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# EFFECT OF NATURAL FEEDING ON THE GROWTH OF SNAKEHEAD FISH (*Channa maruliodes*)

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## ABSTRACT

The obstacle faced by snakehead fish farmers is the provision of feed that has quality and a high protein content for the growth period of fish. The natural feed can be an alternative. The purpose of this study was to determine the effect of the natural feeding of gold snails, earthworms, and Hongkong caterpillar types on the growth of snakehead fish. The research was conducted from January to February 2022, in Adipasir Village RT. 07 RW. 02 Rakit District, Banjarnegara Regency, Central Java. The method used in this study was experimentally arranged using a completely randomized design (CRD). This study consisted of 4 treatments with 4 replications and each treatment consisted of 5 snakehead fish so the number of containers used was 16 pieces and 80 snakehead fish. The analysis used was a one-way Analysis of Variance (ANOVA) with an error level of $\alpha = 0.05$. The treatment consisted of T1 (control with Pellet), T2 (gold snail), T3 (earthworms), and T4 (Hongkong Caterpillars). The results showed that natural feeding influences the growth of snakehead fish. The best treatment is natural food in the form of a Hongkong caterpillar with an absolute weight of 4.7475 g, an absolute length of 3.63 cm, FCR of 1.07.

**Keywords:** Snakehead Fish, Natural Feed, Growth

## 1. INTRODUCTION

Snakehead fish is one type of freshwater fish that has high potential from an economic perspective. This fish has its charm, especially among young people. Some fish from the Channa family have important economic value, both as consumption fish and ornamental fish[1]. *Channa maruliodes* is one of the fish that has a high selling price and is an economically important fish[2]. This fish is classified as a carnivorous fish, in its natural habitat this fish eats insects, worms and also zooplankton. Along with the development of snakehead fish sales in the community, of course, it cannot be separated from several obstacles.

One of the obstacles that may be faced by farmers is the provision of feed that has quality and a high protein content for the growth period of fish. For this reason, it is necessary to utilise natural food in the surrounding environment as a substitute for pellets[3].

So far, feed has become the main factor that influences the growth and survival stages of fish. Fish growth is strongly influenced by the quality and quantity of feed given so that it can speed up the growth of both the weight and length of the fish body[4]. The feed needed by fish must be feed that has high nutritional value consisting of carbohydrates, protein, fat, vitamins, and minerals to support fish growth. The most important nutrient source used in fish growth is protein. The protein requirement of each fish is different, this protein requirement is influenced by the type of fish being kept. Snakehead fish are classified as carnivorous fish, which have predatory properties, and naturally require higher protein for growth compared to other

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types of freshwater fish. The protein requirement in snakehead fish seed feed is 43% while in 30-day-old snakehead fish, the protein required in the feed to be given is 36%.

Some natural feeds that can be used for snakehead fish are gold snails, earthworms, Hongkong caterpillars, and others. Gold snail is a natural food that is easily available and also has a large enough protein content when compared to other feeds. The protein content of gold snails is 40.83%, moisture content 7.20%, ash 18.06%, fat 6.44%, and carbohydrates 27.46%[5]. The protein content of gold snails is very high and has the potential to be used as an alternative fish feed.

Earthworms belong to the invertebrate class, which is one of the sources of high animal feed protein. The nutritional content contained in earthworms includes protein of 63.06%, fat of 18.5%, extract material without nitrogen of 12.41%, ash of 5.81%, and crude fiber of 0.19% [6].

Hongkong caterpillar is the larva of an insect with the Latin name *Tenebrio molitor*. This caterpillar is widely used as pet food. Based on proximate analysis of fecula/excreta Hongkong caterpillars has a protein content of 18.51%, crude fat of 1.3%, and crude fiber of 25.96%, while the larval phase (Hongkong caterpillar) has a high protein content of 46.44%, crude fat of 32.7%, the crude fiber of 4.58%, and water content of 5.33%

## 2. RESEARCH METHOD

### Time and Place

This research was conducted for 40 days from 15 January to 24 February 2022 in Adipasir Village RT. 07 RW. 02 Rakit District, Banjarnegara Regency, Central Java.

### Methods

The method used in this research is experimentally arranged using a completely randomized design (CRD). This study consisted of 4 treatments with 4 replications and each treatment consisted of 5 snakehead fish so the number of containers used was 16 pieces and 80 snakehead fish with a body length of 7-7.5 cm/head, weighing 2.5-3 g/fish. The feed dose used was 5% of the snakehead fish biomass[7], with the frequency of feeding twice, namely at 08.00 and 16.00 WIB.

T1 : Feeding pellets (feed dose 5%) protein content of 35%
T2 : Feeding gold snail (5% feed dose) protein content of 40.83%
T3 : Feeding earthworms (5% feed dose) protein content of 63.06%
T4 : Feeding of Hongkong caterpillars (5% feed dosage) protein content of 46.44%).

### Data Analysis

Analysis of data obtained from observations during the study, namely growth, survival, feed conversion ratio, and water quality of snakehead fish in the cultivation system was carried out by descriptive analysis. From the results of growth and survival measurements, analysis of variance (ANOVA) and Duncan's Multiple Range Test (DMRT) were conducted to determine differences between treatments, using the SPSS 22 program with a 95% confidence level.

## 3. RESULT AND DISCUSSION

### Absolute Weight Growth

Growth is a change in the size of the fish's body in terms of length, weight, or volume within a certain period. According to Gusrina[8], physical growth is expressed by changes in the number and size of cells that make up body tissues at a certain time, while energetically, growth is expressed by changes in the total energy content of the body at a certain time. Based on the results of 40 days of research, the average value of the absolute weight of snakehead fish *(C.maruliodes*) is presented in Table 1.

Table 1, it can be seen that the best treatment is the T4 treatment, with natural feeding in the form of Hongkong caterpillars which produces an average

absolute weight gain of 4.75g. The high absolute growth of snakehead fish in the T4 treatment (Hongkong caterpillars) with an average weight of 4.75g compared to other feeding treatments is due to the protein content in Hongkong caterpillars of 46.44% which can meet the protein needs for snakehead fish growth, this is in line with Boonyaratpalim's statement in Yulisman et al.[9] explaining that the protein requirement in snakehead fish seed feed is 43.06% for growth. Ulfatul[10] states that growth occurs if there is an input of energy and amino acids (protein) derived from feed after the energy and protein are used for maintenance needs. In addition, growth is also influenced by the amount of feed given, space, temperature in water, and other factors.

**Table 1.** Absolute weight growth of snakehead fish (*C.maruliodes*)

| Treatment | Repeat | | | | Total (g) | Average |
|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | | |
| T1 | 1,68 | 1,6 | 1,44 | 1,71 | 6,43 | 1,61 |
| T2 | 2,79 | 2,92 | 2,98 | 2,63 | 11,32 | 2,83 |
| T3 | 2,74 | 2,96 | 2,72 | 3,07 | 11,49 | 2,83 |
| T4 | 4,45 | 4,81 | 4,01 | 5,72 | 18,99 | 4,75 |

Description: T1 (Pellet); T2 (gold snail); T3 (Earthworm); T4 (Hong Kong Caterpillar)

**Table 2.** Absolute length growth of snakehead fish (*C.maruliodes*)

| Treatment | Repeat | | | | Total | Average |
|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | | |
| T1 | 1,5 | 2 | 2,17 | 2,14 | 7,81 | 1,95 |
| T2 | 1,7 | 1,91 | 2,2 | 2,17 | 7,98 | 1,99 |
| T3 | 2,65 | 2,48 | 2,25 | 2,5 | 9,88 | 2,47 |
| T4 | 3,71 | 3,75 | 3,7 | 3,35 | 14,51 | 3,63 |

Description: T1 (Pellet); T2 (gold snail); T3 (Earthworm); T4 (Hong Kong Caterpillar)

The nutritional content possessed by Hongkong caterpillars can meet the daily feed needs of snakehead fish so that the growth of snakehead fish can increase properly. This is in line with the statement of Ulfatul[10] that the utilisation of protein to form tissues is also influenced by the energy content in a feed, the better the energy content in a feed, it will be directly proportional to the utilisation of protein in forming tissues and good growth.

T2 and T3 treatments have the same effect on the growth of snakehead fish. T2 treatment has protein levels that are still lacking for snakehead fish growth. Based on the results of the proximate test[11], gold snail has a protein content of 38.06% while the optimal protein requirement needed by snakehead fish is 43.06%. Whereas in the T3 treatment, earthworms have a fairly high protein of 63.06% which is higher than the protein requirement of snakehead fish of 43.06% for growth. According to Helver[12], explaining that excess protein in feed can reduce growth, if there is too much protein supply in the feed, then only part of the protein will be utilised for fish growth and the remaining protein will be broken down into energy.

The T1 treatment had the lowest weight growth when compared to other treatments. This is because the provision of pellets alone is not enough to meet the needs of fish feed for growth. The protein content in the pellets given was 35%, while the protein requirement for snakehead fish growth was 43.06%. In addition, snakehead fish is a carnivorous fish or predatory fish that tends to prefer live food or natural food that moves in and on the surface of the water. This is in line with the statement of Muliati and Oce[7], fish tend to choose

natural food that is small, and easy to catch and the movement of the food can attract fish to eat it.

**Absolute Length Growth of Snakehead Fish**

According to Gusrina[8], physical growth is expressed by changes in the number and size of cells that make up body tissues in a certain period, while energetically, growth is expressed by changes in the total energy content of the body in a certain period. Based on the results of 40 days of research, the average value of length growth of snakehead fish is presented in Table 2.

The best treatment is found in the T4 treatment (Hongkong worm treatment). The T4 treatment has the highest absolute length because the caterpillar has an optimal protein content and can meet the daily protein needs of snakehead fish. According to Hamka[13], optimal protein content causes the supply of amino acids and proteins into the fish body more so that fish can form new tissues as a driver of growth and repair damaged tissues.

The T3 treatment has the second highest effect because earthworms have higher protein levels than the optimal protein needs of snakehead fish. The protein content contained in earthworms is 64%[14], while the protein requirement of snakehead fish is 43.06%. Protein content that is too high is only partially absorbed by fish. Protein that is too high will produce excess energy to oxidise amino acids so that ammonia increases. This is also following the statement of Feri et al.[15], which explains that the more protein is catabolized, will increase energy to oxidise amino acids which will ultimately increase the ammonia produced. Excess ammonia can be toxic to fish because it can cause irritation to the gills, inhibit growth rates, and can even cause death. Length growth in the T1 (pellet) treatment is the treatment with the lowest results compared to all treatments. The low absolute length in the T1 is because the fish only depend on the nutrients in the pellets. Whereas in their natural habitat, snakehead fish eat food from insects and small fish that have a greater protein content than pellets.

**Survival Rate of Snakehead Fish**

Survival or survival is the ratio of the number of fish alive at the end of cultivation to the number of fish alive at the beginning of cultivation[16]. The average survival of snakehead fish during 40 days of rearing is presented in Table 3.

**Table 3.** The survival rate of snakehead fish (*C.maruliodes*)

| Treatment | Repeat | | | | Average |
|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | |
| T1 | 80 | 80 | 60 | 100 | 80 |
| T2 | 80 | 100 | 80 | 100 | 90 |
| T3 | 80 | 80 | 100 | 100 | 90 |
| T4 | 80 | 100 | 100 | 80 | 90 |

Description: T1 (Pellet); T2 (gold snail); T3 (Earthworm); T4 (Hong Kong Caterpillar)

**Table 4.** FCR value of feed (%) of snakehead fish *(C.maruliodes)*

| Treatment | Repeat | | | | Total | Average |
|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | | |
| P1 | 3,81 | 4,04 | 3,86 | 4,40 | 16,11 | 4,03 |
| P2 | 2,84 | 2,47 | 1,88 | 2,82 | 10,01 | 2,50 |
| P3 | 1,99 | 1,84 | 2,42 | 2,22 | 8,47 | 2,12 |
| P4 | 1,25 | 1,68 | 2,31 | 1,52 | 6,76 | 1,69 |

Description: T1 (Pellet); T2 (gold snail); T3 (Earthworm); T4 (Hong Kong Caterpillar)

In Table 3, it can be seen that the survival rate during the P1 treatment study had a lower SR value of 80%, while the T2, T3, and T4 treatments had the same SR of 90%. A survival rate of >50% is considered good; a survival rate of 30-50% is moderate, 0 less than 30% is not good.

The temperature of the cultivation container during the study was in optimal conditions, which ranged from 25-29$^{o}$C so that it could support the life of snakehead fish. According to Khaerudin[17], the best temperature for the growth and survival of snakehead fish ranges from 25-31$^{o}$ C.

**FCR (Feed Conversion Ratio)**

FCR (Feed Conversion Ratio) is a measure that states the ratio of the amount of fish feed needed to produce 1 kg of cultured fish[18]. the best FCR values in order are T4 (1.69), T3 (2.12), T2 (2.50), and T1 (4.03) the lower the FCR value of a feed, the better the feed can be digested by fish (Table 4). As stated by Fran *in* Almaira[19], the feed conversion value is used to determine the good and bad quality of feed that will be given to cultured fish. The lower the feed conversion indicates the higher the feed efficiency level and vice versa, the higher the feed conversion value, the lower the efficiency value.

The FCR value of a feed is also influenced by the protein content in the feed, the more optimal the protein content in the feed, the lower the FCR value obtained. Fran *in* Ibrahim et al.[20], stated that the level of protein energy contained in fish feed affects the level of efficiency and effectiveness in feed utilization. The best FCR value was obtained from the T4 (Hongkong caterpillar) at 1.1%, this is because the Hongkong caterpillar has a protein content of 46.44% which is following the protein needs of snakehead fish which is 43%. This is in line with the statement of Zulkhasyni *in* Ibrahim et al.[20], that digestibility tends to increase in line with increasing protein levels in feed.

**Water Quality**

The results of the average value of water quality measurements (temperature and pH) of *C.maruliodes* rearing media for 40 days are presented in Table 5.

**Table 5.** Mean values of temperature and pH measurements on *C.maruliodes* rearing media

| Parameters | Value observation | eligibility |
|---|---|---|
| Temperature | 25-29 C$^{0}$ | 25-31$^{0}$ C[17] |
| pH | 7-8,1 | 6,5-9[21] |

Water is a living medium for aquatic organisms, so it is an important factor that must be considered in the cultivation business. This aims to provide carrying capacity for organisms to survive in the cultivation environment. Based on the results of the study, it is known that the water temperature during the study ranged from 25-29$^{0}$ C. According to Khaerudin[17] the best temperature for snakehead fish growth is between 25-31$^{0}$ C, so the temperature during the study can be said to be optimum.

According to Kordi[21], snakehead fish can live in waters that have temperatures >24$^{0}$ C, in this temperature range snakehead fish can grow to a maximum and utilise the feed provided for their growth, while at water temperatures <24$^{0}$ C snakehead fish will still be able to survive with the help of their respiratory organs, but the fish's appetite begins to decrease and this can lead to aquatic bacterial activities that cause disease. Temperature plays an important role as an environmental factor that can affect the growth of aquatic organisms because it is closely related to the metabolic rate for respiration and reproduction of fish[19].

The range of pH values during the study was 7-8.1, while according to Kordi[21], a good pH for the maintenance of snakehead fish seeds ranges from 6.5-9. pH that is lower or higher than the optimal pH

range will inhibit fish growth. According to Almaira[19], a less-than-optimal pH range will result in smaller fish growth compared to optimal pH conditions.

## 4. CONCLUSION

Based on the results and discussion, it can be concluded that natural feeding has a different effect on the growth of snakehead fish. The best treatment was achieved in the Hongkong caterpillar treatment with an absolute weight of 4.7475 g, an absolute length of 3.63 cm, FCR of 1.07.

Based on the conclusion, it is suggested that the community or snakehead fish farmers can utilize Hongkong caterpillars as an alternative feed.

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