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EMBRYONIC DEVELOPMENT OF CHINESE CYPRINIDS PELAGOPHILES UNDER CONDITIONS OF ARTIFICIAL REPRODUCTION IN UZBEKISTAN

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ABSTRACT

The embryonic development of Cyprinids pelagophiles introduced into Uzbekistan from water bodies of China in the early 1960s was studied. In Uzbekistan, the main is the artificial reproduction of the species with gonadotropic stimulation of maturation and incubation of eggs in apparatuses. The rate of embryonic development is somewhat higher than the rate of development in the Yangtze River, which is explained by the design of the water supply system, which provides a more constant water temperature without its daily fluctuations. The water heated in the pond is pumped into tanks above the incubation shop (capacity 90 tons), where the water also warms up and does not have time to notice cool down during the night period in May-June. The design was influenced by the experience of fish farmers in the mass reproduction of herbivorous fish, there are no night temperature drops as in the conditions of the river (for example, in the Yangtze) and as it was in the 1960s - 1990s. The rate of embryonic development of silver carp eggs in the hatchery of the Research Institute of Fish Breeding begins to affect the stage of embryo hatching and increases towards the transition to exogenous nutrition. Under local conditions, more than 10-15 generations of the species have changed. Embryonic development proceeds normally. At a water temperature of 20 - 24 ° C, embryos hatch after 32 hours.

KEYWORDS: *SILVER carp, grass carp, temperature, embryo, hatching.*

1.INTRODUCTION

White (common) silver carp, H. molitrix (Valenciennes), belongs to phytophages, it was widely settled in lakes, reservoirs of the entire flat part of the Aral Sea basin. The technology of artificial reproduction with the use of gonadotropic stimulation of maturation was mastered [1, 2, 4]. Silver carp is the main object in fish production in Uzbekistan. Knowledge of the embryonic development of the species under local conditions was explored in the 1960s, i.e. they were, in fact, fish of the offspring of imported generations. In recent decades, research has not been carried out in the republic. It is necessary to assess the changes in biology that have taken place, including to study the features of embryonic development during artificial reproduction, which was the goal of this work.

The grass carp, Ctenopharyngodon idella, lives in freshwater bodies of Asian rivers flowing into the Pacific Ocean from the Amur in the north to the Mekong in the south. Acclimatized in many countries of Asia, Europe, America, Africa. In the 1960s, it was introduced into the pond farms of Uzbekistan and regularly stocked with juveniles in many lowland reservoirs. However, reproducing herds are noted in the middle reaches of the Syrdarya and Amudarya [1, 2].

2.METHODOLOGY

The work was carried out in May-June 2018 in the fish hatchery of the Research Institute of Fisheries in the Tashkent region. On May 19, 14 females with an average body weight of 5.8 kg and 17 males with an average body weight of 2.69 kg at the age of 4+ were caught from the pond where the pre-spawning maintenance of the broodstock was carried out. The fish were kept separately by sex, the females were given the first injection on May 19 at 18:00, and the second injection on May 20 at 10:30, and males were given an injection simultaneously with the second injection. Immediately after the injection, the fish of both sexes were placed together in a pool with a circular movement of water. The design of the pools is such that spawning takes place in the pool, where the flow of water necessary for spawning of the species is provided, swept and fertilized eggs are immediately taken out of the center of the pool into a special receiver, where they are collected and transferred to incubation devices. Thus, it is possible to quickly determine the time of fertilization of eggs.

The eggs were incubated in the Amur incubation apparatus, from which we collected a random sample of eggs and examined them with a binocular. Stages and stages of egg maturity were determined according to the generally accepted description for cyprinids [4]. Studies were carried out before the transition of larvae to exogenous nutrition, the formation of a mobile mouth-gill apparatus.

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3. RESULTS AND DISCUSSION

The water temperature varied during the experiment within the limits of 20 - 24°C (average 22oC, not differing noticeably in the daytime and at night (Table 1).

Table 1

Indicators of the quality of water entering the factory floors in which embryos of cyprinids pelagophiles develop.

Name of indicators	Standard values (OST 15.372-87)	Indicators of the Tashkent incubation gild
Temperature, C°	19 – 21	20 – 24
Water transparency, m	2,0	0,17 – 0.7
Hydrogen index, (pH)	6,5 – 8,0	7,0 – 8,2
Oxygen dissolved in water, mol/m3 (g/m3)	6,0	6,4 – 8,5
Hydrogen sulfide mg/l	–	–

There are 4 basic phases (periods) of fish life cycle which are Embryonic Phase, Larval Phase, Fry Phase, Adult Phase and Senescence. According to A. Makeeva (1998), the Embryonic Phase includes (I) egg activation and blastodisc formation; (II) cleavage, (III) blastula; (IV) gastrula; (V) organogenesis; (VI) tail bud; (VII) embryonic respiratory system, (VIII) gill-arch and jaw development (last stage often is separated to subperiod of out of egg cell development).

Stage I (activation of the egg and formation of the blastodisc): after fertilization, the activation of the egg takes place, the cytoplasm at the animal pole forms the blastodisc.

Stage II (crushing): a series of cell divisions without cell growth, during which 2, 4, 8, 16 blastomeres are sequentially formed. These first four divisions are meridional, the subsequent fifth division runs parallel to the yolk equator and leads to the appearance of 32 blastomeres, then 64, 128, 256 blastomeres. Stages 64–256 of the blastomere are called "morula". Divisions lead to the formation of a large number of cells arranged in the form of a dome on the periblast. The totality of these cells is called the blastoderm.

Stage III (blastulation): with continued fragmentation of blastomeres, cell differentiation appears. There are early (high dome of blastoderm cells), middle (flattening of the layer) and late (significant flattening and protrusion of the upper part of the yolk sac into the blastoderm) blastula.

Stage IV (gastrulation): the process of separation of the homogeneous blastoderm into germ layers, the yolk is overgrown with the blastoderm until the residual part of the yolk is closed (yolk plug).

Stage V (organogenesis): at the beginning of the stage, the body of the embryo in the form of a roller is located on the yolk sac, the height of the body, especially the anterior part, noticeably increases during the stage, differentiation of organs takes place: the laying of the chord, segmentation of the mesoderm into somites, the appearance of a Kupffer vesicle, a nerve cord . In the region of the anterior cerebral thickening, the rudiments of the eyes appear, developing into eye vesicles, which later turn into eye cups.

Stage VI (separation of the caudal region from the yolk sac): the caudal region of the embryo is formed, the notochord, spinal cord, and somites are differentiated in it. There is a laying of the heart, which soon begins to pulsate. The differentiation of the nervous system leads to the formation of five parts of the brain. The retina develops in the eyes, and a black pigment, melanin, appears in the pigment membrane. The back of the body and tail are bordered by a narrow unpaired fin fold; pectoral fins are laid in the anterior part of the embryo. Neuromuscular motility begins, the embryos become mobile and turn over in the shell.

Stage VII (development of the embryonic vascular system): many definitive vessels develop and a number of provisional ones that act as respiratory organs; the heart is represented by two alternately pulsating sections: the atrium and the ventricle. Arcs are laid in the gill region. There is a straightening of the head. Melanophores appear on the head and back of the embryos. The body is surrounded by an unpaired fin fold; a prianal fold runs along the ventral side of the yolk sac to the anus. The embryos are mobile and toss and turn in the egg shells.

Stage VIII (development of the gill-jaw apparatus): hatching occurs (hatched fish are called prelarvae), then resorption of the yolk sac, changes in the structure of the circulatory system, rapid development of the jaw and gill apparatus, other organ systems, the rudiment of the swim bladder appears. At the beginning of the stage, the mouth is represented by a fossa, which is bordered from below; by the end of the stage, the oral apparatus becomes slightly mobile, gill arches appear. The head of the prelarvae straightens, the eyes are entirely pigmented black (figure 1).

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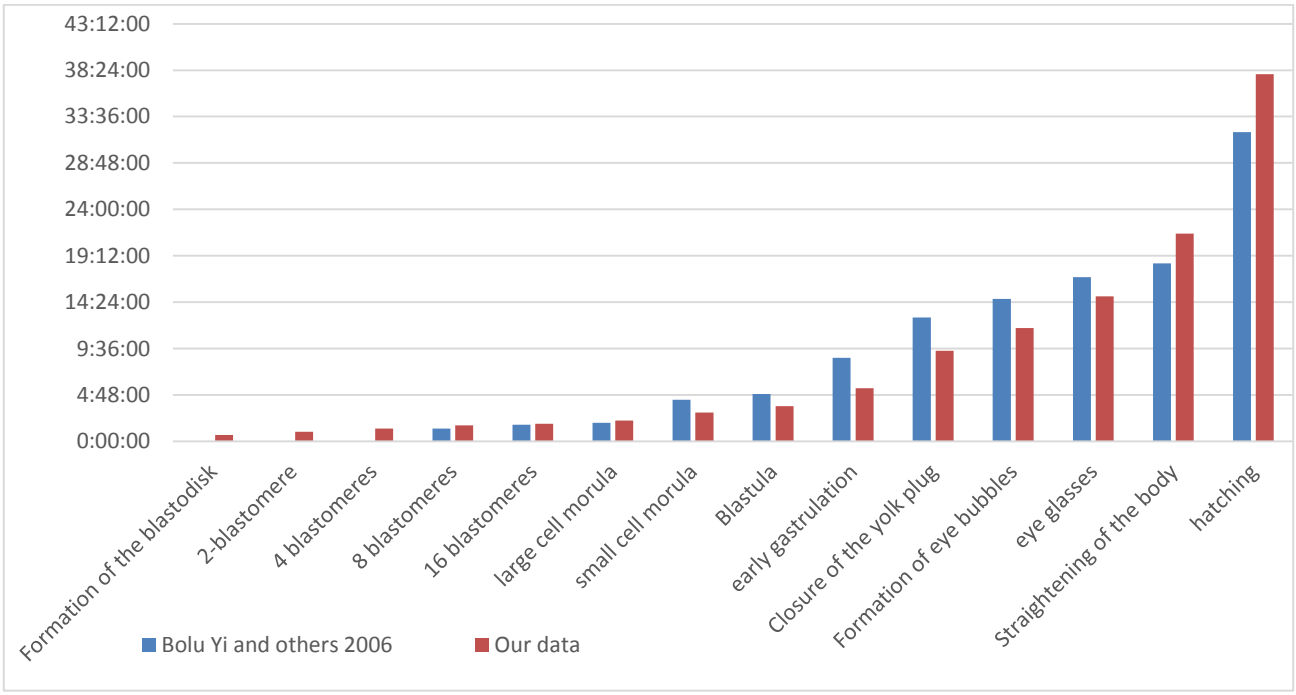

Figure 1. Embryonic development of silver carp in different conditions

Separately, in research there is a question about the size of fish and their growth, in this case, during the period of embryonic development under conditions of artificial reproduction. Silver carp is a fast-growing fish of flat waters. This is a pelagophilic fish (like grass carp), as a result of which embryonic development occurs very quickly.

The schedule for the passage of periods, including the stages and stages of development in grass carp under conditions of artificial reproduction in the Tashkent region, is currently shown in Figure 2.

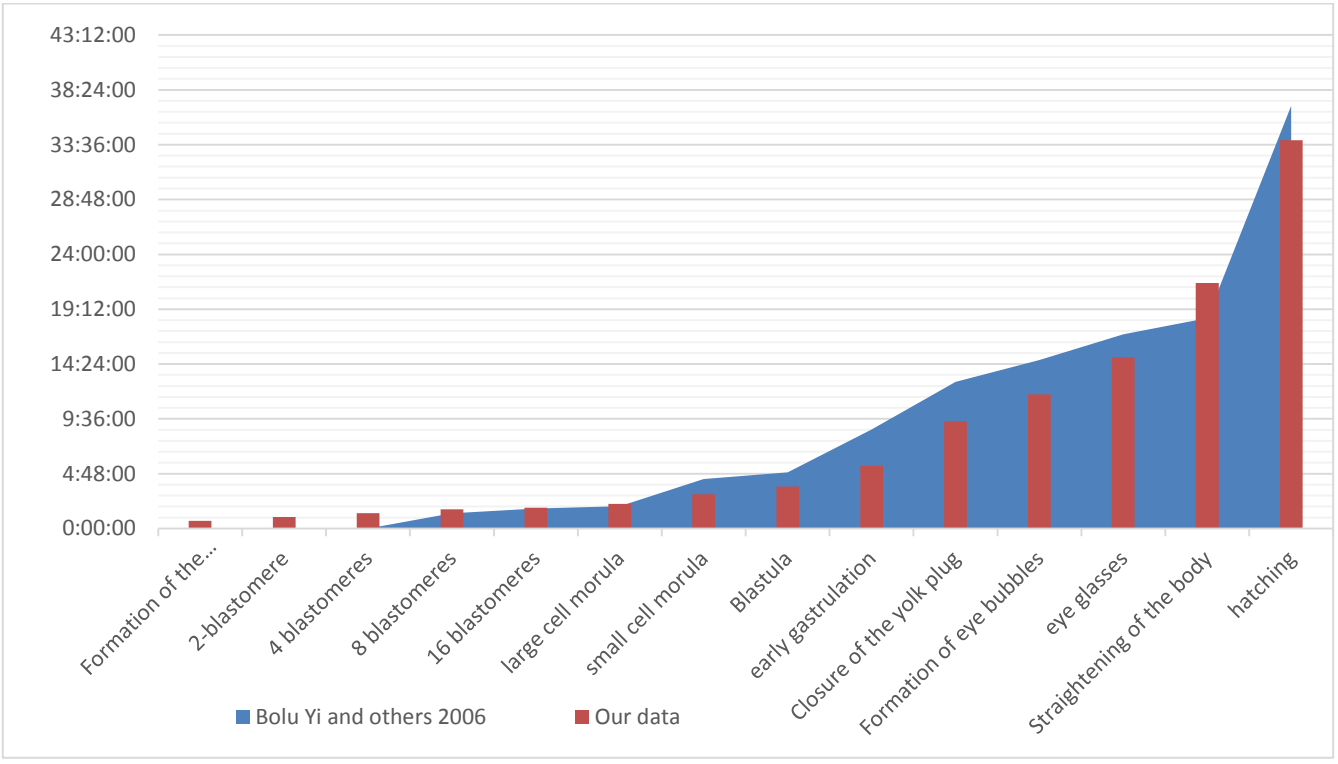

Figure 1. Embryonic development of grass carp in various conditions

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In the pond fish farming of Uzbekistan, silver carp is reproduced on an industrial scale by the method of factory reproduction [2]. In the fish farms of the Tashkent region, broodstocks consist of 3–5-year-old fish, after which the fish are sold as a commodity. Thus, in the conditions of the republic, at least 10 generational changes occurred, the species adapted to new conditions. At the same time, the technology is completely based on data on the embryology of the species obtained in the late 1960s in the so-called. VI - VII zones of fish farming (i.e. in Uzbekistan and the southern part of Russia).

4.CONCLUSION

Thus, with the modern culture of breeding and methods of artificial reproduction of silver carp and grass carp in the fish hatcheries of Uzbekistan (on the example of the fish hatchery of the Research Institute of Fisheries), with artificial insemination, the passage of all stages of the embryonic period of development of objects proceeds normally in accordance with those in the regions natural distribution. The data we obtained for all species showed that in terms of quality (high rates of larval release during incubation of eggs) and development rate (embryonic and larval), the studied generations showed high results, located in the zone of the first 20-40% of all areas of the modern distribution of species. We can assume that this is the optimum zone. In our studies, according to the methodological requirements [3], we chose batches in fish reproduction not the very first in the season, but in the first decade from the beginning of the incubation campaign, that is, again, from a typical mass segment. Comparative reasoning (the length of the body of fish and the value of working fecundity) allows us to assume with a high degree of probability that the offspring obtained from fish that have matured for the second time in their lives have been studied. The obtained results showed that the working fecundity (on the example of carp and grass carp) was higher than the standard for the VII zone of fish farming of the former planned economy. In terms of the rate of development, the indicators were slightly inferior only to regions with a typically tropical climate and surpassed all other regions of a temperate climate.

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