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COMPOSITION, SIZE DISTRIBUTION AND CAPTURE RATE OF FLOAT-OPERATED LIFT NET IN PALABUHANRATU BAY, SUKABUMI

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ABSTRACT
The number of fishing gear operating in a fishing area will have an impact on increasing competition to get the fish caught. This will affect the composition of the fish, size distribution and catch rate. This study aims to analyze the composition of fish, size distribution, and catch rate in the current operation of the Float-operated lift net from February to April in Palabuhanratu Bay. The fishing operation was carried out as many as 20 trips to collect data on fish size (TL and W) and fish species. The composition analysis was carried out by calculating the proportion of the catch, the size distribution analysis was carried out using the class interval calculation approach and the catch rate analysis was carried out by the Catch Rate (CR) calculation. The results showed that the catch composition consisted of three group of species, namely 1 species of pelagic fish, 3 species of demersal fish and 1 species of molluscs. The composition based on weight was dominated by Tembang Fish (S. fimbriata) with a proportion of 43.27%, while based on the number of individuals found was dominated by L. equulus with a proportion of 91.50%. The dominance of different TL sizes for each type of fish. The dominant TL size was caught for Loligo sp and L. equulus at 3-6 cm TL interval, M. maculata at 19-22 cm TL interval, T. savala at 35-38 cm TL interval, and S. fimbriata at 15- 22 cm TL interval. 18 cm. Based on the size of the individual fish caught, the size of the weight caught for Loligo sp was dominated at the W interval of 70-91 gr, M. maculata at the W interval of 180-201 gr, T. savala at the W interval of 4-25 gr, L. equulus at the interval of W. W 4-25 gr, and S. fimbriata at intervals W 180-201 gr. The catch rate of Floating Chart per fish species is in the range of 0.03-2.37 kg/hour. The highest catch rate was found in S. fimbriata at 2.37 kg/hour and the lowest was T. savala at 0.03 kg/hour.

KEY WORDS
Catch, total length, weight, lift net.

This study examines the composition and size distribution of the caught fish and the catch rate of the Bagan Apung fishing gear operated in Palabuhanratu Bay. In particular, the scope of research time which is the limitation of this research is the operation of the Floating Chart in February-April. Where the month period is a transitional wind season, from the west wind season to the east wind season. It is possible that climate change conditions and the increasing number of using Floating Bagan fishing gear at the research site may have an impact on the variety of fish caught, the size of the fish caught and the ability of the fishing gear to produce the caught fish. The increasing number of Floating Bagan users in Palabuhanratu Bay will increase the level of competition to get the caught fish. This is certainly a challenge for many parties, both fishermen who are in the fishing business, fisheries business actors and stakeholders. Measured capture fisheries management policies that are being implemented by the Government require a lot of comprehensive information and data. Therefore, this study aims to analyze the composition, size distribution of fish and catch rates in the operation of Bagan Floating in the transitional wind season, from February to April. The results of this study will provide benefits for many related parties, both stakeholders, academics, fisheries business actors and fishermen in an effort to manage, study and run a floating chart-based fishery business at the research location.

This study will provide information and studies related to the condition of the Floating Bagan fishery in the transitional season in Palabuhanratu Bay in terms of the composition of the fish caught, the size distribution of fish caught and the rate of catch.

Catch rate is an analytical approach that can be used to provide information about the ability of a fishing gear to produce fish in a certain time unit. The increase in the catch rate will have an effect on the amount of fish caught (Triharyuni *et al.*, 2016; Badrudin *et al.,* 2017).

MATERIALS AND METHODS OF RESEARCH

This research was conducted by carrying out fishing operations using Floating Charts in Palabuhanratu Bay in the period from February to April 2022. The number of fishing trips was 20 trips with a total of 40 *hauling* trips. The Floating Chart operation is carried out with a duration of 9 hours/trip, so the total operating hours is 180 hours.

The floating chart that is operated is 9 x 9 m in size with a net dimension of 8 x 8 m, made of *polyethylene* with a mesh size of 0.5 inch. This Floating Chart specification is a general measure of the Floating Chart operated by local fishermen at the research site.

The data collected as material for analysis is data on fish species, the number of individual fish in the tail, the size of the *Total Length* (TL) in centimeters (cm), and fish weight (W: *Weight)* in grams (gr) and kilograms (kg). TL measurements were carried out in the *finfish catch group,* while for the molluscs catch group, the maximum length (Lmax) was measured. The method for measuring Lmax molluscs refers to Staudinger et al. (2009).

Fish size data was obtained through in *situ measurements* using scaled length measuring instruments and scaled scales.

Analysis of the composition of the fish caught was carried out using the following proportion calculation approach:

$$P_i = \frac{B_i}{B_t}\, x\, 100\%$$

Where: Pi – Proportion of Fish Species to $_i$; Bi $_i$ – Fish Type Biomass i; B $_t$ – Total Biomass.

Analysis of the size distribution of the fish caught was carried out by using the interval size calculation approach of *Total Length* (TL) and *Weight* (W). Calculation of the number and class interval is determined using the formulation of the formula Walpole (1995) as follows:

$$k = 1 + 3{,}3 \log n$$

$$c = \frac{r}{k}$$

Where: k - Number of Class, r – *Range*, c - Class Width, n - Total Data.

Catch Rate Analysis (CR) was carried out using the catch rate calculation approach using the interpretation of the Sindo formulation (Sparre and Venema, 1999). The data used in this analysis is *Total catch* (TC) per trip. The formulation of the catch rate calculation formula used refers to Sparre and Venema (1999) as follows:

$$Laju\ tangkap\ (CR) = \frac{Catch}{Effort}$$

Where: CR - Catch rate (kg/hour), Catch - Catch (kg), Effort - Catch effort (in hours)

RESULTS AND DISCUSSION

The Floating Bagan operation during the research resulted in 5 (five) types of fish, namely Tembang Fish (*Sardinella fimbriata)*, Pepetek Fish (*Leiognathus equulus)*, Eteman Fish (*Mene maculata)*, Layur Fish (*Trichiurus savala)* and Squid (*Loligo* sp). Based on the group of fish species, this study resulted in 3 (three) groups of species, namely groups of

pelagic fish, demersal fish and molluscs. The type of pelagic fish caught was S. *fimbriata* and the type of mollusc caught was *Loligo* sp. Meanwhile, L. *equulus,* M. *maculata,* and T. *savala* are groups of demersal fish species.

The total catch obtained during the study was 987,770 grams (987.77 kg) with a total of 46,765 individuals. The average catch per trip is 49.39 kg/trip with the TC value per trip is 24.23-72.58 kg/trip. Based on the number of individual fish caught, TC was obtained as much as 1,319-3,300 fish/trip. The average number of individuals caught per trip is 2,338 individuals/trip.

The composition of the caught fish is presented based on the weight of the fish in grams. The results of the calculation of the proportions showed that the dominant fish caught was Tembang fish (43.27%). While the Layur fish species is the least caught fish species with a proportion of 0.64%.

The group of fish species caught in this study did not differ much from the results of the study of Apriliani *et al.* (2018) and Yuda *et al.* (2012), where there were three groups of fish species caught in the Floating Bagan in Palabuhanratu Bay, namely demersal fish groups, pelagic fish groups and mollusc species. However, there are differences in the composition of fish species.

Several variables that can affect catches include the availability of food in the waters (Nikolsky, 1983; Allen, 2000; Nontji, 2007; Rizwan *et al.*, 2014), *fish behavior* (Gunarso, 1985), and oceanographic conditions of the waters (Sukandar and Fuad, 2015).

Floating Bagan is one type of fishing gear that utilizes *fish behavior* in its fishing mechanism. Fish with positive phototaxis characteristics are the main *target fish* for fishing with Floating Charts (Hasan, 2008). This is what underlies the use of light sources as a tool for collecting fish in the Floating Chart.

The use of different light sources results in different compositions of fish caught (Ta'alidin, 2004; Gustaman *et al.,* 2012; Sudirman *et al.*, 2013; Guntur *et al.*, 2015; Fuad *et al.*, 2016; Rudin *et al., 2015). al.,* 2017; Satriawan *et al.*, 2017; Aswirani, 2018; Sugandi *et* al., 2019); Kaduk *et al.,* 2020; Saragih *et al.,* 2021; Fawzy, 2022). This is because each fish species has a different response to different light sources (Hela and Laevestu, 1970; Puspito, 2008).

If the composition of the caught fish is viewed from the number of individual fish caught, it is known that the L. *equulus species* dominates the catch with a proportion value of 91.50%. The lowest number of individual fish caught was T. *savala* with a proportion of 0.20%.

In the chart fishery, the types of fish that are commonly caught include anchovy (*Stelophorus* sp), tembang fish (*Sardinella fimbriata)*, pepetek fish (*Leiognathus equulus)*, puffer fish (*Rastrelliger* sp), Layur fish (*Trichiurus* sp), squid -Squid (*Loligo* sp), Cuttlefish (*Sepia* sp), Japuh Fish (*Dussumieria acuta)*, Yellowtail Selar Fish (*Selaroides leptolepis)*, Kerong-Kerong Fish (*Terapon jarbua)* (Subani, 1972; Effendi, 2002; Ta'alidin, 2004; Notanubun and Patty, 2010; Yuda *et al.,* 2012; Fauziyah *et al.*, 2012; Sudirman, 2013; Susaniati *et. al.*, 2013; Sasmita and Widodo, 2014; Apriliani *et al.*, 2018; Sunusi, 2018 ; Boesono *et al.*, 2020; Surbakti *et. al.*, 2021).

Many studies have been conducted related to the pattern of fish caught in *Lift nets* that use lights as *fish aggregating devices* (FAD) (Anggawangsa *et al.*, 2013; Aliyubi *et al.*, 2015; Kurniawan *et al.,* 2018; Aditia, 2017; Apriliani *et al. al.*, 2018; Amos *et al.*, 2019). Types of fish caught in the research location, there is a match between the characteristics of *fish behavior* and the living habitat of the caught fish. The fish caught at the research site have a living habitat at a depth of water that is in accordance with the location of the waters and according to the pattern of catching fish in the *lift net* due to being attracted to light, and *feeding activity.*

Floating Chart operation during the research resulted in TC with TL size varying between 6-63 cm. L. *equulus was* caught at 3-6 cm TL size. *Loligo* sp caught were in two groups of $L_{\text{max size,}}$ namely 3-6 cm and 7-10 cm. S. *fimbriata caught* were known to consist of three groups of TL size, namely 11-14 cm, 15-18 cm and 19-22 cm. M. *maculata* caught consisted of four TL size groups, namely 11-14 cm, 15-18 cm, 19-22 cm, and 23-26 cm. T.

savala caught had the most varied size group among others. T. *savala* caught were nine groups of TL size consisting of 19-22 cm, 35-38 cm, 39-42 cm, 43-46 cm, 47-50 cm, 51-54 cm, 55-58 cm., 59-62 cm, and 63-66 cm.

L. *equulus* caught belonged to the small-sized category. According to Lieske (1994), L. *equulus* has a size of Lm (*Length Maturity)* of 10.7 cm with a maximum TL of 28 cm. The size of L. *equulus* caught in this study can be categorized as not suitable for catching, because the size of the catch is below the size of Lm.

T. *savala* caught in this study were in the 19-22 cm to 63-66 cm TL group. This TL measure is in agreement with Novianingrum *et al.* (2017), where Layur fish in Bantul waters were caught at 52.8-86.2 cm TL size. However, the size of the Layur fish caught is different from that produced by Ernawati and Butet (2012), where the Layur fish caught in Palabuhanratu are 75.1-87.5 cm in size.

S. *fimbriata* caught were known to consist of three groups of TL size, namely 11-14 cm, 15-18 cm and 19-22 cm. According to the research results of Sirait *et al.* (2016) S. *fimbriata* caught in the waters of the Labu Coast of North Sumatra from November 2014 to January 2015 were at a size of 14-19,5 cm TL. In Ujung Pangkah waters (Gresik) S. *fimbriata* was caught at sizes 7-15.7 cm (Robiyanto, 2006) and 8-18.9 cm (Sari, 2013). The results of Limbong *et al.* (2022) at PPI Kronjo (Tangerang) it was found that the Tembang fish caught in September-December were in the range of 11.6-17.2 cm. Based on the comparison of several sizes of TL of Ikan Tembang at different times and places, it is known that the size of TL of S. *fimbriata* caught in Palabuhanratu Bay is not much different.

M. *maculata* caught consisted of four TL size groups, namely 11-14 cm, 15-18 cm, 19-22 cm, and 23-26 cm. According to Woodland (2001), the Lm size of M. *maculata* is 14 cm and is commonly caught at 20 cm. M. *maculata* reaches a maximum TL of 30 cm. Based on the Lm size, the M. *maculata* caught in this study were within the acceptable size limits for catching.

Loligo sp caught were in two groups of $L_{max\ size,}$ namely 3-6 cm and 7-10 cm. According to Puspasari and Triharyuni (2013), the average size of squid DML caught in the waters of Rembang (Central Java) is 7.3-9.9 cm and in Cirebon waters it is 7.97-15.96 cm.. While in the Belanakan waters the average DML size of squid is in the range of 13.2-16.5 cm (Pralampita and Chodriyah, 2019). Based on the comparison DML size, it can be seen that the size of the squid caught in Palabuhanratu Bay is below the DML size.

Marzuki and Subani (1989) stated that the squid can reach a size of L_{max} 30 cm. According to Wagiyo *et al.* (2020), the results of research in Jakarta Bay show that the average size of Lm Squid is 9.7 cm in DML with the average size of caught DML is 8.19 cm. Several sizes suitable for catching squid from various sources include the length range of 15-20 cm (Kramadibrata, 1996), 15.0-15.9 cm (Oemar, 1999), 10-70 cm (Kastawi, 2005). Based on the Lm size from various sources that have been explained, it indicates that the size of the squid caught in this study is dominantly below its Lm value, so it can be categorized as not suitable for catching.

The weight of the TC obtained during the operation of the Floating Chart is 987,770 grams (987.77 kg). The results of grouping the data on the size of the individual caught fish were L. *equulus* 1 size group, T. *savala* 6 size group, *Loligo* sp 8 size group, M. *maculata* 10 size group and S. *fimbriata* 10 size group.

The weight of the individual catches obtained in this study ranged from 4-350 grams. The distribution of the weight distribution of fish caught per type of fish caught. L. *equulus* caught in this study were only in one weight group, namely 4-25 grams, while the weights of T. *savala, Loligo* sp, *Mene maculata,* and S. *fimbriata* were more varied.

The weight of individual T. *savala* caught was 20-190 grams with the dominant size caught in the 4-25 gram group. The weight of individual *Loligo sp* caught was 60-330 grams with the dominant size caught in the 70-91 gram group. The weight of individual M. *maculata* caught was 60-262 grams with the dominant size caught in the group weighing 180-201 grams. The weight of individual S. *fimbriata* caught was 155-350 grams with the dominant size caught in the group weighing 180-201 grams. Based on the distribution of the weight of

the individual fish caught, it is known that M. *maculata* and S. *fimbriata* have more weight group variants when compared to other types of fish caught.

The results of the calculation of the catch rate per fish species have been presented. The CR value per fish species obtained in this study ranged from 0.03 to 2.37 kg/hour.

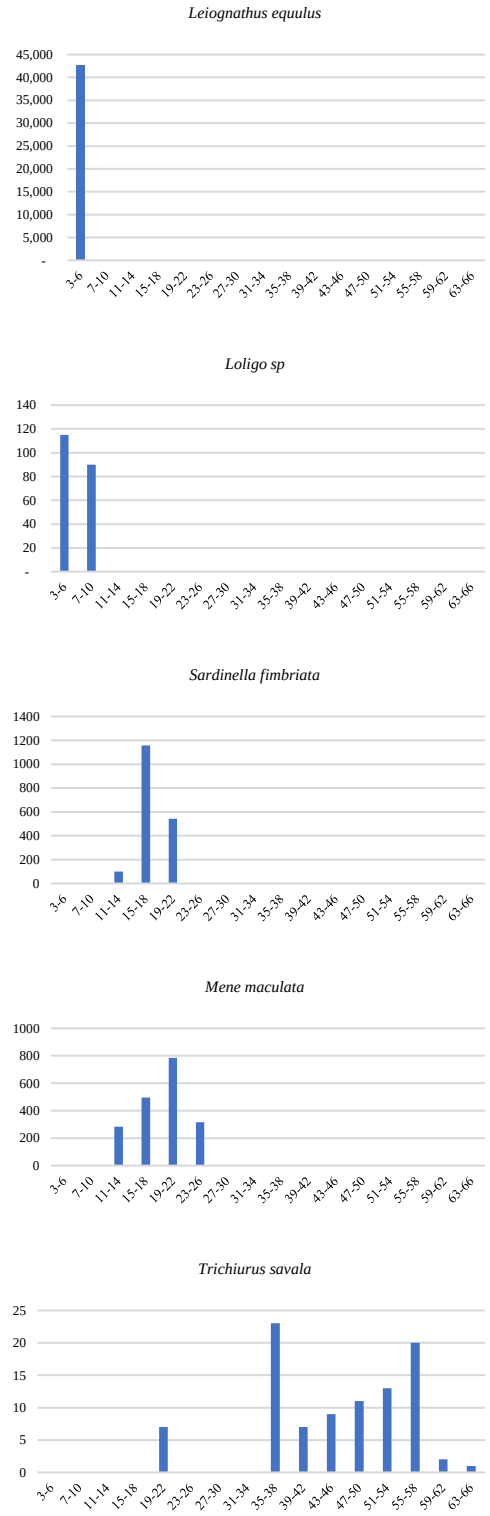

Figure 1 – TL Size Distribution of Captured Fish

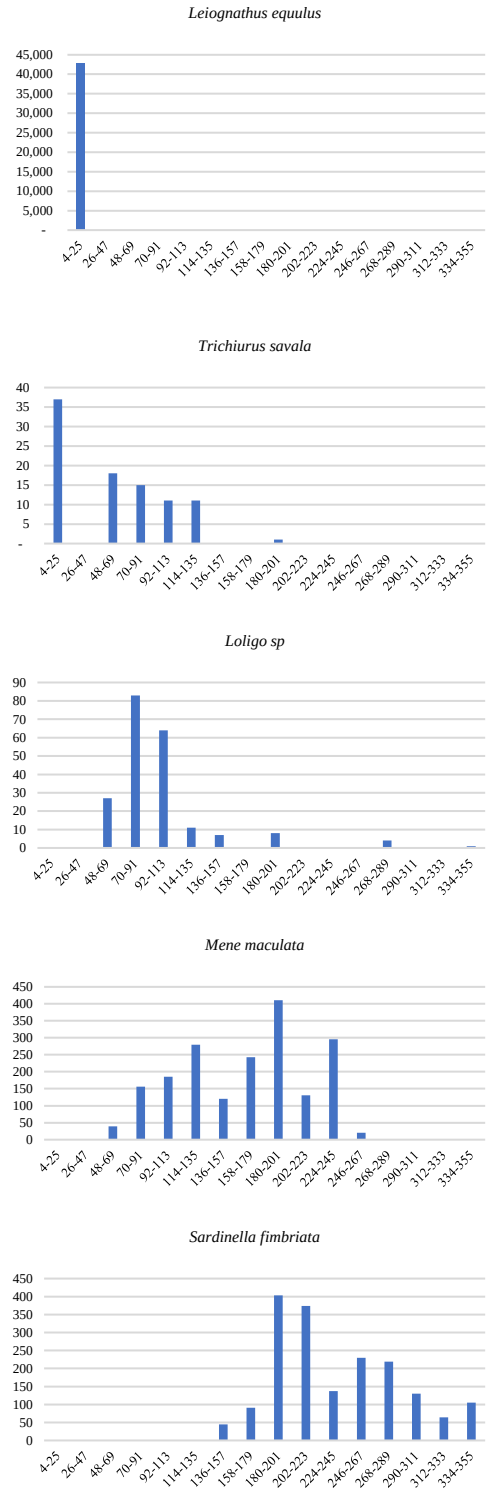

Figure 2 – Distribution of Fish Weight Sizes Caught

The lowest CR value was occupied by *T. savala* with a CR value of 0.03 kg/hour, while the highest CR value was 2.37 kg/hour for *S. fimbriata.* The results of the calculation of the catch rate per fish species in the floating chart operation are not much different from the catch rate values obtained by Apriliani et al. (2018) with the same type of fishing gear. The results of Apriliani *et al.* (2018) stated that *the target fish catch rate* for floating chart is in the range of 0.09-0.19 kg/hour and for *bycatch* is 2.21 – 2.45 kg/hour.

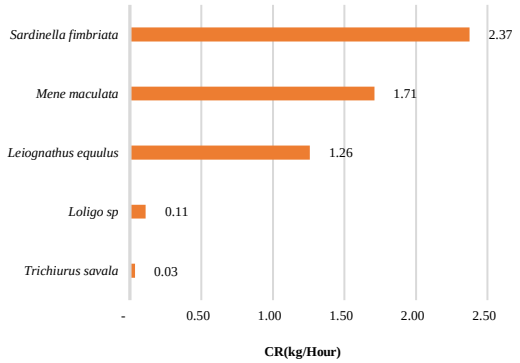

Figure 3 – Catch Rate

When viewed from the fishing trip, it is known that the catch rate of the Floating Bagan operation at the research site is 5.49 kg/trip. According to Dewanti *et al.* (2018), the catch rate of Bagan at TPI Pangandaran (West Java) is 8.18 kg.

CONCLUSION

The Floating Bagan operation in February-April in Palabuhanratu Bay produced 5 (five) species of fish, consisting of 1 species of pelagic fish, 3 species of demersal fish and 1 species of molluscs. The composition of fish caught by weight was dominated by Tembang fish (S. *fimbriata)* with a proportion of 43.27%, while based on the number of individuals caught it was dominated by L. *equulus* with a proportion of 91.50%.

The dominance of the size of the TL caught was different for each type of fish. The dominant TL size was caught for *Loligo* sp and L. *equulus* at 3-6 cm TL interval, *M. maculata* at 19-22 cm TL interval, T. *savala* at 35-38 cm TL interval, and *S. fimbriata* at 15-22 cm TL interval. 18 cm. Based on the weight of the individual fish caught, the size of the caught weight for *Loligo* sp was dominated in the interval W 70-91 gr, M. *maculata* at interval W 180-201 gr, T. *savala* at interval W 4-25 gr, L. *equulus* at interval W 4-25 gr, and S. *fimbriata* at interval W 180-201 gr. The catch rate of Floating Bagan per species is in the range of 0.03-2.37 kg/hour. The highest catch rate was found in S. *fimbriata* at 2.37 kg/hour and the lowest was T. *savala* at 0.03 kg/hour.

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