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Acquired Results on Rearing of Sevruga Larvae (*Acipenser stellatus* – Pallas, 1771) in Superintensive System

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Abstract. The experiments were made in a flow-through superintensive system, sturgeon larvae being reared in spun glass troughs. Experiment duration was 20 days. The biological material, sevruga larvae (*Acipenser stellatus* –Pallas 1771) at the age of 16 days post hatch was acquired by artificial propagation of breeders captured from natural environment. The experiment was carried out in two variants with three replications each. In each variant, the rearing densities were as follow: in variant I –1000 ex/tank, and in variant II –1400 ex/tank. In both experimental variants, the feeding of larvae was made in the same way, respectively: the same number of daily ratios, deal instantaneous for both variants, and it was used the same type of feeds, represented by live diet (*Daphnia species* and *Tubifex species*) and a type of fodder, namely Perla Larva with a protean content of 62.00 %. At the end of experiment, the gained results were as follow: in variant I, the survival rate was 80 %, and the final average body mass of larvae 1.6 g/ex, in variant II, the survival rate was 72 %, and the final body mass of larvae 1.35 g/ex.

Keywords: sturgeon, *Acipenser stellatus*, density, troughs

INTRODUCTION

Sturgeon culture is very important for those countries wherein the natural stocks are declined or disappeared. Currently, some species of sturgeons are being considered interesting candidates to produce them in full cycle.

The first trials in sturgeon farming were carried out almost simultaneously in mid 19th century in Russia, Germany and North America to compensate for declines in the harvest for wild sturgeon (Williot, 2001).

Now, sturgeon catches recorded on global level are in decline because of over fishing and degradation of natural habitat. Concurrently, production of sturgeons presents a special importance for those countries wherein the natural stocks are declined or were disappeared. Currently, some sturgeon species are being considered interesting candidates to produce them in full cycle (Ronyai, 1995).

On sturgeon aquaculture, larval rearing is probably the most difficult part of the hatchery process. Fry survival depends on having a proper culture system and a complete nutritional program (Coppens International, 2007). There fore it is offer a grate importance. At present, growth of sturgeon larvae is making inside of enclosures fitted with rearing tanks and systems to control and action on water physico-chemical parameters in order to assure an optimum environment towards reducing losses.

The present study was after to determine the growth rate, survival rate and behavior of sevruga larvae reared in a superintensive flow-through system, at two different stoking dencities.

MATERIALS AND METHODS

The experiment was come of inside of private sturgeon rearing farm S.C. Beluga Farm Group from Calarasi County.

The rearing system is flow-through and is emplaced into an enclosure as hall type. Sturgeon larvae were reared in spun glass troughs with a capacity of 0.167 m^3.

Feed water for the system come from Tamadau dam whence is gravitationally bring into the rearing enclosure.

Afore to arrive in the rearing tanks, the water pass through a basin fitted with oxygenation system for emergency cases.

Tanks (troughs) for larvae rearing have a rectangular form, fitted with bolters disposed at both ends, perpendicular to bottom of troughs in order to maintain the larvae in the middle part of the tank so that larvae can't escape or be annoy by the water flow.

Water supply of troughs goes through pipes fitted with stop valves, disposed at one abut of the trough.

Discharge of water from troughs is going through across the supplying pipe through another pipe that penetrates vertically the bottom of trough and also determines the level of water inside of trough according to the level that is ascended.

In all the experimental period, the water supply debit in troughs was between 0.2–3 l/minute, and temperature of water oscillated from 21 to 24 ^{0}C.

During the experiment were monitoring the main quality parameters of technological water (Tab.1), namely: pH, dissolved oxygen, total ammonia nitrogen, nitrite, nitrate and hardness.

Tab. 1

Mean value of physical-chemical parameters of water in experimental variants

Parameters	Variant I	Variant II
pH	7.5	7.7
Dissolved oxygen (mg/l)	5.6	5.4
Ammonia nitrogen (mg/l)	0.021	0.028
Nitrite (mg/l)	0.215	0.240
Nitrate (mg/l)	9.85	10.4
Hardness (dGH)	11.3	11.7

The value of physico-chemical parameters of water were situating inside of normal limits for rearing of sturgeon larvae.

Dissolved oxygen was monitoring with WTW oxymeter, pH with WTW pHmeter, and water temperature with a thermometer.

The biological material used for experimentations was represented by sturgeon larvae, namely sevruga (*Acipenser stellatus* – Pallas, 1771) at the age of 16 days post hatch, that were acquired by artificial propagation of breeders captured from natural environment. The experiment was carried out in 20 days. At the beginning of the experiment the average body mass of larvae was 0.23 g/ex.

During the experiment, the diet of sturgeon larvae consisted in (Tab. 2) live food represented by zooplankton (*Daphnia sp.*) and worms (*Tubifex sp.*) as well as in a protean fodder namely Perla Larva having a protean content of 62 %.

Tab. 2

Biochemical structure of delivered feed

Feed	Crude protein (g %)	Lipids (g %)	Ash (g %)
Perla Larva	62.00	11.00	10.00
Tubifex sp.	10.50	2.86	1.50
Daphnia sp.	46.56	3.90	25.85

The rearing experiment was carried out in two variants three replications:

- Variant I –sevruga larvae were populated in rearing tanks at a density of 1000 exemplars/tank. At the end of experiment, the survival rate was 80 %, and final average body mass of 1.6 g/ex.

- Variant II –stocking density of sevruga larvae was of 1400 exemplars/tank. At the end of experiment, the survival rate was 72 %, and final average body mass of 1.35 g/ex.

The conditions for rearing were identical for all experimental variants: the same type of tanks for larvae rearing (troughs), the same water supply debit, namely 0.2 – 3 l/minute. In all three experimental variants, delivery of feed was carried out in the same way, namely the same number of daily feedings; deliver in the same time for all variants. Daily ration of feed was gradually changed according to feeding intensity of larvae.

During the 20 days of experiment in order to determine the growth rate of biological material, 60 larvae were sampled from each experimental variant at every 5 days for biometric measurements. For weighing of larvae it was used an electronic analytical balance KERN ALJ 220-4NM.

RESULTS AND DISCUSSION

At the end of experiment were enlisted some differences between experimental variants, reflected on average body mass, growth rate, specific growth rate and survival rate.

It can be seen as the best growth rate of sevruga larvae (Tab. 3) was recorded in variant I, in which the larvae have been reared at the smallest density. In variant II, in which the stocking density was elder, the average body mass of larvae has been with 15.6 % lower than in variant I. Also, in variant II, the survival rate of larvae has been with 10 % lower than variant I.

Tab. 3

Biotechnological indexes

Age (days)	Average body mass (g/ex)	
	Variant I	Variant II
16	0.23	0.23
20	0.42	0.40
25	0.69	0.63
30	0.98	0.88
35	1.60	1.35

During the experiment it was observed that sevruga larvae did not show a marked cannibalism, this behavior slightly emphatic in variant II.

The survival rate of larvae was determined to the end of experiment by counting larvae of the two experimental variants.

In order to asses the gained results in both experimental variants, it was drafted the chart of daily growth rate (Fig. 1) of sevruga larvae.

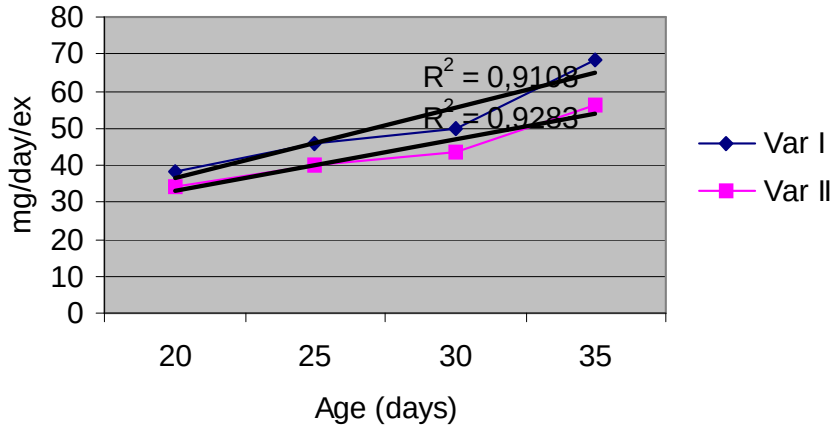

Fig. 1. Daily growth rate of larvae in the two experimental variants

The results show that in both experimental variants the specific growth rate of larvae (Fig. 2) describes a decline initially, after which, at the age of 30 days, the curve follows an ascendant path.

This is due primarily to the fact that the larvae have needed a period of time to adapt to the type of feed delivered. This situation was also mentioned by other authors (Koksal, 2000; Palteanu, 2003; Oprea, 2008) on sturgeon rearing in different growing systems and different density formulas.

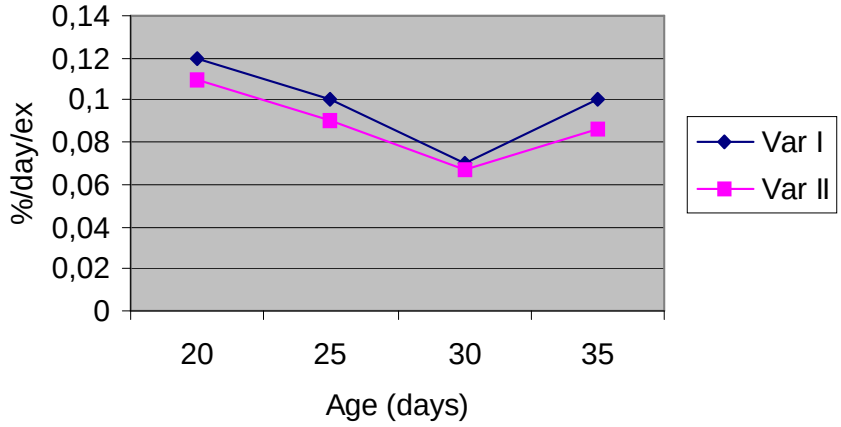

Fig. 2. Chart of specific growth rate

The specific growth rate was determined on the base of formula:

$$SGR = \frac{\ln w_t - \ln w_0}{t} \times 100 ;$$

where:

w_0 and w_t – initial and final body mass; t – time period.

For drawing the diagrams in the paper, has been used the program Microsoft Office-Excel 2003.

CONCLUSIONS

The rearing experiment achieved in 20 days of sevruga larvae follow for two aspects: the effect that different stocking densities may have on the behavior, survival and growth of larvae and the economical aspect that relieve the feasibility of a technology for growth of sturgeons in the first development stage.

On the intensive post hatch rearing technologies for sturgeons, determination of stocking densities must to be made concordantly with the possibility to maintain the environment parameters at optimum limits for growth and also to act on the effect of density on behavior of biological material in order to reduce technological loses.

From the chart of specific growth rate (Fig. 2), it can be observed that the stocking density did not influence the time period needed for larvae to adapt at the type of feed delivered.

In variant II, was observed that because of stocking density used start to appear size differences in larvae stock thing that increase the exhibition of cannibalism occurrence, which was rarely observed in the first variant. This angle conducted to achievement of a smaller survival rate in variant II comparatively with variant I.

Generally, size differences in a group should not exceed 20 % from the average value. In order to reduce the rate of cannibalism and facilitate proper feeding, in case of using high stocking densities it is necessary that periodically to make a grading of larvae.

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