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Utilization Status of Silver Rasbora (*Rasbora argyrotaenia*) in Kampar Kiri River, Lipat Kain Village, Kampar Kiri Sub District, Kampar

Status Pemanfaatan Ikan Pantau (Rasbora argyrotaenia) di Sungai Kampar Kiri Kelurahan Lipat Kain Kecamatan Kampar Kiri Kabupaten Kampar

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Abstract

This research aims to determine the utilization status of silver rasbora (*Rasbora argyrotaenia*) in the Kampar Kiri River, Lipat Kain Village. This research was conducted in March-May 2024 in Sungai Kampar Kiri, Lipat Kain Village, Kampar Kiri Sub District. This research was carried out using a survey method to obtain primary data from measurements of fish caught. Fish sampling is carried out once a month for 3 months by seeing them directly in the Kampar Kiri River with the help of fishermen. The fish samples caught are put into a cool box and preserved using ice cubes. Then, they are taken to the laboratory to measure their length and weight for analysis using Microsoft Excel, FISAT II, and LB-SPR. This research obtained an SPR value for monitored fish of 83% or 0.83. The SPR value of this monitoring fish is still above the standard SPR limit (30% / 0.3). So, the status of silver rasbora utilization in the Kampar Kiri River is included in the under-exploited category.

Keywords: Utilization Status, Rasbora, LB-SPR, Kampar Kiri River

Abstrak

Penelitian ini bertujuan untuk mengetahui status pemanfaatan rasbora perak (Rasbora argyrotaenia) di Sungai Kampar Kiri Desa Lipat Kain. Penelitian ini dilaksanakan pada bulan Maret hingga Mei 2024 di Sungai Kampar Kiri, Desa Lipat Kain, Kecamatan Kampar Kiri. Penelitian ini dilakukan dengan menggunakan metode survei untuk mendapatkan data primer dari hasil pengukuran ikan yang tertangkap. Pengambilan sampel ikan dilakukan setiap satu bulan sekali selama 3 bulan dengan cara melihat langsung di Sungai Kampar Kiri dengan bantuan nelayan. Sampel ikan yang tertangkap dimasukkan ke dalam cool box dan diawetkan dengan menggunakan es batu. Kemudian dibawa ke laboratorium untuk diukur panjang dan beratnya untuk dianalisis menggunakan Microsoft Excel, FISAT II, dan LB-SPR. Dari penelitian ini diperoleh nilai SPR ikan yang dipantau sebesar 83% atau 0,83. Nilai SPR ikan hasil monitoring ini masih berada di atas batas standar SPR (30%/0,3). Jadi, status pemanfaatan ikan rasbora perak di Sungai Kampar Kiri termasuk dalam kategori kurang tereksploitasi.

Kata kunci: Status Pemanfaatan, Rasbora, LB-SPR, Sungai Kampar Kiri

1. Introduction

Riau Province has four main rivers: the Indragiri River, Rokan River, Kampar River, and Siak River. The Kampar River produces a relatively large aquaculture and capture fisheries, reaching 70% of Riau Province's fisheries production (BPS, 2022). It originates from the confluence of two equally large rivers: the Kampar Kiri and Kampar Kanan (Harahap et al., 2021).

Kampar Kiri River itself passes through many areas from upstream to downstream. One of the areas passed by the Kampar Kiri River is Lipat Kain Village. Lipat Kain Village is where the community conducts fishing activities and acts as fishermen. The catches from fishermen in this area are diverse, such as wallago catfish (*Wallago leeri*), sengarat fish (*Belodonthycthys dinema*), giant featherback *(Chitala hypselonotus*), Asian redtail catfish (*Hemibargus nemurus*), *Pangasius polyuranodo* and silver rasbora (*Rasbora Argyrotaenia*).

Silver rasbora is a leading commodity from the catch. High levels of fishing and consumption by the community are one of the causes of the decreasing fish stocks in this area. Based on interviews conducted with local fishermen, it is known that the utilization of silver rasbora in Lipat Kain Village by fishermen from the local area using nets and gill nets. In this sub-district, there are almost 50 fishermen who are divided into two groups.

Apart from fishing, illegal gold mining activities (IGMA) are also centered on the Singing River in the Lipat Kain Sub-district. This can also affect the habitat and distribution of fish stocks in the Kampar Kiri River because the Singing River flows into the Kampar Kiri River. Illegal gold mining activities (IGMA) cause a decline in water quality. Also, it damages the habitat, which can impact the decline in fish resource stocks in the Lipat Kain Sub-district. Until now, there has been no information regarding the status of the utilization of silver rasbora in the Kampar Kiri River; for this reason, research is needed to determine the status of the utilization of silver rasbora in the Kampar Kiri River as a reference in the management of fishery resources in the Kampar Kiri River.

2. Material and Method

2.1. Time and Place

This research was conducted from March to June 2024. Silver rasbora was sampled from March to May 2024 in the Kampar Kiri River, Lipat Kain Village, Kampar Kiri District, Kampar Regency, Riau Province.

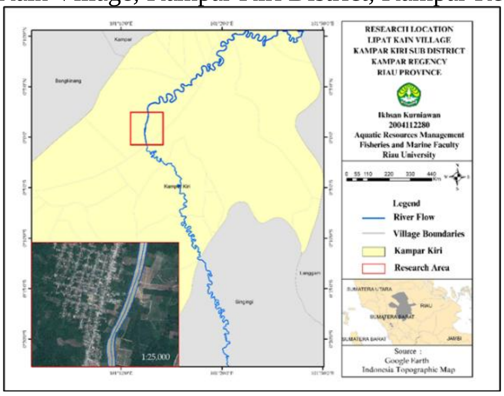

Figure 1. Research location of Silver rasbora utilization status

2.2. Methods

The method used in this study is the survey method, where the waters of the Kampar Kiri River, Lipat Kain Village as the research location, and silver rasbora are used as research objects. The data collected are primary and secondary. Primary data is the result of measurements of silver rasbora caught during the study, and secondary data is based on research that has been carried out.

2.3. Procedures

For handling, the fish samples obtained were analyzed in a fresh and intact condition and had varying sizes. Then, the fish samples were weighed using a scale, and their body length was measured. The water quality measurement carried out was temperature. Temperature measurement was carried out using a thermometer by dipping the thermometer into the water until the temperature indicator was stable and then recorded. Fish length was measured using a measuring board, and fish weight was measured using a scale with an accuracy of 0.1 g.

2.4. Data Analysis

2.4.1. Length Frequency Distribution

The steps to create an extended frequency distribution are to determine the number of class intervals required using the formula (Walpole, 1992): n=1+3,32Log N

Information:

N = Total of size groups

N = Total of fish observed

Determine the class width of each size group using the formula: C=(a-b)/c
Information:
C = bin width
a = Maximum length of fish
b = Minimum length of fish
c = class

2.4.2. Length and Weight Relation

The relation between length and weight can follow the cubic law, where the weight of the fish is the cube of its length. However, the actual relationship in fish is not like that because the shape and length of the fish are different. The relationship between length and weight can be known by the following formula (Effendie, 2006):

$$W = aLb$$

Information:
W = Fish weight (g)
L = Total length of fish (mm)
a = Intercept (intersection of the length-weight relationship curve with the y-axis)
b = Length-weight growth pattern predictor

2.4.3. Growth Parameters (L∞, K, dan t0)

The growth model is related to the length of the fish; this formula is used to show the growth of the length of the fish at the age of one year younger, meaning that the growth of the fish at a certain age does not experience a change in length one year later. Fish growth is analyzed using the Bertalanffy growth model (1938) with the following equation:

$$Lt=L\infty(1-e^{\wedge}(-K(t-t0)))$$

Information:
Lt = length of fish at age t (mm)
L∞ = Maximum length
K = Growth coefficient (per unit time)
t0 = Theoretical age at which length is equal to zero

The method of determining the asymptotic length (L∞) and growth coefficient (K) is estimated using the ELEFAN I subprogram found in the Fisat II software. While the theoretical age (t0) is not available in the software, the calculation of the t0 value is obtained manually using the Pauly empirical equation (1984) as follows:

$$\text{Log } (-t0) = -0{,}3922 - 0{,}2752(\text{Log } L\infty) - 1{,}038(\text{Log } K)$$

2.4.4. Mortality and Exploitation Rate

The total mortality rate (Z) was estimated using the Jones & Van Zalinge (1981) method found in the FISAT II software. The empirical Pauly formula (1984) was used to calculate the natural mortality rate (M) as follows:

$$\text{Log } M = -0{,}0066 - 0{,}279 \log L\infty + 0{,}6543 \log K + 0{,}4634 \log T°C$$

Information:
M = Natural mortality
L∞ = Asymptotic length in the Von Bertalanffy equation
K = Growth coefficient in Von Bertalanffy growth
T = Average water surface temperature (^{o}C)

2.4.5. Length Maturity (Lm 50)

The first gonad maturity size (Lm) is when 50% of the fish are in gonad maturity condition. The length of the fish when the gonads first mature is analyzed based on Gonad Maturity Level (TKG) data. Estimation of the size of fish at first gonad maturity (Lm = L50) was carried out using a logistic curve approach (Sparre & Venema, 1998) by using the equation model:

$$Q=1/((1+e^{\wedge}(-a(L-L50))))$$

Information:
Q = mature gonad length class fraction (TKG III and IV)
1 = 100% mature gonad value
e = 2,718
a = constant
L = Middle value of long class
Lm50 = length of fish at 50% gonad maturity

Based on the equation above, it can be changed into a linear form as follows:

Ln(Q/(1-Q))=-aL_50+aL

Using linear regression, the length of the fish at gonad maturity is obtained using the equation:

L_50=aL/a

Information:

aL = intersep
a = slope

2.4.6. *Determination of Utilization Status*

Determining the SPR value can be done by using the Length-Based SPR (LB-SPR) model proposed by Hordyk et al. (2014). This model has several advantages, including analyzing simple data. Based on the SPR value, an agreement is made on the SPR reference limit (SPR value threshold), which describes the stock status of a fish resource, as referred to the criteria set by NOAA Fisheries, namely:

Table 1. Category of fish resources utilization (exploitation) status

SPR	<30%	(30-50%)	>60%
Exploitation Status	Red	Yellow	Green
	Over exploited	*Fully-moderate exploited*	*Under exploited*

3. Result and Discussion

3.1. *Frequency Distribution of Silver Rasbora Length*

Based on research conducted from March to May 2024, 484 silver rasbora samples were obtained with a length of 70-131 mm. In March, 161 fish samples were received, with 100 male silver rasbora and 61 female silver rasbora. In April, 153 fish samples were obtained, with 88 male silver rasbora and 65 female silver rasbora. In May, 170 fish samples were obtained, with 67 male silver rasboras and 103 female silver rasboras. The highest number of catches was in May, with 170 fish, and the lowest was in April, with 153 fish. The difference in catches each month is influenced by rainfall, rising water levels, and the spawning pattern of silver rasbora. Rainfall also significantly affects fishermen because rainfall will determine and influence the implementation of fishing operations (Hermansyah et al., 2023). This is what makes it difficult for fishermen to catch much fish.

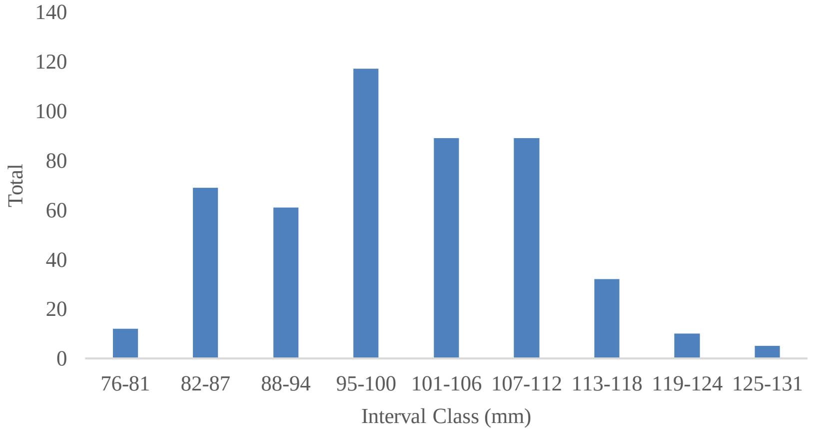

Figure 2. Frequency distribution of silver rasbora length

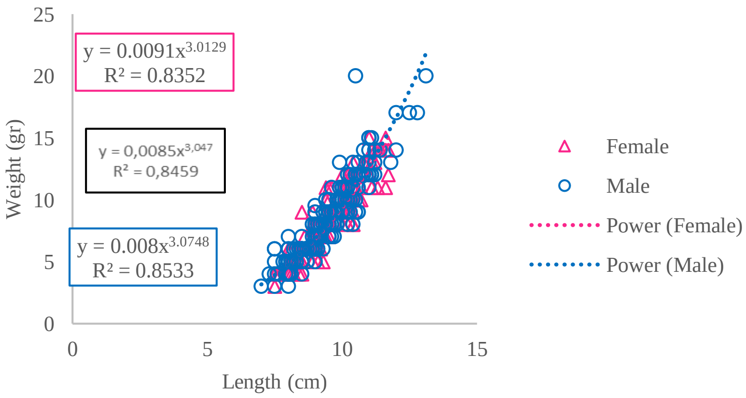

Figure 3. Length and weight relation silver rasbora

3.2. Length and Weight Relation of Silver rasbora

According to Effendie (1979), the length-weight relationship in the form of a general formula, namely W = aLb, where W is the total weight of the fish, L is the total length of the fish, and a and b are constants that indicate the growth pattern of the fish. Based on the length-weight data that has been analyzed, the equation W = 0.0085L3.047 is obtained. This equation results from ANOVA analysis using the regression method with a b value of 3.047. The T-test results on the length-weight data of the silver rasbora were obtained with a T count value of 0.087 and a T table of 1.96. Based on the results of the T count and T table tests, it can be concluded that the growth pattern of silver rasbora in the Kampar Kiri River is positive allometric or that the growth of fish weight is more dominant than the growth of length.

3.3. Gonad Maturity Level of Silver rasbora

Based on the observed panfish samples, it was found that there were 150 panfish with TKG I, 142 TKG II, 91 TKG III, 72 TKG IV, and 29 TKG V. This explains that TKG I and II are the most common levels of gonad maturity found during the study. This is thought to be caused by the panfish in the Kampar Kiri River, which are still in the growth process and fast-spawning period. Widiana et al. (2019) state that the small number of fish found with TKG IV is thought to be due to the fast-spawning period, so female fish with mature gonads will release all their eggs. It is also believed to be because the location where the fish samples were taken was not a spawning ground, so when the samples were taken, the fish would migrate to another place, and only a few fish with mature gonads were caught.

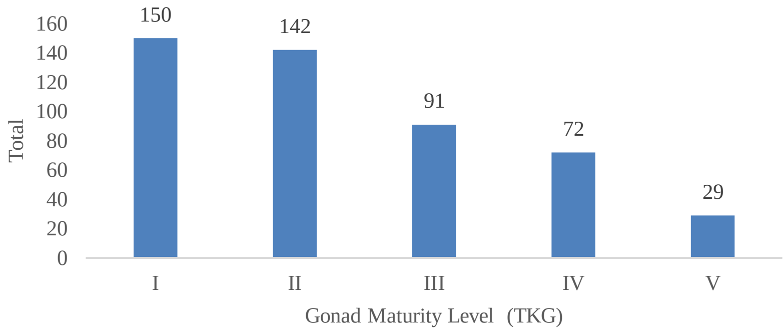

Figure 4. TKG silver rasbora

3.4. Growth Rate of Silver rasbora

Based on research conducted on silver rasbora, growth rate parameters were obtained from Bertalanffy (1938). The value of the growth coefficient parameter (K) of the silver rasbora in the Kampar Kiri River is 1.01, which means that the growth of the silver rasbora in the Kampar Kiri River increases by 1.01 per year. Apart from the growth coefficient, during the study, an asymptotic length (L∞) of 109.6 was obtained, which means that the silver rasbora in the Kampar Kiri River can grow to 109.6 mm. Furthermore, the theoretical age of 0.96 means that the silver rasbora in the Kampar Kiri River have a length of 0.96 mm when they are born or have just hatched. Wiadnya et al. (2000) stated that several factors interact and accompany each other, such as quantity, competition, food quality, mortality rate, and age, all of which can affect the growth rate of fish.

3.5. Mortality Rate of Silver rasbora

Based on data during the research conducted in the Kampar Kiri Lipat Kain River, the Z value of the silver rasbora was 1.43 per year. Natural mortality (M) at a temperature of 29°C was 0.97 per year. The capture mortality (F) obtained during the study was 0.46 per year. The natural mortality rate of silver rasbora in the Kampar Kiri River was more significant than the capture mortality rate, which means that the aquatic environment where the silver rasbora live in the Kampar Kiri River still supports the life of silver rasbora. Alfayeat et al. (2020) state that environmental factors influencing the natural mortality rate are temperature, maximum length, and growth rate (K).

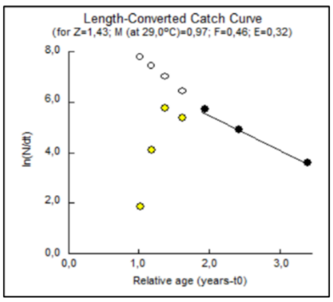

Figure 5. Mortality rate of silver rasbora

3.6. Exploitation Rate

The level of exploitation of silver rasbora in the Kampar Kiri River is still in the category of not exceeding the maximum stock utilization (moderate), which is at 0.32 or 32%. This is by Sparre & Venema (1998), E=0,50 shows the maximum stock utilization level, and E>0.50 shows the stock utilization level is already in the overexploitation category. According to Kartini et al. (2017), the fishing mortality rate (F) dramatically influences the exploitation rate (E) of a species, and the higher the fishing mortality rate, the higher the exploitation rate. According to Monika et al. (2020), overexploited species will impact the reduction of adult fish, so adult fish will be caught first before spawning at least once in their life cycle. This overexploitation will cause the degradation of a species from the waters, which will worsen over time and cause the extinction of the species.

3.7. Utilization Status of Silver Rasbora

Based on research conducted using the Length Based Spawning Potential Ratio (LB-SPR) model analysis. LB-SPR modeling is very effective when research is conducted in an area with minimal fisheries data (Darmawan et al., 2020).

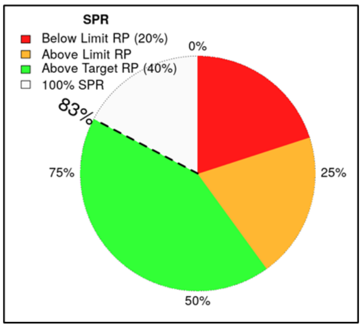

Figure 6. Percentage value of SPR of Silver rasbora

Based on Figure 6, it can be seen that the SPR percentage value of the monitored fish is at 83% or 0.83. The SPR value of the monitored fish is still above the standard SPR limit or can be said to be under-exploited, which means that the monitored fish caught are more significant than Lm 50 (the size of mature gonad fish). As long as the SPR value is above 30% (sustainable utilization point/sustainability reference points), the condition of the fish resource stock in these waters is still good or sustainable and can increase fishing efforts by 10% (Hordyk et al., 2014).

Season and weather also influence the determination of fishing areas and catches (Darmawan et al., 2020). According to the results of interviews with fishermen, monitoring fish fishing in the Kampar Kiri River is carried out throughout the year, and there is never a fishing season. This will affect the size of the fish caught because when the water level rises, the fish will migrate. The possibility of fish being caught in the spawning area (nursery ground) is higher than standard water surface conditions because when the water level is expected, the fish will have a different spawning area from the feeding ground.

3.8. Silver Rasbora Management Efforts

Management efforts can be made to manage fish resources in the under-exploited category by adding fishing fleets in the Kampar Kiri River area. This fishing fleet is added to maximize the catch obtained in the Kampar Kiri River. Nelwan et al. (2010) state that the dynamics of small-scale fishing fleets are a form of increasing fishing efforts to maximize catches.

According to Hilborn (2007), Increasing fishing efforts carried out by small fishermen can be in the form of allocating fishing gear, modifying fishing gear, improving technology, and expanding fishing areas. Adding and modifying fishing gear can be one of the efforts that can be made to increase catches. Other efforts to increase fishing can be made by educating the public about silver rasbora so that they can be utilized more so that public interest and market demand for silver rasbora will increase. Apart from education, increasing public interest can also be done by using silver rasbora in the under-exploited category in various forms of fish processing, such as frozen food or other fish processing, which will increase demand for silver rasbora. Based on this, the estimation of fish utilization status based on LB-SPR is also a monitoring tool in a fishing area, analyzing the actions that must be taken in the future to maintain the fishing area's resources (Hordyk et al., 2014).

4. Conclusions

Based on the research, the utilization status level (SPR) of silver rasbora in the Kampar Kiri River, Lipat Kain Village, is under-exploited with a value of 0.83. The value of mortality due to fishing against natural mortality (F/M) is 0.47, and the average size of silver rasbora caught in the Kampar Kiri River is larger than the first size of gonad maturity (Lm 50).

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