

Providing different natural feeds on the growth rate of *tor soro* larvae

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Abstract. *Tor soro* is an Indonesian freshwater fish that is threatened with extinction. Preventing the extinction of the *Tor soro* fish is by carrying out cultivation activities. This research aims to determine the impact of providing different varieties of natural feed on the growth rate of *Tor soro*. Completely Randomised Design (CRD) consisting of four treatments (A; *Artemia salina* 21 days, B; *Artemia salina* 7 days and *Tubifex* sp. 14 days, C; *Daphnia* sp. 21 days, D; *Daphnia* sp. 7 days and *Tubifex* sp. 14 days) was the method used in this research. Fish maintenance is for 21 days with a feeding frequency of twice (morning and evening). The results of the ANOVA test showed that giving different natural feeds impacts absolute length growth and specific growth rate, but does not significantly differ the survival rate of *Tor soro* fish larvae. The highest absolute length growth was 1.07 ± 0.01 cm and 0.036 ± 0.025 g of the absolute weight growth. The difference in days of feeding impacts fish growth because the protein contained in *Tor soro* fish feed varies (Treatment B). The conclusion obtained from this research was that the highest value was found in treatment B.

1 Introduction

Tor soro is a freshwater fish commodity that is very prospective for aquaculture [1][2]. *Tor Soro* is one of the fish species whose population has declined in nature [3]. One alternative that can be done to increase the population is to increase the growth rate at the larval stage.

The larval stage is the most vulnerable. That is because the larvae must be given appropriate food to support growth after the yolk runs out. [4] stated that the critical phase occurs is the larval phase because there are many deaths in that phase. Death in the larval phase occurs because the fish larvae have not found the appropriate feed. Fish larvae feed needed for growth is protein ranging from 35-50% [5]. [6] states that feeding with high protein values and following the larvae's mouth opening can increase growth and shorten larval rearing. Natural feeds with a high protein content and size suitable for larval mouth openings include *Artemia salina*, *Tubifex* sp. and *Daphnia* sp.

Artemia salina contains the nutrients needed to help fish larvae grow and survive [7]. The nutrient content in *Artemia salina* is very high, one of which is protein which is 41.21%, fat 29.10%, and ash 11.29% [8]. *Artemia* merupakan pakan alami yang disukai oleh larva *Tor soro* [4]. *Tubifex* sp. is a natural food that is easily digested and has active movement. The nutrient content of *Tubifex* sp. is 3% crude fibre, 11.21% water, 64.47% crude protein, 17.63% crude fat, 7.48% ash, and 10.06% betaine [9]. In addition to *Tubifex* sp., *Daphnia* sp. is also a natural feed that is easily digested with nutrient content suitable for fish larvae. [10] stated that *Daphnia* sp. has a protein content of 39.24%, fat of 98%, carbohydrates of 4.32%,

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and ash content of 14.63%. Based on research [4], the average weight gain of *Tor soro* larvae was 0.35 grams, the average length gain of *Tor soro* larvae was 1 cm, and the growth rate of *Tor soro* larvae was 0.01% after 29 days of feeding with *Artemia*. In this way, this research needs to be done to determine the amount and type of natural feed that is effective and suitable for *Tor soro* fish larvae.

2 Material and Method

2.1 Location and Time for Research

This research was carried out at the Cijeruk Fresh Fish Germplasm Research and Development Facility in January - February 2022.

2.2 Research Methodology

The method of Completely Randomized Design (CRD) is the method used in this study. The treatment in CRD method used consisted of four treatments (A; *Artemia salina* 21 days, B; *Artemia salina* 7 days and *Tubifex* sp. 14 days, C; *Daphnia* sp. 21 days, D; *Daphnia* sp. 7 days and *Tubifex* sp. 14 days).

The container used in larvae rearing is a 30x25x20 cm aquarium with a water volume of 15 L. The number of containers is 16 aquariums that have been cleaned beforehand and equipped with an aerator. Larvae were obtained from the Cijeruk Freshwater Fisheries Germplasm Research and Development Institute. *Tor soro* larvae used as test animals are larvae that are 5 days old after hatching with a length of ± 0.1 cm. *Tor soro* were reared based on the guidelines of the Institutional Animal Care and Use Committee (IACUC, 2018) and have ethical approval B/034SN/XII/2022 from the animal ethics committee of the School of Marine and Fisheries Faculty, Universitas Syiah Kuala. *Tor soro* larvae were stocked at 1 fish/L [11] with the larvae were reared for 21 days from day 5 after hatching to day 25 after hatching. The feed given is by the treatment in this study. The frequency of feeding was 2 times a day with the Ad satiation method. The parameters in this study are as follows:

Absolute Length Growth (L), absolute weight growth (W), and survival rate (SR) are measured using the following formula [12]:

$$L = L_t - L_0$$

$$W = W_t - W_0$$

$$SR = N_t / N_0 \times 100\%$$

Pieces of information: L=Absolute length growth (cm), L_t =Fish length at the end of study (cm), L_0 = Fish length at the start of the study (cm), W=Absolute length growth (g), W_t =Fish length at the end of study (g), W_0 = Fish length at the start of the study (g), SR= Survival rate (%), W_t = Number of fish at the end of study (fish), W_0 = Number of fish at the start of study (fish).

The water quality measured is acidity (pH) measured using LAMOTTE pH 5. Temperature and oxygen content (DO) were measured using a Ysi Pro DO Meter. Water quality measurements were taken every 7 days during the study. Sampling at the beginning and end of the study for absolute length growth, absolute weight growth, and survival rate.

2.3 Data analysis

The analysis used is ANOVA with a 95% confidence level. If different natural diets had an effect ($P < 0.05$) on absolute length growth, absolute weight growth and survival rate, the analysis was continued with Tukey's post hoc test. Descriptive analyses were performed on data from water quality measurements.

3 Results and discussion

The results of the ANOVA analysis test showed that different natural diets had an effect ($P < 0.05$) on the absolute length growth of *Tor soro* fish, but did not affect the absolute weight growth and survival of *Tor soro* fish. The research data can be seen in Table 1 as follows.

Table 1. Analysed data on all research parameters

Treatment	Parameters		
	Absolute Length Growth (cm)	Absolute Weight Growth (g)	Survival Rate (%)
A	0.98±0.02 ^b	0.02±0.02	95.00±3.33
B	1.07±0.01 ^c	0.04±0.03	96.67±3.85
C	0.82±0.03 ^a	0.02±0.01	90.00±3.85
D	1.00±0.03 ^b	0.03±0.02	91.67±3.33

Note. A; *Artemia salina* 21 days, B; *Artemia salina* 7 days dan *Tubifex sp.* 14 days, C; *Daphnia sp.* 21 days, D; *Daphnia sp.* 7 days dan *Tubifex sp.* 14 days)

Data analysis (Table 1) shows that the treatment with the highest value in all parameters is treatment B. In treatment B, the absolute length growth value was 1.07 ± 0.01 cm, absolute weight growth 0.036 ± 0.025 g and survival rate $96.67 \pm 3.85\%$. The lowest value of all parameters was in treatment C. The value of each parameter was 0.82 ± 0.03 cm (absolute length growth), 10.25 ± 0.27 %/day (Absolute weight growth) and 90 ± 3.85 % (survival rate).

The results of the water quality measurements are shown in Table 2. Temperature, pH and dissolved oxygen (DO) were measured as water quality data.

Table 2. Measurement data of water quality parameters

Treatment	Water Quality Parameters		
	Temperature (°C)	pH	DO (mg/L)
A	23.5-25.4	7.59-7.93	4.56-4.96
B	23.2-25	7.51-7.72	4.49-4.67
C	23-25.1	7.46-7.78	4.48-4.74
D	23.4-25	7.54-7.72	4.53-4.68

Tor soro fish larvae during 21 days of rearing with different natural feeds experienced differences in absolute length growth, Absolute weight growth, and survival between all treatments. The treatment that had the highest absolute length growth value was treatment B with an absolute length growth value of 1.07 ± 0.01 cm and absolute weight growth of 0.036 ± 0.025 g. The highest absolute length growth value was treatment B with an absolute length growth value of 1.07 ± 0.01 cm. Research by [4] resulted in an average length growth of 1 cm and an average weight growth of 0.35 g of *Tor soro* fish during 29 days of maintenance and feed given to *Tor soro* fish in the form of *Artemia*. Based on the above statement, feeding in treatment B (*Artemia salina* 7 days and *Tubifex sp.* 14 days) during 21 days of maintenance

showed the best results. This is because during the 21-day rearing showed the same results as the 29-day rearing and the protein content in the feed given was high. In addition, the difference in days of feeding impacts fish growth because the protein contained in *Tor soro* fish feed varies (7 days *Artemia salina*, 14 days *Tubifex* sp.). According to [8], *Artemia* contains protein, namely 41.21%, while the protein content of *Tubifex* sp. is crude protein 64.47% [9]. Protein is a nutrient that plays a very important role in fish growth and protein is the the largest component of meat and serves as the building blocks of body tissues [13].

Survival rate is the percentage of the number of live fish reared from the start of rearing to the end of rearing. In this study, the best survival rate of *Tor soro* larvae was obtained in treatment B (*Artemia salina* 7 days and *Tubifex* sp. 14 days) during 21 days of rearing, namely $96.67 \pm 3.85\%$. According to [14] survival rate is considered good when the survival rate of fish is greater than 50%. The survival rate of fish in the larval stage is influenced by the availability of food following the required nutrients and the mouth opening of fish larvae. [15] stated that the survival and growth of fish are influenced by the food given to fish larvae. [16] also stated the same, namely the results of their research, a combination of 50% *Artemia* and 50% *Tubifex* feed showed the highest survival results. [17] also stated that the combination of 3 weeks of *Artemia* and 3 weeks of *Tubifex* feed showed a high survival rate of 86%.

The results of quality measurements (Table 2) during 21 days of fish rearing are within the optimal range for fish rearing. [18] stated that a good pH value for fish farming is 6.5-9 and DO ranges from 4.48-4.96 mg/L. [19] stated that if DO value in the rearing tank exceeds 5 mg/L, the fish experience stress and die. [20,21] stated that water quality that is not in the optimal range can cause death, stress and disturbance of metabolic processes.

4 Conclusion

Feeding different natural diets affected absolute length growth ($P < 0.05$). However, it did not affect absolute weight growth and fish survival. The best treatment was treatment B (*Artemia salina* 7 days and *Tubifex* sp. 14 days). The value of absolute length growth was 1.07 ± 0.01 cm, absolute weight growth was 0.036 ± 0.025 g and survival rate was $96.67 \pm 3.85\%$.

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