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Ernaningsih

Faculty of Fisheries and Marine Sciences, Universitas Muslim Indonesia, Menara UMI, Jl. Urip Sumoharjo No 225, Panaikang, Kec. Panakkukang, Kota Makassar, Sulawesi Selatan, Indonesia

Muh Jamal

Faculty of Fisheries and Marine Sciences, Universitas Muslim Indonesia, Menara UMI, Jl. Urip Sumoharjo No 225, Panaikang, Kec. Panakkukang, Kota Makassar, Sulawesi Selatan, Indonesia

Hamsiah

Faculty of Fisheries and Marine Sciences, Universitas Muslim Indonesia, Menara UMI, Jl. Urip Sumoharjo No 225, Panaikang, Kec. Panakkukang, Kota Makassar, Sulawesi Selatan, Indonesia

Nurfika Ramli

Faculty of Fisheries and Marine Sciences, Universitas Muslim Indonesia, Menara UMI, Jl. Urip Sumoharjo No 225, Panaikang, Kec. Panakkukang, Kota Makassar, Sulawesi Selatan, Indonesia

Ummyaty

Faculty of Fisheries and Marine Sciences, Universitas Muslim Indonesia, Menara UMI, Jl. Urip Sumoharjo No 225, Panaikang, Kec. Panakkukang, Kota Makassar, Sulawesi Selatan, Indonesia

Corresponding Author:

Ernaningsih

Faculty of Fisheries and Marine Sciences, Universitas Muslim Indonesia, Menara UMI, Jl. Urip Sumoharjo No 225, Panaikang, Kec. Panakkukang, Kota Makassar, Sulawesi Selatan, Indonesia

Diverse, size range and life stage of snapper (*Family Lutjanidae*) traded at the Paotere fish landing base (PPI) Makassar City, South Sulawesi

Ernaningsih, Muh Jamal, Hamsiah, Nurfika Ramli and Ummyaty

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Abstract

Snapper is one of the economically valuable reef fish traded at PPI Paotere. Therefore, research is needed on the inventory of the type, size structure and life stage of snapper (*Family Lutjanidae*) in the Paotere Fish Landing Base Makassar City. The results of the study obtained 16 species of snapper (*Family Lutjanidae*). It consists of the genera *Lutjanus*, *Etelis*, *Syhmphorus* and *Pristipomoides*. The most common snapper are *Lutjanus gibbus*, *Lutjanus fulviflamma* and *Lutjanus vitta*. The least found snapper are *Pristipomoides typus*, *Lutjanus bengalensis*, *Lutjanus lutjanus*, *Lutjanus sabae*, *Etelis carbunculus* and *Syhmphorus nematophorus*. *Lutjanus bohar* species have a more varied size with a length range of 18.73-76.12 cm, a mean 47.94 cm In contrast to the lowest size variation in species *Lutjanus biguttatus* with a size range of 10.08-23.02 cm, mean 17.24 cm. Life stage of snapper traded at PPI Paotere 15% juvenile, 65% sub adults dan 20% adults.

Keywords: Inventory, length range, life stage, snapper, Paotere

1. Introduction

Small-scale multi-gear fisheries contribute half of global fisheries landings (Herrón, 2018) ^[1]. In demersal fisheries in Indonesia, grouper is often caught together with snapper at depths of 50-500 m (Dimarchopoulou *et al.*, 2021) ^[2]. Grouper and snapper are one of the high economic value commodities in Indonesia both in live, fresh and processed forms (khasanah *et al.*, 2019; Ernaningsih *et al.*, 2022) ^[3, 4].

Fishery products are one of the important aquatic biological resources (Mote *et al.*, 2017) ^[5], is a source of protein for human life (Cahya *et al.*, 2016) ^[6]. The diversity of fish species, especially in economically important fish species, is an important study that is beneficial to human life (Saleky *et al.*, 2021) ^[7]. Snapper is a species of demersal fish from the family Lutjanidae which has high economic value in Indonesia. Snapper catch production in South Sulawesi in 2011 amounted to 12,445 tons/year, increased to 24,874.35 tons/year in 2017, then decreased to 17,318.42 tons/year in 2021 (Pratiwi, *et al.*, 2023) ^[8]. Paotere Fish Landing Base (PPI) Makassar City is one of the fish landing sites that acts as a center for production, processing, marketing of fishery products and fostering fishermen groups in Makassar City. The type of fish caught is important information in an effort to inventory the diversity of fish species. The size of length and phase of life is an important study in fisheries biology in efforts to utilize and manage resources. Information on fisheries biology and size structure is required for management purposes (El-Kasheif, 2021) ^[9]. The study on this matter has not been carried out at the Paotere Fish Landing Base, Therefore, it is important to conduct research on the inventory of species, size structure and life stage of snapper (*Family Lutjanidae*) traded at the Paotere fish landing base (PPI) Makassar City

2. Research methods

2.1 Time and place of research

This research was conducted from December 2022 to February 2023 at the Paotere fish landing base (PPI), Ujung Tanah District, Makassar City, South Sulawesi (Fig 4).

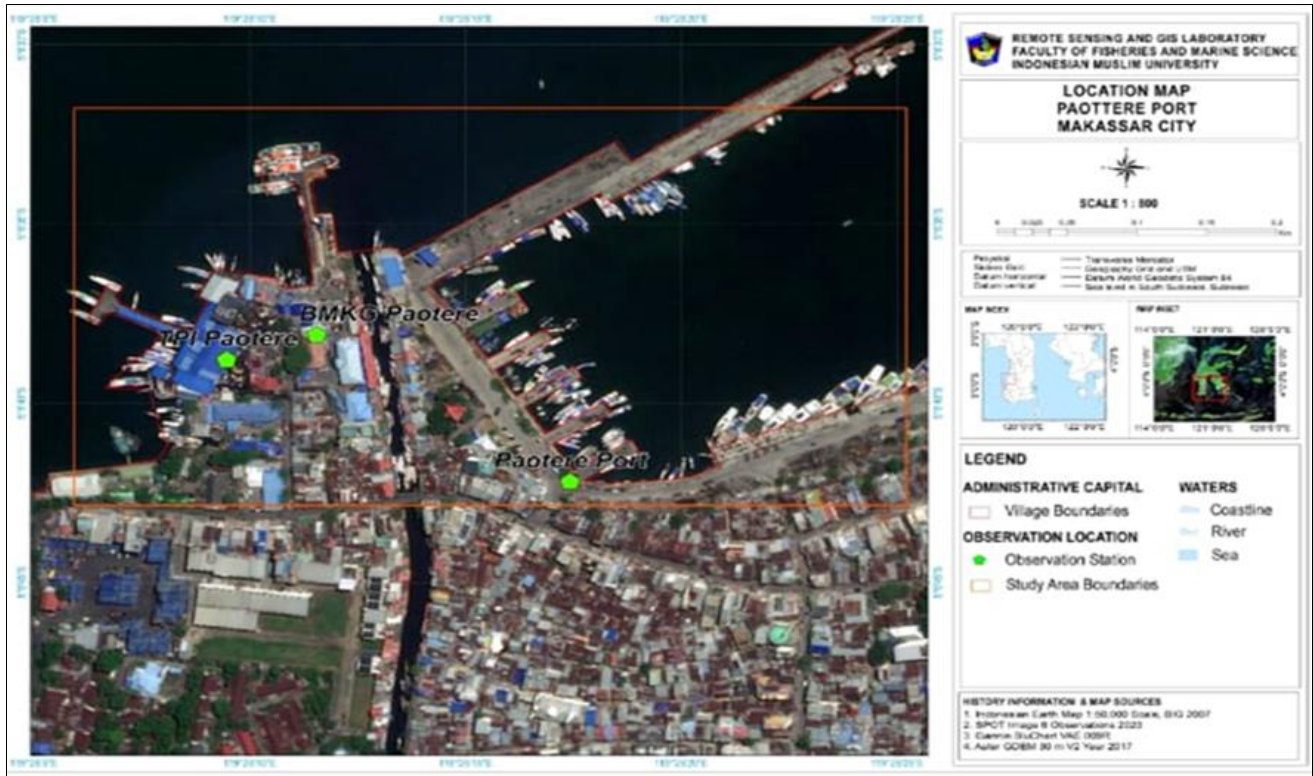


Fig 1: Map of PPI Paotere Research Location Makassar City

2.2 Research procedure

Snapper (Family *Lutjanidae*) is obtained from the catch of small-scale fishermen traded at the Paotere Fish Landing Base (PPI). Data collection through visual observation by measuring the total length of snapper species allowed by the seller. Fish measurements are carried out by separating snapper species, recording the length of fish (TL) using a

measuring board with a capacity of 60 cm with an accuracy of 1 cm and take pictures using *the mobile camera*. Total length (TL) measurements are made from the outermost end of the mouth to the outermost tip of the fish tail (Fig 2). Data collection is carried out twice a week from 06.00-09.00, following PPI Paotere's operating hours.

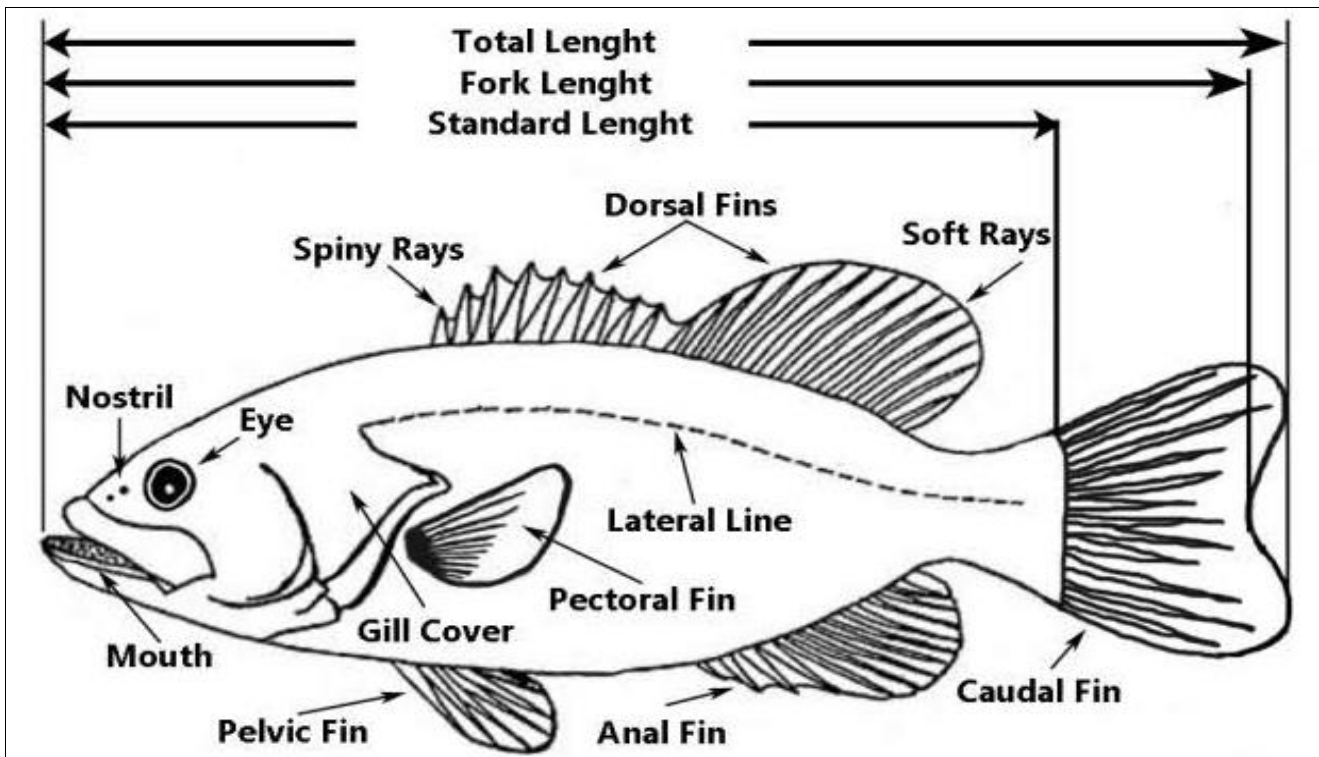


Fig 2: Measurement of the total length (TL) of the outermost mouth end to the outermost tail tip of the fish

Observed species were adjusted based of references including Allen *et al.* (2003) ^[9] and Heemstra & Randall (1993) ^[10], and

on-line databases including FishBase (Froese & Pauly, 2022) ^[11].

2.2 Data analysis

The types, numbers and phases of life of snapper traded are analyzed descriptively and presented in graphic form. Identify fish species using fish IDER and FISHBASE guidelines. Data on the length range analyzed using PRISM software and presented in the form of boxplot graphs. The total length data obtained are used to estimate the life stage of each fish. The method of determining the life stage used is based on (Nadiarti *et al.*, 2015) ^[12]. The size range of fish is divided into three where fish with TL < 1/3 of the maximum length are classified as juveniles, TLs between 1/3 and 2/3 of the

maximum length are classified as adults, and those with TL > 2/3 of the maximum length are classified as adults(Nadiarti *et al.*, 2015) ^[12].

3. Results

3.1 Inventory of Snapper species: Snapper Family Lutjanidae found during the study as many as 485 individuals consists of 4 genera (*Lutjanus*, *Etelis*, *Symphorus* and *Pristipomoides*) and 16 species. The genus *Lutjanus* comprises 13 species, Genus *Etelis* 3 species, *Symphorus* 2 species and *Pristipomoides* 1 species (Table 1 and Fig 3).

Table 1: Types of snapper (Family Lutjanidae) traded in PPI Paotere, Makassar

Genus	Spesies	Jumlah Individu	Percentages
Lutjanus	<i>Lutjanus gibbus</i>	250	51.50%
	<i>Lutjanus vitta</i>	49	10.10%
	<i>Lutjanus timorliensis</i>	15	3.10%
	<i>Lutjanus sabae</i>	2	0.40%
	<i>Lutjanus bohar</i>	20	4.10%
	<i>Lutjanus deccussatus</i>	25	5.20%
	<i>Lutjanus fulvus</i>	17	3.50%
	<i>Lutjanus fulviflamma</i>	62	12.80%
	<i>Lutjanus carponatatus</i>	15	3.10%
	<i>Lutjanus russelli</i>	15	3.10%
	<i>Lutjanus bengalesis</i>	1	0.20%
	<i>Lutjanus biguttatus</i>	6	1.20%
	<i>Lutjanus lutjanus</i>	2	0.40%
Etelis	<i>Etelis carbunculus</i>	3	0.60%
Symphorus	<i>Symphorus nematophorus</i>	2	0.40%
Pristomoides	<i>Pristomoides typus</i>	1	0.20%
Total Spesies	16 Spesies	485	100%

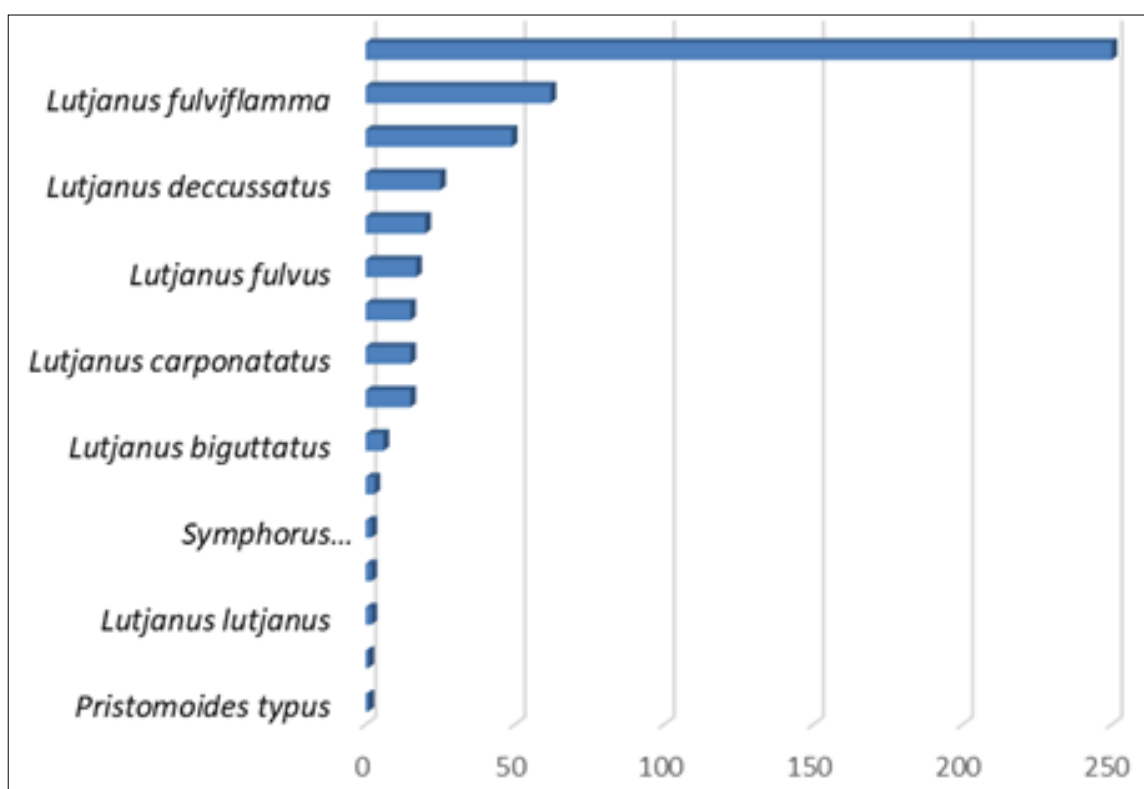


Fig 3: Snapper species traded in PPI Paotere, Makassar.

3.2 Length size range

The range of fish length measures obtained during the study is as shown in Fig (4).

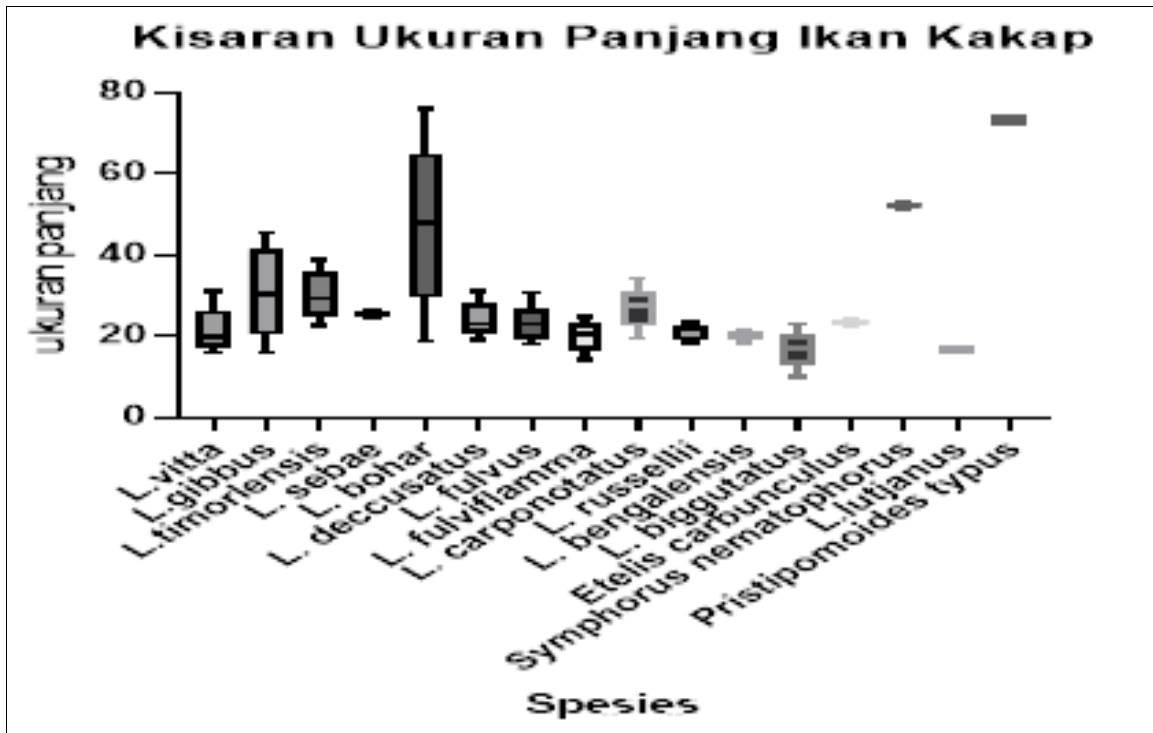


Fig 4: Bloxplot diagram of the length of snapper traded in PPI Paotere, Makassar

3.3 Life stage of Snapper (Family Lutjanidae)

The life stage of fish is divided into 3 parts, namely juvenile, young fish and adult fish which are measured according to the maximum length of spesies. Fish with a length of <1/3 maximum length are categorized as juvenile, 1/3-2/3 are

categorized as sub adults and >2/3 are categorized as adult fish (Nadiarti *et al*, 2015) ^[12]

A total of 485 snapper were found during the study, 15% of them are phase juvenile, 65% phase sub adults and 20% phase of adult (Table 2 and Fig 5)

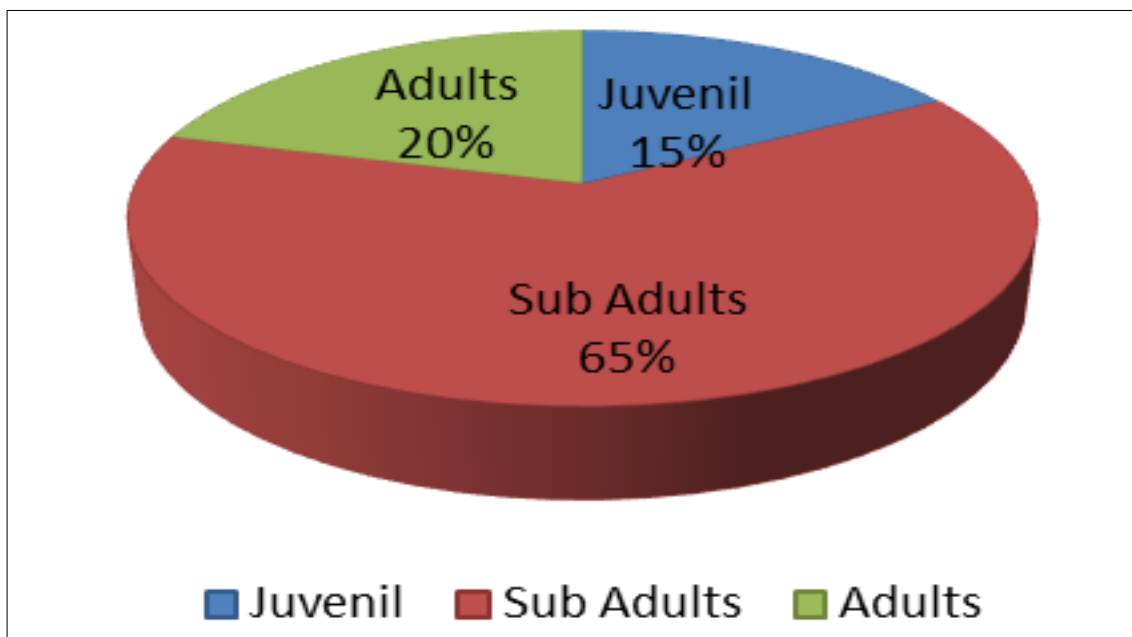


Fig 5: Life stage diagram of snapper (*Family Lutjanidae*) traded in PPI Paotere Makassar

Table 2: The length of snapper (*Family Lutjanidae*) traded in PPI Paotere, Makassar

Nama Spesies	Total individuals	Juvenile	Sub Adults	Adults	Max Length
<i>Lutjanus gibbus</i>	250	1	182	66	56
<i>Lutjanus vitta</i>	49	0	45	4	40
<i>Lutjanus timorlensis</i>	15	4	11	0	73.7
<i>Lutjanus sebae</i>	2	2	0	0	116
<i>Lutjanus bohar</i>	20	0	19	1	90
<i>Lutjanus deccussatus</i>	25	0	15	10	35
<i>Lutjanus fulvus</i>	17	0	15	2	40

<i>Lutjanus fulviflamma</i>	62	62	0	0	35
<i>Lutjanus carponatatus</i>	15	0	5	10	40
<i>Lutjanus ruselli</i>	15	0	15	0	50
<i>Lutjanus bengalensis</i>	1	0	1	0	30
<i>Lutjanus biguttatus</i>	6	0	2	4	25
<i>Lutjanus lutjanus</i>	2	2	0	0	35
<i>Etelis carbunculus</i>	3	3	0	0	127
<i>Symphorus nematophorus</i>	2	0	2	0	100
<i>Pristimoides typus</i>	1	0	0	1	70
	485	74	312	98	

4. Discussion

Snapper Family Lutjanidae found during the study as many as 485 individuals consists of 4 genera (*Lutjanus*, *Etelis*, *Symphorus* and *Pristipomoides*) and 16 species. Snapper species (family Lutjanidae) found by Burhanuddin & Iwatsuki (2010) [13] in the Spermonde Islands, South Sulawesi consists of 8 genera and 42 species. Halimah (2022) [14], found snapper traded at TPI Rajawali Kota Makassar consists of 4 genera and 20 species. Snapper found in PPI Paotere is more diverse than the types of snapper in Barru waters (Rahmat, 2007) [15] who found 5 species of snapper with the same genus. Research (Prisantono *et al.*, 2010) [16] in Arafura sea waters found 15 types of Snapper, different from what is obtained by Surahman *et al* (2019) [17] in the Sea of Arafura where at the turn of season II who got 8 species of snapper with the same genus namely *Lutjanus*. (Madiyani *et al.*, 2018) [18] Menemukan ikan karang yang tertangkap di perairan Wondama Bay Regency sebanyak 11 Genus, satu diantaranya adalah *Lutjanus*. Overall, we recorded a total of 266 species of reef fish in Tawi-Tawi with Epinephelinae (48 species), Lutjanidae (40 species) and Acanthuridae (33 species) as the most speciose groups (Muallil *et al.*, 2020) [19]

Snapper traded at PPI Paotere, especially snapper from several islands in the Pangkep Islands namely Sanane Island and Sabutung Island and some of the Islands Sangkarrang District, Makassar City, South Sulawesi namely Lumu-Lumu Island and Kodingareng. *Lutjanus gibbus* is the most common type found in PPI Paotere dengan 51, 5% from a total of 485 individuals obtained. In addition to *Lutjanus gibbus*, *Lutjanus fulviflamma* is also widely found with a proportion of 12.8% of the total individuals. *Lutjanus vitta* was found with a proportion of 10.1% of the total individuals. Conversely, snapper species are rarely found with a percentage of < 1% with only two individuals each, namely *Lutjanus sebae*, *Symphorus nematophorus* and *Lutjanus lutjanus* while *Lutjanus bengalensis* and *Pristipomoides typus* only one individual.

Figure 4 shows that the species *Lutjanus bohar* has a more variable size with a length range of 18.73-76.12 dengan nilai rata rata 47.94 cm, The lowest size variation in the species *Lutjanus biguttatus* with a size range of 10.08-23.02 with an average value of 17.24 cm.

The size range of *Lutjanus bohar* is more varied compared to other species traded in PPI Paotere with a range of 18.77-76.12 cm with an average size of 47.94 cm. According to (Allen, 1985) [20], *Lutjanus bohar* can reach a maximum length of up to 90.0 cm. Snapper with less diverse variations is *Lutjanus biguttatus* with a range of 10.08-23.02 cm and an average length of 17.24 cm. *Lutjanus biguttatus* is also a species of snapper that found with the smallest size. This is also in line with Allen (1985) [20] who states that *Lutjanus biguttatus* can only reach sizes up to 25 cm.

The large proportion of young fish caught is thought to be related to the fishing rod used. The hook used by PPI Paotere

fishermen to catch fish has a size that varies according to the size of the fish to be caught. The hooks on fishing gear is 1-15 numbered 8, 10 and 12. On the basic raw catcher the number of hooks of 50-150 pieces the numbered 8. In addition, the large proportion of young fish caught is suspected to be a factor of high fishing intensity so that snapper is in a state of overexploitation. The results of the study (Ernaningsih, 2022) [4] found that red snapper (*Lutjanus gibbus*) caught in the Spermonde islands was in an overfishing condition.

Prihatiningsih *et al.* (2017) [21] found that young and adult fish were caught more. This happens because the fishing gear used No. 7-10 results in fish caught dominated by small fish. So it is necessary to adjust the size of the hooks > No.10 so that the size of the fish caught is larger. The habitat of adult snapper inhabits rocky waters and coral reefs to a depth of 60 m while sub adults snapper prefer coastal areas that have mangrove areas (Badrudin *et al.*, 2008; Allen, 1985) [20]. According to Suman *et al.*, (2017) [22], if young fish are caught too much, there will be growth overfishing, also causes *overfishing recruitmen*, because young fish that have not had time to mature and spawn have been caught first So that it loses its opportunity for *recruitment*. If in the long term these fishing conditions continue to occur, it will lead to *growth overfishing* resulting in temporary population loss and changes in the food chain.

5. Conclusion

Snapper Family Lutjanidae found during the study consisted of 4 genera (*Lutjanus*, *Etelis*, *Symphorus* and *Pristipomoides*) and 16 species. *Lutjanus bohar* has the largest variation in length measuring 18.73-76.12 cm with and mean 47.94 cm and *Lutjanus biguttatus* has the lowest size variation of 10.08-23.02 cm with and mean 17.24 cm. Proportion of snapper life phase, 15% juvenile, 65% sub adult, 20% adult

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