sources from the current exploitation activities.

## CONSENT

As per international standard or university standard, respondents' written consent has been collected and preserved by the author(s).

## COMPETING INTERESTS

Authors have declared that no competing interests exist.

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