

Trend analysis of catching fish *Decapterus* sp. in the Muncar Coastal Fisheries Port, Banyuwangi, Indonesia

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ARTICLE INFO	ABSTRACT
<p>Keywords: CPUE Flying fish Purse seine Catch production</p>	<p>Small pelagic fish resources in the Java Sea, especially Banyuwangi, are dominated by catches of <i>Decapterus</i> sp, which are mostly landed at the UPT of the Coastal Fisheries Port Muncar. This study aimed to provide information on CPUE trends (Catch Per Unit Effort) and the seasonality of flying fish in the Coastal Fisheries Port Muncar as an effort to encourage effective and sustainable in using of fishery resources. The method used in this study was a survey. The research data was obtained through secondary data including time series of the production of catches of flying fish, and trip data of purse seine, payang and bagan from 2015 to 2019 collected by Coastal Fisheries Port Muncar. The analysis used the CPUE analysis by comparing catches to capture attempts. The results showed, from 2015 to 2019, the highest CPUE of flying fish occurred in 2019, amounting to 13 365.5 kg/trip, while the lowest CPUE occurred in 2016 amounted to 1 050.6 kg/trip. The trend of CPUE flying fish from 2015 to 2019 experienced a fluctuating increase with an average of 7 327.5 kg/trip. A good season for flying fishing occurs from May to December, and shares a peak in December, while famine occurs in January.</p>
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1. Introduction

Banyuwangi is the most eastern district of East Java province, which has great fishery potential because the area is directly bordered by the Bali Strait and the Indian Ocean (DPKB, 2010). Banyuwangi coast has several fishing ports, one of which is the Coastal Fishing Port, Muncar. It is one of the places where most of the fisheries in Banyuwangi are landed and dominated by flying fish (Wijaya, 2002). *Decapterus* sp. is one of the fisheries resources that play a role in the economic

sector in fisheries in the Java Sea with a production level of 60 % of the total catch of other small pelagic fish, so that flying fish is sought after and is the main target of catches (Aziz et al, 2000). Flyfish have a size of about 15 cm to 25 cm with the characteristic presence of small fins (finlets) behind the dorsal and anal fins, as well as the presence of thick cold scales (lateral scute) in the lateral line (Nontji, 2002; Ditjen Fisheries, 1998).



Figure 1. Flying Fish (*Decapterus* sp.)

Small-sized of flying fish is generally caught using a net, while large ones are caught with a circular net (purse seine), and medium-sized fish are caught with a parasol. Research from Wijayanto (2016) showed the Coastal Fisheries Port Muncar is more interested in using purse seine than other equipments. The catches using purse seine are bigger, but the magnitude of the catches of the floating fish is uncertain, or there is a fluctuation in the catching of the flying fish due to the uncertain fishing season, and the estimated famine season cannot be determined in Banyuwangi Sea.

Based on these problems, it is necessary to research so that the need for payang fish resources continues to be fulfilled so that it needs an effective purse seine fishing operation, one of which is through information on the CPUE trends in flying fish and estimation of the pattern of fishing seasons landed at PPP Muncar. Estimation of fly fishing patterns will provide information to determine the operational time of flying fishing, thus minimizing the risk of loss.

2. Material and methods

This research employed survey approach. The collected data is secondary data which was calculated statistically from 2015 to 2019 of fishery activities in the Coastal Fishing Port, Muncar, and supporting data such as journals, and related literature that supported this research. The obtained statistical data were the value of production and average catches of flying fish, annual and monthly production data per type of fishing gear (purse seine, paying, and net), and catches per-effort capture (CPUE). The data that had been obtained was then processed using Microsoft Excel software. The seasonal pattern of catching fishes was determined by the time series analysis approach for the preparation of the fishing season index (IMP) (Haluan, 2001). Catches per capture attempt could be calculated using the following formula provided by (Gulland, 1893; Mahmud, 2015).

$$CPUE_i = \frac{C_i}{F_i}$$

CPUE_i : catch per attempt in the year (kg / trip)

C_i : catches per year (kg)

F_i : attempt to catch per year (trip)

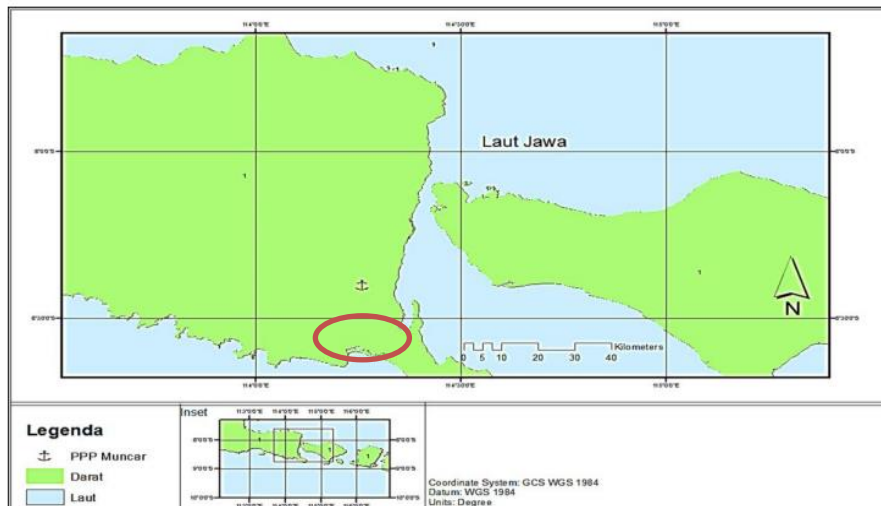


Figure 2. Research Location Map
Source: Imron, 2017

3. Results and Discussion

3.1. Amount of production and average fly fishing

The development of the number of fly fish production from 2015 to 2019 fluctuated. It decreased from 2015 to 2017 and there was a significant jump up to 2019. The data could be seen in Figure 3:

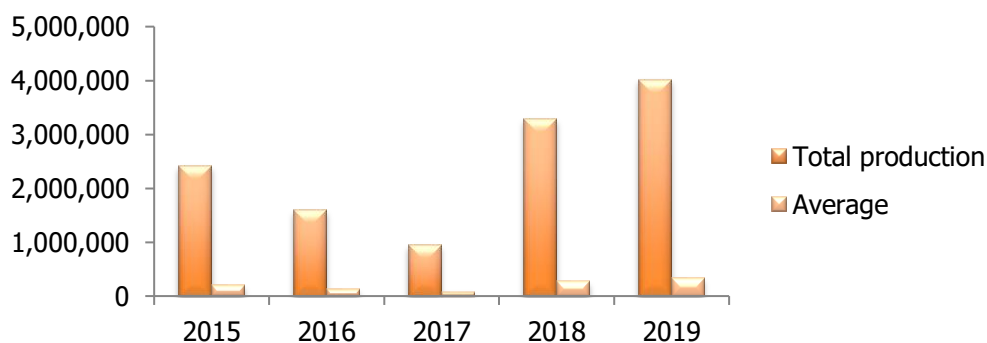


Figure 3. Total Production and Average of Catching Flying Fish from 2015 to 2019

Based on Figure 3, it could be seen that the data experienced fluctuations in flying fish production. From 2015 to 2017, the catch of the flying fish has decreased dramatically with the lowest amount of production occurring in 2017, which was 949 318 kg (with an average of 79 110 kg), and there was a significant increase until 2019 with a total production by 4 021 635 kg (with an average by 335 114 kg).

The terrible season or bad weather caused a decrease in the number of fish catches in the Bali Strait fish from 2015 to 2017 because the small-sized of vessels could not reach fishing areas, and go to sea. The cause a decrease in fishing yield is the influence of changes in environmental conditions, such as wind, salinity, temperature, weather, and season. Other factors that cause a decline in fishing yields are over-fishing efforts in the Java Sea, including in the western Java Sea and East Java Sea (Prihartini et al, 2007; Perdana et al, 2012).

3.2. Catching gear of Flying Fish at Muncar Coastal Fishing Port

The coastal fishing port, Muncar is one of the places where most of the flying fish are landed in Banyuwangi. The catch of flying fish in Muncar used many fishing tools with different productivity. In this study, the researchers chose to examine 3 fishing gear namely, purse seine, payang, and bagan as fishing gear that had high, medium, and low effectiveness. A purse seine was usually used to catch large-sized of flying fish, for medium-sized fish caught with paying, while small-sized flying fish were caught with a chart.

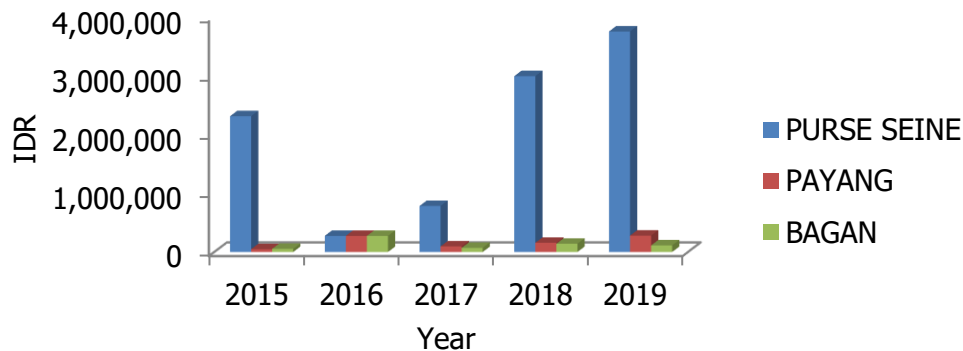


Figure 4. Catching of flying fish from 2015 to 2019

Figure 4 shows a very significant catch from 2015 to 2019. Fishing gear that is very influential for the results of flying fish is purse seine. This fishing gear had a very significant effect compared to the payang and bagan fishing gear. The highest catch yield using purse seine fishing gear was IDR 3 755 746 in 2019, and the lowest in 2016 was IDR 274 200. Paying fishing gear with the highest fishing yields was IDR 278 639 in 2019, and the lowest in 2015 was IDR 47 645. The catch results using bagan fishing gear was amounted IDR 274 200 in 2016 and the lowest in 2015 was amounted IDR 53 945.

The above data proves the results of each fishing gear are not the same and the volume of fish income is also different for each fishing gear, so it can be concluded that the use of fishing gear has a significant effect on the catches of floating fish. From 2015 to 2019, the purse seine fishing gear increased very dramatically and significantly because the purse seine had high fishing effectiveness, so it could catch fish in large numbers. Another factor that influences the magnitude of purse seine productivity is the number of fishing gear in Banyuwangi is widely available (DPKB, 2010) so that the catch of fishermen using this tool is also large.

Flying fish could be caught long year because its salinity tolerance is not much different from the salinity of tropical and subtropical waters (Almuas, 2005). Payang is a type of traditional tool and has not changed much but is still a productive tool, while the fishing gear of bagan uses lights and nets, the bagan can only be used at night and the capacity is not large enough (Widjojo, 1966).

3.3. Catching production of flying fish in the coastal fishing port, Muncar

Catch fishing production in the Muncar, Banyuwangi using purse seine showed very significant fluctuations. Fishing data could be seen in Figure 5. In 2019, the data showed that the production of flying fish revealed a higher increase by 3 755 746 kg. Meanwhile, the lowest fishing production in 2016 was 274 200 kg.

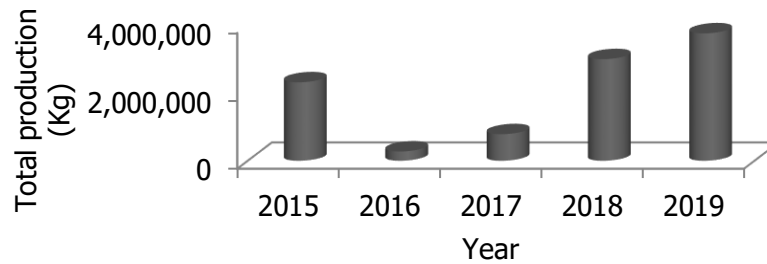


Figure 5. Annual production of catches of flying fish

Figure 5 shows the annual production of catches of flying fish with the use of purse seine and the results are quite significant. In 2019, the data above showed that the production of flying fish showed a higher increase by 3 755 746 kg, while the lowest fishing production in 2016 was 274 200 kg.

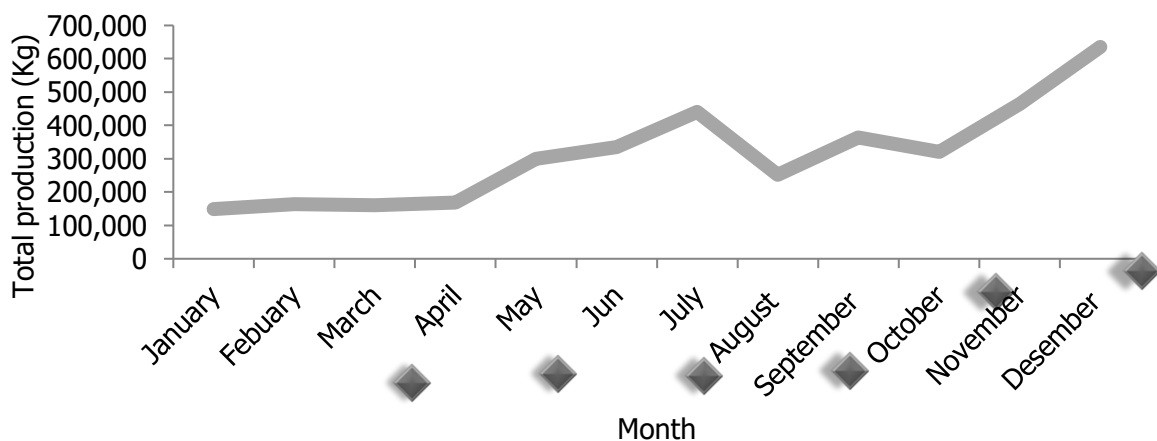


Figure 6. Monthly Catch Production of Flying Fish in 2019

Catch fishing production based on Figure 6 shows significant data. On december showed the highest production of flying fish by 635 448 kg, while the lowest was in January by 149 504 kg. The ups and downs in fishing production were influenced by seasonal factors or environmental conditions. The peak season for catching flying fish occurred in July because in July the season has begun to enter the fishing season.

In the east season, there is a dry season in Indonesian which results in high water sanitation so that the flying fish groups are more in the catching area than in the western season (beginning of the rainy season). According to [Genisa \(1998\)](#), in July to December (east season), flying fish migrate through the Java Sea, and in December to January (west season). During the eastern season, there are many fish in the Java Sea when the season is relatively calm and the fish are large so that the fishermen can get more catch ([Astuti, 2008](#)).

3.4. Efforts to catch flying fish in Muncar

In the effort to catch of flying fish, there are 3 fishing gears used for catching flying fish. The fishing gear that is used is the purse seine, payang, and bagan. Data could be seen in Figure 7.

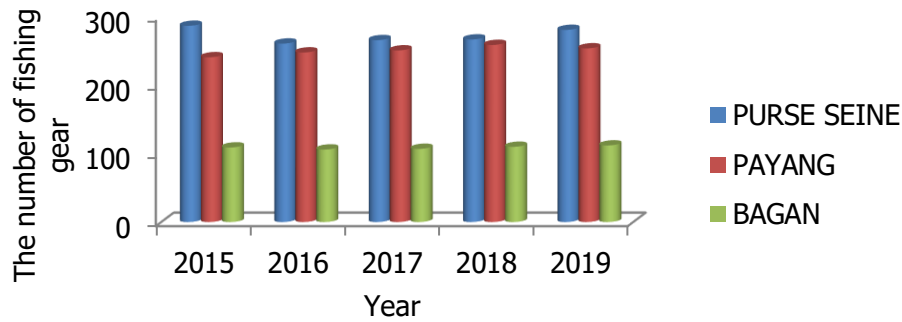


Figure 7. Efforts to catch flying fish from 2015 to 2019

Efforts to catch of flying fish from 2015 to 2019 showed that the results of fishing using purse seine were more dominant compared to the use of paying and bagan fishing equipment. Catching using purse seine fishing gear resulted in a high fishing yield by 281 units, while in the paying fishing gear was 254 units and in the bagan fishing gear was 112 units. Furthermore, purse seine fishing gear on the income of flying fish was very influential.

The catch using purse seine fishing gear was indeed quite high and continued to increase every year. It is equipped with a ring and also a wrinkle rope / dirty rope and nets that originally do not have a pocket will form at the end of the capture. In purse seine fishing gear also showed several factors, namely the search for fish groups, the encirclement of fish groups, and the operation of the net (Inoue, 1961). It is also different from the paying and baan fishing gear because paying is a traditional net and the catch has not changed because according to fishermen this tool is still productive, and the bagan is a fishing gear using nets and lights, and the fishing is only done at night (Widjojo, 1966).

3.5. Catch-catching efforts (CPUE) of flying fish

Catch-catching efforts (CPUE) of Flying Fish in the catch (purse seine, paying, and bagan) has different functions, and ways to get the results of flying fish. The capacity that is obtained for each fishing gear is also different. In the calculation of CPUE itself to see how the rate of capture and effort in a capture. From the results obtained with CPUE, there were catches and efforts that is portrayed in Table 1.

Table 1. Catching Production, Catching Efforts and Flying Fish CPUE

Year	Purse seine			Paying			Bagan		
	Catch (Kg)	Effort (Unit)	CPUE (Kg/Unit)	Catch (Kg)	Effort (Unit)	CPUE (Kg/Unit)	Catch (Kg)	Effort (Unit)	CPUE (Kg/Unit)
2015	2 312 667	287	8 058.1	47.645	241	198	52 945	109	485.7
2016	274 200	261	1 050.6	274.200	248	1.106	274 200	106	2586.8
2017	783 665	266	2 946.1	95.495	251	380	70 030	107	654.5
2018	2 995 007	267	11 217.3	156.285	259	603	140 275	110	1275.2
2019	3 755 746	281	13 365.6	278.639	254	1.097	112 051	112	1000.5
Jumlah	10 121 285	1.362	36 638	852 264	1 253	3 384	649 501	544	6 003
Average			7 327.5			677			1 200.5
FPI			1			0.1			0.2

The development of flying fish production from 2015 to 2019 has fluctuated. The decline of flying fish production occurred in 2016 and 2017 then increased until 2019. The decrease in CPUE might also be caused by the increase of fishing grounds distant due to changes in weather, salinity, wind, temperature, population and resource of fish communities. According to [Avrionesti \(2018\)](#), pelagic fish are very sensitive to environmental changes, they live at depths of around 40 m to 70 m. Flying fish live in warm waters (more than 26 °C) with a salinity more than 30 ppt, a pH more than 7.75, and dissolved oxygen (DO) concentrations more than 4.2 mL L⁻¹. One of the declines in the catch is due to an indication of the effect of decreasing the abundance of small pelagic fish due to excessive fishing activities ([Atmaja, 2007](#); [Suwarno, 2013](#)).

4. Conclusion

Catch-catching efforts (CPUE) tended to increase from 2015 to 2019 with an average by 7 327.5 kg. The highest CPUE of flying fish occurred in 2019 by 13 365.7 kg trip⁻¹, the lowest CPUE occurred in 2016 by 1 050.6 kg trip⁻¹. The peak season for catching floating fishes occurred in December. Furthermore, the fishing should be conducted in May-December, and the catching famine season occurred in January, bad fishing was in January-April.

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