

THE EFFECT OF PROVIDING DIFFERENT TYPES OF NATURAL FEED ON THE ABSOLUTE LENGTH GROWTH OF MANFISH (*Pterophyllum scalare*) MEASURING 4-5 cm IN EXPERIMENTAL TANKS

Pengaruh Pemberian Jenis Pakan Alami yang Berbeda Terhadap Pertumbuhan Panjang Mutlak Ikan Manfish (*Pterophyllum scalare*) Ukuran 4-5 cm di Bak-Bak Percobaan

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(Received December 29th 2025; Accepted February 19th 2026)

ABSTRACT

Indonesia is a significant hub for the global ornamental fish sector, contributing approximately 400 out of 1,100 internationally traded freshwater ornamental fish species, including the highly popular Manfish (*Pterophyllum scalare*). Due to its graceful movement and distinct flat body shape, the manfish is a key commodity. This omnivorous species exhibits a carnivorous tendency, prioritizing a high-protein diet for optimal growth. While Manfish sized 4-5 cm can consume commercial feed, they show a preference for natural feeds like brine shrimp (*Artemia salina*), tubifex worms (*Tubifex* sp.), and water fleas (*Daphnia* sp.) due to their high nutritional content and motion, which stimulates appetite. Maintaining an optimal diet, specifically 30-45% protein and 6-10% fat during the juvenile stage, is crucial for successful cultivation and is primarily provided through these natural feeds. Length is often considered a more stable indicator of skeletal growth than weight in ornamental fish studies. This research aims to determine the effect of different types of natural feed on the absolute length growth of Manfish (*Pterophyllum scalare*) measuring 4-5 cm in experimental tanks and to identify the best natural feed type for maximizing this growth. The study will be conducted using an experimental method with a Completely Randomized Design (CRD) consisting of three treatments and nine replications each: Treatment A (*Tubifex* sp.), Treatment B (*Artemia salina*), and Treatment C (*Daphnia* sp.). The study will use 81 Manfish (4-5 cm, mean weight 3,05 g/fish) with a stocking density of 1 fish/L.

Keywords: Growth, Manfish Seeds, Natural Food

ABSTRAK

Ikan manfish merupakan komoditas utama. Spesies omnivora ini menunjukkan kecenderungan karnivora, memprioritaskan diet tinggi protein untuk pertumbuhan optimal. Meskipun ikan manfish berukuran 4-5 cm dapat mengonsumsi pakan komersial, mereka lebih menyukai pakan alami seperti udang air asin (*Artemia salina*), cacing tubifex (*Tubifex* sp.), dan kutu air

(*Daphnia* sp.) karena kandungan nutrisinya yang tinggi dan gerakannya yang merangsang nafsu makan. Mempertahankan diet optimal, khususnya 30-45% protein dan 6-10% lemak selama tahap juvenil, sangat penting untuk keberhasilan budidaya dan terutama disediakan melalui pakan alami ini. Panjang sering dianggap sebagai indikator pertumbuhan kerangka yang lebih stabil daripada berat dalam penelitian ikan hias. Penelitian ini bertujuan untuk mengetahui pengaruh berbagai jenis pakan alami terhadap pertumbuhan panjang absolut ikan manfish (*Pterophyllum scalare*) berukuran 4-5 cm dalam tangki percobaan dan untuk mengidentifikasi jenis pakan alami terbaik untuk memaksimalkan pertumbuhan tersebut. Penelitian ini akan dilakukan dengan metode eksperimental menggunakan Rancangan Acak Lengkap (RAL) yang terdiri dari tiga perlakuan dan sembilan ulangan masing-masing: Perlakuan A (*Tubifex* sp.), Perlakuan B (*Artemia salina*), dan Perlakuan C (*Daphnia* sp.). Penelitian ini akan menggunakan 81 ekor ikan Manfish (4-5 cm, berat rata-rata 3,05 g/ikan) dengan kepadatan tebar 1 ekor/L.

Kata Kunci: Benih Manfish, Pakan Alami, Pertumbuhan

INTRODUCTION

Indonesia is a global center of aquatic biodiversity, contributing approximately 400 of the world's 1,100 ornamental fish species, making it the third-largest global exporter (KKP, 2023). One of the main commodities sought after for its beautiful morphology and movement is the angelfish (*Pterophyllum scalare*) (Zubaidah *et al.*, 2020). As omnivorous fish with carnivorous tendencies, angelfish require a diet high in animal protein to support their growth (Nekoubin *et al.*, 2015).

Natural feeds such as *Tubifex* sp. (57% protein), *Daphnia* sp. (37.38% protein), and *Artemia* sp. (40-60% protein) are the primary choices for aquaculture due to their comprehensive nutritional profile and attractiveness to fry (Anggraini, 2017; Fadilah *et al.*, 2019; Juita *et al.*, 2022). Growth measurements in ornamental fish are more accurate using absolute length parameters because they reflect the stability of skeletal development rather than body weight (Lemos *et al.*, 2025).

This study aimed to analyze the effect of various natural food types on the absolute length growth of 4-5 cm angelfish and to determine the most effective feed type.

METHODS

Place and Time

This research was conducted at PT. Harmoni Mitra Marindo, located in Pucanglaban District, Tulungagung Regency, East Java Province. The research is estimated to last 30 days, from November 1, 2025, to November 30, 2025.

Research Tools and Materials

The equipment used in this study includes 27 15 L plastic containers equipped with an aeration system as experimental units. Growth parameters were measured using an analytical balance (accuracy of 0.01 g) and a ruler, while water quality was monitored using a pH meter, thermometer, and DO meter. Other supporting equipment included fishing nets, stationery, and documentation equipment.

The test material used was angelfish (*Pterophyllum scalare*) fingerlings measuring 4-5 cm with an average weight of 3.05 g per fish. The rearing medium used was settled fresh water. The natural feeds tested included silkworms (*Tubifex* sp.), *Artemia salina*, and water fleas (*Daphnia* sp.). Before use, all research containers were sterilized using detergent to maintain the hygiene of the media.

Test Containers and Animals

The research containers used in this study were plastic buckets with a capacity of 15 liters, each filled with 3 liters of freshwater. Before use, the water was allowed to settle for 24 hours. This was to ensure the freshwater used as the research medium remained sterile from contaminants and disease factors.

Feeding and Feeding

The test feeds used in this study consisted of natural feeds of *Tubifex* sp., *Artemia salina*, and *Daphnia* sp. as treatments. These feeds were administered at a dose of 5% of the biomass weight of the test animals. Feeding was carried out three times daily: in the morning from 7:00 a.m. to finish, in the afternoon from 12:00 p.m. to finish, and in the evening from 5:00 p.m. to finish.

Research Design

This study used an experimental method with a Completely Randomized Design (CRD) consisting of 3 treatments and 9 replications (a total of 27 experimental units). The number of replications was determined based on the Federer formula $(t - 1)(n - 1) \geq 15$, to ensure valid control of confounding variables (Kusriningrum, 2010). The treatments tested included different types of natural food: treatment A (feeding with *Tubifex* sp.), treatment B (feeding with *Artemia salina*), and treatment C (feeding with *Daphnia* sp.).

Research Procedures

All experimental units (plastic buckets and holding tanks) were sterilized using detergent, rinsed with fresh water, and dried. The containers were arranged according to the research layout and filled with 3 liters of fresh water that had been decomposed using Ketapang leaves for 24 hours. Each unit was equipped with a uniform aeration system to ensure stable dissolved oxygen levels throughout the treatment. Angelfish were acclimatized for 15 minutes to allow for environmental adaptation before stocking. Initial parameters measured included average weight using an analytical balance (3.05 g/fish) and initial body length (L_0) using a ruler. Natural food (*Tubifex* sp., *Artemia salina*, and *Daphnia* sp.) was prepared according to the treatment dosages. The amount of feed provided was 5% of the fish biomass.

Data Analysis

The data obtained were statistically analyzed using one-way analysis of variance (ANOVA) to test the effect of independent variables on the dependent variable. The testing criteria were compared with the calculated F_{value} against the F_{table} at the 5% and 1% confidence levels. If the analysis results show a significant effect ($P < 0.05$) or a highly significant effect ($P < 0.01$), a Least Significant Difference (LSD) test is performed to determine the differences between treatments (Prayitno, 2012). The entire data computation process was assisted by IBM SPSS Statistics 27.

Absolute Length Growth

The formula used to calculate absolute length growth, according to Zonneveld *et al.* (1991), is as follows:

$$L = L_t - L_0$$

Where:

L = Absolute length growth of test animals (cm)

L_t = Average final length of test animals (cm)

L_0 = Average initial length of test animals (cm)

RESULTS

Based on the results of research on the effect of different types of natural food on the absolute length growth of 4-5 cm angelfish (*Pterophyllum scalare*) in experimental tanks, different averages were obtained between treatments. The range, average, standard deviation, and absolute length growth of 4-5 cm angelfish for each treatment can be seen in Table 1 below.

Table 1. Range, Average, and Standard Deviation of Absolute Length Growth of 4-5 cm Angelfish for Each Treatment

Treatment	Angelfish Absolute Length Growth Range (cm)	Average (cm)	Standard Deviation (sd)
A	0.6 – 1	0.81	0.12
B	0.4 – 0.7	0.52	0.09
C	0.2 – 0.5	0.31	0.10

Based on Table 1 above, treatment A showed the highest average absolute length growth of 4-5 cm angelfish. Subsequently, treatments B and C showed decreasing average absolute length growth of 4-5 cm angelfish. Figure 1 below presents a graph of the average absolute length growth of 4-5 cm angelfish for each treatment.

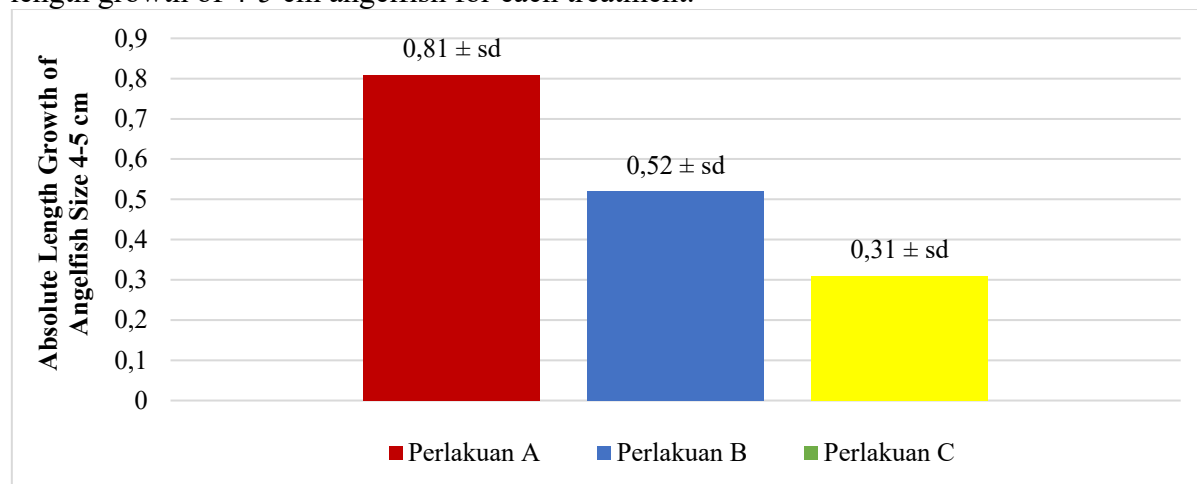


Figure 1. Graph of the Average Absolute Length Growth of 4-5 cm Angelfish for Each Treatment

To determine whether there were significant differences between treatments, a one-way ANOVA test was conducted, and the results are shown in Table 2 below.

Table 2. One-way ANOVA Test of Absolute Length Growth of 4-5 cm Angelfish

	Sum of squares	Df	Mean square	F	Sign.
Between Groups	1.134	2	0.567	46.394	0.001
Within Groups	0.293	24	0.012		
Total	1.427	26			

Based on Table 2 above, it can be seen that the provision of different types of natural food significantly affected the absolute length growth of 4-5 cm angelfish ($F > \text{Sign}$). The average and notation of absolute length growth of 4-5 cm angelfish can be seen in Table 3 below.

Table 3. Average and Notation of Absolute Length Growth of 4-5 cm Angelfish

Treatment	N	Subset for alpha = 0.05		
		1	2	3
A	9	0.81 ^a		
B	9		0.52 ^b	
C	9			0.31 ^c

Based on Table 3 above, it can be seen that treatment A was significantly different from treatments B and C, and treatment B was also significantly different from treatment C.

The results showed that the temperature ranged from 28.1 to 28.3°C. The temperature range, average, and standard deviation for each treatment can be seen in Table 4 below.

Table 4. Temperature Range, Average, and Standard Deviation for Each Treatment

Treatment	Temperature Range (°C)	Average (°C)	Standard Deviation (sd)
A	28.1 – 28.3	28.18	0.07
B	28.1 – 28.3	28.17	0.06
C	28.1 – 28.3	28.18	0.09

Based on Table 4 above, it can be seen that the average temperature for each treatment was relatively similar.

The results showed that the acidity level ranged from 6.9 to 7.9. The range, average, and standard deviation for each treatment can be seen in Table 5 below.

Table 5. Acidity Range, Average, and Standard Deviation for Each Treatment

Treatment	Acidity Range	Average	Standard Deviation (sd)
A	6.9 – 7.9	7.06	0.33
B	6.9 – 7.3	7.04	0.11
C	7.0 – 7.2	7.04	0.20

Based on Table 5 above, it can be seen that the average acidity level for each treatment was relatively similar.

The results showed that dissolved oxygen levels ranged from 5.32 to 5.61 ppm. The range, average, and standard deviation for each treatment can be seen in Table 6 below.

Table 6. Range, Mean, and Standard Deviation of Dissolved Oxygen for Each Treatment

Treatment	Dissolved Oxygen Range (ppm)	Average (ppm)	Standard Deviation (sd)
A	5.39 – 5.59	5.48	0.07
B	5.35 – 5.61	5.48	0.08
C	5.32 – 5.61	5.48	0.08

Based on Table 6 above, the average dissolved oxygen levels for each treatment were relatively similar.

DISCUSSION

Providing different types of natural feed significantly ($P < 0.05$) affected the absolute length growth of angelfish (*Pterophyllum scalare*) measuring 4-5 cm. Based on the 5% LSD test, treatment A (*Tubifex* sp.) produced the highest growth of 0.81 cm/fish, followed by treatment B (*Artemia salina*) at 0.52 cm/fish, and treatment C (*Daphnia* sp.) at 0.31 cm/fish. The high growth in treatment A correlated with the higher protein content of *Tubifex* sp. (57%)

compared to *A. salina* (52.7%) and *Daphnia* sp. (42%). Protein is an essential macronutrient for tissue synthesis, muscle formation, and the primary energy source that accelerates the growth rate of fish (Hermawan, 2013; Putranti *et al.*, 2015).

In addition to nutritional factors, physical aspects of the feed such as size, color, and movement also determine growth performance. *Tubifex* sp. The striking reddish color and slow movement at the bottom of the container reflect the palatability and feeding behavior of angelfish, which respond strongly to kinetic and visual stimuli at the bottom (Tang, 2015). Conversely, in treatments B and C, growth was lower because suboptimal protein content inhibited body biomass synthesis (Anggraeni & Abdulgani, 2017). Protein deficiency in treatment C even risked stunting, decreased immunity, and faded body color (Lall & Kaushik, 2021; Kiron, 2012). The small size of *Daphnia* sp. feed and its rapid and transparent movement also reduced feed consumption efficiency, given that angelfish tend to prefer easily captured feed (Yulisman & Sasanti, 2012).

Water quality conditions during the study were within the optimal range for angelfish growth, with a temperature of 28.1–28.3°C, a pH of 6.9–7.9, and dissolved oxygen (DO) of 5.32–5.61 ppm. These stable environmental parameters support optimal biological activity, metabolism, and feed conversion for test animals (Hamid & Harmadi, 2023; Swain *et al.*, 2020).

CONCLUSION

The provision of different types of natural feed had a significant effect ($P < 0.05$) on the absolute length growth of angelfish (*Pterophyllum scalare*) measuring 4–5 cm, with the *Tubifex* sp. feed treatment (Treatment A) providing the best results of 0.81 cm/tail. Water quality conditions during the study, including temperature (28.1–28.3°C), pH (6.9–7.9), and dissolved oxygen (5.32–5.61 ppm), were in the optimal range and were homogeneous, so they were not a limiting factor for the growth of the test fish.

ACKNOWLEDGEMENT

The author would like to express his gratitude to the Faculty of Food and Fisheries Technology, Dr. Soetomo University, Surabaya, for the support and facilities provided during the research. He also thanks his supervisor for providing direction, guidance, and constructive feedback throughout the research and writing of this article. Furthermore, he would like to thank all parties who have assisted, both directly and indirectly, in ensuring the successful completion of this research.

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