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SOME ASPECTS OF THE REPRODUCTIVE BIOLOGY OF KRAI COB (*Auxis thazard*) IN SIBOLGA, NORTH SUMATERA

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ABSTRACT

Tuna, tuna and skipjack (TTC) species in North Sumatra have contributed to world tuna production. One of the sources of neritic tuna caught in Indian Ocean waters (WPP 572 and 573) is tuna krai (Auxis thazard). Tongkol krai (Auxis thazard) has a high economic value in Indonesia, especially in the waters of Sibolga and its surroundings. Ensuring the sustainability of cob krai resources is an absolute must. The purpose of this study was to determine the reproductive biology of Tongkol Krai (*Auxis thazard*) in North Sumatra. Research on the Sibolga Archipelago Fisheries Port (PPN) in February, July, and October 2019. This study uses quantitative research using survey methods, with the sampling technique used in this study is *purposive stratified sampling.* The results showed that the correlation between length and weight of 118 Krai Cob W= 0.0078L 3.234, with a positive allometric growth pattern. Spread Length 25-41cmFL. Sex ratio 1:0.83 and not significantly different. The first time the gonads matured in females at 31.74cmFL, and 28.43cmFL in males. Female krai cob had TKG I 21.05%, TKG II 5.26%, TKG III 2.63%, TKG IV 63.17%, and TKG V 7.89%. Cob krai Male TKG I 8.69%, TKG II 4.34%, TKG III 8.69%, TKG IV 73.91%, and TKG 4.34%.

Keywords: Cob Krai, North Sumatra, Reproductive Biology

INTRODUCTION

The main marine fisheries commodities that are set to become export growth targets in the 2010-2014 strategic plan are tuna, skipjack and tuna (TCT) (Wijopriyono, 2012). Tongkol krai (*Auxis thazard*) has a high economic value in Indonesia, especially in the waters of Sibolga and its surroundings (Hartaty & Setyadji, 2016). The potential for fishing in Sibolga is very large, but the potential for fishing must be balanced with proper management in order to utilize its fishing potential in a sustainable manner (Pratiwi et al., 2020). Continuous fishing will threaten the sustainability of fish resources, the status of the use of krai cob is already in the fully exploited stage(Ilhamdi et al., 2016). rai is a commodity with high competitivenes (Salmarika et al., 2018)Management and utilization of marine and fishery potential must be able to improve people's welfare (Mustofa et al., 2014). Research on the reproductive biology of cob krai in Sibolga still needs to be done and further studies are needed. This research is needed to know the conditions of the cob krai fishery in Sibolga, in order to be able to determine the size of the first gonad maturity of the cob krai fish, both male and femaleThis is important to do to know for sure the state of Krai cobs in nature.

RESEARCH METHODS

Time and Place

Archipelago Fisheries Port Research (PPN) Sibolga is a special port for fishermen in North Sumatra Province. This port is located on the west coast of North Sumatra Province, overlooking the Indian Ocean. PPN Sibolga is located on Jalan Gatot Subroto, Sarudik District, Central Tapanuli Regency, and geographically it is located at the coordinates position of $01^{0}02'15"$ South Latitude and 100^{0} 23'34" East Longitude (Figure 1). The research was carried out for 12 months in the 2019 Fiscal Year. This research used quantitative research using the survey method (Duli, 2019). Using aspects of measurement, calculation, formulas and certainty of numerical data (Musianto, 2002). The sampling technique used in this research is *purposive stratified sampling* (Notoatmodjo, 2010). Data on fleet characteristics, fishing operations, fishing grounds and catches were obtained from various sources and the best fisheries actors. Production and fishing effort data are obtained from port statistics or fisheries supervisors.

Figure 1. PPN Sibolga

Data

Analysis Length and Weight

Analysis Growth analysis uses length and weight parameters, with a linear regression approach, the relationship between the two parameters can be seen by the exponential equation formula, namely (Liestiana et al, 2015):

$$W=aL^b \quad \text{..... (1)}$$

Description: W = Weight (g); L = Fork length (cm); a = *Intercept* (the intersection of the curve of the relationship between the weights and the y axis); b : *Slope* (slope angle of the *regression*).

Sex ratio analysis Sex

Ratio is used to compare male and female fish. To find the sex ratio can use the following equation (Effendie, 2002):

$$p = \frac{n}{N} \; x \; 100\ \% \quad \text{.....(2)}$$

Analysis of First Gonadal Maturation

The method for estimating the size of the first maturation of the gonads is carried out using a mathematical approach based on the Spearman-Karber method (Udupe, 1986)

$$m=\left[xk+\left(\frac{x}{2}\right)\right]-\left(x\Sigma p_i\right) \quad \text{.....(3)}$$

$$\text{antilog } m=m\pm 1{,}96\sqrt{x^2\sum\left(\frac{(p_i \times q_i)}{(n_i-1)}\right)}$$

Description : m = log of fish length at first gonad maturity; ***x***k = log of the middle value of the last length class the fish has gonadally matured; ***x*** = log of increase in length at the mean; p_i = proportion of gonadal mature fish in the i-length class with the number of fish length interval; n_i = the number of fish in the length class I; $q_i = 1 - p_i$; M = the length of the first gonadal mature fish is antilog m

Gonad Maturity Level (TKG)

Gonad Maturity Level (TKG) is used to determine when the fish is gonadally mature (Mariskha & Abdulgani, 2012). Gonad Maturity Level macroscopically can be seen through the morphology of the gonads (Diana, 2007)

Table 1. Gonad Maturity Level of Female Fish based on Cassie modification (Effendie, 1979 in (Effendie, 1979))

TKG	Female
I	The ovaries are like long threads to the front of the body cavity. Color clear smooth surface
II	Larger ovarian size. The color is darker yellowish. Eggs are not clearly visible to the eye
III	Ovaries are yellow. Morphologically the eggs begin to look grain with the eye.
IV	The ovaries are getting bigger, the eggs are yellow, easy to separate. Oil grains do not appear to fill 1/2-2/3 of the abdominal cavity, the intestines are squeezed.
V	The ovary is wrinkled, the walls are thick, the remaining eggs are near the release

RESULT AND DISCUSSION

Results

The sample of Krai Cob was obtained from the catch on land at PPN Sibolga. Tongkor krai measured in this study amounted to 117 tails with fork lengths ranging from 25.5-41.5cmFL. The results showed that the correlation between length and weight of Krai Cob W= $0.0078L^{3.234}$. The regression coefficient (b) formed in the analysis of the long-weight relationship is 3.234 with a determination coefficient of 0.9897 (Figure 1). After being tested with a t-test at a 95% confidence interval, it is known that the growth pattern of Tongkol Krai in PPN Sibolga is allometric positive.

Krai Cob obtained as many as 46 male fish and 38 female fish with a length distribution between 25-45 cmFL. The number of male and female fish was not significantly different. The sex ratio of Krai Cob in PPN Sibolga is known to be 1:0.83 and is not significantly different or balanced based on the results of the chi-square test with a 95% confidence interval. The first time the gonads matured in females at 31.74cmFL, and 28.43cmFL in males. A total of 26.32% female cob krai are immature gonads, and 73.68% are gonadally mature. A total of 13.04% of male Krai Cob were gonadally immature, and 86.96% were gonadally mature (Figure 2). Female krai cob had TKG I 21.05%, TKG II 5.26%, TKG III 2.63%, TKG IV 63.17%, and TKG V 7.89%. Male cob TKG I 8.69%, TKG II 4.34%, TKG III 8.69%, TKG IV 73.91%, and TKG 4.34% (Figure 3).

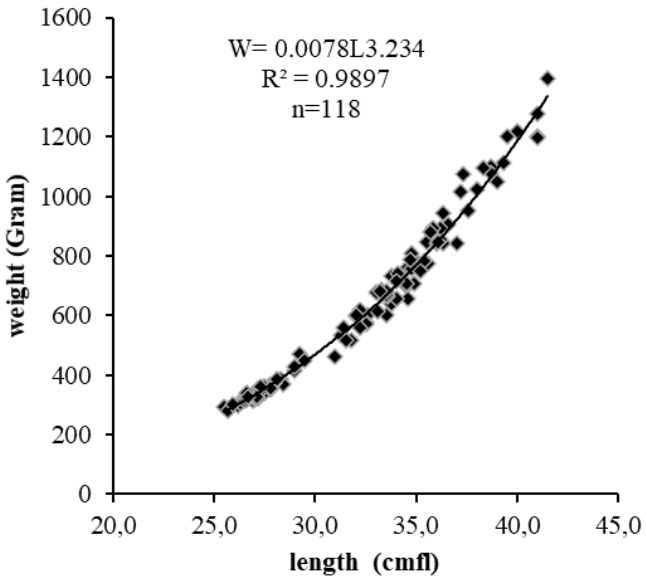

Figure 1. Krai Cob Growth Pattern

Discussion

Karai cobs caught 25.5-41.5cmFL, this is lower in distribution than in previous studies ranging from 19-45 cmFL, or an average length of 32.91 cmFL (Hartaty & Setyadji, 2016). The frequency of fork length of tuna (Auxis thazard) landed at PPI Kusamba, Klungkung 200 mm – 356 mm (Sanjaya, PNKK, Restu, IW, & Pratiwi, 2019). The distribution of krai cob length in the West Indian Ocean, Sumatra 19 – 42 cmFL (Tampubolon et al., 2016). In the waters of Bone Bay 22-50 cm (Kantun, Cahyono and Karsana, 2016).

The growth pattern of komo cobs in this study was positive allometric. This means that length growth is faster than weight gain (Kusumawardani, Fachrudin, & Boer, 2013). Some growth patterns from various locations can be seen in Table 2.

In this study, a balanced sex ratio was obtained, which means that one male fish can fertilize one female fish (Senen, Sulistiono, and Muchsin, 2011). A balanced sex ratio between male and female individuals results in the possibility of maximum fertilization during the mating season (Hasanah, Restiangsih, & Bin, 2019).

The first time the female gonads matured was 31.74cmFL, and 28.43cmFL in males, this indicates that the female tuna had smaller gonad maturity than the male tuna. (Hasanah et al., 2019). Some of the research results that show the ripeness of the krai cob gonads can be seen in Table 3.

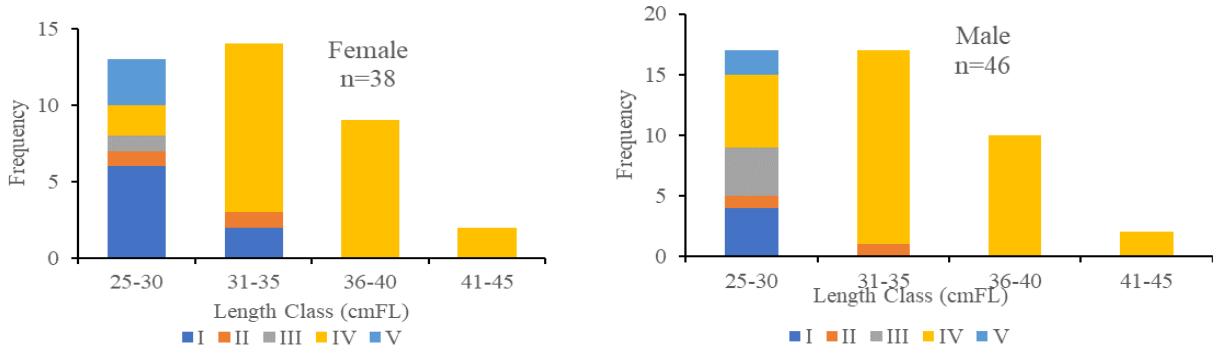

Figure 2. Distribution of Gonadal Maturity Level of Krai Cob

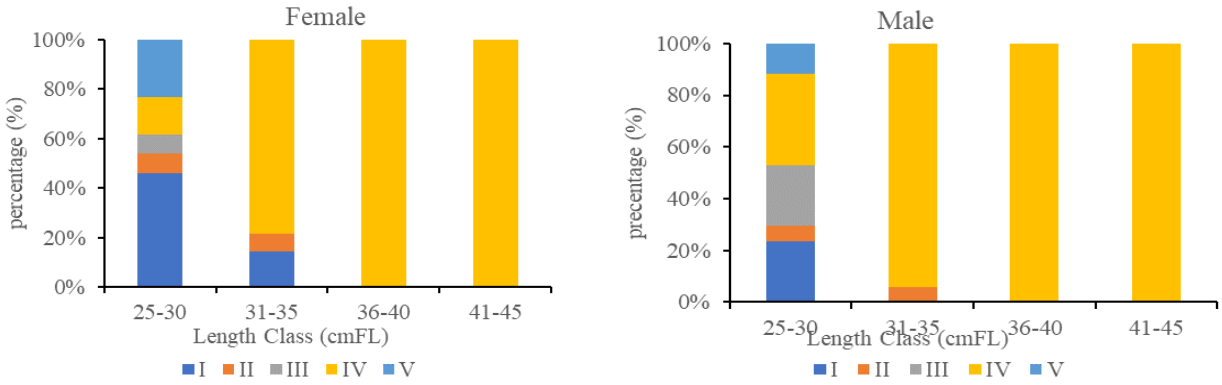

Figure 3. The Percentage of Gonad Maturity Level of Krai Cob

Table 2. Growth Pattern of Cob Krai from Various Locations

Location	of Growth Pattern	a	b	R^2	n	source
Indian Ocean west of Sumatra	Allometric positive	9E-06	3.1489	0.8535	5673	(Tampubolon et al., 2016)
PPI Kusamba	allometric negative	0, 00008	2.6744	0.7593	725	(Sanjaya, PNKK, Restu, IW, & Pratiwi, 2019)
Sibolga	Positive	0.9897	3.2334	0.0078	117	This Research

Table 3. Size at First Maturity of Cob Krai in Various Locations

Location	Lm male	Lm female	Lm	source
Indian Ocean western Sumatra	-	-	34.89 cmFL	(Tampubolon et al., 2016)
Sibolga waters	28.43cmFL	31.74cmFL	-	This study

The proportion caught is dominantly gonadally mature, both male and female, this is because the proportion of juvenile fish (*juvenile fish*) and species composition indicate that the fishing gear used by fishermen is selective in determining the size of the catch (Pratiwi et al., 2020). In general, tuna krai caught are fish that have grown so big that They threaten the continuity of their catch (Widodo et al., 2014). The extraction rate of komo cobs in Sibolga waters is relatively low, so it is still possible to increase the actual extraction rate of the catch which is currently around 30% to achieve the best utilization rate (E = 0.5) (Barata et al., 2011). However, it should be noted that the addition of fishing effort does not increase the number of catches (Ilhamdi et al., 2016). Catching cob krai according to their biological characteristics, namely having a habit of coordinating in groups, so that they have a good coordination system (Kantun et al., 2018).

The frequency of tuna (Auxis thazard) adult or mature gonads landed in Sibolga is more than 70% of the total sample size. This can be caused because most of the catchers in Sibolga use purse seines (Sanjaya et al., 2019). So that the selectivity of fishing gear greatly affects the dominant proportion of fish caught that are mature gonads.

CONCLUSION

The results showed that the correlation between length and weight of Krai Cob W= 0.0078L 3.234 with a positive allometric growth pattern. Spread Length 25-41cmFL. Sex ratio 1:0.83 and not significantly different. The first time the gonads matured in females at 31.74cmFL, and 28.43cmFL in males. Female krai cob had TKG I 21.05%, TKG II 5.26%, TKG III 2.63%, TKG IV 63.17%, and TKG V 7.89%. Cob krai Male TKG I 8.69%, TKG II 4.34%, TKG III 8.69%, TKG IV 73.91%, and TKG 4.34%

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REFERENCES

Barata, A., Bahtiar, A., & Hartaty, H. (2011). Pengaruh Perbedaan Umpan Dan Waktu Setting Rawai Tuna Terhadap Hasil Tangkapan Tuna Di Samudera Hindia. *Jurnal Penelitian Perikanan Indonesia*, *17.2*, 133–138. DOI: http://dx.doi.org/10.15578/jppi.17.2.2011.133-138

Diana, E. (2007). *Tingkat Kematangan Gonad Ikan Wader (Rasbora Argyrotaenia) Di Sekitar Mata Air Ponggok Klaten Jawa Tengah* (1st Ed.). Fakultas Matematika Dan Ilmu Pengetahuan Alam Universitas Sebelas Maret Surakarta.

Duli, N. (2019). *Metodologi Penelitian Kuantitatif: Beberapa Konsep Dasar Unutk Penulisan Skripsi Dan Analisis Data Dengan Spss* (1st Ed.). Deepublish.

Effendie. (1979). *Metoda Biologi Perikanan* (1st Ed.). Yayasan Dewi Sri.

Effendie, M. . (2002). *Biologi perikanan*. Yayasan Pustaka Nusantara.

Hartaty, H., & Setyadji, B. (2016). PARAMETER POPULASI IKAN TONGKOL KRAI (Auxis thazard) DI PERAIRAN SIBOLGA DAN SEKITARNYA. *BAWAL*, *8*(Vol 8, No 3 (2016): (Desember, 2016)), 183–190.

Hasanah, N., Restiangsih, Y. H., & Bin, S. (2019). Struktur Ukuran dan Performa Pertumbuhan Ikan Cakalang (Katsuwonus Pelamis) Yang Didaratkan Di Ppi Labuan Bajo, Kabupaten Donggala, Sulawesi Tengah. *Proceeding Simposium Nasional Kelautan Dan Perikanan 6*, 217–222.

Ilhamdi, H., Telussa, R., & Ernaningsih, D. (2016). Analisis Tingkat Pemanfaatan Dan Musim Penangkapan Ikan Pelagis Di Perairan Prigi Jawa Timur. *Jurnal Satya Minabahari*, *01*(02), 52–64.

Kantun, W., Darris, L., & Arsana, W. S. (2018). Komposisi Jenis Dan Ukuran Ikan Yang Ditangkap Pada Rumpon Dengan Pancing Ulur Di Selat Makassar. *Marine Fisheries : Journal Of Marine Fisheries Technology And Management*, *9*(2), 157. DOI: https://doi.org/10.29244/jmf.9.2.157-167

Kusumawardani, N. M., Fachrudin, A., & Boer, M. (2013). Kajian Stok Sumber Daya Ikan Tongkol , Euthynnus Affinis Di Perairan Selat Sunda Yang Didaratkan Di Pelabuhan Perikanan Pantai Labuan ,Pandeglang, Banten. *Prosiding Seminar Nasional Ikan Ke 8 Kajian*, 163–176.

Liestiana, H., Ghofar, A., & Rudiyanti, S. (2015). Aspek Biologi Ikan Layang (Decapterus Macrosoma) Yang Didaratkan Di Ppp Sadeng, Gunungkidul, Yogyakarta. *Diponegoro Journal Of Maquares*, *4*(4), 10–18.

Mariskha, R. P., & Abdulgani, N. (2012). Aspek Reproduksi Ikan Kerapu Macan (Epinephelus Sexfasciatus) Di Perairan Glondonggede Tuban. *Jurnal Sains Dan Seni Its*, *1*(1), 27–31.

Musianto, L. S. (2002). Perbedaan Pendekatan Kuantitatif Dengan Pendekatan Kualitatif Dalam Metode Penelitian. *Jurnal Managen Dan Kewirausahaan*, *4*(2), 123–136.

Mustofa, N. R., Mudzakir, A. K., & Kurohman, F. (2014). Pengembangan Berbasis Komoditas Unggulan Perikanan Tangkap Di Kabupaten Pekalongan. *Journal Of Fisheries*

Resources Utilization Management And Technology, *7*(2), 54–61.

Notoatmodjo, S. (2010). *Metodologi Penelitian Kesehatan*. Renakacipta.

Pratiwi, M. A., Putra, I. P. Y. P., & Arthana, I. W. (2020). Penilaian Status Domain Sumber Daya Ikan Berdasarkan Pendekatan Ekosistem Untuk Pengelolaan Perikanan Tongkol Krai (Auxis Thazard) Di Perairan Selat Lombok Yang Didaratkan Di Desa Seraya Timur , Bali. *Jurnal Pengelolaan Perikanan Tropis*, *4*(2), 29–37.

Salmarika, Taurusman, A. A., & Wisudo, S. H. (2018). Status Pengelolaan Sumber Daya Ikan Tongkol Di Perairan Samudera Hindia Berbasis Pendaratan Pukat Cincin Di Pelabuhan Perikanan Samudera Lampulo, Aceh: Suatu Pendekatan Ekosistem. *Jurnal Penelitian Perikanan Indonesia*, *24*(4), 263–272.

Sanjaya, P. N. K. K., Restu, I. W., & Pratiwi, M. A. (2019). Kajian Pertumbuhan Ikan Tongkol (Auxis Thazard) Yang Didaratkan Di Pangkalan Pendaratan Ikan (Ppi) Kusamba , Kabupaten Klungkung , Bali Pada Musim Barat. *Current Trends In Aquatic Science*, *2*(1), 13–20.

Tampubolon, P. A. R. P., Novianto, D., Hartaty, H., Kurniawan, R., Setyadji, B., & Nugraha, B. (2016). Size Distribution And Reproductive Aspects Of Auxis Spp. From West Coast Sumatera, Eastern Indian Ocean. *Research Institute For Tuna Fisheries, Ministry Of Marine Affairs And Fisheries, Indonesia*, 1--8. Udupe, K. S. (1986). Statistical Method Of Estimating The Size At First Maturity In Fishes. *Fishbyte*, *4*(2), 8–10.

Widodo, A. A., Satria, F., & Sadiyah, L. (2014). Status Pemanfaatan Dan Pengelolaan Sumberdaya Ikan Tuna Neritik Di Samudera Hindia Wpp 572 Dan 573. *Jurnal Kebijakan Perikanan Indonesia*, *573*(No 1), 23–28.

Wijopriyono. (2012). Daya Dukung Sumber Daya Perikanan Tuna Di Samudera Hindia Dalam Kaitannya Dengan Industrialisasi Perikanan. *Jurnal Kebijakan Periknaan Indonesia*, *4*(2), 101–108.