

Size Structure Of Skipjack (*Katsuwonus Pelamis*) Captured By Pole And Line Fishermen Inside And Outside Of Fish Aggregation

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Abstracts: Research on size structure of skipjack captured by pole and line fishermen inside and outside of fish aggregation device area has been done from January until June 2016 in Gulf of Bone waters. The objectives of research were to analysis of size structure, percentage of suitable length to catch, and yield composition of pole and line with FAD and without FAD. Size structure was analyzed by method of Bhattacharya, percentage of suitable length to catch by method of Mallawa, and catch composition by column diagram. The result showed that the size structure was different between skipjacks captured by pole and line with FAD and without FAD, where skipjack captured by pole and line with FAD dominated by small fishes while skipjack captured by pole and line without FAD dominated by large fishes, percentage of suitable length to catch of skipjack captured by pole and line without FAD was high than pole and line with FAD while both were still low, yields of pole and line with FAD and pole and line without FAD consist of skipjacks and yellow fin tuna where skipjack was dominant for all trip.

Index Terms : Skipjack, Yields, Pole and Line, Fish Aggregation Device, Bone Gulf waters

I. INTRODUCTION

1.1 Background.

The Gulf of Bone waters is part of Indonesian Fishery Area Management – 713 waters (WPP RI 713) has high potency of big pelagic fishes especially skipjack tuna. Mallawa *et.al* (2012) and Baso (2013) described that in the Gulf of Bone waters skipjack tuna can be caught by fishermen using kinds of fishing gears such as traditional seine net, purse seine, boat lift net and pole and line. Based on statistic data of Fishery Services of Luwu regency South Sulawesi 2016 [2] showed that large portion of annual production of skipjack was yield capture of pole and line either by pole and line operated in fish aggregation device area or outside of fish aggregation area. The field observations showed that in the waters of Gulf of Bone size structure of skipjack be captured by pole and line using fish aggregation device and without fish aggregation device was different (Mallawa *et al* (2012)[13,14] Utilisation of fish aggregation device on skipjack fishery in Pacific Ocean increasing number of small skipjack in yield Broomhead *et al* (2003)[3] and WCPFC (2009)[23]. The same phenomenom found in tropical part of South Pacific Ocean (Univ.of Hawai 2009)[22] .Dempster and Taquet (2004 and 2005)[6,7] and Davies *et.al* (2014)[5] explained that in one side the utilisation of fish aggregation device in kinds of fishing technology can increase productivity but other side it can provoke ecological problems.

1.2 Research Objectives

The objectives of the research were (1) to analyze size structure between skipjack caught by pole and line with FAD and without FAD, (2) to compare percentage of catch suitable length between skipjack caught by pole and line in FAD area and outside FAD area, (3) to know ratio skipjack – yellowfin tuna both in pole and line with FAD and without FAD.

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2. METHODS

2.1 Time and Place.

The research was conducted for six months, from January until June 2016 in Luwu waters Gulf of Bone South Sulawesi, Indonesia (Figure 1)



Figure 1. Location of research [1]

2.2 Collect of Data

Data about fork length of skipjack have been collected by researcher directly on the board during fishing operation and at fishing base. In this research about 3,350 fish captured by pole and with fish aggregation device and 3,500 fish captured by pole and line without fish aggregation device were measured. It is also observed ratio skipjack – yellowfin tuna and number of fish captured per trip.

2.3 DataAnalysis

Size structure has bees analyzed by column diagram or histogram and Bhattacharya method (Sparre *et.al.*, 1989)[21]. Size structure comparative between skipjack captured by pole and line with FAD and without FAD used t-Student test. Percentage of Catch Suitable Length by method of Mallawa (Mallawa *et.al*, 2012)[13] as following equation,

$$\% \text{ of Lsc} = (n \text{ Lsc}/N) \times 100 \%,$$

Where

n is number of fish of CSL

N is total fish in capture

Lsc is length of first spawning of fish. Length of first spawning of skipjack was determined by point of view histology. In this research length of first spawning was fish more than 55 cm of length (FL). Yield composition or ratio skipjack and tuna in captured were analyzed descriptively and show on pie diagram. Amount of yield was expounded in number of fish per trip where trip of pole and line with FAD and without FAD was daily trip.

3. RESULT AND DISCUSSION.

3.1 Size structure of skipjack.

3.1.1 Skipjack caught by pole and line inside of fish aggregation device area.

Result of measuring showed that skipjack captured was not varie monthly. Skipjacks captured by fishermen using pole and line with fish aggregation device in January showed that the smallest size, biggest size and average length were 26.1 cm FL, 41.0 cm FL and, 33.9 cm FL respectively. In February the smallest fish, biggest fish and, average length were 27.2 cm FL, 38.9 cm FL and 33.9 cm FL respectively. In March the smallest fish, biggest fish and, average length were 27.3 cm FL, 39.9 cm FL and 34.9 cm FL respectively. In April the smallest fish, biggest fish and average length were 26.0 cm FL, 40.2 cm FL and 34.1 cm FL respectively. In May, the smallest fish, biggest fish and, average length were 28.0 cm FL, 39.0 cm FL and 34.6 cm FL respectively. In June, the smallest fish, biggest fish and, average length were 35.0 cm FL, 38.0 cm FL dan 35.92 cm FL respectively. Among skipjack it is also found the small size yellow fin tuna (*Thunnus albacores*). In January, the smallest size, biggest size and average length of yellow fin tuna were 26.1 cm FL, 41.0 cm FL and, 33.9 cm FL respectively. In February the smallest fish, biggest fish and, average length were 27.2 cm FL, 38.9 cm FL and 33.9 cm FL respectively. In March the smallest fish, biggest fish and, average length were 27.3 cm FL, 39.9 cm FL and 34.9 cm FL respectively. In April the smallest fish, biggest fish and average length were 26.0 cm FL, 40.2 cm FL and 34.1 cm FL respectively. In May the smallest fish, biggest fish and, average length were 36.0 cm FL, 38.0 cm FL and 36.16 cm FL respectively. In June the smallest fish, biggest and average length of yellow fin tuna were 35.0 cm FL, 40 cm FL and 36.8 cm FL respectively. Based on total data of fishes measured that the smallest fish, biggest fish and average length of skipjack captured by pole and line at fish aggregation device area were 26.0 cm FL, 40.1 FL and 34.87 cm FL respectively, and the smallest fish, biggest fish and average length of yellow fin tuna captured at fish aggregation device area were 34 cm FL, 38 cm FL and 36.25 cm FL respectively. Mallawa *et.al.*, (2012)[11,13] reported that at Gulf Bone waters in East season skipjack captured by pole and line fishermen in fish aggregation area had length range about 29.0 – 68.9 cm FL, the average length about 46.37 cm FL, and dominant length was in 45.0 – 50.0 cm FL. Mallawa *et.al* (2012)[14] described that skipjack caught by pole and line fishermen in fish aggregation device at Gulf of Bone waters had a length

range about 30.2 - 69.2 cm FL, average length about 50.0 cm FL and dominant length was 50.2 – 52.2 cm FL.

3.1.2. Skipjack captured by pole and line outside of fish aggregation device area.

Based on length data of skipjack captured by pole and line fishermen out side of fish aggregation device area that in April the smallest, the biggest and, average length of skipjack were 50 cm FL, 67 cm FL and 56,9 cm FL respectively. In May the smallest, the biggest and average length of skipjack were 49.3 cm FL, 67.3 cm FL and 55.9 cm FL respectively. In June the smallest, the biggest and the average length of fish were 48 .9 cm FL, 68.1 cm FL and 55.9 cm FL. respectively. Mallawa *et.al.*, (2012) described that skipjack caught by pole and line fishermen out side of fish aggregation device area had length range of 39,8 – 68,5 cm FL, average length of 58.7 cm FL and dominant length of 60 – 65 cm FL. Baso (2013) reported that skipjsck caught by pole and line fishermen out side of fish anngregation device area in East season had a length range, average length and, dominant length about 39.0 – 69.0 cm FL, 53.47 cm FL and 47.0 – 55.0 cm FL respectively. Among skipjack the fishermen also caught small yellow fin tuna. In the April, it is found that the smallest, biggest and, average length of yellow fin tuna were 50.0 cm FL, 90.0 cm FL dan 59.1 cm FL respectively, in May the smallest, biggest and, average length of yellow fin tuna were 50.0 cm FL, 89.5 cm FL dan 60.8 cm FL respectively, and in June the smallest, biggest and average length were 50.0 cm FL, 87.9 cm FL dan 59.8 cm FL respectively. Based on total sample that skipjack captured by pole and line fishermen outside of fish anngregation device area has length range of 48.9 – 67.3 cm FL and average length of 56.23 cm FL and yellow fin tuna has length range of 50.0 – 90.0 cm FL and average length of 59.9 cm FL.

3.1.3.The comparison of Size Structure.

Comparison of size structure of skipjack capured by pole and line fishermen inside and outside of fish aggregation device area showed in Figure 2 and Figure 3. Based on Figure 2 and Figure 3 that size structure of skipjack caught inside and aoutside of fish aggregation device area was different where skipjacks caught inside fish aggregation device area dominated by young fishes and pre adult fishes (24 – 42 cm of length) while skipjack caught outside of fish aggregation device area dominated by pre adult fishes and adult fishes (48.9 – 67.3 cm of length). Mallawa *et .al.*, (2012) reported that size structure of skipjack captured in fish aggregation device area by pole and line fishermen in East Season (June until September) dominated by small skipjacks. Mallawa *et.al.*, (2014)[17] reported that at Makassar Strait waters, the skipjacks captured by kinds of fishing gears inside of fish aggregation device area were dominated by young fishes and had a size more smallest than skipjack captured outside of fish aggregation device area. Hallier and Gartner (2008)[9] explained that at West Pacific waters use of fish aggregation decice in skipjack and tuna fishing caused the catch was dominated by small skipjack and small tuna. Koya *et.al.*, (2012)[10] described that an Indian Ocean waters the wassize structure of catch of skipjacks captured inside of fish aggregation device area was dominated by small size of fishes or young skipjacks.

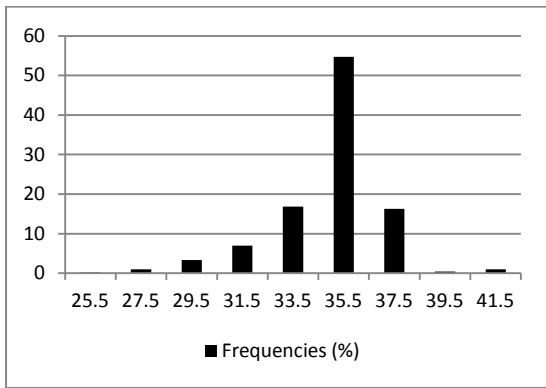


Figure 2. Size structure of skipjack caught by pole and line inside of FAD

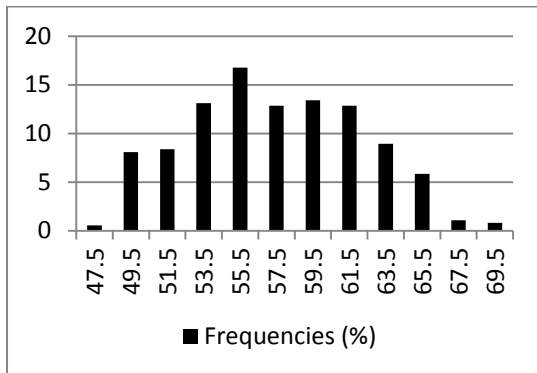


Figure 3. Size structure of skipjack caught by pole and line outside of FAD

3.2. Percentage of Catch Suitable Length 3.2.1 Skipjacks Caught Inside of Fish Aggregation Device Area.

Analysis result showed that from January until June percentage of suitable length to catch of skipjacks caught by pole and line fishermen inside of fish aggregation device area was very low, about 0.0 – 0.25 % of total catch as shown in Figure 4.

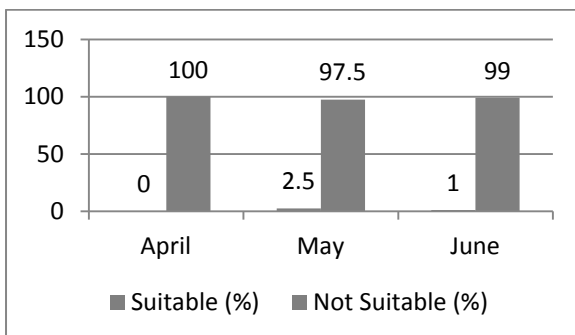


Figure 4. Percentage of catch suitable length of skipjacks caught inside of fish aggregation device area

3.2.1 Skipjacks Caught Outside Of Fish Aggregation Device Area.

Analysis of fishermen catch result showed that range percentage of suitable length to catch of skipjacks caught by pole and line in outside of fish aggregation device area

period of April until June about 25.30 % - 32.5 % as shown in Figure 5.

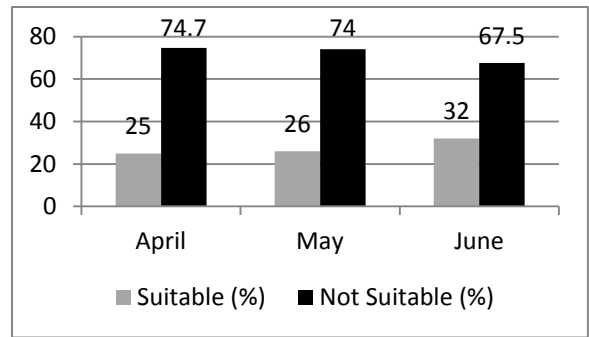


Figure 5. Percentage of catch suitable length of the

skipjacks caught outside of fish aggregation device area. Mallawa *et.al.*, (2012and 2013)[[11][15] reported that at Gulf of Bone waters percentages of catch suitable length of skipjacks captured inside and outside of fish aggregation device area in West to East season were about 21.0 % and 51.0 % respectively, in East season were 28.0 % and 52.0 % respectively, in East to West season about 20.89 % and 51.9 % respectively. Mallawa *et .al* (2014)[[17] described that at Makassar Strait waters percentages of suitable length to catch of skipjack captured by pole and line fishermen inside and outside of fish aggregation device were 8.76 % and 35.0 % respectively. Phenomenon low of percentage of suitable length to catch of skipjacks caught inside of fish aggregation device area be caused by firstly, that skipjacks had a behavior school in floating object in the sea, secondly, skipjacks had behavior on shore and off shore migration or size dependant migration, thirdly, fishermen placed their fish aggregation fish device in shallow waters Mallawa *et al.*, (2016)[[18] explained that skipjacks used Gulf of Bone waters as a feeding ground or nursery ground, stayed there until 3 – 4 years old and then migrated to spawning ground. Coan (2000)[4] described that skipjacks found in East Pacific Ocean has 31 – 64 cm of length.

3.4. Catctth Composition

3.4.1 Catctth Composition of pole and line operated inside of fish aggregation device.

Observation result on catch of pole and line fished inside of fish aggregation device area showed that the ratio of skipjacks and yellowfin tuna was different according to the months as show in Figure 6.

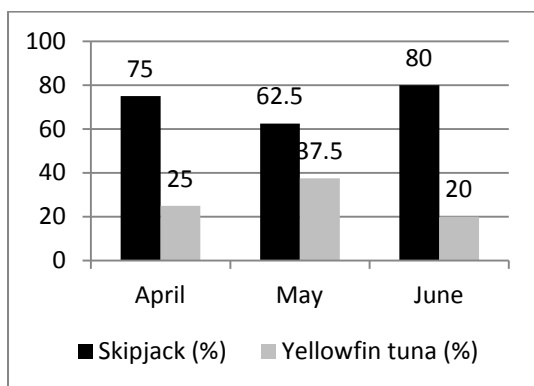


Figure 6. Catch composition of pole and line fished inside FAD area.

Based on Figure 6 we can explain that ratio of skipjacks and yellowfin tuna in catch of pole and line operated by fishermen inside of fish aggregation device area has been varied according to the months. In April the catch consist of 75.0 % of skipjacks and 25.0 % of yellowfin tuna, in May 62.5 % of skipjacks and 37.5 % of yellowfin tuna and, in June 80.0 % of skipjacks and 20.0 % of yellowfin tuna. Totally, portion of skipjacks in catch of pole and line operated outside fish aggregation device had a range 62.5 – 80.0 % and. average was 72.5 %.while yellowfin tuna 20.0 – 37.5 % of catch and average was 32.6 %. It was also reported that purse seine operated inside of fish aggregation device area at tropical Pacific Ocean, among skipjacks also found small tuna [22 and 23]. Girard *et.al.*, (2004)[8] reported that yellowfin tuna had a specific movement around floating objects or fish aggregation device in the sea.

3.4.2 Catch composition of pole and line operated outside of fish aggregation device area.

In pole and line operated outside of fish aggregation device among skipjack as main target fish, yellowfin tuna also found in catch. The ratio of skipjack and yellowfin tuna varied according to months as shown in Figure 7.

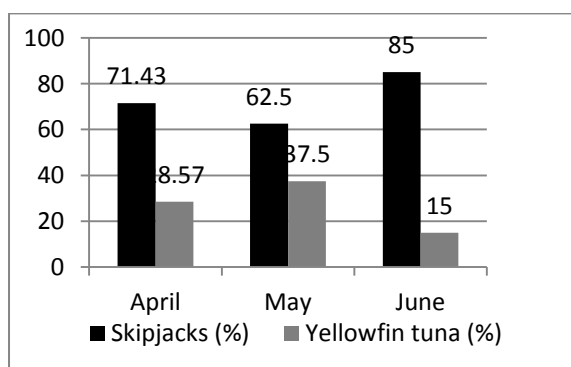


Figure 7. Catch composition of pole and line fished outside of FAD area

Data in Figure 7 explained that portion of skipjacks in catch of pole and line fished outside of fish aggregation device area was 62.5 until 85.0 % of total catch and average was 73.33 % of total catch, and yellowfin tuna was 15.0 – 37.5 %, and average was 26.67 %. Mallawa *et al.*, (2012)[12]

reported that in East season pole and line operated outside of fish aggregation device area caught not only skipjacks but also yellowfin tuna.

IV. CONCLUSION

Size structure of skipjack caught by pole and line operated with fish aggregation device was different with skipjack caught by pole and line without fish aggregation device where skipjack captured by pole and line with FAD was dominated by small size while skipjack captured by pole and line without FAD was dominated by large size, percentage of catch suitable length of skipjack caught by pole and line without fish aggregation device was high relatively than skipjack caught by pole and line with fish aggregation device while both were categorized still low, appearance of yellowfin tuna in pole and line with or without fish aggregation device while skipjack tuna was dominant for all trip, catch per trip of pole and line with FAD was high than pole and line without FAD.

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