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RIPE EGGS AND FECUNDITY OF FIRST TIME MATURED RAINBOW TROUT (ONCORHYNCHUS MYKISS) UNDER CONDITIONS OF CHIRCHIK RIVER, UZBEKISTAN

Sulaimonov Sh.Kh.*; Alimova, A.T*; Kamilov B.G*; Kim S.I; Kamilov B.G****

*Tashkent State Agrarian University,
Tashkent, UZBEKISTAN
Email id: bkam58@yandex.ru

**Astrakhan State Technical University branch in Tashkent Region,
Samarkand, UZBEKISTAN
Email id: bkam58@yandex.ru

***Institute of Zoology of Uzbek Academy of Science,
Samarkand, UZBEKISTAN
Email id: bkam58@yandex.ru

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ABSTRACT

The parameters of the female rainbow trout (Oncorhynchus mykiss) reproductive biology, grown from imported eyed eggs in the conditions of the Tashkent region of Uzbekistan were studied. Females reached firstmaturition at the 3-years-old age; females were 40-66 (mean-55.2) cmof total body length, 1370 - 5450 (2963.6) gof total body weight. Gonad weight at stage IVvaried300-900 (532.4) g, the absolute fecundity - 2520-15660 (5981.4) eggs. The ripe eggs size varied 3.6-6.0 mm, the individual average size of ripe eggs varied 4.43 - 5 (4.86) mm.

KEYWORDS: *Rainbow trout, Oncorhynchusmykiss, ripeoocytes size, absolute fecundity, Uzbekistan*

INTRODUCTION

Cold-water aquaculture is promising for development in the mountainous and foothill zones in conditions of Uzbekistan, which is situated in south of the temperate zone; such development will allow the rational use of the water resources. In recent years, rainbow trout (*Oncorhynchus mykiss*) culture has begun development; artificial reproduction and fish seed mass production is strong limitation for trout culture. Several trouthatcheries import fertilized eyed eggs from different sources, different batches of which can vary greatly in quality. The need to establish their own breeding program is obvious in the country; one of the main criteria, clearly underestimated in many countries of the transition period from a planned economy to a market economy, is the study of the object and the availability of a developed technology for its cultivation in local conditions. An important indicator is the time of first maturation and size of mature eggs. The fish farm "Golden fish group" (Tashkent region) brought fertilized eyed eggs of the rainbow trout company "Aqua search" in the winter of 2016, finished incubation and raised fry in hatchery in tanks with water supply from a spring; fingerlings were transported to a cage farm in premountain reservoir, where part of the generation was raised for several years (up to sexual maturity) as local brood stock. The trout were fed with Coppens aquaculture feed appropriate for each age-size group. Females of this generation reached their first maturity at the age of 3 years and were used in reproduction at the fish farm. **[1]**

MATERIAL AND METHODS

The material was collected from December 10, 2020 to January 10, 2021 in the cage farm of the Golden fish group. The dissolved oxygen level (mg / L with an accuracy of 0.1) and temperature (^{o}C, with an accuracy of 0.1) were measured using a "HANNAHI 9147" thermooximeter, pH (with an accuracy of 0.01) using a portable pH meter "pHscan30S", also used traditional methods to determine other indicators of water quality. **[2]**

Of the fish selected for the incubation, 63 mature females were randomly selected. In fish, the total body length (TL, cm) was measured with an accuracy of 0.1 cm and the total body weight (W, g) with an accuracy of 1 g. At dissection, the stage of maturity of the fish was determined. In mature females, a 5 g sample was taken from the middle of the gonads and fixed in a 4% formalin solution. In office conditions, the sample was washed for 20 minutes in running water, the eggs were freed from the remains of the stroma, and their number was counted using a Bogorov camera. Then the eggs were placed in a half of a Petri dish, and in the apparatus for reading microfilms "Mikrofot-5 PO-1" the contours of random 100 eggs in a row were accurately outlined. The increase was determined to be 9.5 *. For each egg, two mutually perpendicular diameters were measured, averaged, and the size of an individual egg was obtained taking into account the instrument magnification (DO, mm). **[3]**

Results

The cage farm is located in the Khodjikent reservoir (in fact, a hydroelectric complex) in the upper reaches of the Chirchik River within line of sight below the dam of the Charvak reservoir. The cages are set along the right bank, in fact, in a straight line (Fig. 1).

Fig. 1 - Khodjikent reservoir (in left) and cage fish farm "Golden Fish" (in right). Water quality analysis stations are shown.

Throughout the year, the total hardness of water was 2.0 mg-eq / l (MPC 1.5-7.0), mineralization was 110 mg / l (MPC 1000-1500), hydrocarbons were 17.5 mg-eq / l (MPC 60-120), the chloride concentration was 0.709 mg / l (MPC 25-40), color - 540 nm. The most limiting for trout breeding is the water temperature (MPC for trout is up to 18 ° C). In February - March, the water temperature is very cold (4.9 - 5.2 ° C.), In April - an average of 7 ° C, from mid-May, the water in the reservoir warmed up to a level at which the growth of rainbow trout is noticeable - above 11 ° C, in summer - up to 13oC, and from October it decreased to 10oC. In the cages of the fish farm, intensive aquaculture is used (they contain trout at high stocking densities), which affects the amount of dissolved oxygen (MPC 6 mg / l). During the fall-spring, the amount of dissolved oxygen did not fall below 10.1 mg / l, even in summer, when the water warmed up, the indicator did not fall below 8.2 mg / l, i.e. the oxygen regime is favorable. The hydrogen potential (pH) varied from 7.4 to 7.68 throughout the year at all stations. The concentration of ammonium ion in autumn and spring was 0.00, only in summer it rose to 0.00-0.08 at stations. That. According to the indicated parameters of fishery water quality, the location of the cage fish farm is favorable for trout breeding, but the water in this reservoir can be considered cold (for the conditions of

Uzbekistan), which is explained by the release of water from the deep-water Charvak reservoir from the lower part of the dam. only in summer it rose to 0.00-0.08 at stations. That. According to the indicated parameters of fishery water quality, the location of the cage fish farm is favorable for trout breeding, but the water in this reservoir can be considered cold (for the conditions of Uzbekistan), which is explained by the release of water from the deep-water Charvak reservoir from the lower part of the dam. only in summer it rose to 0.00-0.08 at stations. That. According to the indicated parameters of fishery water quality, the location of the cage fish farm is favorable for trout breeding, but the water in this reservoir can be considered cold (for the conditions of Uzbekistan), which is explained by the release of water from the deep-water Charvak reservoir from the lower part of the dam. **[4]**

For the first time maturing females of the generation of rainbow trout, selected for the incubation campaign, had a total body length of 40 - 66 (on average 55.2 + 0.85) cm.The total body weight of females was 1370 - 5450 (2963.6 + 138.36) g There is a significant difference in quality of fish in terms of body size (the coefficient of variation of females in body length was 12.26, in body weight - 37.35), which is explained by the beginning of the establishment of breeding in the fish farm. Within the brood stock, a strong positive relationship was revealed between the length and weight of the brood stock (r = 0.83), which is characterized by the regression equation (W = 0.1261 * TL2.4976) (Fig. 2). **[5]**

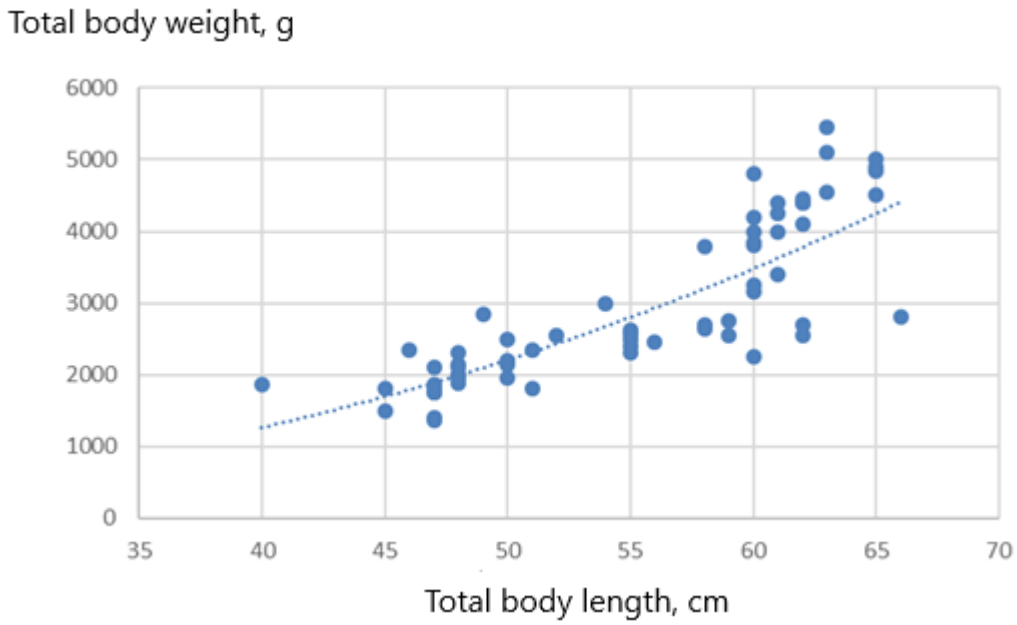

Fig. 2 – Matured rainbow trout females relationship between total body weight and total body length

All studied females had gonads at a well-defined stage IV of maturity: the ovaries are highly developed, occupy the main part of the abdominal cavity of females, developed eggs of orange, pink-red color, have reached an almost definitive size. Yolk particles in the form of globules merge into one mass. Oocytes mature and are ready for ovulation with further fertilization. **[6]**

The sizes of mature eggs in the gonads of females in each individual had a certain variability; the distribution of eggs in size was close to normal.

In some individuals, the minimum egg diameters varied from 3.6 to 4.7 (4.20 + 0.03) mm; the coefficient of variation in the sample was 3.1. At the same time, the maximum individual sizes of individual eggs in females were 4.8 - 6.0 (5.36 + 0.03) mm; the coefficient of variation was 8.61. The average individual sizes of eggs in females varied within the range of 4.43 - 5.50 (4.86 + 0.03)

mm; the coefficient of variation in the sample was 5.08. Thus, the matured oocytes with the smallest size in the sample of females were more homogeneous, and the maximal ones were significantly more variable. **[7]**

The data presented show a noticeable variability in the size of matured eggs in the sample of the reared flock of first maturing female trout.

A weak positive relationship (r = 0.37) was found between the average individual sizes of ripe eggs and the body length of female rainbow trout (Fig. 3).

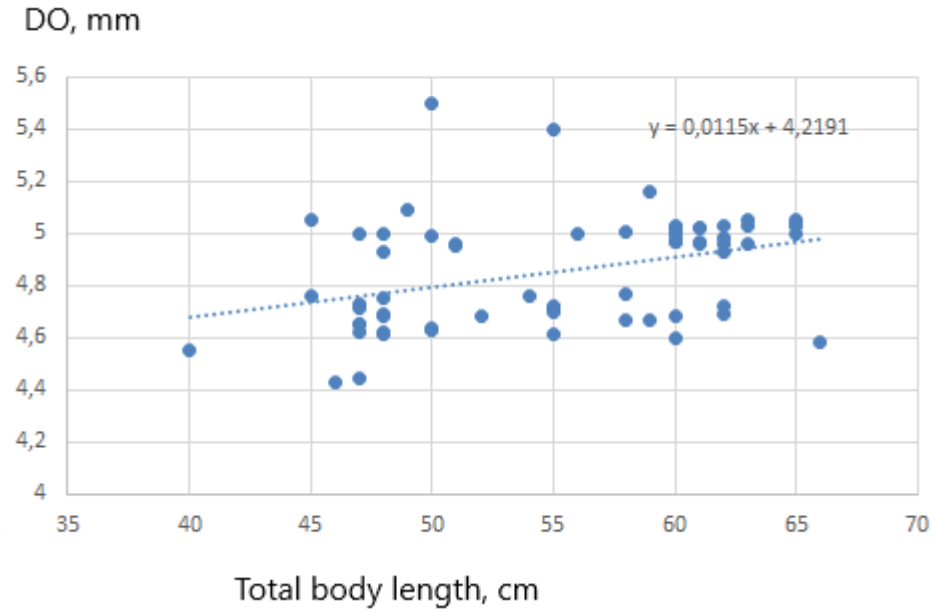

Fig. 3 - Regression dependence of the average individual sizes of ripe eggs (DO) and the total body length of female rainbow trout

The positive dependence of the body size of fish and the size of mature eggs was more pronounced if the total body weight was taken as an indicator of fish size: females with a larger body mass had larger mature eggs (r = 0.46) (Fig. 4), the relationship can be characterized by the regression equation DO = 0.0885 * W + 4.5938.

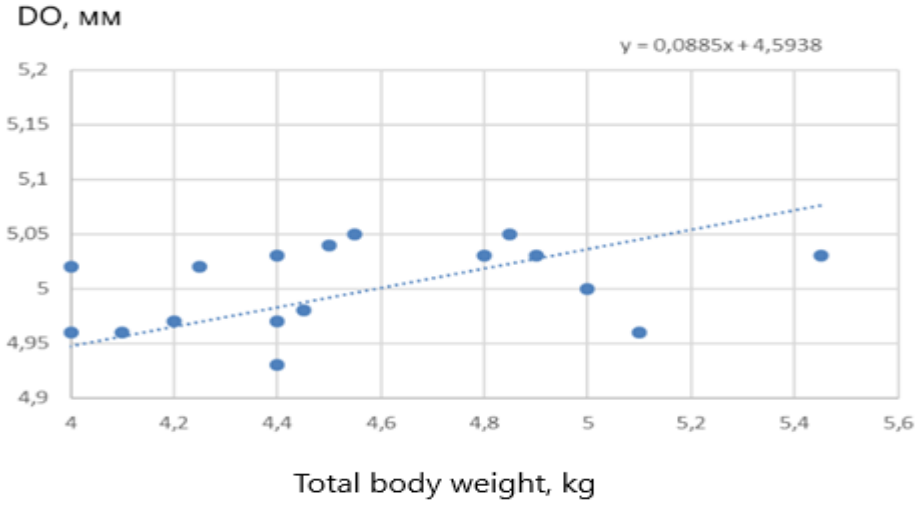

Fig. 4 - Regression dependence of the average individual sizes of ripe eggs (DO) and the total body weight of female rainbow trout

In individuals of the studied herd, the mass of gonads at stage IV immediately before the release of reproductive products varied 300 - 900 (532.34 + 14.50) g. Larger females had a greater mass of gonads. A strong positive correlation was found between the total body length and the mass of the gonads (r = 0.8). The correlation dependence of the gonad weight on the total body weight in the maturing female rainbow trout was even stronger (r = 0.98). **[8]**

The investigated females of rainbow trout had an absolute fecundity of 2520 - 15600 (5981.4 + 48.91) eggs. A positive strong dependence of the absolute fecundity value on the body length of females (r = 0.77) (Fig. 5) and an even stronger dependence on the total body weight of fish (r = 0.92) (Fig. 6) were also revealed. These dependencies are shown in Figure 5, where the regression equations are shown. **[9]**

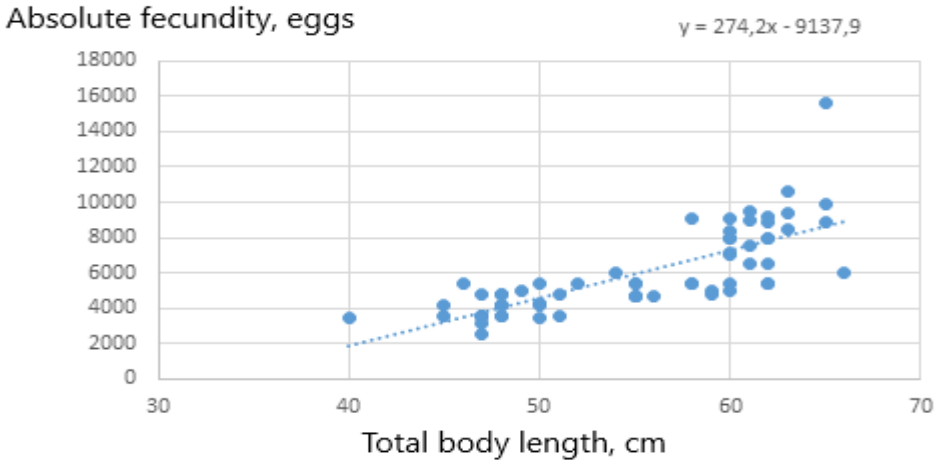

Fig. 5 - Dependence of individual absolute fertility on the total body length of the first maturing female rainbow trout

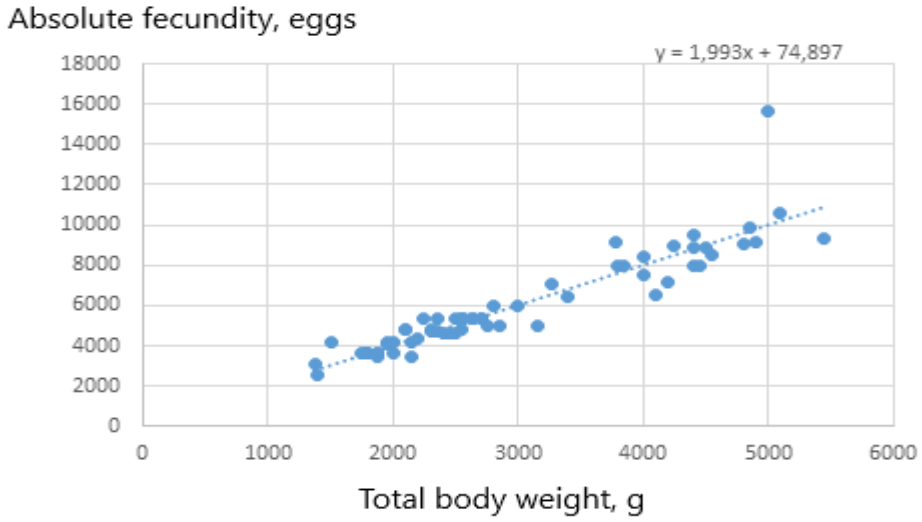

Fig. 6 - Dependence of individual absolute fertility on the total body weight of the first maturing females of rainbow trout

DISCUSSION

Prosperous fish species as cold-blooded animals that live in water (a universal solvent) are characterized by significant variability in many aspects of development and growth biology, which characterizes their adaptation to different habitats. The currently prosperous salmon species (genera Salmo, Oncorhynchus, etc.) are also characterized by the different quality of various aspects of reproductive biology. This is what allowed the widespread species to create vast ranges

in Eurasia (both in inland water bodies and in the oceans of the Northern Hemisphere). The widespread distribution of trout (salmon) as objects of aquaculture became possible precisely due to the adaptive capabilities of the species. Thanks to this widespread dispersal of several salmon species in world aquaculture, the species have expanded their ranges to the Southern Hemisphere, where they are also cultivated as in mariculture. and in freshwater conditions. The problem of mass local artificial reproduction of any aquaculture object requires a deep study of the peculiarities of the passage of reproductive biology processes in specific local environmental conditions. Uzbekistan was not included in the natural distribution area of rainbow trout, the species was introduced here as an object of aquaculture. The species has found favorable conditions for growing marketable fish in the foothill and mountainous zones of the republic (Kamilov, Khalilov, 2014), the question arises about the passage of reproductive cycles in local specific conditions. Uzbekistan was not included in the natural distribution area of rainbow trout, the species was introduced here as an object of aquaculture. The species has found favorable conditions for growing marketable fish in the foothill and mountainous zones of the republic (Kamilov, Khalilov, 2014), the question arises about the passage of reproductive cycles in local specific conditions. Uzbekistan was not included in the natural distribution area of rainbow trout, the species was introduced here as an object of aquaculture. The species has found favorable conditions for growing marketable fish in the foothill and mountainous zones of the republic (Kamilov, Khalilov, 2014), the question arises about the passage of reproductive cycles in local specific conditions. **[10]**

Normally, the older generation of germ cells is formed from the fund of oocytes during previtellogenesis, which occupy almost the entire volume of gonads in both polycyclic (Murza, Khristoforov, 1991) and monocyclic salmonids (Persov, 1975; Zelennikov, 2003, Zelennikov, Golod, 2019). **[11]**

In fish farming, the dependence of the development and growth of offspring on the size of the eggs is studied. In rainbow trout, a positive correlation was found between the size of eggs and the size of larvae: larger eggs are obtained from larger eggs (Springate and Bromage, 1985). For the related Arctic char (Salvelinusalpinus), it was found that growth was faster in individuals hatched from larger eggs (Wallace and Aasjord, 1984). At the same time, already soon after hatching, environmental factors begin to exert an increasing influence on the growth of the offspring, and the dependence of the development and growth of the offspring on the size of the eggs becomes not decisive, as, for example, it was manifested in J. From et al. (From et al., 1991) .

It has been noted that individual mature eggs in rainbow trout range from 3.8 mm to 6.2 mm. The average diameter of mature oocytes in different populations and in different nurseries varies from 4 to 6 mm (Murza and Khristoforov, 1991; Emelyanova et al., 2000; Scott and Sumpter, 1983, Tyler et al., 1990; Estay et al, 2012 and etc.). **[12]**

In general, it can be assumed that the broodstock of rainbow trout, raised from imported fertilized eggs in the conditions of the Tashkent region, matures normally. Females of the studied generation reached their first sexual maturity at the age of 3 when they reached a total body length of 40-66 (55.2) cm, a total body weight of 1370 - 5450 (2963.6) g. Mass of gonads at stage IV in fish sampled for incubation the campaign was 300 - 900 (532.4) g. The absolute fecundity was 2520 - 15660 (5981,, 4) eggs. The sizes of individual eggs varied in the females of the herd 3.6 - 6.0 mm, the average individual sizes of mature eggs were on average 4.43 - 5 (4.86) mm in the herd.

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