Original article DOI: 10.19027/jai.23.2.262-268

Larval rearing of kelabau fish *Osteochilus melanopleurus*, Bleeker 1852 with different live feed

Pemeliharaan larva ikan kelabau *Osteochilus melanopleurus*, Bleeker 1852 dengan pakan alami berbeda

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(Received August 15, 2023; Received in revised form October 13, 2023; Accepted August 16, 2024)

ABSTRACT

This study aimed to determine the effect of different starting feeds on the growth and survival rate of kelabau fish larvae (*Ostechilus melanopleurus*, Bleeker 1852). The research was conducted in a Complete Randomized Design (CRD), 3 treatments and 3 replicates. The tested animals used were 7-Dpc (Day post hatch) 90 kelabau fish (*Ostechilus melanopleurus*) larvae with an initial average length of 0.50 ± 0.06 cm and an initial weight of 0.03 ± 0.02 g. Treatment of one (P1) *Artemia nauplii*, (P2) *Tubifex* sp., and (P3) Daphnia. Aquarium research containers size 30×30×20 cm^3 9 pieces with a volume of 5 L of water without water flow in the first week onwards from the second week to the 4^{th} week are increased to 10 L with a water recirculation system with a water flow of about 0.5 L per minute. Measurement of the length and weight of the larvae is carried out once a week for 4 weeks. The results showed that the highest length and weight growth was obtained in the P2 treatment of 3.92 ± 0.13^c cm and 1.25 ± 0.03^c g, and the lowest growth was in the P3 treatment of 1.73 ± 0.05^a cm and 0.093 ± 0.010a g. The ANOVA results showed that feeding *Tubifex* sp. had a very noticeable different effect with a value of P<0.01.

Keywords: feed type, *Osteochilus melanopleurus*, growth

ABSTRAK

Salah satu penyakit yang menyerang ikan lele adalah penyakit kuning atau dikenal juga dengan penyakit kuning, Penelitian ini bertujuan untuk mengetahui pakan awal berbeda terhadap pertumbuhan dan kelulushidupan larva ikan kelabau (*Ostechilus melanopleurus*, Bleeker 1852). Metode Penelitian yang digunakan adalah metode eksperimen, dengan Rancangan Acak Lengkap (RAL), 3 perlakuan dan 3 ulangan. Hewan uji yang digunakan adalah larva ikan kelabau (*Ostechilus melanopleurus*, Bleeker 1852) umur 7 hari sebanyak 90 ekor dengan rata-rata panjang awal 0,50 ± 0,06 cm dan berat awal 0,03 ± 0,02 g. Perlakuan satu (P1) *Nauplii Artemia*, (P2) *Tubifex* sp. dan (P3) Kutu Air. Wadah penelitian akuarium ukuran 30×30×20 cm^3 9 buah dengan volume 5 L air tanpa aliran air pada minggu pertama dan seterusnya dari minggu kedua sampai minggu ke 4 ditambah menjadi 10 L dengan sistem resirkulasi air dengan aliran air sekitar 0,5 L per menit. Pengukuran panjang dan bobot larva dilakukan seminggu sekali, selama 4 minggu. Hasil penelitian menunjukkan bahwa pertumbuhan panjang dan berat tertinggi ditunjukkan pada perlakuan P2 sebesar 3,92 ± $0,13^c$ cm dan 1,25 ± $0,03^c$ g, dan pertumbuhan terendah yaitu pada perlakuan P3 1,73 ± $0,05^a$ cm dan 0,093 ± $0,010^a$ g. Hasil ANOVA menunjukan bahwa pemberian pakan *Tubifex* sp. memberikan pengaruh berbeda sangat nyata dengan nilai P<0,01.

Kata kunci: *Osteochilus melanopleurus*, pertumbuhan, tipe pakan

INTRODUCTION

Osteochilus melanopleurus (Kottelat *et al*., 1993), is known as kelabau fish, which is an Indonesian freshwater fish. *O. melanopleurus* is popular with the community and has high economic value in the local market as a consumption fish. *O. melanopleurus* is sold fresh among the public. Riau Province and Kalimantan Island have extensive river waters as habitats for kelabau fish. Intensive fishing without cultivation causes *O. melanopleurus* larvae in natural waters tobedifficult to find. *O.melanopleurus*isincludedinone type of fish that has Endemic status (endangered species) or fish will become extinct. Therefore, the brood maturation of *O. melanopleurus* gonads has been successfully carried out by Asiah *et al*. (2021). The next year's production of seeds and yolk absorption rate has also been successfully carried out by Asiah *et al*. (2022).

Seed provision is an absolute factor in fish hatcheries (Lukman *et al*., 2021). The process of producing fish fry optimally in an effective and efficient way is called hatchery management. The seeding process and seed availability will be hampered if hatchery management is lacking (Akbarurrasyid *et al*., 2020). There are several activities in fish hatchery management including pond cleaning, brood maintenance, brood selection, hatchery, hatchery and feeding (Ardyanti *et al*., 2018). Feeding management is one of the hatchery management factors that most influence fish growth and the most expensive variable on input costs in the aquaculture production process (Huda & Gusmarwani, 2020).

Knowledge of feeding habits is needed to obtain normal and optimal fish growth patterns. Maximum growth can be achieved if farmed fish are fed according to the level of satisfaction of the fish. Fish will consume feed freely when enough feed is available and stop eating when full (Gultom, 2021). Feed is a source of energy and plays an important role in determining population levels, growth rates and conditions of fish. So, optimal growth largely depends on the amount and quality of feed given. Feed quality is obtained by providing all the nutrients needed by fish (Huda & Gusmarwani, 2020).

Sustainable fish farming practices require appropriate domestication techniques and appropriate and efficient larval rearing and feeding techniques (Tiani & Narayana, 2018). The growth of fish larvae can be interpreted as changes in size (length and weight) over a certain period of time. The growth rate of fish is very volatile and depends heavily on various environmental factors. Feed quality and its availability is one of the most important environmental factors affecting fish growth (Hamdan *et al*., 2014). The growth of fish larvae is also influenced by the quality of feed and the acceptability of fish to the feed (Mohanty *et al*., 2013). Fish larvae respond to the initial feed given depending on the type of feed and the size of the larval mouth opening. These two factors have an impact on larval growth and survival rates (Herlina & Widaryati, 2020; Mahendra & Supriadi, 2020). Furthermore, Pratiwy *et al*. (2023) Feeding behavior is the way fish find, select, and consume food. Understanding fish eating behavior is important to knowing the fulfillment of nutrition and optimal growth in fish.

Based on the analysis of the stomach contents of osteochilus fish, several types of feed were found which generally consist of plankton, water insects and detritus (Icas *et al*., 2019). In building a fish hatchery system, the type of feed given can be adjusted to the eating habits of fish. Therefore, larval feed can be introduced from various live and artificial feeds and dry feeds. When fish larvae are reared and raised in tubs and aquariums (indoor rearing systems), the selection of larval feed becomes very important (Hamdan *et al*., 2014). Some feeds that have been used in the maintenance of fish larvae such as tubifex worms, nauplii Artemia and Daphnia (Said *et al*., 2021).

Until now, in Indonesia there is still no information about the feed of early larvae of *O. melanopleurus* reared in a controlled environment. Therefore, research is needed on the influence of various types of initial feed for *O. melanopleurus* larvae in order to help the development of hatchery technology for buffalo fish in the future. This study examined the effect of larval initial feeding (*Tubifex*, Artemia nauplii, and water fleas) on the growth and survival of *O. melanopleurus* fish larvae maintained under controlled conditions.

MATERIALS AND METHODS

Time and place

The study was conducted in January-November 2022 at the Faperika Fish Hatchery and Breeding Laboratory of Riau University, Pekanbaru, Riau Province, Indonesia.

Research design

The research design for determining the effect of different starting feeds on the growth and survival rate of kelabau fish larvae (*Ostechilus melanopleurus*, Bleeker 1852) used three treatments with three repetitions.

Breeder test

The kelabau fish was obtained from the Kampar River. Broods are selected based on morphological and physiological criteria. The female fish of the gonads is characterized by an enlarged abdomen and when stripping on the abdomen towards the genital hole, a handful of eggs were taken out. As for the male fish, the body shape is slimmer and when ordered on the abdomen, it goes to the genital hole to secrete a little sperm fluid. These mature and ready broods are spawned by the hormone injection method.

Stimulants

The hormone used in this study was OVAPRIM by SYNDELL USA 0.5 ml/kg for the female brood) and 0.3 ml/kg for the male brood.

Material

The types of feed tried in this larval breeding study are tubifex worms, obtained from tubifex worm collectors in Pekanbaru; artemia nauplii, obtained from the hatching of artemia cysts; and water fleas (Moina and Daphnia), obtained from a sewer of stagnant water on Garuda Street Pekanbaru. The dose used for the injection of the female brood is 0.5 ml/kg of broodstock and 0.3 ml/kg for male broods. Maintenance equipment consists of nine aquariums measuring 30×30×20 cm. Each aquarium is equipped with inlet and outgoing water pipes and aeration stones. The aquarium is installed on an iron rack, and each aquarium is given a sign of treatment.

This maintenance aquarium is equipped with a water system in and out of the water recirculation system. Water enters the maintenance aquarium through pumping from the filter bath installed under the maintenance bath. The filter tub consists of mechanical filters (sand, palm fiber, gravel), charcoal, and biological filters (Bioballs). Then the water from the biological filter flows into the free space where the pump is installed. From here, water is pumped into each of the maintenance troughs with a flow of about 0.5 L per minute. In each maintenance aquarium, there is an interconnected water drainage channel outward to the filter tub.

Research methods

The trial design used a one-factor Complete Randomized Design (CRD) with three treatments each with three repeats as follows: P1: *Tubifex sp* feeding, P2: Nauplii Artemia feeding, and P3: Daphnia feeding. Artificially spawned 10-day-old *O. melanopleurus* larvae were used in this experiment. The experimental larvae were divided into three treatment groups, each given *Tubifex* sp, Artemia, and Water Flea feed types. Feeding was given six times daily using the ad libitum method at 07.00, 11.00, 15.00, 19.00, 23.00 and 03.00 WIB. The aquarium was cleaned or dissipated every morning before feeding at 07.00. Weight, absolute length, and SR measurements were carried out every seven days for up to 28 maintenance days.

Data analysis

Growth and survival data are presented in the form of Standard Average±Deviation. After being transformed (arcusinus or Logarithm), a One-Way Diversity Analysis (ANOVA) was carried out to determine the effect of the type of feed treatment given. When the F value shows significant results followed by Duncan's further test.

Test parameter measurement

Sampling was carried out five times, namely sampling on day 1 (beginning of research), day 7, day 14, day 21, and day 28 (end of research). Fish larvae were taken for sampling in the afternoon as much as 100% of the total fish population in one research container by weighing the body weight and measuring the length of the fish.

Measured parameters

Absolute weight growth

The formula used to measure absolute weight according to (Effendie, 2002) is:

$$Wm = Wt - Wo$$

Note:

Wm	= Average absolute weight gain (g)
Wt	= Average weight at the end of the study (g)
W0	= Average weight at the start of the study (g)

Absolute length growth

The absolute length growth of larvae uses the (Effendie, 2002) formula, namely:

$$Lm = Lt - Lo$$

Note:
Lm = Average absolute length growth (cm)
Lt = Average length at the end of the study (cm)
L0 = Average length at the start of the study (cm)

Specific growth rate

The specific growth rate calculated using the (Effendie, 2002)formula is:

$$SGR = \frac{\ln Wt - \ln Wo}{t} \times 100$$

Note:
LPS = Specific Growth Rate (%/day)
Wt = Larval weight at the end of the study (g)
W_0 = Larval weight at the start of the study (g)
t = Maintenance time (days)

Survival rate

Survival using the formula according to (Effendie, 2002) can be calculated using the formula:

$$SR\ (\%) = \frac{Nt}{No} \times 100$$

Note:
SR = Survival Rate (%)
Nt = Number of live larvae at the end of the study (Fish)
No = Number of larvae alive at the start of the study (Fish)

RESULTS AND DISCUSSION

Result

Analysis of Variance (ANOVA) conducted on data on percent length gain (Table 1) showed significant differences between treatments (feed type) ($F = 432.671$, $p<0.01$). Duncan's further test results ($P<0.01$) resulted in the highest growth obtained in larvae fed with tubifex worms (P2), followed by larvae eating Artemia nauplii (P1) and Water fleas (P3). Analysis of data diversity percent weight gain (Table 1) showed very significant differences between groups of larvae fed different feeds ($F = 784{,}810$; $P<0.01$). Duncan's advanced test showed that kelabau larvae fed with tubifex (P2) worms differed markedly compared to other natural foods. Based on proximate analysis carried out on several natural feeds in the form of Artemia, Tubifex, and Daphnia, the nutritional content was obtained which is presented in Table 2.

Discussion

The growth and survival rate of kelabau fish larvae cultured in aquaria with a recirculation system is fully influenced by the type of feed. As shown in Table 1, the percent of the increase in length, weight, and survival rate of larvae of natural-fed kelabau fish (tubifex, Artemia nauplii, and Daphnia). Among natural foods, tubifex contributed the highest yields in terms of increase in length (3.92 ± 0.13) and weight (1.257 ± 0.03), while the highest survival rate of artemia natural feed (93.94 ± 10.5), while the worst of survival is *Tubifex* sp. feed nature has an important role

Table 1. Growth in Absolute Weight (g), Absolute Length (cm), Specific Growth Rate (%/day), and Survival Rate (%) of *O. melanopleurus*.

Treatment	Absolute Weight (g)	Absolute Length (cm)	SGR (%/day)	Survival Rate (%)
$P_{1\ (Artemia)}$	0.393 ± 0.06^{b}	2.65 ± 0.08^{b}	0.019 ± 0.04^{b}	93.94 ± 10.50^{c}
$P_{2\ (Tubifex)}$	1.257 ± 0.03^{c}	3.92 ± 0.13^{c}	0.022 ± 0.03^{c}	90.91 ± 0.00^{a}
$P_{3\ (Daphnia)}$	0.093 ± 0.01^{a}	1.73 ± 0.05^{a}	0.002 ± 0.02^{a}	91.67 ± 14.43^{b}

Note: Uppercase letters behind the mean (±standard deviation) in the same row indicate a significant difference ($P<0.05$). SGR= Specific Growth Rate.

Table 2. Proximate analysis of Artemia, Tubifex, and Daphnia.

Sample Code	Ash Content	Protein	Fat	BETN
Artemia	12.04	56.84	17.83	1.70
Tubifex	5.89	77.42	14.15	0.44
Daphnia	10.32	61.93	10.55	0.50

Result of feed nutrition analysis in dry weight (%).

in aquaculture, especially in rearing of larvae and fry (Hamron *et al*., 2018). According to (Mandal *et al*., 2016), Tubifex has a high protein content for good fish growth and development, young fish need to consume lots of protein.

Fish metabolic function will be improved with adequate nutritional intake. *Tubifex* sp. was good for the growth of fish freshwater due to its high protein content. The nutritional content of Tubifex sp., i.e., 57% protein, 13.30% fat, and 2.04% carbohydrate (Febrianti *et al*., 2020). *Tubifex* sp. has autolysis properties and contains various stimulating exogenous enzymes, the formation of digestive enzymes makes the growth of *O. melanopleurus* larvae better than other natural food. Tubifex sp. movement is slow therefore it is easily caught by fish larvae, the size corresponds to the mouth-opening fish larvae, and easy to digest (Sitanggang & Pasaribu, 2019).

The growth in length and weight of *O. melanopleurus* larvae is presented in Figures 1 and 2. *Tubifex* sp, in this study produced the highest growth and high survival. This is because tubifex feed is a feed that corresponds to the mouth opening of the kelabau larvae. Another study of peres fish larvae (*Osteochilus* sp.) found that tubifex feed gave the lowest results.

This was because the size of the mouth opening of peres fish larvae was smaller than tubifex (Akhyar *et al*., 2016) heavy growth of absolute and specific growth rate. Likewise, the results of the study of (Bhagawati *et al*., 2021) on nilem fish larvae (*Osteochilus hasselti* Valencienes, 1842) found that infusoria feed combined with pellets gave an absolute high length growth result of 7.46 mm, but in this study gave a better absolute length growth result of 44.2 mm with *tubifex* sp feeding.

Tubifex sp feed is a natural feed that gives better results than other natural feeds from several studies that have been done. It is suspected that tubifex worms have high nutrition with a protein content of 54.73%, fat content of 13.25%, and ash content of 6.7% (Sriwahyuni *et al*., 2020). Artemia with a protein content of 50.34%, fat

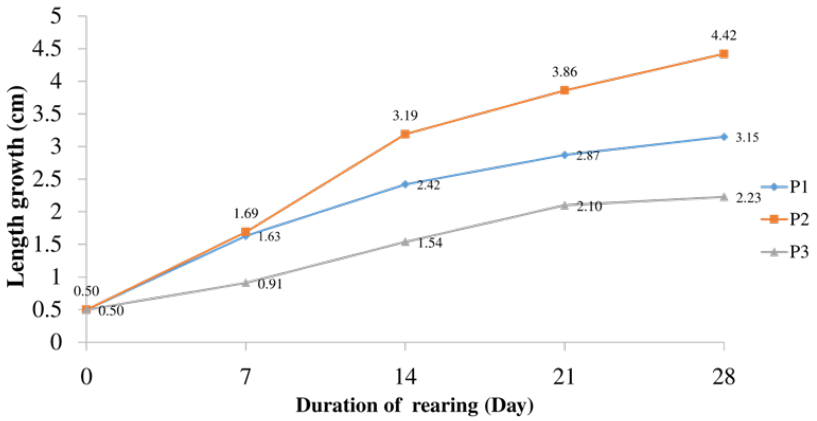

Figure 1. Length growth of larvae of *O. melanopleurus* for 28 days of maintenance.
Note: P1= Artemia; P2= Tubifex; P3= Daphnia.

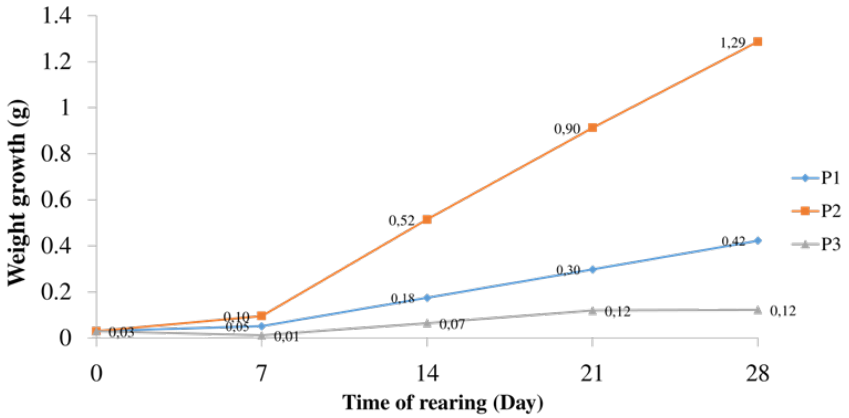

Figure 1. Length growth of larvae of *O. melanopleurus* for 28 days of maintenance.
Note: P1= Artemia; P2= Tubifex; P3= Daphnia.

content of 1.77%, and ash content of 22.20% (Widiastuti *et al*., 2012). Water Fleas (Daphnia) have a protein content of 50% of dry weight and fat which is 20%**.**

CONCLUSION

The results of this study concluded that natural-feed tubifex worms provide a higher growth performance when compared to other natural foods and have a statistically significant effect when compared to other natural foods. The initial feed for kelabau fish larvae (*Osteochilus melanopleurus*, Bleeker 1852) aged seven days after hatching until the fry of kelabau fish is ready to be stocked suitable is *Tubifex* sp. *Tubifex* sp as a starting feed for larvae still have problems due to availability factors and relatively expensive prices. Therefore, it is necessary to study further the right time to replace this live feed with artificial feed without reducing its growth and survival rate.

ACKNOWLEDGMENT

The authors would like to thank the Institute for Research and Community Service, Riau University Research Center and the Ministry of Research, Technology and Higher Education (Ristekdikti) for funding this research.

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