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Population Dynamics of Layur Fish (trichiurus sp.) Landed at the Fish Auction Place (tpi) Tenda Village, Hulonthalangi District, Gorontalo City

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Abstract:

Layur fish (Trichiurus sp.) is a demersal fish that has important economic value as a fisheries commodity. Continuous layur fishing activities can result in a decline in layur fish stocks. The aim of this research is to determine the mortality rate, growth and utilization rate of Layur fish. Sampling was carried out in April, May and August 2020 and was carried out once each month at the Fish Auction Place (TPI) in Tenda Village, Hulonthalangi District, Gorontalo City. The method used is survey. Fish samples were taken using a systematic random sampling method. The data taken is data on the length and weight of the Layur fish. The results of the research obtained a sample of 187 individuals, with a length range of 8.30-69.50 cm. Total length and a weight ranging from 6.20 to 198.00 grams. The first size caught (Lc50%) was 46.10 cm total length. The results of calculating the relationship between length and weight show that the fish is allometrically negative, with the equation W = 0.0085L2.947. Growth analysis obtained L∞ of 47.00 cm. Total length, growth coefficient (K) of 0.72, t0 = - 0.094 years, with peak recruitment occurring in August. Total mortality (Z) is around 2.68/year, natural mortality (M) is 0.61/year and fishing mortality (F) is 2.70/year. The utilization rate (E) is 0.80, which indicates that the utilization rate is above optimum.
Keywords: layur fish, growth, morality and utilization, tpi tent.

Introduction

Damersal fish, one of which is the Layur Fish (Trichiurus sp.), are often found in Tomini Bay, Sulawesi Sea, Java and Sumatra. The distribution area of Layur fish covers sea waters throughout Indonesia. Layur fish are carnivorous fish that have strong and sharp teeth or fangs on their jaws. Layur fish is one of the fishermen's catches landed at TPI Tenda Gorontalo City. Seatail fish are caught with many fishing tools, including purse seines, purse seines, payangs, longlines, bagangs and

arad nets (Harjanti et al., 2012). One type of Layur fish caught is Trichiurus lepturus. The high demand for Layur fish has caused the rate of exploitation to increase (Fofandi, 2012). This increase in fishing effort will result in a decline in Layur fish, which can lead to a decline in Layur fish stocks (Putra et al., 2018).

Layur fish is a resource that can be recovered, but has limitations in recovering itself. Excessive fishing of Layur fish (Trichiurus sp.) can cause a decline in the population. If this continues, the stock of Layur fish in nature will decrease and cause the Layur fish to become extinct and disrupt the balance of the ecosystem.

This research is important to study the population parameters and level of utilization of Layur fish, which is needed in developing a better management concept for Layur fish resources. The aim of this research is to analyze the size structure, size first caught (Lc50%), length-weight relationship, analyze mortality rates (total, natural and caught) and level of utilization of Layur fish.

RESEARCH METHODS

Research location Fish sampling was carried out using Systematic Random Sampling. Fish samples were taken randomly at 10%. Sampling was carried out 3 times and was carried out once every month, starting in April, May and August 2022. The method used was the survey method. According to Widiyono and Hariyanto (2016), the survey method is a type of descriptive research. Descriptive research is designed to obtain information about symptom status at the time the research was conducted.

RESEARCH PROCEDURE

Size Structure

Size structure analysis was used to determine the frequency of size of Layur fish caught during the research period. The formula used is:

K = 1+3.33 log NI = R/K

Note: Lt= length of fish at age t; L∞= asymptotic length of fish; K= growth rate coefficient; t= age of fish caught; t0= theoretical age of the fish when length is 0

The size of the first catch can be obtained by plotting the frequency of the first fish caught with the length of the fork, so that we get 50% of the length of the fish when first caught.

Growth

Growth parameter values were analyzed using the FiSAT II program, using the formula:

Lt = L∞ [1- exp-K(t-t0)]

Mortalias Pace

Total Mortality (Z) was analyzed using the Beverton & Holt (1980) method, namely:

Z= K (Linf-L^) / (L-L')

Natural mortality (M) uses the Pauly (1980) equation, namely:

LnM= -0.0152 - 0.279*LnL□+ 0.6543*LnK + 0.4634*LnT

Fishing mortality can be obtained using the formula:

F = Z - M

Note: K= parameter that describes the growth rate; L= Asymptotic length; L^= Average length of fish caught; L' = The smallest measurement limit for the length of the class of fish caught.

Utilization Rate

Utilization level analysis aims to calculate and determine the utilization status of the resources used. The formula used to calculate the utilization rate value is as follows:

E = F/Z

Note: E= Utilization level; F= Capture Mortality; Z= Total mortality. Note: K= number of classes N= total data I= class interval R= largest value

RESULTS AND DISCUSSION

The TPI Tent Research Location for Gorontalo City, Gorontalo Province, is located at 0019' – 1015 N and 123o43' – 123o43'E. The position of this province is in the northern part of the island of Sulawesi, which is directly bordered by North Sulawesi Province to the East and Central Sulawesi Province to the West, while to the North it directly faces the Sulawesi Sea and to the South with Tomini Bay which is deep sea water (deep-sea waters).

Overall, Gorontalo Province has an area of 12,215.44 km2, consisting of (1) Boalemo Regency covering an area of 2,248.24 km2 (18.4%), (2) Gorontalo Regency covering an area of 3,226.98 km2 (28.05%), (3) Pohuwato Regency covering an area of 4,491.03 km2 (36.77%), (4) Bone Bolango Regency covering an area of 1,984.40 km2 (16.25%), (5) North Gorontalo Regency covering an area of 1,230.07 km2 (10.07%), and (6) Gorontalo City covering an area of 64.79 km2 (0.53%).

Gorontalo Province is an archipelagic area with a total coastline of 560 km and a total sea area of 50,500 km2. Gorontalo has quite large fisheries potential, namely the estimated number of marine fish (pelagic and damersal) is 1,226,090 tons/year (19.15% of marine fisheries potential throughout Indonesia) with a new utilization rate of around 28.22%. This potential also includes the potential of Tomini Bay of 293,830 tons/year, so that its potential in the fisheries sector has not yet been explored (Gorontalo Province Fisheries and Maritime Service, 2012).

TPI (Fish Auction Place) Tent. Size Structure and Size First Caught (Lc50%) The number of Layur fish samples obtained during the research from April, May and August 2022 was 187 individuals. The length of the Layur fish caught is around 8.30-69.50 cm in total length. The first size caught was 46.10 cm. Total length can be seen in Figure 1.

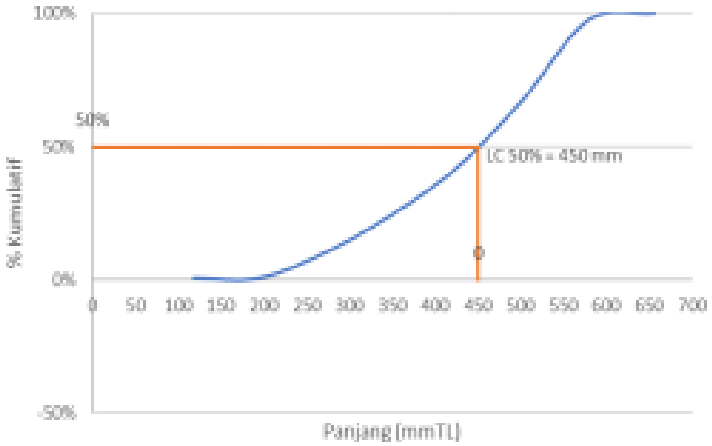

Figure 1. Graph of Size First Caught. Relationship between length and weight

Size Structure and Size First Caught (Lc50%) Based on research results, the size of Layur fish ranges from 8.3-69.5 cm Total Length. Figure 1 shows the catch in April of 32 individuals with a length range of 41.51-58.91 cm. Total length, in May there were 51 individuals with a length range of 35.80-67.65 cm. Total length and in August there were 43 individuals with a length range of 35.80-67.65

cm. 11.62-43.50 cm Total Length. Overall the size of the most caught fish ranged from 44.25 to 51.30 cm in total length.

The results of this study show that larger fish are caught in greater numbers. The size structure obtained is smaller compared to the research results of Phuryandari et al. (2020) which was landed at PPS Cilacap ranged from 52-114 cm in total length and was greater than the results of Ahmad (2008) in Pelabuhanratu, West Java, obtaining a length of around 100-600 mm in total length. Differences in the size of fish caught are influenced by hereditary factors, gender, age, parasites, disease, environmental conditions and differences in sampling time (Agustina et al., 2015). The first length caught (Lc50%) of the Layur fish was 47.0 cm Total Length. The results obtained are different from the research of Panggabean et al. (2015) in Cilacap waters and its surroundings was 505.1 mmTL. Based on the results of Lc50%, research shows that Layur fish is included in fish worth catching.

Growth

The relationship between the length and weight of layur fish follows the equation W = 0.0085L2.947, with a coefficient of determination of 0.72 and a correlation coefficient of t0 = -0.906. The curve of the relationship between length and weight of layur fish is presented in Figure 2.

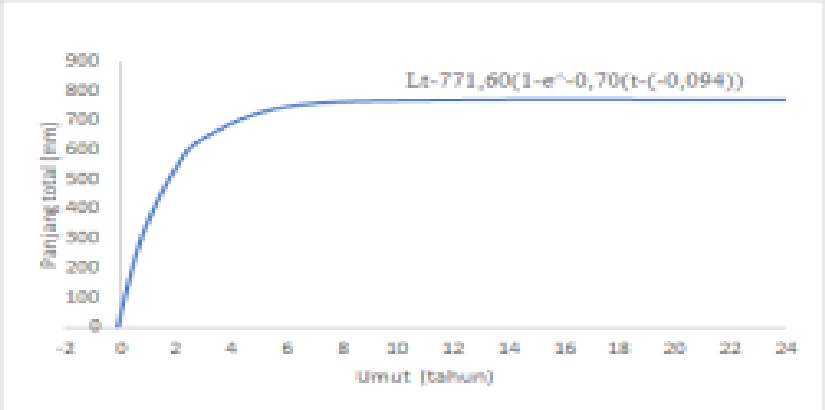

Figure 2. Graph of the Relationship between Length and Weight of Layur Fish

Growth and Recruitment Patterns The Von Bertanlanffy growth equation for the Layur fish studied was Lt = 78.00 (1 – e - 0.70(t-0.094)). The maximum length that fish can achieve (L∞) is 78.00 cm Total Length, with a value of K = 0.72 per year. The theoretical age (t0) of Layur fish is -0.094 years. Based on the growth equation, the relationship between length and age of Layur fish can be seen as follows (Table 1.)

Table 1. Relationship between the length of the Layur fish (mm) and the age of the fish (years

No	Age (Years)	Total Length (mm)
1	-0.094	0
2	0	40.54
3	0.5	223.07
4	1	360.02

5	2	539.88
6	3	641.14
7	6	748.32
8	12	770.86
9	24	771.60

Layur fish have relatively slow growth because the time required for layur fish to reach L∞ is 24 years. Layur fish recruitment patterns can be estimated through the FiSAT II program using input data L∞, K and t0. It can be seen in Figure 3 that the recruitment season for Layur fish occurs from July to October, and the peak recruitment for Layur fish is in August.

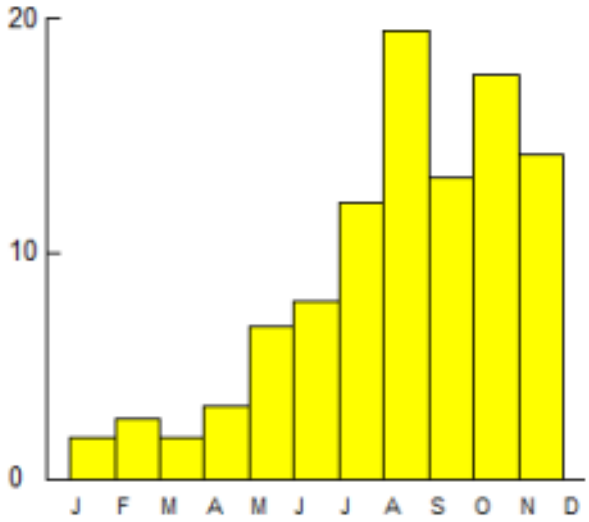

Figure 3. Histogram of layur fish recruitment patterns

Length and Weight Relationship

Based on the results in Figure 4, the relationship between length and weight shows that the regression coefficient (b) for Layur fish is 2.947. This shows that the b value of Layur fish is included in the negative allometric growth pattern. Indicates that growth in length is faster than weight. Research by Vianita et al. (2014), in Morodemak PPP, the b value was 2.68, which indicates that the growth pattern is negative allometric. Panggabean et al. (2015), amounting to 2,891. The research results obtained show that the growth pattern of Layur fish is thinner compared to Layur fish caught around Pelabuhanratu Bay and Binuangean waters, Banten. However, the Morodemak PPP and Cilacap waters show the same growth pattern. 7-0776 Growth and Recruitment Patterns of Layur Fish have a L∞ length value of 771.60 mmTL, with a growth coefficient (K) value of 0.70 and a theoretical age value (t0) of -0.094 year.

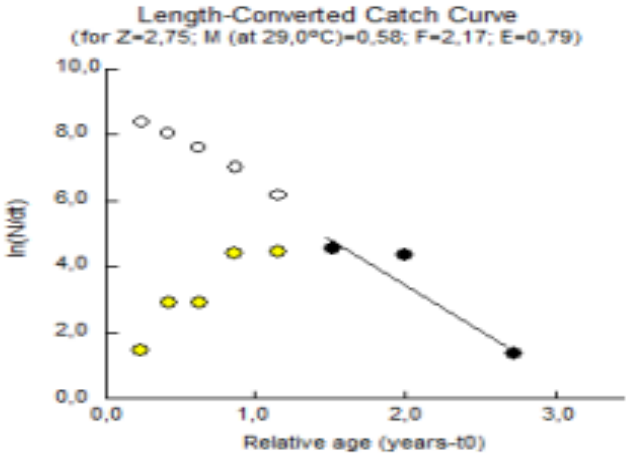

Figure 4. Mortality Rate and Exploitation Rate Curve

This shows that the growth rate of young fish has a relatively fast growth rate when compared to old ones. According to Effendi (2002), young fish will have relatively fast growth while adult fish will be slower to reach their asymptote length. Results of analysis of the growth curve (Figure 2) It takes time for Layur fish to reach maximum length at the age of 24 years. This shows that Layur fish have a long life cycle because the K value obtained is quite high. This high K value can cause fish to quickly become extinct because the M value is also high. According to Beverton and Holt (1959) in Saputra (2009), the growth curvature index (K) is related to the age of the fish, because K describes the time needed for the fish to reach L∞, and long life will be related to mortality.

In general, fish with high K values have large M values, and species with low K values have low M values. Fish that grow slowly (low K) will quickly become extinct if mortality is high.

Mortality Rate and Exploitation Rate

Based on this curve, it shows that total mortality (Z) is 2.68/year with natural mortality (M) being 0.61/year, and fishing mortality (F) 2.07/year. The exploitation level obtained was 0.80, which shows that the utilization level is above optimum.

Mortality Rate and Exploitation Level Based on the research results, total mortality (Z) was 2.75/year and natural mortality (M) was 0.58/year. Mortality due to fishing efforts (F=ZM) was 2.17/year. Natural mortality is lower than fishing mortality, which means that more Layur fish landed at TPI Tenda die as a result of fishing activities. The Exploitation Level (E) was found to be 0.80, this exploitation value exceeds the optimum value, namely 0.5. According to Gulland (1971), it indicates that a resource has experienced over exploitation. The level of exploitation of Layur fish obtained was 0.80. This value indicates that Layur fish has exceeded the optimum catch limit of 50%. So that the Layur fish at TPI Tenda have experienced biological growth overfishing and recruitment overfishing. According to Restiangsih and Amri (2018), growth overfishing occurs if the catch is dominated by small fish in growing size, while recruitment overfishing occurs if exploitation activities catch more fish that are ready to spawn (spawning stock) or adult fish with mature gonads. Recruitment overfishing is a worse form of fishing and occurs during the spawning process and is usually more disruptive to the existence of fish stocks than growth overfishing (Allen et al. 2013).

CONCLUSION

Based on the results of the research that has been carried out, it can be concluded that the first size caught (Lc50%) is 46.10 cm Total Length, this result is greater than the L∞ value of 78.00 cm Total Length, so it can be said to be worth catching. Calculation of the relationship between length and weight shows that growth is negative allometric and the growth pattern of Layur fish is relatively fast, following the Von Bertalanffy equation, namely Lt = Lt = 78.00 (1 – e - 0.70(t-0.094), with peak recruitment occurring in the month August. The total mortality rate (Z) of Layur fish is 2.68/year, natural mortality (M) is 0.61/year and fishing mortality (F) is 2.70/year. The exploitation rate (E) of Layur fish is 0 .80 indicates that these waters have experienced overfishing

References

1. Agustina, S., M. Boer and A. Fahrudin. 2015. Population Dynamics of Savalai Hairtail Fish (Lepturacanthus Savala) in Sunda Strait Waters. Marine Fisheries: Journal of Marine Fisheries Technology and Management. 6(1): 77-85.

2. Ahmad, Y. 2018. Growth Model of Layur Fish (Trichiurus lepturus Linnaeus, 1758) in Palabuhanratu, West Java. AGROCIENCE. 1(1): 104-115.

3. Allen, M., MJR Hanson., Ahrends and R. Arlinghaus. 2013. Dynamic angling effort influences the value of minimum-length limits to prevent recruitment overfishing. Fisheries Management and Ecology. (20): 247-257.

4. Dahuri, RJ, Ginting, SP, and Sitepu, MJ, 1996. Integrated Management of Coastal and Marine Resources. PT. Pradnya Paramita. Jakarta. 305 p.

5. Department of Maritime Affairs and Fisheries. 2020. Latest Developments in Indonesian Maritime and Fisheries Development Policies and Programs. DKP RI, Jakarta. 63 p.

6. Gorontalo Province Fisheries & Marine Service, 2020. Gorontalo Province Annual Fisheries Report Statistics.

7. Effendie, MI 2002. Fisheries Biology. Pustaka Nusatama Foundation, Yogyakarta, 163 pp.

8. Fofandi M, D. 2012. Popolation Dynamics and Fishery of Ribbonfish (Trichiurus lepturus) of the Saurasta Coast. Central Marine Fisheries Research of India, 1(3): 1-6.

9. Gunarso, W. 1985. Fish Behavior in Relation to Fishing Methods and Tactics. Jur. Utilization of Fisheries Resources Fak. IPB Fisheries, Bogor. 143 p.

10. Gulland JA. 1971. The fish resources of the ocean. Fishing News. West Byfleet. 255p.

11. Harjanti, R., P. Wibowo and T. Hapsari. 2012. Analysis of the fishing season and level of utilization of Layur fish (Trichiurus sp.) in Palabuhanratu waters, Sukabumi, West Java. Journal of Fisheries Resources Utilization Management and Technology. 1(1): 55-66.

12. Mallawa, Najamuddin and Zainuddin, M., 2006. Analysis of Fisheries Potential Development in Selayar Regency, South Sulawesi Province. Makassar.

13. Indradi. I., D. Wjayanto., T. Yulianto and Suroto. 2013. Feasibility Analysis of Kendal Regency Marine Fisheries Business. Journal of Fisheries Science, 8 (2):52-56

14. Panggabean, AS, A. Suman and E. Sostenes. 2015. Population Dynamics of Spiny Fish Resources (Trichiurus lepturus, Linnaeus, 1758) in Cilacap Waters and Surrounding Areas. Indonesian Fisheries Research Journal. 21(3):155- 167.

15. Pauly, D. 1980. A Selection of Simple Method for The Assessment of Tropical Fish Stock. F.A.O. Fish Tech. New York.

16. Phuryandari, A., A. Ghofar and SW Saputra. 2020. Analysis of the Potential and Level of Utilization of Layur Fish (Trichiurus Sp.) Landed at the Cilacap Ocean Fisheries Port (PPS). Pen Aquatics: Scientific Journal of Fisheries and Marine Affairs. 19(2).

17. Putra, HS, R. Kurnia and I. Setyobudiandi. 2018. Study of Stock Resources of Layur Fish (Trichiurus lepturus Linnaeus, 1795) in Palabuhanratu Bay, Sukabumi, West Java. Journal of Tropical Fisheries Management. 2(2): 21-21.

18. Restiangsih, Y. H and K. Amri. 2019. Biological Aspects and Food Habits of Skipjack Fish (Katsuwonus pelamis) in the Flores Sea and Surrounding Areas. BAWAL Widya Capture Fisheries Research. 10(3): 187-196.

19. Saputra, WS 2009. Research-Based Population Dynamics. Diponegoro University Publishing Agency, Semarang, 203 pp.

20. Vianita, R., SW Saputra and A. Solichin. 2014. Biological aspects of layur fish (Trichiurus lepturus) based on catches at PPP Morodemak. Management of Aquatic Resources Journal (MAQUARES). 3(3):160- 167.

21. Sultan M., 2004. Development of Capture Fisheries in the Taka Bonerate Marine National Park Area. Dissertation. Bogor Agricultural Institute Postgraduate School. Bogor.

22. Syamsuddin, 2008. Analysis of Sustainable Development of Skipjack Fish (Katsuwonus Pelamis Linneus) in Kupang, East Nusa Tenggara Province. Dissertation. Postgraduate Program Agricultural Systems Study Program, Hasanuddin University. Makassar.

23. Syamsuddin, ML2013. Spatial and Temporal Distributions of Big Eye Tuna (Thunnusobesus) catches affected by Oceanographic conditions and Ocean Clime Variability in the Eastern Indian Ocean off Java. Ph.D Dissertation. Hokkaido University. 110pp.

24. Widodo, K. Azis, B. Priyono, G. Tampubolon, N. Naamin, A. Djamali. 1998. Stock Assessment Method. In: Potential and Distribution of Marine Fish Resources in Indonesian waters. National Commission for the Study of Marine Fish Stock Resources LIPI, Jakarta. 251 p.

25. Zainuddin, M., AFP Nelwan, A. Farhum, MAI Hajar, Najamuddin, M. Kurnia and Sudirman. 2013. Characterizing Potential Fishing Zone of Skipjack Tuna during the Southeast Monsoon in the Bone Bay-Flores Sea Using Remotely Sensed Oceanographic Data. International Journal of Geosciences, Vol. 4: 259-266.