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Indicator Parameters Population for the Management of Threadfin Bream (*Nemipterus* Spp.) In the Inshore Java Sea, Indonesia

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Abstract

This study was to assess parameters indicators of population of threadfin bream, to see how appropriate management strategies, the utilization of inshore Threadfin bream in shore Java Sea. Research was conducted during the ten months from January to October 2015. The study was conducted in PPI Kronjo, Banten. Threadfin bream analyzed from catches of three different types of trip: daily, ≤ 1 week, and ≥ 2 week. Analysis conducted by population parameters include: the growth parameters, gonad maturity level, the size of the first captured and mature gonads, spawning potential ratio. The result of this research showed the proportion of immature condition threadfin bream with highest on daily trip, 86% in ≤ 1-week trip, and 73% in ≥ 2 week trip exploitation rate E <0.5 at the daily trip, and E> 0.5 on a trip ≤ 1 weeks, and ≥ 2 weeks. Rated K on a daily trip (0.60 / year), ≤ 1 week (0.44 / year) and ≥ 2 weeks (0.37 / year). Spawning potential ratio could be only analyzed on trip ≤ 1 week (SPR 13%), and ≥ 2 weeks (SPR 12%). Threadfin bream catches were dominated by juvenile threadfin bream which known Lc <Lm. The highest risk was juvenile threadfin bream caught in coastal areas, with K high recovery could be conducted on these fishing areas.

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Threadfin bream SPR value is above 10%. In order to increase the SPR level until 20%, recommendation which should be implemented is minimum size of catches about 165.20 to 171.00 mm.

Keywords: Threadfin bream; Indicator population; Spawning potential; Java Sea.

1. Introduction

Kurisi as local name of Threadfin Bream (*Nemipterus spp*) is a genus of the family Nemipteridae. One type of demersal fish caught almost all year round, has a wide spread area, caught ranging from small to medium size with a nearly uniform color [1]. Classification of Threadfin Bream in Indo-Pacific waters are divided into 26 types [2]. *Randalli Nemipterus* type found in the Northeast Mediterranean [3]. *N. japonicus* in Cochin - India [4]. Threadfin Bream Species *N. japonicus, bipunctatus N., N. Randalli*, found in the waters of Mumbai - India [5]. *N. zysron* in marine waters Iraq [6]. *N. japonicus* in the South China Sea [7]. *N. hexodon* in the Madura Strait [8]. Threadfin Bream caught in the Java Sea, among others *N. bathybius; N. hexodon; N. japonicus; N. marginatus; N. mesoprion: N. nemathoporus; N. nemurus*; and *N. tambuloides* [9]. Threadfin Bream is one of demersal species that have important economic value in the Java Sea. Meat of Threadfin Bream dominant white color with a protein content of 16.85%. A special characteristic of Threadfin Bream's meat has gelling better than the red-fleshed fish [10]. Increased economic value Threadfin Bream, impact on increasing fishing effort Threadfin Bream. Originally Threadfin Bream is a result of bycatch species, often time Threadfin Bream become one of the main species targeted [11]. Threadfin Bream caught sizes tend to be smaller. In the waters of the Java Sea the size of the smaller fish caught. The phenomenon indicates the pressure of possible arrest and the small size is the size of the fish that are young or juvenile [12]. Two types of Threadfin Bream caught in the waters north of Java has the level of vulnerability of arrest is quite high, namely *N. japonicus* and *N. gracilis* [13]. Threadfin Bream resource management can't be separated relation to the management of demersal fish resources. Pressure catching demersal fish resources in the various sub-areas of the Java Sea is uneven, the highest pressure occurs in shallow waters (inshore) East Lampung and South Sumatra, Java and northern oceans [9]. Base trawlers fishing operations at the beginning of its development, is concentrated in the northern waters of Java, Kronjo, Jakarta, or Blanakan Subang, Cirebon, Tegal, Semarang, Juwana, Rembang and Tuban. Conversely fishing pressure in the southern waters of Borneo and on the offshore Java Sea at depths greater than 40 m is relatively low [9]. Many factors that must be understood in the fishery are multi-species and multi-gear, step-by-step management of fish resources in the waters can be set on one particular fish species are targeted arrests. The consideration is based on the assumption that if the population of a species of fish can continue, other fish populations that exist in the community will be better in terms of species of look like [9]. Indicators based population parameter length data composition Threadfin Bream fish landed in PPI Kronjo, developed into the stock status assessment Threadfin Bream through potential spawning ratio of Threadfin Bream stock status using indicators of population parameters, is one of the basic science evidence for management advice Threadfin bream particular and demersal fish resources. Status spawning ratio can be used as an indicator of the harvest control management system coupled with monitoring and more specific policies related to fish resources [14]. The need for scientific evidence, the data is not being met due to the development of small-scale fisheries and the fisheries mix with no guarantee of accurate data [15].

Utilization of information on fishing effort, species of fish, and the fishing area, becomes important in a data poor fisheries conditions [16]. Indicators based population parameter length data composition of Threadfin Bream fish landed in PPI Kronjo, developed into the stock status assessment Threadfin Bream through potential stock status of potential spawning ratio using population parameter indicator, was one of the basic science evidence for management advice and resources specifically Threadfin Bream demersal fish in general. Determination basis based management composition length data available fish from fish landed, developed into the ratings the stock to estimate the SPR, is used as a management system in harvest control combined with monitoring, assessment, and policies that are more specifically related to fish resources [14]. The study aims to determine the parameters of the fish population Threadfin Bream indicators on which to base the determination of the reference point (reference point) as recommendations for the management of inshore Threadfin Bream in the Java Sea. Determining these indicators is carried out through the analysis of data-based estimation of the stock with a length of Threadfin Bream and assessment of spawning potential ratio. Stock-based estimation methods length (Length - based stock assessment), the assessment Spawning Potential Ratio (SPR) using the frequency data length and degree of maturity of gonads, can be used as an alternative base determination in conditions of poor management of the data [17].

2. Material and Methods

2.1. Sampling Locations

Data fish biology conducted since January to October 2015. The research is in Fish Landing Port (PPI) Kronjo, Kronjo subdistrict, Tangerang, Banten Province. Intake of fish biological data and interviews conducted in PPI Kronjo (Figure 1).

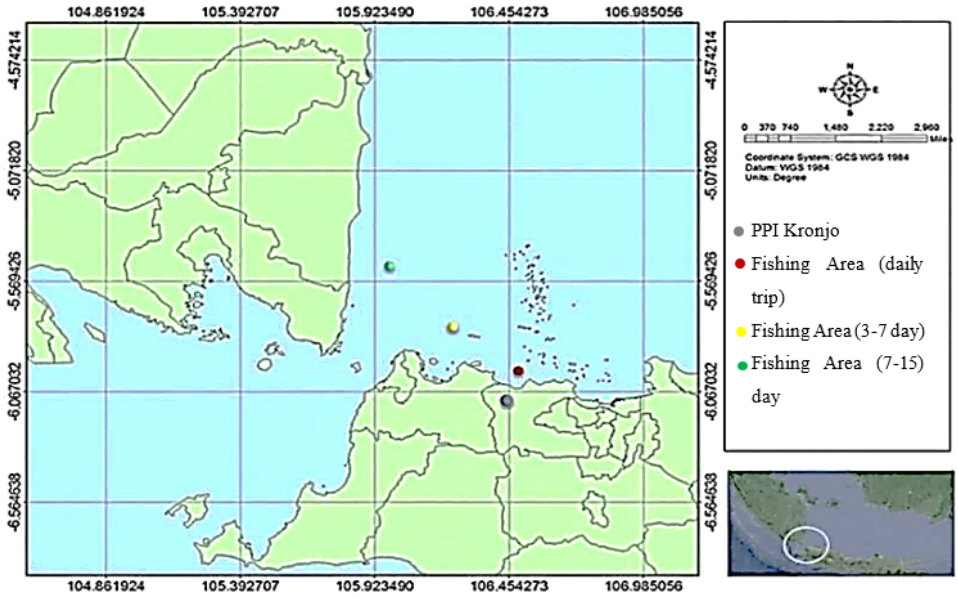


Figure 1: Sampling Location in Kronjo Bay, Tangerang, Indonesia

2.2. Collecting Data Method

Threadfin Bream landed each recorded amount based on the type and fishing locations, which is distinguished by catching trip patterns (a long day), consisting of (a) the daily trip; (B) trip ≤ 1 week (3-7 days); (C) ≥ 2-week trip (7-18 days). Biological data collection Threadfin Bream fish from a fish sample used in this study are all kinds of fish Threadfin Bream landed in PPI Kronjo, of ships with different trip. The number and size of the sample depends on the availability Threadfin Bream catches. Measuring total length using a ruler measuring 118 models Wildco which has an accuracy of 0.01 mm. Furthermore, the weight weighed using electric scales SF-410 has an accuracy of 0.01 grams.

2.3. Data Analysis - Distribution of fishing areas

Estimation of fishing areas is done through data analysis point coordinates obtained from fishing vessels that have a GPS (Global Positioning System), were analyzed using ArcGIS software. Furthermore, the data is confirmed by interviews with fishermen, to clarify the fishing areas that have not been identified.

2.4. Data Analysis - Threadfin Bream species composition

The species composition was analyzed based on the results of identification, ranging from family, genus, and species.

$$pi = \frac{ni}{N} x100\%$$

Where *pi* is the percentage of fish from fish samples taken, *ni* is the number of fish species identified, and N is the total samples of fish.

2.5. Data Analysis - Indicators Population Parameters (Length-Weight Relationship)

Length-weight analysis was conducted to determine the pattern of growth Threadfin Bream fish landed in PPI Kronjo, following equation [18]:

$$W = aL^b$$

W is the weight of the fish (g), L is the total length of fish (mm), a is a constant or intercept and b is the exponent or angle tangential. Testing this hypothesis is then tested using the t test at 95% confidence interval as follows:

$$t_{hitung} = \left|\frac{b-3}{Sb}\right|$$

$$S_b{}^2 = \frac{S^2}{\sum_{i=1}^{n} x_i^2 - \frac{1}{n}\left(\sum_{i=1}^{n} x_i\right)^2}$$

A value calculated as $a = 10^{bo}$ and b as $b = b1$. B value is used to determine growth patterns and hypotheses used in determining the pattern of growth. Comparison of t-count value with t-table carried on a 95% confidence

interval. The growth pattern of Threadfin Bream fish with due regard to the rules of the decision as follows: if the value $t_{count} > t_{table}$, was rejected by the null hypothesis (H_0) and if the value of $t < t_{table}$, failed rejected the null hypothesis (H_0).

2.6. Data Analysis - Indicators Population Parameters (The Growth Parameters)

The coefficient of growth that used to follow the model of Von Bertalanffy [19] defined as:

$$Lt = L_{\infty}\left[1 - e^{(-K(t-t_0))}\right]$$

Lt is the size of the fish in age *t* (mm), L_{∞} is the asymptotic length (mm), *K* is the coefficient growth (year^{-1}), and t_0 is the age of the fish on a zero-length hypothesis (years).

2.7. Data Analysis - Indicators Population Parameters (Gonad Maturity Level)

Gonad maturity level is the stage of gonadal development before and after the fish spawn [18]. TKG identification can be carried out by looking at the condition of the gonads in accordance with the maturity level of gonadal morphology.

2.8. Data Analysis - Indicators Population Parameters (The Size of First Captured Fish)

The average size of the first captured (*Lc*) refers to the analysis Beverton and Holt (1957) in Sparee and Venema [19] with formula:

$$SL = \frac{1}{1+\exp(S1-S2*L)}$$

S1 is the estimated amount, L is the length of the class interval midpoint, *S1* and *S2* are constants.

2.9. Data Analysis - Indicators Population Parameters (The Size of First Mature Gonads)

The estimation of the size of the first mature gonads (L_m) periodically can be used as an indicator of the pressure of the population [20]. Threadfin Bream estimation of the length of the first mature gonads using King [21], carried out by plotting the percentage of the cumulative proportion of mature fish gonads with each length of fish:

$$P = \frac{1}{1 + exp^{[-r(L-L_m)]}}$$

P is the proportion of mature crab gonads, r is the slope, Threadfin Bream Length L (mm) and Lm is the length of the first mature gonads Threadfin Bream, hereinafter:

$$L_m = a * r \quad \text{where } r = -b$$

Where L_m is the size of the first mature gonads, a is the intercept and b is the slope.

2.10. Data Analysis - Indicators Population Parameters (Mortality and Exploitation Rate)

According Sparre and Venema [19], the mortality parameters include natural mortality (M), fishing mortality (F), and total mortality (Z). Total mortality rate (Z) is suspected to catch on a linear curve based on the data length. The rate of natural mortality (M) estimated using an empirical formula of Pauly (1980) in Sparre and Venema [19] as follows:

$$(M) = 0{,}8\ exp^{(-0{,}0152-0{,}279 \ln L_\infty + 0{,}6543 \ln K + 0{,}463 \ln T)}$$

Furthermore, Pauly [22] states the rate of exploitation can be determined by comparing F to Z, F = Z-M. F is the fishing mortality rate (per year), Z is the total mortality rate (per year), and E is the rate of exploitation in F = F / Z.

2.11. Data Analysis - Indicators Population Parameters (Spawning Potential Ratio)

The average size Threadfin Bream mature gonads (L_m) is functionally obtained by plotting the cumulative frequency to every length Threadfin Bream, so that would be obtained logistic curve raw, wherein the point of intersection between curve 50% cumulative frequency is the length of the fish at the time of 50% mature gonads [14]. Spawning potential ratio (Spawning Potential Ratio, SPR) to compare the Traffic spawning (reproductive capacity) of STOL in conditions not yet exploited. SPR analysis procedures carried out by following the method presented by Prince and his colleagues (2014) in (Ernawati and his colleagues [23]):

$$SPR_t = \frac{\sum_{t=0}^{t} EP_t}{\sum_{t=0}^{tmax} EP_t}$$

$$EP_t = N_t W_t m_t$$

Where SPR_t a proportion of the production potential at age t, EP_t is a production output at age t, N_t is the number of individuals at age t with N_0 is the number of individuals beginning with the number 1000, m_t is the mature size of the gonads. Enter the required data in the calculation of the SPR, the value of: K, L_∞ and t_0 can be obtained from the Von Bertalanffy growth function, as well as the values of a and b was regression results of length-weight relationship and value of L_m.

Further, the input data will be processed by using an excel spreadsheet, where the additional information required is SSB_F (Spawning Stock Biomass-current), and $SSB_{F=0}$ (Spawning Stock Biomass - at the moment there has been no catching). SPR value determination is done by using a model Length-Based SPR (LB-SPR) is expressed by Hordyk and his colleagues [14].

3. Results and Discussion

3.1. Fishing Areas

Data collection area of the interviews as well as the coordinates of the location of fishing Threadfin Bream, can be identified fishing areas for fishing vessels based in the PPI Kronjo (Table 1).

Table 1: The distribution of fishing area fishing vessel based in PPI Kronjo

Type trip	Ukuran Kapal	Alat tangkap	Daerah penangkapan
Daily trip	< 5 GT	Gillnet, Traps (*bubu*), fishing pole, seine (*payang*), mini trawl (*dogol*)	5°44'46"-5°37'23" S and 106°16'36"-106°14'58" E
≤ 1 week	5-10 GT	seine, mini *cantrang*, *apolo net*	5°23'13"-3°49'30" S and 106°57'10"-106°57'27" E
≥ 2 week	10-30 GT	*Cantrang*	5°23'13"-3°49'30" S and 106°57'10"-106°57'27" E

Regional fishing boats fishing operations with daily trip has a distribution pattern that is almost fixed, from North Tangerang to about Tunda Island. ≤ 1 week on a trip from the North Coast Tangerang, around Tunda island, Pandjang Island, Tidung, as well as the Sunda Strait. Fishing areas for vessels with a ≥ 2-week trip, from the waters of the Sunda Strait, around the East Lampung, Bangka Belitung until Bodies. Pressure catching demersal fish resources in the various sub-areas of the Java Sea is uneven, the highest pressure occurs in shallow waters (inshore) East Lampung and South Sumatra, as well as the northern waters of Java [9]. The shift began in the fishing area of Tangerang and Banten waters, until in East Lampung. Fishing areas for vessels with a ≥ 2-week trip, are on a wider range 5 ° 23'13 "-3 ° 49'30" latitude and 106 ° 57'10 "-106 ° 57'27" East. Fishing areas for vessels of 10-30 GT reached by traveling 2-3 days, starting from the waters of the Sunda Strait, around the East Lampung, until the waters of the Bangka - Belitung. Fishing grounds in the waters of East Sumatra (Lampung and South Sumatra), and South Bangka-Belitung in March, April, May, August, and September. In June and July more operationalize fishing boat in the waters of the North Seribu Islands.

The development is caused by trawlers fishing operations base at the beginning of its development, is concentrated in the northern waters of Java, Kronjo, Jakarta, or Blanakan Subang, Cirebon, Tegal, Semarang, Juwana, Rembang and Tuban. Conversely fishing pressure in the southern waters of Borneo and on the offshore (offshore) Java Sea at depths greater than 40 m is relatively low [9]. The spatial distribution of fishing effort important for the management of fisheries [24]. Distribution of demersal fish resources is more influenced by environmental factors, especially salinity levels of the water depth [25].

Based on the results of the mapping fishing areas, visible overlap in particular fishing area for vessels with a trip ≤ 1 week with daily trip, and ≤ 1 week with ≥ 2 weeks. Generally, fishermen still have a tendency to catch on the water area is closer as the daily trip and ≤ 1 week, in addition to the efficiency of capital turnover and the result will be faster. But for old vessels with fishing operations ≥ 2 weeks to adjust to the number of supplies. Another thing that led to the conduct fishing operations is not too far, because of the patrols conducted by the Water Police and Air East Lampung and other authorities after the entry into force of the ban on the use of trawl

(*hela*).

3.2. Threadfin Bream Species Composition

Results Threadfin Bream identification of fish species landed by vessel on a trip different levels, namely, the daily trip (864), ≤ 1 week (2555), and ≥ 2 weeks (4771) (Figure 2).

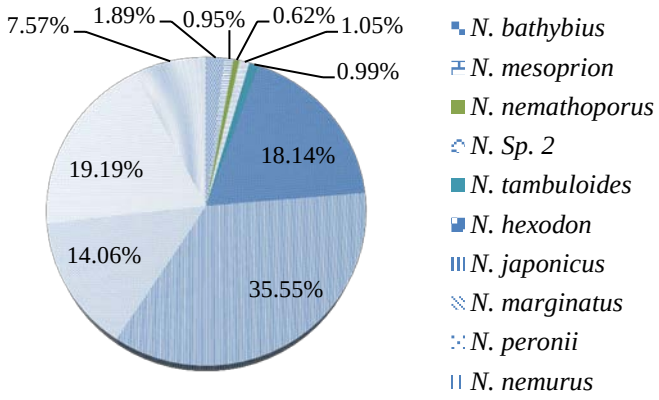


Figure 2: Threadfin Bream species composition landed in PPI Kronjo

Distribution of demersal fish resources is more influenced by environmental factors, especially salinity levels of the water depth. *Nemipterus mesoprion* clustered in shallow waters with low salinity levels and high temperatures. In the waters of the South China Sea *Nemipterus marginatus*, *Nemipterus peronii* and *Nemipterus tambuloides*, are found in relatively deeper waters with salinity is relatively high and at a relatively low temperature [25]. Threadfin Bream was captured at noon, and usually some kind is found in relatively deep waters, where the temperature is lower. Threadfin Bream captured species composition is influenced by the ability of the nets into the water body. Operation target of gear *cantrang* are hordes of demersal fish are at depths between 10-30 m. therefore for the depth of their fishing gear had to be adjusted which ranged from 14-35 m, so that demersal fish can be caught. Fishing activities using *cantrang* take place on exposure to relatively shallow waters, i.e. at a depth of less than 40 m. An abundance of *N. japonicus* females is more common in depths greater than 50 m [26]. Based on the landed catch is dominated by *hexodon N*., *N. japonicus*, and *N. marginatus*, are more likely to be caught as compared to other types. Based on the added distribution by, any kind will have the possibility of captured different types of Threadfin Bream with distribution in shallow areas will have a higher possibility caught, compared with other types that have abundance in deeper waters.

Based on the distribution abundance, more young Threadfin Bream found at a depth lower than the adult Threadfin Bream, it is visible from the eating habits found in Threadfin Bream [2]. An abundance of prey will affect the abundance of prey organisms; it is the number of small-sized Threadfin Bream found in shallower water. The increase in fertility will increase the number of prey for Threadfin Bream. Threadfin Bream a carnivorous fish species, but Threadfin Bream that live at depths of 10-20 m is dominated by species of shrimp, Polychaeta, clams, and foraminifera, fish, algae and diatoms. At the fish was captured at depths of 20-30 m was found fish in addition to shrimp and cephalopods. While at depths greater than 40 m were indications of

cannibalism [27].

3.3. Indicators Population Parameters (Length-Weight Relationship)

Analysis of length and weight relationship using data length and weight of the five species of fish landed in PPI Kronjo as presented in Table 2.

Table 2: The coefficient of length-weight relationship Threadfin Bream

Type trip	Sex	N	Length-weight Relationship			
			a	*b*	R^2	The growth pattern
Daily trip	Female	475	0,0004	2,3164	0,8727	negative allometric
	Male	389	0,0004	2,3077	0,7767	negative allometric
≤ 1 week	Female	864	0,00003	2,7890	0,8759	negative allometric
	Male	1410	0,00002	2,8412	0,8997	negative allometric
≥ 2 week	Female	2134	0,00006	2,6504	0,8597	negative allometric
	Male	2636	0,00002	2,9047	0,9165	negative allometric

Threadfin Bream landed in PPI Kronjo generally has a value of *b* vary considerably, although of very similar shape to one another. Possible Threadfin Bream coefficient b is determined by the environmental conditions and the maturity level of gonads. Environmental influences seen in Threadfin Bream of daily trip, where the value of *b* in the dry season for the months of July to October (1.7896 to 2.0233), lower than the rainy season in January-March (1.1180 to 2.1663). While Threadfin Bream on a trip ≤ 1 week and ≥ 2-week trip has a value of *b* is greater than the daily trip.

Threadfin Bream captured on the trip had a relatively larger size, thus allowing a greater predation to food. Threadfin Bream is a carnivorous fish species, which have different food phase when juvenile and adult. In Threadfin Bream greater adaptation to the depth of the higher pressure causes, Threadfin Bream tend to move slowly. It is shown that the fish that swim actively demonstrate a lower *b* value than the fish that swim passively [28].

3.4. Indicators Population Parameters (Estimation of growth parameters)

The estimation of the growth parameters of the five species of Threadfin Bream fish landed in PPI Kronjo (Table 3).

Table 3: The estimation of the growth parameters of five Threadfin Bream landed in PPI Kronjo

Type trip	Sex	Growth Parameters		
		K (year-1)	$L\infty$ (mm)	t_0 (month)
Daily trip	Female	0,60	143,68	-0,18
	Male	0,98	145,43	-0,11
≤ 1 week	Female	0,63	183,23	-0,16
	Male	0,86	204,78	-0,11
≥ 2 week	Female	0,55	192,46	-0,18
	Male	0,47	232,84	-0,20

Comparison of the growth curve of each trip show that coefficient growth in daily trips ≤ 1 week greater than ≥ 2 weeks, especially on the type of Threadfin Bream male (0.98 / year). Length L_∞ ranged between 143.68 mm on Threadfin Bream female and 145.43 mm on Threadfin Bream male. The condition is influenced by the size of the captured and gonad maturity level. On a daily trip Threadfin Bream size captured having a small size and in the immature state. Rapid growth rate in Threadfin Bream indicates an abundance of food and appropriate environmental conditions. length Threadfin Bream rapid growth occurs at a young age and getting slower with age until it reaches an asymptotic length, where the fish will not grow length again. Early growth Threadfin Bream have a high growth rate, and require large amounts of food [29].

Migration patterns on small demersal to a shallower, especially in small-sized fish and fishing gears, affect the rate of capture of small fish. ≤ 1 week on a trip to the level of the capture of sized fish species Threadfin Bream male L_∞ (204.78 mm) had a growth rate (0.86 / yr.). Trip ≥ 2 weeks had the highest growth rate compared to the daily trip and trip ≤ 1 week, indicated by the value of K is small. Value L_∞ greatest value compared with the daily trip and ≤ 1 week. The rate of growth in ≥ 2-week trip is in decline, presumably because the level of adaptation to the depth Threadfin Bream and food available.

The rapid growth of the young-old fish occurs due to the energy obtained from food mostly used for growth. The difference in the growth rate is influenced by the availability of food in the environment of fish, because the growth speed will be different in different years as well, especially on young fish when the speed is relatively faster than the already large fish. The rapid growth and short age of the fish indicates the rate of management of fish resources.

Generally, fish that have small *K* takes a long time to reach its maximum length. The high value of *K* indicates the speed of the fish to achieve faster L_∞ and age of fish is getting shorter [19]. The value difference is caused by internal and external factors. Internal factors that influence the genetic factors, parasites, disease, and external factors that influence the temperature and food availability [18]. *K* high value may indicate a quick recovery from the waters of fishing pressure. While the value of different *K* allegedly influenced by dietary factors, competition, pollution and genetic factors. indicates that the food menu Threadfin Bream changed along with changes in body size [29].

3.5. Indicators Population Parameters (Gonad Maturity Level)

Threadfin Bream gonad maturity level showed Threadfin Bream gonadal development of female and male fish. Threadfin Bream gonad maturity level captured the three types have different compositions. Yet all three dominated by Threadfin Bream immature gonads. Most of the fish samples obtained during the research in some immature gonads. At almost the entire daily trip Threadfin Bream captured 100% in still in the immature stage because it is at TKG I and II. Trip of ≤ 1 week had Threadfin Bream landed in the immature state as much as 84% (female) and 86% (male). Mature phase 16% (female) and 14% (male). Trip of ≥ 2 week had captured the immature phase of 75% (female) and 77% (male), and the mature phase 25% (female) and 23% (male).

The results of the analysis of the maturity level of gonads were caught on three types of trip has a different

composition (Figure 3).

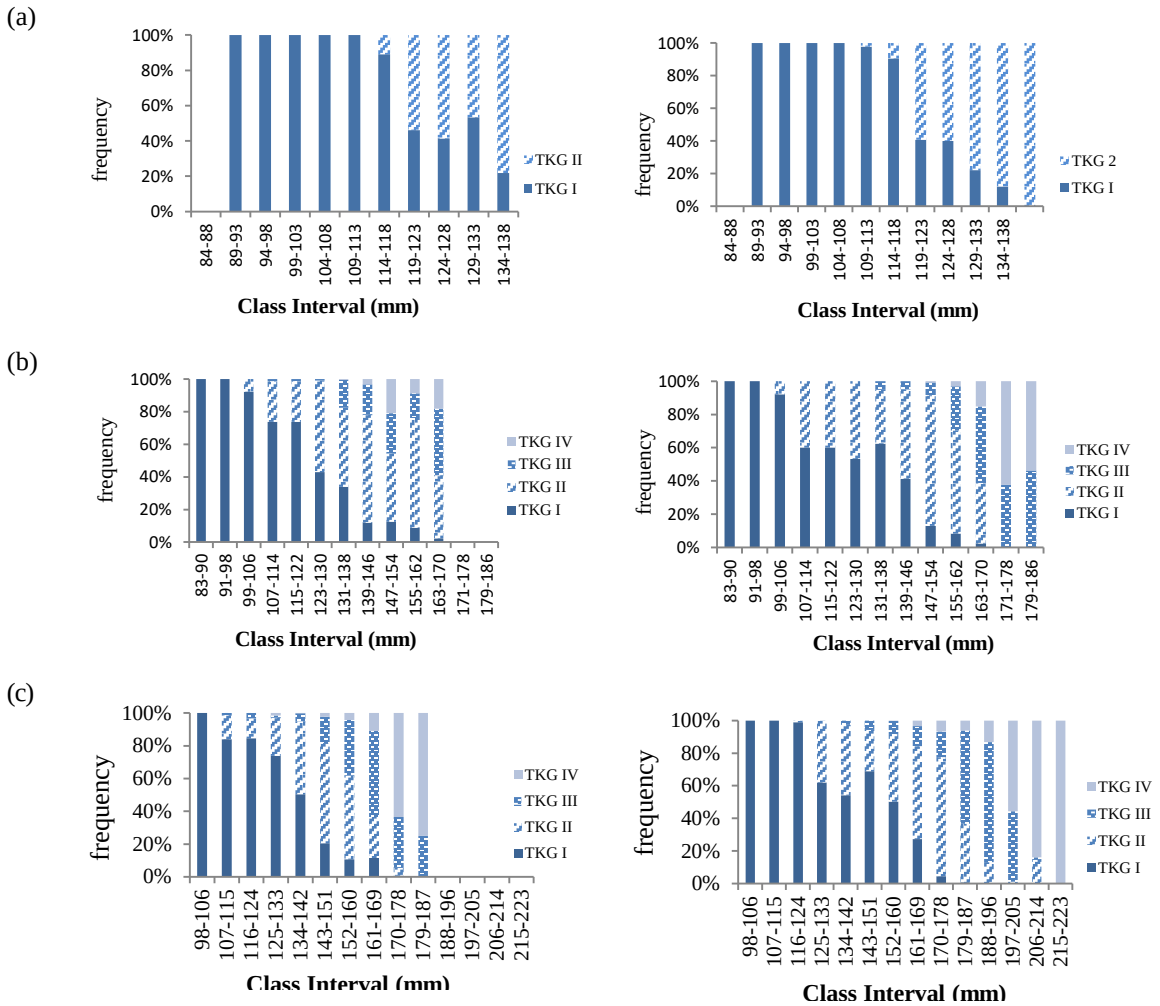


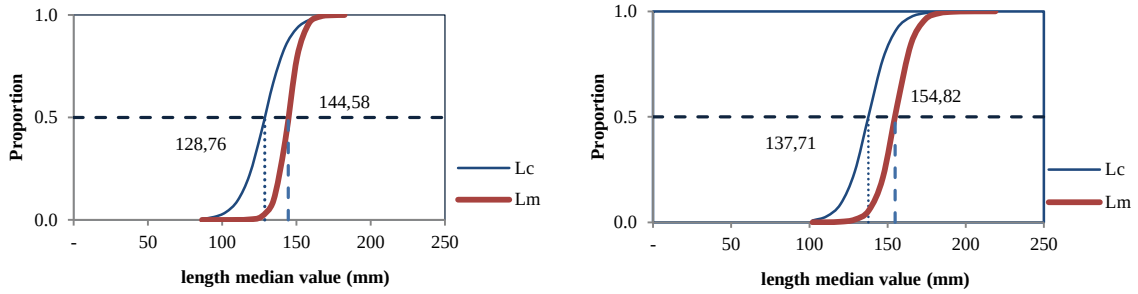
Figure 3: Gonad maturity level Threadfin Bream: (a) the daily trip; (b) ≤ 1 week trip; (c) ≥ 2-week trip, and (i) Female (ii) Male

Allegedly gonads mature fish migrate to deeper waters, the trend was due to migration patterns found on demersal organisms are vertical migration [30]. It is alleged that caused the fish captured during the condition of the gonads mature a bit, because it is not covered by the fishing equipment used.

The low selectivity of fishing gear particularly mesh sizes increase the risk of the capture of Threadfin Bream small in size, it indicates the greater the capture of small fish [12].

3.6. Indicators Population Parameters (The Size of First Captured (L_c) and mature gonads (L_m))

The analysis of the size of first captured and mature gonads was presented in Figure 4:



(a) (b)

Figure 4: Comparison of size Lc and Lm on: (a) ≤ 1 week trip and; (b) ≥ 2-week trip

Analysis for *Lc* and *Lm* conducted on Threadfin Bream female, it is considered fish in the waters of reproductive factors determined more by Threadfin Bream female that reach the size of *L∞,* so that by *Lc* smaller than male. Differences in patterns of adaptation due to the influence of natural or fish because fishing pressure has led to the first mature gonad size varies [31]. Measurement values *Lc*, value comparison *Lc* with *Lm* in the study indicate that *Lc*<*Lm* where this comparison showed that the fishing of Threadfin Bream as a fishing ground for vessels in PPI Kronjo in conditions that are not decent catch. Lm is found to decrease symptoms of fish suffering from high intensity captured. *Lm* analysis used the determination of symptoms overfishing and resource management patterns Threadfin Bream [32]. In Threadfin Bream resources landed in PPI Kronjo not indicated the existence of recruitment overfishing. ≤ 1 week on a trip recruitment overfishing value amounted to 17.03%. At trip of ≥ 2 week, recruitment overfishing value amounted to 29.24%. The condition is evident from the high level of growth overfishing wherein captured Threadfin Bream size smaller than the value of *Lm (Lc <Lm).* Which means that most of the Threadfin Bream fish landed in the PPI Kronjo was small and had not reached the mature phase of the gonads or spawn.

3.7. Indicators Population Parameters (Mortality and Exploitation Rate)

The results of the analysis of mortality and exploitation rate, with an average water temperature of 29-32^{o} C was presented in Table 4.

Table 4: Mortality and Exploitation Rate of Threadfin Bream

Type trip	Sex	Mortality and exploitation rate			
		Z (/year)	*M*(/year)	*F*(/year)	*E*(%)
Daily trip	Female	1,18	0,68	0,50	0,42
	Male	1,40	0,94	0,46	0,33
≤ 1 week	Female	1,78	0,66	1,12	0,63
	Male	2,24	0,78	1,46	0,65
≥ 2 week	Female	1,49	0,59	0,90	0,60
	Male	1,43	0,51	0,92	0,64

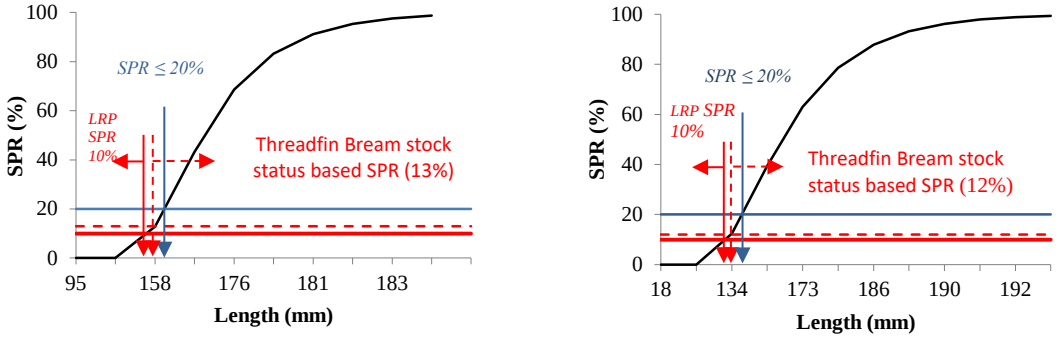
Total mortality rates the Threadfin Bream with daily trip (0.41 / year) has a lower level than the trip ≤ 1 week (0.71 / year) and ≥ 2 weeks (0.67 / year). Total mortality rate the Threadfin Bream male was bigger on daily trip

(0.94 / year) and a trip ≤ 1 week (0.78 / year). This indicates that the total mortality the male fish on the trip is more vulnerable than female fish. Unlike the trip ≥2 week where conditions of Threadfin Bream female total mortality were higher than the other trip. The total mortality is influenced by natural mortality, on the daily trip rate of natural mortality (0.68 / year) is higher than the trip ≤ 1 week (0.51 / year) and the trip ≥ 2 week (0.44 / year). It was alleged in the fishing area of the daily trip; Threadfin Bream had captured sized juvenile prone to predation. In addition, according Sparre and Venema [19], natural mortality is also caused due to predation, disease, stress, spawning, hunger, and old age.

Mortality natural (M) male fish higher than a female. The natural mortality (M) male fish larger than a female. Similarly, mortality captivity for male fish larger than a female [32]. The rate on the highest exploitation trip ≤ 1 week, with the lowest in trip daily. The rate of exploitation Threadfin Bream resulting from trip ≤ 1 weeks and ≥ 2 weeks has passed through the steady which is a resource 0,5 (Gulland 1971 in Paully [22]). The rate of exploitation (E) Threadfin Bream landed in PPI Kronjo show is already above the optimum value is E> 0.50, except for the daily trip. When the captured were made on waters has indicated a state of over-exploitation then the economic benefits will be reduced. The combination of Z values (0.85 to 3.40) and M (0.73 to 3.10), F (0.03 to 0.72) and E (0.02 to 0.27) showed a low level of survival of annual life [33].

3.8. Indicators Population Parameters (Spawning Potential Ratio)

The analysis showed that the spawning potential ratio Threadfin Bream on the fishing area ≤ 1 week trip in the position of 13% and ≥ 2-week trip was at 12% (Figure 5).



(a) (b)

Figure 5: Comparison of size Lc and Lm on: (a) ≤ 1 week trip and; (b) ≥ 2-week trip

Results SPR analysis showed that Threadfin Bream captured at a different third trip showed a value of 13% to ≤ 1 week trip to the size L_m (144.58 mm), and 12% for trip of ≥ 2 week to the size L_m (154.82 mm). SPR is possible because the difference value on the ≤ 1 week trip to reach only a small sized fish, so the size of a big fish in a state of gonads mature a slightly capture. The difference in rates of SPR on any type of Threadfin Bream, which was located on the area of the Java Sea, is possible because of the range of different fishing gear on the level of depth, and the distribution of different types of Threadfin Bream at the level depth. Type *N. japonicus* had a highest level of vulnerability captured for spread wide at the level depth was 5-80 m [13]. For

these species of *N. hexodon*, *N. peronii*, and *N. nemurus* for allegedly abundance at depths of more than 20-50 m [2]. Distribution of this species highest at depths up to 100 m [2].

In the fishing areas for fishing vessels on the trip ≤ 1 week. Stock condition may be possible to be maintained at the current SPR conditions, namely at the level of 13% or by not overextending SPR 10% (biological limit reference point) is in the range of 151.40 mm size. Optimal management is to increase the SPR to the extent of 20% (target reference point or biological sustainability) with a minimum size recommendations catch on the size of 165.20 mm. For fishing areas with ≥ 2-week trip can be recommended for SPR of 10% with a size of 158.88 mm and SPR 20% with a size of 171.00 mm.

4. Conclusion

The results showed that on the daily trip Java's northern sea and fishing area deployment which is not far, exploited by artisanal fishermen with vessels <5 GT. The principle of exploitation by the fishermen identified with basic needs. The fishing was carried out with a long operating time ≤ 1 week, using fishing vessels GT 5-10, had started catching area from the North Sea of Kronjo to the Sunda Strait.

Duration of fishing operations depend on the ability of supplies. Carried out efforts to use the principle of effectiveness level, where the size of the vessel is able to reach a wider area, a relatively short trip, so the capital turnover and the result will be faster. At ≥ 2-week trip the vessel with the size of 10-30 GT, the fishing area allowed is 4-12 sea miles, but in practice the ability to cruise ships to more than 12 sea miles. That vessel from PPI Kronjo able to reach the area of the East Sea Lampung and South Sumatra.

The overlapping area of fishing can be caused by depletion of the resource potential of the fish in the sea, so that the fishermen have to move to a more distant area. In addition to potentially causing conflicts among fishermen, fishing areas overlap between the size of the vessel and the administrative authority, causing the production of fishery data collection becomes ambiguous.

This research is still in the narrow scope of data collection, which is only of PPI Kronjo, so it should be carried out comparative research on fish landing areas. Especially those that have the same fishing area with ship-based PPI Kronjo.

Control gear from start to reach depths up in mesh sizes that can capture the minimum size of fish that may be caught. Control gear from start to reach depths of up in size of the mesh size, the determination of the minimum size of fish caught. Thus, it will minimize the chances of small Threadfin Bream capture. Reach depth can reach targets at Threadfin Bream fish and other demersal fish are at depths greater than 35 m.

Determining the size of which may be captured based on the results of the analysis of *Lc* and *Lm* with the aim to set limits on the minimum size that can be measured. However, the risks of the boundary determination will make more big fish captured. Recommendations ideal was worthy of the determination of the resulting capture of Spawning Potential Ratio analysis. Limit the size by 20% SPR acts as a balance between the minimum fish size that can be captured and limitations of large fish that can be catch to prevent recruitment overfishing.

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