Effect of Artificial Feed Feeding Engineering (pellets) on Survival Rate of Juvenile snakehead fish (Channa striata) on Adaptation in Happa Experiments

I Made Kawan[1*], Semara Edi[2], Dewa Sadguna[3]
Universitas Warmadewa, Denpasar-Bali, Indonesia

{imadekawan@yahoo.co.id[1], semara_edi@yahoo.co.id[2], dewasadguna59@gmail.com[3]}

Abstract. Effect of Artificial Feed Feeding Engineering (pellets) on Survival Rate of Juvenile snakehead fish (Channa striata) on Adaptation in Happa Experiments were carried out at the Laboratory of Aquatic Resources Development, Faculty of Agriculture, Warmadewa University, Denpasar. The purpose of this study was to determine the engineering of artificial feeding which could provide the highest juvenile survival rate for snakehead fish. Snakehead fish (Channa striata) is a type of freshwater fish that lives in public waters, including rivers, swamps and lakes. One of the methods for seed propagation is by applying hatchery technology using artificial feeding techniques (PF500 pellets) combined with natural feed for water fleas (Dapnia sp) and silk worms (Tubifex). It is hoped that the combination of feeding is expected to be able to determine the artificial feeding (pellet) engineering that provides adequate nutritional needs so as to provide the highest survival rate in juvenile growth of snakehead fish at the adaptation stage of passive food habits. The method used in the engineering research of giving pellets is an experimental method using a completely randomized design (CRD) which consists of 6 treatments and 3 replications. The treatments in this experiment consisted of: A. Giving 100% pellets; B. Providing a combination of pellets 75% with Dapnia sp 12.5% and Tubifex 12.5%; C. Providing a combination of 50% pellets with Dapnia sp 25% and 25% Tubifex; D. Provision of a combination of 50% Pellet and 50% Tubifex; E. Giving a combination of 50% pellets with Dapnia sp 50%; and treatment F. Giving combination of 25% pellets with 37.5% Dapnia sp and 37.5% Tubifex. The response variable observed was the survival rate. Analysis of variance was used to determine the effect of response variables and the least significant difference (LSD) test was carried out, graphics and water quality in the experimental bath The results showed that pelleting engineering had a significant effect on snakehead fish juvenile survival (p> 0.05), where the highest survival rate (100%) was given by giving 25% pellets combined with 37.5% Dapnia and 37.5% Tubifex (treatment F). The juvenile survival of snakehead fish is strongly influenced by the nutritional content of the available natural feed and pelleting is a juvenile adaptation so that in rearing culture it is accustomed to eating pellets (passive food). The highest juvenile survival rate of snakehead fish (treatment F) gave an average absolute weight growth of 1.753 grams for 60 days from an initial weight of 0.3 grams and an average absolute length growth of 4.5 cm from an initial length of 2 cm. The quality of the experimental water, the water temperature ranged from 29.3 - 30.4 oC, the pH of the water ranged from 7.96 - 8.57 and dissolved oxygen ranged from 7.0 to 7.4 ppm.

Keywords: Pellet-feeding Engineering; snakehead fish juvenile; Survival Rate

WARDS 2020, December 21, Indonesia

DOI 10.4108/eai.21-12-2020.2305838

1 Introduction

Snakehead fish is a type of freshwater fish found throughout Indonesia. Snakehead fish has been associated as a medicine, because its content has been clinically proven in several diseases. Snakehead fish has a high protein content, especially albumin and essential amino acids, fats, especially essential fatty acids, minerals especially zinc / zinc (Zn) and several vitamins which are very good for Muh. Asfar et al (2014) [1].

The benefits of snakehead fish are now known to have advantages over other types of fish because they have nutrients that can cure various diseases. Harianti (2011) stated

that the albumin content of snakehead fish is relatively high, about three times that of other consumption fish; Amino acids are also very complete and contain zinc minerals and other trace elements that the body needs; and Albumin is a part of protein which is very important for the body[2].

The demands and needs of local and foreign markets are increasing along with the increasing production value of Channa striata cultivation each year. FAO statistical data (2000) states that the total production of Channa striata from cultivation in 2003 was 5,448 tons and increased in 2004 to 11,498 tons, while from the catch in 2003 was 7,327 tons and increased in 2004 by 16,528 tons. [3]Based on the data above,

it shows that the business opportunities for cultivating this species are becoming increasingly prospective and strategic (Nurbakti, L.; et al., 2009)

Snakehead fish is a type of freshwater fish from the genus Channa which has economic value which has long been used as consumption fish. [4]The Channa genus consists of 4 species, namely Channa striata (snakehead fish), Channa gachua (bakak fish), Channa micropeltes (toman fish) and Channa lucius (bujok fish). The body is round, flat on the posterior side, the back is almost black brown, the abdomen is brownish white (Jangkaru, 1999 in Andi N.A., et al; 2017).

The systematics of snakehead fish Anonymous (2020) in according to Ardianto (2015) in Anonil literature review 2011 is as follows[5]:

Kingdom	: Animalia
Filum	: Chordata
Subfilum	: Vertebrata
Superklas	: Pisces
Class	: Actinopterygii
Super Ordo	: Teleostei
Ordo	: Perciformes
Subordo	: Channoidei
Family	: Channidae
Genus	: Channa
Species	: Channa striata

General morphology of snakehead fish is as follows: has a large and slightly flattened head like a snake's head, there are large scales on the head, a round body shape like a torpedo, an elongated dorsal fin and a rounded tail fin at the end, the upper side of the body head to tail dark, brownish black or greenish, the underside of the body is white, the sides have thick lines and have a large mouth, with large, sharp teeth. The outer shape (morphology) of snakehead fish can be seen in Figure 2, Source: https://www.sem customize.com [6].

Figure 1. Morphology of Cork Fish (Channa Striata)

[7]According to Azzamy (2018) it is stated that the morphology of snakehead fish has the following characteristics:

the upper body of the snakehead fish is generally brown to black and the lower body (abdomen) is light brown to whitish; the shape of the head is slightly flattened like the head of a snake with large scales on the head; the shape of his head like a snake is what makes snakehead fish nicknamed the "snake head".

Anonymous (2019) describes the eating behavior of snakehead fish as follows: the eating habits of snakehead fish can be identified from their habitat; snakehead fish are carnivorous fish or other animal eaters; these fish usually eat worms, shrimp, frogs, and other types of fish; snakehead fish will grab prey that is silent around water plants where this camouflage is done to avoid the sight of the prey; suddenly the snakehead fish will glide quickly towards its prey; then it will swallow it directly because it is supported by its large mouth[8].

Aquaculture activities consist of hatchery and enlargement activities. Fish hatchery activities aim to produce chicks that are counted in number units (tails) so this activity prioritizes the number of seeds produced, therefore the survival rate is the most taken into account. While the rearing cultivation activity has the objective of producing the total weight (kg) of raised fish so that what is prioritized is what percentage (%) of the food given can be converted into fish meat, so in fish rearing the most calculated is weight growth and fish feed conversion and its efficiency.

[9]Muhammad, Z. (2017) conducted research on efforts that could increase the feeding response and growth of snakehead fish seeds, namely by adding other ingredients to the feed which function to increase the response to eating fish, for example by adding attractants to the feed. Attractants are additives in feed that give off a certain aroma and can stimulate fish to eat, thereby making fish feed intake better. The attractants in the feed formulation will stimulate the fish to approach and consume the artificial feed given.

Naturally, fish mortality occurs in the early stages of its birth, because of the learning process to find food and threats from predators in its environment. Therefore, at this stage it is necessary to receive special care to be able to maintain its survival. One way that can be used is by

carrying out domestication, namely taming from wild fish to controlled cultivation. This adaptation process will be effective starting from the beginning of life (Juvenile period), the change in food habits from natural to artificial feed will occur slowly. Therefore, research on the effect of artificial feed (pellet) engineering on survival rate of snakehead fish (Channa striata) juvenile on adaptation in Happa This experiment needs to be done.

The purpose of this study was to obtain the highest survival rate in juvenile snakehead fish from the engineering treatment of artificial feeding (pellets) combined with natural Dapnia and Tubifex feed. The expected benefit is the availability of cork fish seed stocks that are adaptable to artificial feed (pellets) for cultivation.

2 Methods

This research was conducted at the Laboratory of Water Resources Development, Faculty of Agriculture, Warmadewa University, Denpasar, Jalan Terompong 24 Tanjung Bungkak Denpasar.

The method used in research on the effect of artificial feed engineering on survival rate of snakehead fish (Channa striata) juvenile on the adaptation in the experimental Happa is Design Experiment (Experimental Design). The experimental design used was a completely randomized design (CRD) with six (6) treatments and three (three) replications, so that the number of treatment units was 18 experimental units.

The treatment in this research was artificial feed (pellets) combined with two (2) types of natural feed, namely water lice (Dapnia sp) and silk worms (Tubifex). The types of treatment consist of:

A. Administration of 100% pellets;
B. Giving a combination of pellets 75%, with Dapnia sp 12.5% and Tubifex 12.5%;
C. Giving a combination of 50% pellets with Dapnia sp 25% and 25% Tubifex;
D. Giving a combination of 50% Pellet and 50% Tubifex;
E. Giving a combination of 50% pellets with Dapnia sp 50%;
F. Giving a combination of 25% pellets with Dapnia sp 37.5% and Tubifex 37.5%

The percentage of survival calculated using the Effendie formula (2002), in Muhammad, Z (2017) is as follows[9]:

$$\textbf{Survival rate} = \frac{Nt}{N0} \times 100\,\%$$

Where;
N0: the initial juvenile count of culture
Nt: number of juvenile survival at the end of culture

The flow chart in the framework of conducting this research follows the standard steps in research that uses experimental methods. Design uses a completely randomized design (CRD). In aaddition to the treatment, all variables were made homogeneously, namely: the number and size of the *juvenile*, the size of the maintenance container, the placement of the containers was randomized (lottery), the water quality was regulated as homogeneously as possible apart from the impact of the treatment. Each treatment container (Happa) was spread 10 juvenile snakehead fish which had homogeneous weight and length. Observations were made every week for 6 weeks. The response variables observed were survival rate and water quality in the experiment site. The research flow chart can be presented in Figure 2 below:

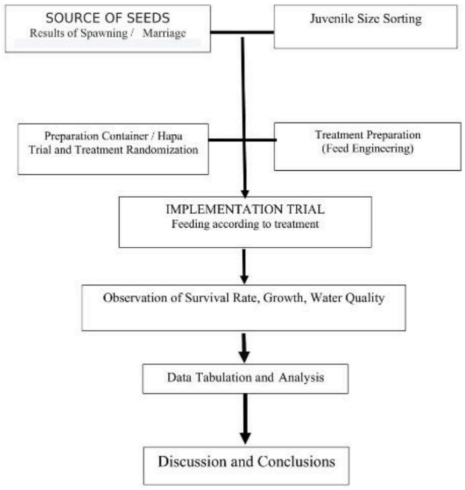

Figure. 2. Flowchart of Experiments in Research

The research data were analyzed statistically by using analysis of variance (Variant Analysis). Variant analysis was used to determine the effect of artificial feed engineering on the survival rate of snakehead fish juvenile, and if the treatment had a significant effect, it was continued with the Least Significant Difference (LSD) test which was continued by displaying a graph to see the pattern of the relationship between the treatment and the response variable that occurred.

3 Results and Discussion

Survival Rate

The data from the calculation of survival rate (Table 1a) has an abnormal distribution (around 80-100%) or is clustered in the distribution in positive areas, therefore in order to carry out variant analysis, the binomial data in the form of a percentage (%) needs to be transformed into arcsin. The survival data of snakehead fish that have been transformed by arcsin are presented in Table.1b.

Table 1a. Survival Rate (%) of Snakehead Fish Juvenile

Treatment	**Survival Rate(%)/Replication**			**Total**	**Average**
	I	**II**	**III**		
A	80,00	80,00	80,00	240,00	80,000
B	80,00	90,00	90,00	250,00	83,333
C	100,00	90,00	80,00	260,00	86,667
D	90,00	90,00	90,00	270,00	90,000
E	100,00	100,00	90,00	290,00	96,667
F	100,00	100,00	100,00	300,00	100,000

Table 1b. Survival Rate Data Transformation (Arcsin) of Snakehead Fish Juvenile

Treatment	Survival Rate(%)/Replication			Total	Average
	I	II	III		
A	63,44	63,44	63,44	190,31	63,435
B	63,44	71,58	71,58	206,57	68,855
C	90,00	71,58	63,44	225,00	75,000
D	71,58	71,58	71,58	214,70	71,565
E	90,00	90,00	71,6	251,57	83,855
F	90,00	90,00	90,00	270,00	90,000

Furthermore, the data was analyzed of variance (Test F) to determine whether the treatment of artificial feeding (pellets) had an effect on the juvenile survival of snakehead fish. In the F test it can be seen from the values: Source of Diversity, Degrees of Freedom (DB), Total Squares (JK), Middle Square (KT), Calculated F values (Fhit) and F tables (0.01 and 0.05). The results of the F test analysis are presented in Table 2 as follows:

Table 2. Result Variance Analysis (Test F) of Snakehead Fish Javanite

Source of Variance	DB	JK	KT	F hitung	F Tabel 0,05	F Tabel 0,01
Treatment	5	1456,752	291,350	5,452*	3,106	5,064
Error	12	641,246	53,437			
Total	17	2097,998				

Source : Data Analysis

Table. 2 It can be seen that the calculated F value is greater than F table 0.05 ($p > 0.05$), this shows that artificial feeding (pellets) combined with Dapnia and Tubifex natural food has a significant effect on the juvenile survival of snakehead fish. The difference in survival between treatments can be seen from the Least Significant Difference (LSD) test. The results of the LSD test can be seen that the provision of a 25% percentage of artificial feed (pellets) provides the highest significant survival compared to other treatments, while giving a percentage of pellets between 50-100% or treatments A, B, C, D and E have no significant effect on viability of snakehead fish juveniles (Table 3.).

Tabel 3. LSD Test Results for Juvenile Snakehead Fish Survival Rate:

Treatment	Average	Notation
A	63,435	b
B	68,855	b
C	71,565	b
D	75,000	b
E	83,855	b
F	90,000	a

Source: Data Analysis

The survival rate of snakehead fish at the adaptation stage is highly dependent on the types of natural food available in its environment. In addition, the nutritional content of natural food eaten will provide endurance to be able to survive. The results of research for 60 days on survival by giving the highest percentage of natural food 75% (37.5% Dapnia sp. And 37.5 % Tubefex) all juveniles (100%) or 90 (arcsin) can maintain their life (Pigure.3). These fish usually eat worms, shrimp, frogs, and other types of fish; snakehead fish will grab prey that is silent around water plants where this camouflage is done to avoid the sight of the prey; suddenly the snakehead fish will glide fast towards its prey; then it will swallow it directly because it is supported by its large mouth. Feeding artificial (pellets) is a process of adapting the behavior of active (mobile) food to passive (immobile) food.

Research that has been carried out by Erick E. (2013) [10] with the treatment of differences in water heights of snakehead fish seed rearing media, the percentage of survival of snakehead fish seeds was 96% at 5 cm water level treatment and (b) the highest absolute weight growth value 0 , 81 grams with a water height of 15 cm.

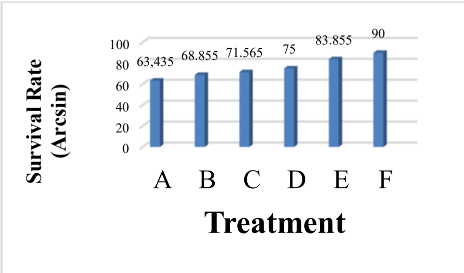

Figure 3. Grafic Survival Rate in Aresin each Treatment

Growth

During the research, given treatment with artificial feed (pellets) combined with live natural feed, namely Dapnia and Tubifex, can provide differences in growth in each treatment given both the average growth weight and length. The highest growth occurred in treatments given live natural feed at most (75%) or 37.5% Dapnia and 37.5% Tubifex (Treatment F).

Growth of average weight and length of snakehead fish juveniles for each treatment and replication during the 60-day study can be seen in Table 4a. and 4b. In treatment C, D and E were given artificial feed pellets (50%) but different percentages and types of live natural feed, namely treatment C was given a combination of 25% Tubifex and 25% Dapnia, treatment D was given 50% Tubifex and treatment D was given 50 feed % Dapnia. The difference in the amount and type of natural food greatly affects the growth during the juvenile period of snakehead fish. The percentage of natural feed 75% (treatment F) can provide the highest growth compared to 100% survival or 90 in Arcsin, followed by treatment E, treatment D and treatment C and without natural feed. This growth difference is due to the fact that during the juvenile period the snakehead fish still have active eating behavior, this can be seen in the growth in treatment E compared to treatment D, namely the difference in activity between dapnia and tubifex, where giving dapnia 50% (treatment E) gives growth was higher than that given 50% natural tubifex feed.

Table 4a. Grouth in Average Individual Weighy (gram) Juvenil snakehed fish Dusring Research

Treatment	Growth in Average Individual Weight (gram)/Replication			Total	Average (gram)
	I	II	III		
A	1,16	1,48	1,34	3,98	1,327
B	1,18	1,30	1,44	4,12	1,373

C	1,35	1,51	1,41	4,27	1,423
D	1,40	1,62	1,46	4,48	1,493
E	1,47	1,55	1,53	4,55	1,517
F	1,60	1,82	1,84	5,26	1,753

Source : Primary Data

Table. 4b. Growth in Average Individual length (cm) Juvenile snakehead fish During Research

Treatment	**Growth in Average Individual Weight (gram)/Replication**			**Total**	**Average (gram)**
	I	**II**	**III**		
A	1,16	1,48	1,34	3,98	1,327
B	1,38	1,30	1,44	4,12	1,373
C	1,35	1,51	1,41	4,27	1,423
D	1,40	1,62	1,46	4,48	1,493
E	1,47	1,55	1,53	4,55	1,517
F	1,60	1,82	1,84	5,26	1,753

Source : Primary Data

The growth in average weight and length of individuals during the study can be seen more clearly in Figure 4a and Figure 4b, where the highest growth was found in treatment F, namely by giving a combination of 25% pellet feed with 37.5% and 37 Dapnia natural feed. 5% Tubifex.

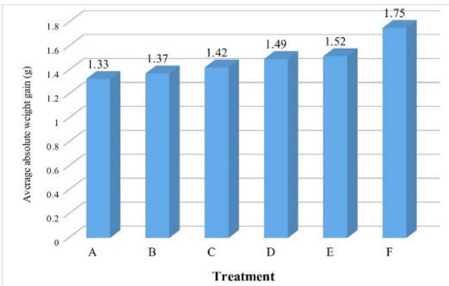

Figure 4a. Graph of Individual Average Weight Growth during the Study

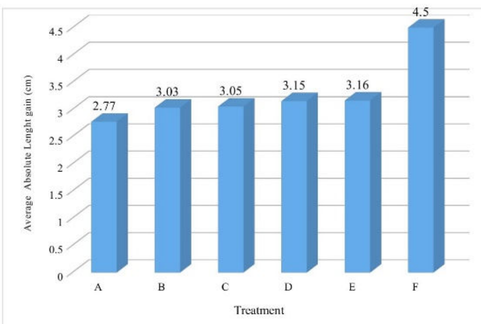

Figure 4a. Graph of Individual Average Lenght during the Study

Water Quality

During the 60-day study the experimental happa was in one research tub that was protected in the room, with the hope that the environmental conditions of the water did not affect the differences in the treatment given. The results of observing the quality of water in the research basin obtained an average temperature range of 29.3 - 30.4 ° C; pH 7.96-8.57 and dissolved oxygen 7.0 - 7.4 ppm. The quality of the water used as a rearing container still meets the requirements of snakehead fish life, [11] Negara (2018) states that the optimal water quality for snakehead fish is a temperature range of 28-31ºC, a pH range of 7-9 and dissolved oxygen> 5 ppm.

4 Conclusion

Giving Artificial Feed (Pellet) has a significant effect (p> 0.5) on the Survival Rate of Juvenile Cork Fish (Channa striata) on Adaptation in Experimental Happa. The highest juvenile survival rate of snakehead fish (100%) was given the treatment of artificial feed (pellets) as much as 25% and natural feed (37.5% Dapnia and 37.5% Tubifex).

References

[1] Muh. Asfar, Abu Bakar Tawali, and Meta Mahendradatta; 2014. Potential of Cork Fish (Channa Striata) as a Source of Health Food (review). Proceedings of the National Seminar on Industrial Technology II 2014 ISBN: 978-602-14822-1-6.

[2] Harianti, 2011. Fish Cork (Channa Striata) And Various Benefits of Albumin Contained in it. Balik Diwa Journal, Volume 2 Number 1 January-June 2011.

[3] Nurbakti Listyanto and Septyan Andriyanto, 2009. Snakehead Fish (Channa Striata) Benefits of Development and Alternative Cultivation Techniques; Aquaculture Research Center. Media Aquaculture Volume 4 Number 1 Year 2009.

[4] Andi Noor Asikin and Indrati Kusumaningrum, 2017. Edible Portion and Chemical Content of Cork Fish (Channa Striata) from Pond Cultivation in Kutai Kartanegara Regency, East Kalimantan. ZIRAA'AH, Volume 42 Number 3, October 2017 Pages 158-163 e-ISSN 2355-3545.

[5] Anonymous; 2020; Literature Review Anonil 2011. Repository Unimus ac.id; 25 pages.

[6] Anonymous; 2019. Morphology and Classification of Cork Fish (Channa Striata) http://wwwpertanianku.com.

[7] Azzamy, 2018. Classification and Morphology of Cork Fish (Channa striata). Articles, Aquaculture

[8] Anonymous; 2019. Get to know the eating habits and habitat of cork fish. http://wwwpertanianku.com.

[9] Muhammad Zainuri; Mirna Fitrani1; Yulisman (2017). Pertumbuhan Dan Kelangsungan Hidup Benih Ikan Gabus (Channa Striata) yang Diberi Berbagai Jenis Atraktan. Jurnal Akuakultur Rawa Indonesia, 5(1) :56-69 (2017) ISSN : 2303-2960.

[10] Erick Extrada; Ferdinand HT; Yulisman., 2013. Survival and Growth of Cork Fish (Channa Striata) Seeds at Various Levels of Water in Maintenance Media. Indonesian Journal of Swamp Aquaculture, 1 (1): 103-114 (2013) ISSN: 2303-2960

[11] Negara, A P. 2018. Evaluation of the Suitability of Waters for Cultivating Cork Fish (Channa striata) in the Pegadungan River, Rantau Jaya Makmur Village, Putra Rumbia District, Central Lampung Regency. Bandar Lampung: University of Lampung.