Effect of various natural feed on the growth and survival of Tinfoil barb larvae as local fisheries (*Barbonymus schwanenfeldii*)

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Abstract. Natural feed is needed to improve larvae growth, because of high nutritional value; appropriate size for the larvae's mouth opening; attracts the attention of fish and is easily digested by the larvae. The study purpose is to ascertain how various natural feed affect Tinfoil barb larvae's development and survival (*Barbonymus schwanenfeldii*). The study was carried out at the Lukup Badak Fish Seed Center, Pegasing, Central Aceh, from July to September 2022. A completely randomized design (CRD), comprising four treatments with four replications, namely: Treatment 1 (*Artemia* sp.), Treatment 2 (*Rotifera* sp.), Treatment 3 (*Chlorella* sp.), and Treatment 4 (*Nannochloropsis* sp.) was used for data analysis. Feeding was carried out ad libitum 4 times a day. The ANOVA result showed that feeding different natural feed to the Tinfoil barb larvae for 28 days significantly ($P<0.05$) effect on length rate and growth rate, but had no discernible impact on specific growth rate or survival ($P>0.05$). The highest length rate was found in the treatment of *Artemia* sp. (4.72 mm) while the highest weight rate was found in *Rotifera* sp. treatment (0.0119 g). *Artemia* sp. and *Rotifera* sp. are natural feed that have excellent nutrients for growth development of Tinfoil barb larvae.

1 Introduction

Tinfoil barb (*Barbonymus schwanenfeldii*) is a native fish found in Lake Laut Tawar, Aceh Province [1], with local name is Lemeduk. However, Tinfoil barb that are marketed are generally caught from lakes and rivers. If fishing is carried out continuously, it is feared that there will be a decrease in the number of fish populations and can even cause extinction. The development of Tinfoil barb farming is currently being carried out at the Fish Seed Center (BBI) Lukup Badak Takengon, Central Aceh. However, in its development, Tinfoil barb still has several obstacles that cause slow fish growth and low survival rates, including feed [2]. One of the factors supporting the success of fish farming is the availability of feed, especially natural feed where the provision of natural feed is a major component in larval care. The

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advantage of using natural feed is that it has a size that matches the larval mouth opening, has high nutritional value, is always moving so as to attract fish attention, and is easily digested by larvae [3].

Natural feed consists of phytoplankton and zooplankton, such as *Artemia* sp., *Chlorella* sp., *Rotifera* sp., and *Artemia* sp. *Artemia* sp. is from the zooplankton group that is commonly used during larval stadia because it contains high protein, and several fatty acids important for larval growth and survival [4]. *Rotifera* sp. contains high nutritional value and its size is suitable to the mouth opening of fish larvae [3]. Meanwhile, natural feed that is also often used from the phytoplankton group is *Chlorella* sp. because it is easy to provide and relatively cheap and increases the growth and survival of larvae [5]. *Nannochloropsis* sp. is a type of natural feed from the phytoplankton group that has antimicrobial content and relatively fast growth and has high nutritional value which is used as food for the aquaculture hatchery industry such as juveniles, bivalves and fish larvae [6].

Previous studies on the effect of natural feeding on Tinfoil barb have been conducted. According to [2] the natural feeds such as *Artemia* sp. can promoted the fish larvae growth, but the study still limited to *Artemia* sp. only. The study purpose was to ascertain how various natural feed affect the growth and survival of Tinfoil barb larvae.

2 Material and methods

2.1 Materials

The materials used in the study were 3-days-old Tinfoil barb larvae and different natural feed that obtained from Lukup Badak Fish Seed Center.

2.2 Research methods

The research was conducted from July - September 2022 at the Lukup Badak Fish Seed Center, Pegasing, Central Aceh. A completely randomized design (CRD), comprising four treatments with four replications, namely: Treatment 1 (T1 = Feed with *Artemia* sp.), Treatment 2 (T2 = Feed with *Rotifera* sp.), Treatment 3 (T3 = Feed with *Chlorella* sp.), and Treatment 4 (T4 = Feed with *Nannochloropsis* sp.) was used for data analysis.

2.3 Research procedure

The study was conducted in several stages, including: a) Culture of different natural feed, *Artemia* sp., *Rotifera* sp., *Chlorella* sp., and *Nannochloropsis* sp.; b) Preparation of fish sample, as many as 20 fish per aquarium with a stocking density of 5 fishes/liter; The three-days-old Tinfoil barb larvae measured the length and weight as initial data; The sampling was carried out every seven days including weight measurements and measurements of water quality such as temperature, pH and dissolved oxygen; and c) Feeding during maintenance, the larvae are fed ad libitum at 07.00 am, 11.00 am, 14.00 pm, and 18.00 pm.

2.4 Research parameters

2.4.1 SR

SR is determined using the formula [7]:

$$SR = Nt/No \text{ x } 100\% \quad (1)$$

Where: SR = Survival rate (%); Nt = Number of fish at the conclusion of the experiment (fish); No = Number of fish at the beginning of the trial (fish)

2.4.2 LR

LR is determined using the formula [8]:

$$LR = Lt\text{-}Lo \quad (2)$$

Where: LR= Length rate (g); Lt = Average length of fish at the conclusion of the experiment (g); Wo = Average fish length at the beginning of the trial (g)

2.4.3 GR

GR is determined using the formula [8]:

$$GR = Wt\text{-}Wo \quad (3)$$

Where: GR= Growth rate (g); Wt = Average weight of fish at the conclusion of the experiment (g); Wo = Average fish weight at the beginning of the trial (g)

2.4.4 SGR

SGR is determined using the formula [9]:

$$SGR = [(Ln\ Wt\text{-}Ln\ Wo)/t]x\ 100\% \quad (4)$$

Where: SGR= Specific growth rate (%/day); Wt = Average weight of fish at the conclusion of the experiment (g); Wo = Average fish weight at the beginning of the trial (g); t = Rearing period (days)

2.5 Data analysis

Analyse of Variance (ANOVA) was carried out to detect the treatment result of each natural feed, and the difference among the treatment was examine for futher test.

3 Result and discussion

The ANOVA result showed that feeding different natural feed to the Tinfoil barb larvae for 28 days significantly ($P<0.05$) effect on length rate and growth rate, but had no discernible impact on specific growth rate or survival ($P>0.05$) (Table 1).

Table 1. The growth and the survival of Tinfoil barb larvae

Treatment	LR (mm)	GR (g)	SGR (%/day)	SR (%)
T1	4.72 ± 0.52^{b}	0.0111 ± 0.0011^{ab}	6.73 ± 0.32^{a}	82.5 ± 8.66^{a}
T2	4.47 ± 0.37^{ab}	0.0119 ± 0.0009^{b}	6.94 ± 0.48^{a}	85 ± 10.8^{a}
T3	3.77 ± 0.22^{a}	0.0098 ± 0.0011^{a}	6.47 ± 0.29^{a}	78.75 ± 14.36^{a}
T4	4.19 ± 0.26^{ab}	0.0101 ± 0.0006^{ab}	6.36 ± 0.31^{a}	77.5 ± 11.9^{a}

Natural food that is preferred because it has several benefits and advantages, among others, it is adaptable in a wide range of environments, has the required nutritional content, can be enriched before use as feed, it has a size that matches the larval mouth opening, is always moving so as to attract fish attention, and is easily digested by larvae, because the digestive tract and organs of the larvae are not well develop [10]. The treatment of *Artemia* sp. (4.72 mm) provides a better length growth rate compared to the treatment of *Chlorella* sp. This is in accordance with the statement of [2] that *Artemia* sp. can increase length growth in Tinfoil barb larvae. This is also confirmed by [10] that giving *Artemia* sp. to mackerel larvae showed the best absolute length growth results. *Artemia* sp. has a fairly high protein content of 66.45% [11]. In addition, it also has a size that is more suitable for larval mouth openings and is attractive to fish [12].

The absolute weight growth values in the *Rotifera* sp. treatment had significant effect compare to *Chlorella* sp. This is because *Rotifera* sp. has a fairly high protein content of 62.41% [4]. The high protein content is thought to cause higher weight growth in the *Rotifera* sp. treatment. Protein is a nutrient that is needed by fish for body maintenance, tissue formation, and replacement of damaged body tissues [13]. In addition to containing nutrients that are in accordance with the needs of fish larvae, it also has characteristics that support it as a suitable initial feed for larvae, such as small in size, moving slowly, making it easier for larvae to predate *Rotifera* sp [14]. Fish larvae need food with high protein content to support their growth and development. Protein requirements for small fish are generally higher than for large fish because larvae require more energy for the growth and development of their organs [15].

The survival and specific growth rate values were no significant effect**, t**his is because each natural food has sufficient nutritional content. In addition to protein factors, food attractiveness factors are thought to also have a major function in the survival and growth development of larvae [10]. Food that has better attractiveness will stimulate the appetite of fish larvae to prey on it.

Measurement of water quality parameters during this study showed that the temperature ranged from 22-26°C. The values are still in the normal range so it is good for the fish growth. The pH value obtained during the study ranged from 6.9 to 7.0. This is the ideal pH for the life of freshwater biota. The concentration of dissolved oxygen in this study ranged from 7.8-8.4 mg/L. In general, the measured water quality parameters support the growth of Tinfoil barb larvae [2].

4 Conclusion

Artemia sp. and *Rotifera* sp. are natural feed that have excellent nutrients for growth development of Tinfoil barb larvae.

References

1. N. Nurfadillah, I. Hasri, dan F. Fahma. Polyculture of tilapia (*Oreochromis niloticus*) and Lemeduk (*Barbonymus schwanenfeldii*) in floating net cages as a strategy for utilizing natural food. E3S Web of Conferences, EDP Sciences. **339**, p. 01008 (2022)
2. S. Mellisa, I. Hasri, N. Nurfadillah, I. I. Arisa. The effectiveness of feeding artemia enriched with vitamin C on the growth performance and survival of Lemeduk fish larvae (*Barbonymus schwanenfeldii*). Conference Series: Earth and Environmental Science, IOP Publishing. **674**, p. 012061 (2021)

3. I. Prayogo, M. Arifin. Teknik Kultur Pakan Alami *Chlorella* sp. dan *Rotifera* sp. Skala Massal dan Manajemen Pemberian Pakan Alami pada Larva Kerapu Cantang. J. Ilmu Perikanan **6**, 2 (2015)
4. V. E. Herawati, J. Hutabarat, O. K. Radjasa. Nutritional Content of *Artemia* sp. Fed with *Chaetoceros calcitrans* and *Skeletonema costatum*. HAYATI Journal of Biosciences. **21**, 4 (2014)
5. S. M. Aly, N. I. ElBanna, M. Fathi. Chlorella in aquaculture: challenges, opportunities, and disease prevention for sustainable development. Aquaculture International. **32**, 2 (2024)
6. K. M. Eryalçın, D. Dominguez, M. Izquierdo. Content in nine minerals and seven vitamins of rotifers (*Brachionus plicatilis*) fed commercial diets and two forms of *Nannochloropsis oculata*. J. of the World Aquaculture Society. **55**, 6 (2024)
7. S. Goddard. Feed management in Intensive Aquaculture (1996)
8. M. I. Effendie. Biologi perikanan (1997)
9. S. S. De Silva, T. A. Anderson. Fish Nutrition in Aquaculture (1994)
10. Farida, E. I Rahardjo dan M. Sahrio. Pengaruh Beberapa Jenis Pakan Alami Terhadap Pertumbuhan Dan Kelangsungan Hidup Larva Ikan Tengadak (*Barbonymus schwanenfeldii*). Jurnal Ruaya. **4**,2 (2016)
11. R. Widiastuti, J. Hutabarat, V. E. Herawati. Pengaruh Pemberian Pakan Alami Berbeda (*Skeletonema costatum* dan *Chaetoceros gracilis*) Terhadap Pertumbuhan Biomass Mutlak dan Kandungan Nutrisi *Artemia* sp. Lokal. J. of Aquaculture Management and Technology, **1**, 1 (2012)
12. M. Yuhana, M. Zairin Jr. The nutritional value of *Artemia* sp. enriched with the probiotic *Pseudoalteromonas piscicida* and the prebiotic mannan-oligosaccharide. Aquaculture, Aquarium, Conservation & Legislation. **10**, 1 (2017)
13. M. Marzuqi, N. W. W. Astuti, K. Suwirya. Pengaruh kadar protein dan rasio pemberian pakan terhadap pertumbuhan ikan kerapu macan (*Epinephelus fuscoguttatus*). J. Ilmu dan Teknologi Kelautan Tropis, **4**, 1 (2012)
14. M. Nur, M. Ansar, D. Lestari, R. Fitriah, C. R. Mahfud. Pengaruh Pemberian Ragi Roti dengan Dosis yang Berbeda Terhadap Kepadatan Rotifera (*Brachionus plicatilis*). J. of Fisheries and Marine Science, **3**, 2 (2022)
15. G. Radhakrishnan, V. S. M. Shivkumar, B. S. Yashwanth, N. Pinto, A. Pradeep, M. R. Prathik. Dietary protein requirement for maintenance, growth, and reproduction in fish: A review. J. of Entomology and Zoology Studies, **8**, 4 (2020)