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Comparative Use of Live Feed in African Catfish Larvae Raising

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Summary: In October 2023, for 15 days, in 60-liter plastic containers with aeration at a temperature of 25-26 ° C, African catfish larvae were fed with live food: zooplankton (collected in the Tuyabuguz reservoir), Daphnia magna, common tubifex and aulophorus. The fry grew to an average of 0.63 g, 0.87 g, 1.13 g and 1.07 g, respectively. The recovery was 58%, 61%, 71.5% and 45.6%, respectively. Indicators of growth and quality of feed are given.

Key words*:* African catfish, Clarias Garie Pinus, fish feeding, live feed, Uzbekistan

In continental countries, as well as when cultivating new species of fish, there is a real situation of lack of starting high-protein balanced feeds. The problem is aggravated by the global trend to stop further growth in the production of fishmeal - the basis of fish feed in industrial aquaculture (due to the possibility of overfishing of fish as raw material for this type of production). In connection with this, fisheries science pays great attention to the search for alternative feeds for different periods of life of various fish species (Hardy, Tacon, 2002; Cayen et al, 2016). One direction is to search for other sources of animal origin, for example, poultry and livestock by-products (Davis, Arnold, 2000; Goda et al, 2007; Olaniyi et al, 2016). Particular attention is paid to feeding the larvae. In the larval period, methods are important to increase the survival rate of the generation and achieve an acceptable high growth rate in order to raise fry weighing 1-5 g within 0.5 - 1 month. The purpose of this work was to determine the effectiveness of using a number of live foods when growing larvae of the African Clarias catfish (Clarias gariepinus) in closed conditions and available on the local market.

Material and methodology

The experiment was carried out in October 2023 at the Educational Farm of the Tashkent State Agrarian University. African catfish larvae were brought from the fish hatchery of the Institute of Zoology on the third day after mass hatching from eggs. They were transported in a 60-liter canister to the laboratory, waited until the water in the containers and the canister became the same, and the larvae were planted immediately in the experimental containers. 500 African catfish larvae were planted in each experimental container. By this time, the yolk sacs of African catfish larvae had practically disappeared, and the larvae began to feed on exogenous food on their own. In the laboratory, African catfish larvae were placed in 60-liter plastic containers equipped with aquarium aerators and thermostats (Fig. 1). Throughout the experiment, the water temperature was maintained at 25-26°C. We began to feed the larvae with four types of live experimental food: zooplankton organisms, daphnia, and oligochaete worms - the common tubifex and aulophorus.

The water in the containers was completely changed every 12 hours. For this purpose, the laboratory had containers with water so that the water in them was the same temperature as in the experimental containers. At first, the containers contained water to a depth of 4 cm; as the size of the fish increased, the volume of water was increased. At the end of the experiment, the depth of water in the container was 20 cm.

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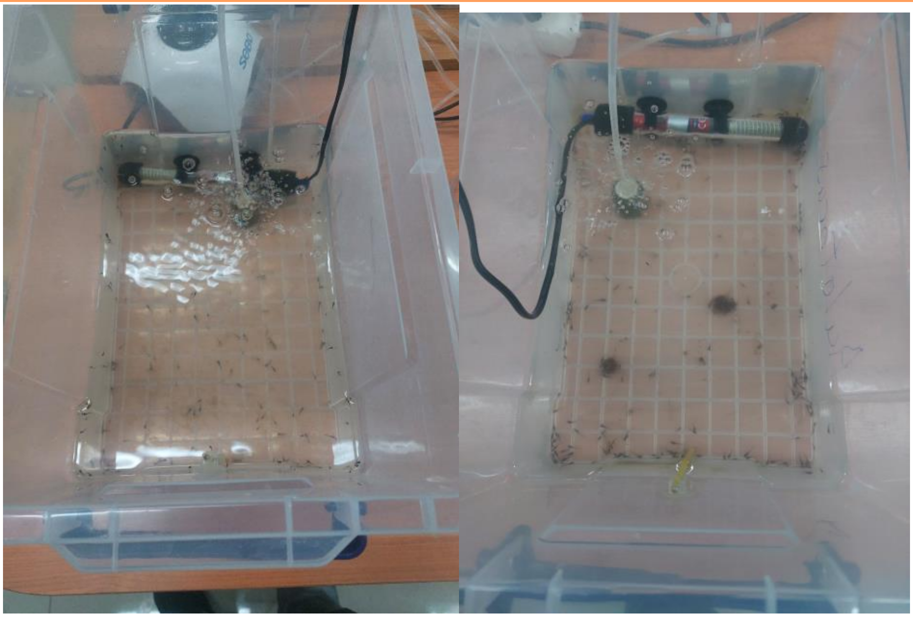
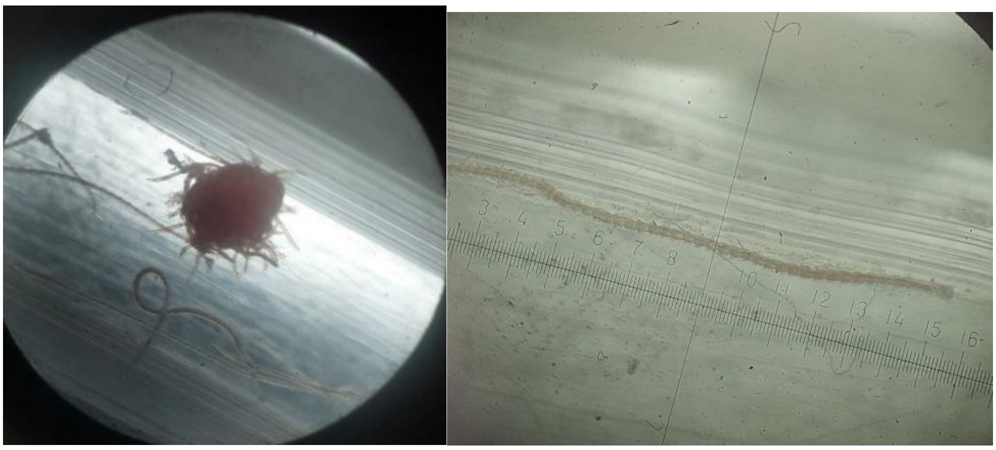


Rice. 1. African catfish larvae in experimental containers with added food

In the Tuyabuguz reservoir of the Tashkent region, zooplankton was collected every day; a standard plankton net was used for this; zooplankton was collected in a fish cage near a wall covered with fouling on both sides, as well as next to the cage. It was assumed that the introduction of constant food into cages with carp and commercial African catfish allows the development of richer zooplankton. The collected organisms in a plastic 10-liter canister were brought to the laboratory daily and placed into containers with experimental African catfish larvae. Since the plankton net has a cup for collecting organisms, we determined the mass of the lump for the experiment. Cyclops dominated the zooplankton collections.

Every day we purchased collections of live daphnia (Dapnia magna), which is constantly harvested at wastewater treatment plants and sold for the needs of decorative aquarium keeping. We received the ordered quantity every day from one of these suppliers.

Also, from these suppliers we purchased oligochaete worms, Tubifex tubifex, and Aulophorus, Dero furcata, in the quantities we needed on a daily basis and added them to containers with African catfish larvae (Fig. 2). Having weighed out 1 g of worms, we placed them on glass in a thin straight strip, which we divided into a certain amount along the length of this strip, thus determining the amount we needed on a particular day according to the diet. In the first 5 days, the selected mass of worms of both species was carefully crushed with a scalpel blade before being added. Since the common tubifex is larger, its mass continued to be cut and crushed with a scalpel blade over the next 5 days before being placed in a container with African catfish larvae.



Rice. 2. Oligochaete worms under the eyepiece of a binocular loupe

In all variants, the same amount by weight of live food was added every day.

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The growth of fish and the quality of feed were judged by the following indicators, calculated based on individual indicators of fish in the variants:

• body weight gain: dw (g) = w2 – w1; (where w1 (g) is the initial average individual body weight of fish; w2 (g) is the final average individual body weight of fish);

• body weight growth rate (g/day): dw/t; (where t is the duration of feeding in days);

• specific growth rate of fish (Specific growth rate): SGR (% per day) = [(lnw2 – lnw1)/t] * 100; (where ln is the natural logarithm);

• feed conversion rate (FCR, feed conversion rate): K = amount of feed introduced (g) / DW (g) (Where DW is the increase in the total biomass of fish in the cage);

The reliability of determining the indicators of variation statistics in all cases was accepted as P – 0.95).

results

Throughout the entire experiment, the water temperature in all containers was maintained at 25–26 °C, which was adjusted daily, as well as the operation of the aquarium aerators in each experimental container.

3rd day after the start of mass hatching of free African catfish embryos from egg shells. The larvae have greatly reduced yolk sacs. 0.1 g of live food was added to the container.

On the fourth day after the start of mass hatching, active movement of larvae was noted in all containers. Due to the change of water, its contamination was practically not noted.

Starting from the 9th day, cases of death of larvae began to be visually noted. Dead African catfish larvae were immediately removed from the container using tweezers.

On the 10th day of the experiment, there was an increased amount of larval waste in the variant with tubifex feeding.

A total of 15.8 g of live food was added to each experimental container during the experiment. The average weight of larvae in the variants for 15 days of experimental feeding is given in Table 1.

Table 1. Average weight of African catfish (g) on the 15th day of the experiment according to options

Type of live food	*Min. – Max.*	*Xavg. + Sx*	*Cv, %*
Zooplankton	0,5 – 0,9	0,63 ± 0,03	19,5
Daphnia	0,5 – 1,2	0,87 ± 0,06	28,2
Aulophorus	0,6 – 1,7	1,13 ± 0,09	29,4
Tubifex	0,6 – 1,7	1,07 ± 0,09	31,2

Body length indicators for juvenile African catfish according to feeding options are given in Table 2.

Table 2. Body length of African catfish (cm) on the 15th day of the experiment according to options

Type of live food	*Min. – Max.*	*Xavg. + Sx*	*Cv, %*
Zooplankton	2,4 – 3,4	2,89 ± 0,70	10,0
Daphnia	2,8 – 3,9	3,43 ± 0,11	12,0
Aulophorus	3,0 – 4,7	3,86 ± 0,12	12,2
Tubifex	3,0 – 4,7	3,85 ± 0,12	12,1

The yield of fry from planted larvae was: in the variant with feeding with zooplankton - 58%, daphnia - 61%, aulophorus - 71.5%, tubifex - 45.6%.

The growth rates of African catfish larvae according to feeding options for 15 days are shown in Table 3. It can be seen that in all experiments the larvae showed high growth rates.

Table 3. Growth rates of African catfish larvae by variant

Growth rate	Types of experimental live foods			
	zoopl	daphnia	aulophorus	tubifex
w1, g	0,03	0,03	0,03	0,03
w2. g	0,63	0,87	1,13	1,07
dw, g	0,6	0,84	1,1	1,04
W1, g	15	15	15	15
W2, g	182	264	403	347
DW, g	167	249	388	332
t, days	15	15	15	15
growth rate, g/day	0,04	0,06	0,07	0,07
SGR (% per day)	20,30	22,45	24,19	23,83
FCR	0,09	0,06	0,04	0,05

Discussion

The success of aquaculture globally is based on the fact that technologies are being developed for different geographical conditions, different species of fish, different periods of their life cycles, and cultivation systems of different intensity. At the same time, most of the world's fish is produced in aquaculture in conditions where high-protein and balanced feeds are not used. Due to the trend towards a halt in the growth of production of such high-protein feeds, work on the search for alternative feeds constitutes a significant part of fisheries research (Davis, Arnold, 2000; Hardy, Tacon, 2002; Goda et al, 2007; Cayen et al, 2016 Olaniyi et al, 2016). The larval period in different species is similar in that during this period of ontogenesis many species have similar requirements; the larvae feed on zooplankton organisms. This makes it possible to conduct experiments using various types of live food. Since the larvae have a low body weight, the use of live food will require a small weight, which can be used by small farms, even with the further cultivation of the object (fish species) in industrial conditions.

In this study, we used available live foods to feed African catfish larvae. Such food can be easily purchased from people who provide food for aquarium hobbyists, or it can be cultivated independently.

The common tubifex is a type of oligochaete worm; these are thin thread-like pinkish worms up to 40 mm long. Each body segment has 4 setae. They feed on decaying particles, swallowing and passing silt through the intestines. It lives at the bottom of silted standing reservoirs, in polluted streams and rivers, forming huge accumulations in the silt. The tubifex is found at the bottom all year round. It is widely used in feeding aquarium fish as live food. Cultivation methods have been developed, but procurement systems in wastewater treatment plants have also been established. Purchasing in a city like Tashkent is not a problem.

Aulophorus also belongs to the oligochaete worms, it also withstands severe water pollution with organic matter, and has also become widespread as a food crop in the aquarium industry. In an adult (having reached a length of 1-2 cm) additional oral openings are formed on the body, through which new individuals are separated. Thus, most often the worm population (especially when cultivated at home) is a mass of clones of a common ancestor. Since it reproduces vegetatively, it can be more easily cultivated, which is used to feed fish in aquariums.

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During the growing season, Daphnia magna can be purchased in large quantities from food suppliers for aquarists; they are harvested at wastewater treatment plants.

In our study, African catfish larvae reached different sizes in different live food treatments. One-factor analysis of variance showed that there is an influence of such factors as different types of food on the achieved sizes of fish (Fact. = 37.1, Ftab. = 2.50).

It can be seen that the smallest fish were in the variant with feeding on zooplankton, the larger fish were in the variant with daphnia, then Tubifex and then Aulophorus. The difference in results between the options with feeding zooplankton and daphnia according to the t-test was significant (tfact - 3.46; ttable - 1.77). The difference between the variants with daphnia and tubifex is not significant (1.6; 1.77, respectively). The difference between the options with feeding with Daphnia and Aulophorus was significant (2.75; 1.77). A comparison of the size of the fry between the options with feeding two types of worms showed that the difference was not significant (tfact. – 0.77; ttable. – 1.77).

The indicators of larval growth in different variants and the quality of food are shown in Table 3. It can be seen that in all variants the fish grew, but the best indicators were when using oligochaete worms, especially Aulophorus.

Also, when feeding with Aulophorus, there was the highest yield of fry from the number of planted larvae, and the indicator is very attractive (71%). In other options, quite acceptable results were also obtained with a yield of at least 45% when feeding tubifex and 58% and 61% when feeding zooplankton and daphnia.

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