Journal of Coastal and Ocean Sciences *e-issn: 2746-4512*
Volume 4 No. 1, January 2023: 25-30 *p-issn: 2745-4355*

Estimation Fishing Season of Skipjack Tuna (*Katsuwonus pelamis*) Using Data on Catch Production at Kutaraja Oceanic Fishing Port Aceh Province

Juniori Hulkman Hasugian[1*], Arthur Brown[1], Bustari[1]
[1]Department of Utilization of Fisheries Resources, Faculty of Fisheries and Marine, Universitas Riau
Kampus Bina Widya KM. 12,5 Simpang Baru, Kec. Tampan, Kota Pekanbaru 28293
Corresponding Author: junior.hulkman3537@student.unri.ac.id

Received: 10 December 2022; Accepted: 30 December 2022

ABSTRACT

Kutaraja Ocean Fishing Port (PPS) is a fishing port that has various catch characteristics; one of the most dominant catches is skipjack tuna. The purpose of this study was to analyze the skipjack tuna catches per unit fishing effort (CPUE) and to estimate the skipjack tuna fishing season index at the Ocean Fishery Port of Kutaraja. This research was conducted in October 2021 at the Kutaraja Ocean Fishing Port using the survey method. The results of the study showed that skipjack tuna catches at the Samudera Kutaraja Fishing Port in 2016-2020 experienced quite significant fluctuations. In addition, the fishing effort is quite high so the catch of skipjack per fishing effort (CPUE) for the 2016-2020 periods has decreased. The highest CPUE value was in September 2018, namely 7.163 kg/unit, and the lowest was in January 2016, namely 483 kg/unit. In this study, it can be assumed that the peak season for skipjack tuna occurs in May, July, August, September, and October. The moderate season for skipjack tuna occurs in January, February, March, June, November, and December.

Keywords: Fishing Season, Skipjack Tuna, Purse seine, Kutaraja Ocean Fishing Port

1. INTRODUCTION

Aceh Province is one of the islands that has the largest fishing center port (type A), namely the Kutaraja Ocean Fisheries Port (PPS) with very diverse catch characteristics (Salmarika *et al.,* 2019). Regarding fish catches, based on data obtained from the Kutaraja Ocean Fisheries Port Regional Task Force Unit (UPTD PPS) in 2018 there were several dominant types of fish in Kutaraja PPS including tuna, mackerel, skipjack tuna, and koheru.

According to data from UPTD PPS Kutaraja in 2020, as many as 531 units of ships are operating at PPS Kutaraja. Purse seine vessels are the most dominantly used vessels, reaching 326 units (61%). Followed by handline vessels with 195 units (37%) and gillnet vessels with 10 units (2%). Therefore, purse seine vessels are the most dominant vessels used in Kutaraja PPS and their main catch is skipjack tuna.

Skipjack tuna (*Katsuwonus pelamis*) was the most dominant fish landed, reaching 7,079.45 tons (48%). Followed by koheru (Decapterus) reaching 4,091.3 tons (28%), yellowfin tuna (*Thunnus albacares*) 2,257.14 tons (15%), bullet tuna (*Auxis rochei*) 742 .45 tons (5%), and frigate tuna (*Auxis thazard*) reached 632.27 tons (4%) (UPTD PPS Kutaraja, 2018). Based on the acquisition of fish catch production data from UPTD PPS Kutaraja, skipjack tuna is the most dominant fish caught so to maintain its sustainability, it is necessary to identify the seasonal pattern of distribution of fishing areas spatially and temporally so that the distribution pattern of skipjack tuna can be identified. By knowing the fishing season pattern, it is hoped that it can be used to determine the right time to carry out fishing operations

2. RESEARCH METHODS

Time and Place

This research was conducted in October 2021 at the Kutaraja Ocean Fishing Port, Banda Aceh City, and Aceh Province.

Methods

The research method used in this study was a survey method by making direct observations in the field, obtaining primary data and secondary data, and conducting interviews by preparing questionnaires to be asked to anglers and the management of the Kutaraja Ocean Fishing Port

Data Analysis

This study analyzes the data obtained and then tabulates it by recapitulating data on ship trips and catches for the last 5 years in 2016 – 2020. Descriptive analysis is statistics used to analyze data by describing or describing the data that has been collected as it is without intent to make blind conclusions that apply to the general public or generalizations. (Sugiyono & Arfani, 2014). The analysis carried out is:

Analysis of Catch per Unit Catch Effort (CPUE)

The equation used is based on Noija *et al*., (2014) namely:

$$CPUE=\frac{Catch}{effort}$$

Information:

$CPUE_t$ = catch per unit of fishing effort in year t

$Catch_t$ = catch in year t

$Effort_t$ = fishing effort in year t

Analysis of Catching Seasonal Patterns

Determination of fishing season patterns using time series analysis of monthly data on skipjack tuna catches for five years followed by moving average calculations. Determining the fishing season pattern using the moving average method has the advantage of being able to isolate seasonal fluctuations so that it can determine the right time to catch fish. According to Syahrir *et al.* (2010) in determining the value of the IMP, it uses monthly CPUE data for a certain period of time (minimum 5 years). If you have the IMP value, you can know the trend of the fishing season so that the right fishing time can be determined.

Fishing Fleet

Based on the logbook, the fishing fleet that catches skipjack tuna at the Ocean Fishery Port of Kutaraja is purse seine (ring seine). Purse seine until now, it is still the most productive small pelagic fishing gear. Purse seine vessels that land fish at the Kutaraja Ocean Fishery Port carry out fishing activities for 10-15 days. There are 326 purse seine vessels at the Kutaraja Ocean Fishing Port with different tonnage (GT). Ships with tonnage ≤ 50 GT totaled 232 units and ships with tonnage > 50 GT totaled 94 units. The catches of the purse seine vessels in the Kutaraja Ocean Fishery Port are skipjack tuna, frigate tuna, and tuna. The number of crew members on purse seine ships is 12-35 people. Purse seine vessels make arrests in WPPNRI 572 which covers the waters of Aceh and the Indian Ocean.

The catch of skipjack tuna operated by purse seine vessels varies each month. This is caused by several factors such as the size of the ship (GT), the number of ships in operation, the number of crew, and the number of trips carried out each month. The same thing was also expressed by Suryana *et al.* (2013) which states that the factors that influence catches are the length of vessel size (GT), the number of fleets, and fishing gear used.

The main catches of purse seine vessels are large pelagic fish such as skipjack tuna, frigate tuna, and tuna. This was also stated by Mirnawati (2019) who stated that the main catches of purse seines, in general, are schooling pelagic fish such as skipjack tuna (*Katsuwonus pelamis*), koheru (*Decapterus* sp), horse-eye jack (*Caranx* sp), sardinella (*Sardinella* sp), mackerel fish (*Rastrelliger* sp), frigate tuna (*Auxis thazard*), ray-finned fish (*Sardinella fibriata*), and baby tuna (*Euthynnus alletteratus*). The grouping of Purse Seine vessels based on ship size can be seen in Table 1.

3. RESULT AND DISCUSSION

Table 1. Classification of purse seine vessels based on ship GT.

No	GT Ship	Total Fleet	No	GT Ship	Total Fleet
1	5	4	31	38	3
2	6	55	32	39	2
3	7	10	33	40	6
4	8	2	34	41	1
5	9	5	35	42	2
6	10	3	36	43	1
7	11	1	37	44	2
8	12	8	38	45	5

9	13	7	39	46	2
10	14	3	40	47	1
11	15	4	41	48	6
12	16	7	42	49	2
13	17	7	43	51	5
14	18	8	44	52	4
15	19	5	45	53	3
16	20	5	46	54	5
17	21	1	47	55	12
18	22	4	48	56	5
19	23	1	49	57	12
20	24	5	50	58	8
21	25	2	51	59	25
22	28	1	52	60	18
23	29	7	53	76	2
24	30	12	54	77	2
25	32	2	55	80	1
26	33	4	56	90	1
27	34	6	57	98	1
28	35	4	58	110	1
29	36	2	59	120	1
30	37	4	60	131	1

Catch Yield per Skipjack Tuna Catching Effort

The data used in this study is logbook data for the Kutaraja Ocean Fishing Port in 2016-2020 according to Syahrir *et al.* (2010) in determining the value of IMP uses monthly CPUE data for a certain period of time (minimum 5 years).

From the logbook data, it is known that purse seine vessels catch skipjack tuna at the Kutaraja Ocean Fishing Port. The skipjack catch data is tabulated in graphical form, namely by month of each year so that it can be seen how the level of fluctuation increases or decreases in catches in certain months in the last 5 years and also as a basic reference in determining the fishing season index, the graph can be seen in Figure 1.

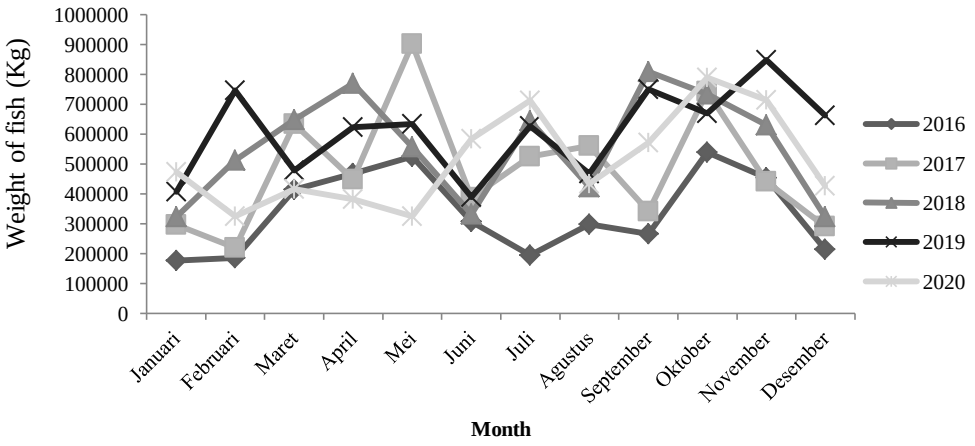

Figure 1. Graph of Skipjack tuna monthly catches

Figure 1 shows that the catch of skipjack tuna from 2016-2020 has fluctuated every month. The highest catch of skipjack tuna in the graph above was in May 2017, which was 901,236 kg, while the lowest catch was in January 2016, which was 176,372 kg. From the results of interviews, anglers at sea varied depending on the size of the ship used.

Figure 1 shows that the catch of skipjack tuna during 2016-2020 has fluctuated. March to May and September to November experienced an increase in catches. Whereas in June, July,

December to February the catch decreased. This is because March-April and September-November are fishing seasons, while June-July and December-February are not fishing seasons. Zulkarnain *in* Kekenusa (2012) stated that skipjack-fishing season generally occurs twice a year, peaking in March – April and October – November.

The number of purse seine vessels that catch skipjack tuna during 2016-2020. During the 5-year period, the number of purse seine vessels also fluctuated. From January to May, many purse seine vessels operate to catch fish. Meanwhile, from June to December, only a few purse seine vessels operate to catch fish. From the results of interviews with anglers, said that the factors that influence the number of vessels operating are due to weather factors such as high rainfall, the occurrence of a bright moon or damage to the ship's engine.

The skipjack fishing effort was carried out by using the variable number of vessels at the Kutaraja Ocean Fishing Port from logbook data which also experienced fluctuations every month from 2016-2020. Data on the number of skipjack fishing vessels are tabulated in graphical form, which can be seen in Figure 2.

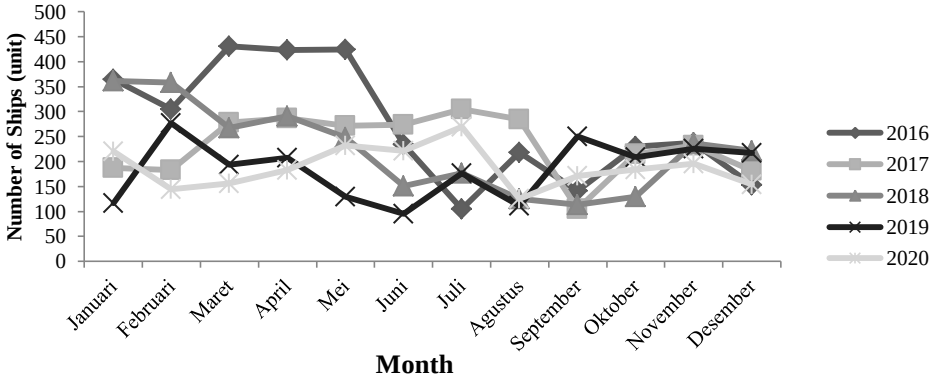

Figure 2. Graph of monthly skipjack fishing effort

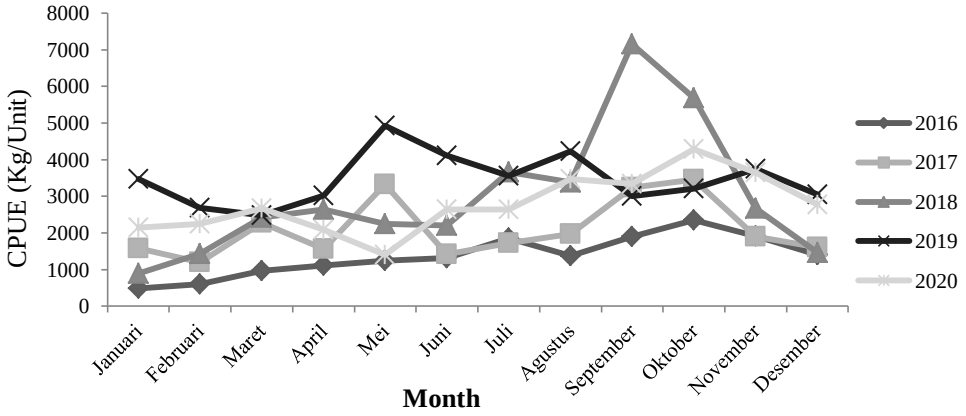

Figure 3. Monthly Skipjack CPUE Values 2016 – 2020

The catch of skipjack tuna (Figure 1) and the number of skipjack fishing vessels (Figure 2) during 2016-2020 fluctuated. This is due to the oceanographic conditions of the waters, which experience the same thing every year so the results are not much different. The oceanographic conditions of the waters in WPPNRI 572, especially in the northern waters of Aceh Province, have good enough temperatures for the survival of skipjack tuna. Habib *et al.* (2019) stated that the temperature in the northern waters of Aceh Province has values ranging from 26.4°C to 27.4°C, which at this temperature is a good temperature for skipjack tuna.

The highest number of skipjack fishing vessels in the graph above occurred in May 2016, namely 424 units, while the lowest number of skipjack fishing vessels occurred in June 2019, namely 95 units. If the skipjack catches and the number of skipjack fishing vessels are known, then the CPUE value can

also be known, because the number of skipjack catches and the number of fishing vessels influence the CPUE value. Data on skipjack CPUE values in 2016-2020 (Figure 3).

The catch and fishing effort of skipjack tuna fluctuated. So that the monthly CPUE value of skipjack tuna for 5 years also fluctuated. The CPUE value of skipjack tuna varies with the highest value in September 2018 of 7.163.044 (kg/unit) and the lowest in January 2016 of 483.210 (kg/unit).

Catching Season Index

The skipjack fishing season index can be estimated by calculating the fishing season index value. This calculation can be obtained based on data on catches and fishing effort obtained from Logbook data of the Kutaraja Ocean Fishing Port for the 2016-2020 period. The results of the calculation of the skipjack tuna fishing season index (IMP) can be seen in Table 2.

Table 2. Catching season index (IMP) of skipjack tuna

Month	PMI (%)	Seasons in Indonesia	Season
January	74.30	West	Currently
February	70.02	West	Currently
March	94.85	Transition I	Currently
April	84.01	Transition I	Currently
May	108.97	Transition I	Peak
June	89.40	East	Currently
July	109.42	East	Peak
August	105.01	East	Peak
September	146.28	Transition II	Peak
October	143.64	Transition II	Peak
November	99.48	Transition II	Currently
December	74.62	West	Currently

Based on Table 2, shows that the fishing season index values obtained each month have different values which are influenced by catches and fishing efforts made. In addition, the skipjack fishing season index in Table 2 can also be seen in Figure 4.

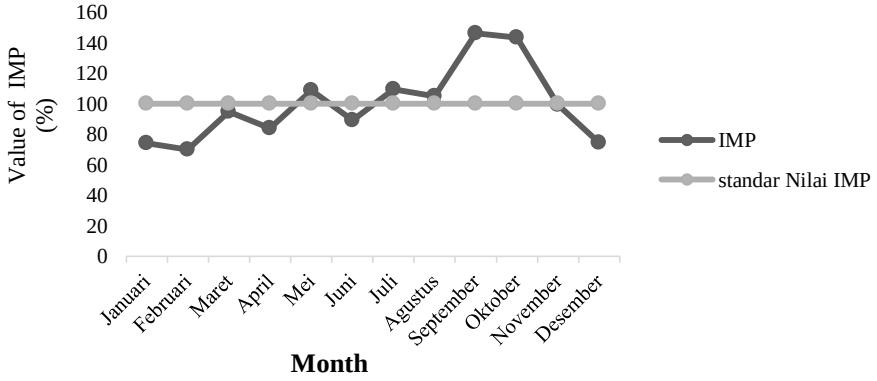

Figure 4. Index of skipjack tuna fishing season

Figure 4 shows the skipjack tuna fishing season index in which it can be assumed that month that have the same value or more than 100% are thought to be the peak season for skipjack tuna fishing, which occurs in May, July, August, September, and October. Meanwhile, months that have the same value or more than 50% are thought to be the medium season for skipjack fishing, namely January, February, March, April, June, November, and December.

Determining the fishing season pattern using the moving average method has the advantage of being able to isolate seasonal fluctuations so that it can determine the right time to catch fish. The fishing season index is divided into three, namely peak season, medium season, and lean season (Wahju *et al*.,

2011). In Table 2, it can be seen that the skipjack-fishing season index only experiences 2 seasons, namely the peak season and the middle season. The peak season for skipjack tuna occurs in May, July, August, September, and October. The moderate season for skipjack tuna occurs in January, February, March, April, June, November, and December.

Fishing activities in Indonesia are generally influenced by four seasons. Namely the West Season (December-January), Transitional Season I (March-May), East Season (June-August) and Transitional Season II (September-November). Peak seasons often occur in Transitional Season I, Eastern Season, and Transitional Season II. In the West Season, it does not experience a peak season due to this period wind direction and surface currents move towards the East. While the distribution of sea surface temperature this season the lower water masses are in the southern waters. In the western season, rainfall is quite high in certain waters (Fadika, 2014). High rainfall makes operation difficult because it endangers the safety of anglers. Therefore, the catches in December-February are few.

From the results of interviews, anglers said that from July to October the fish catch was abundant, the amount caught in one trip could reach 8-10 tons. According to anglers, a large number of fish in that month is due to the rainy season, lots of fish food, dark moon, and fish traveling. Meanwhile, from November to April, the fish catches are very small, where the fish catch per trip is approximately 3 tons. According to the anglers, the reduction in fish was caused by the weather at the time of fishing.

4. CONCLUSION

In general, skipjack tuna catches at the Samudera Kutaraja Fishing Port in 2016-2020 experienced quite significant fluctuations. In addition, the fishing effort is quite high so the catch of skipjack per fishing effort (CPUE) for the 2016-2020 periods has decreased. The highest CPUE value in September 2018 was 7,163 kg/unit and the lowest were in January 2016 namely 483 kg/unit. In this study, it can be assumed that the peak season for skipjack tuna occurs in May, July, August, September, and October. The moderate season for skipjack tuna occurs in January, February, March, June, November, and December.

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