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Testing stocking densities in North American sturgeon (*Polyodon spathula*) culture in the post-embryonic development period

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Abstract: The paper presents the results obtained during the growth of the North American sturgeon *Polyodon spathula* during the period of post-embryonic development. Sturgeon larvae aged 5 days old of *P. spathula* obtained by artificial reproduction at SCDP Nucet, were stocked and raised until the age of 30 days in two experimental variants: variant 1 (V1): 1000 ex/m³, respectively 1500 ex/tank; variant 2 (V2): 2000 ex/m³ respectively, 3000 ex/tank in 10 Ewos type fiberglass tanks (useful volume -1500 liters/tank). The water temperature during the experiments was between 17.0-22.5°C. In both experimental variants, the sturgeon fry were fed both zooplankton and artificial feed. The zooplankton administered came from specially prepared cultures. The technological indicators obtained at the end of the post-embryonic development period (30 days) were as follows: in variant 1 (V1) fry with an average mass of 6.95 g/ex were obtained (survival rate of 19.8 %) and in the variant 2 (V2) the fry recorded an average mass of 4.8 g/ex (survival rate 12.3 %). The differences recorded in survival between the two experimental growth variants were due to the fact that the adaptation to feeding with artificial feed became more difficult. Also, overcrowding causes typical manifestations that consist in the appearance of large differences between individuals that favor cannibalism.

Introduction

Polyodon spathula, belongs to order *Acipenseriformes* and family *Polyodontidae*, a species originally from hydrographical basin of rivers Mississippi and Missouri from North America. Paddlefish, similar to sturgeons, are sought for their high quality meat and caviar. Their meat is white, firm, and considered boneless, and their eggs are greyish-black and measure between 2.0 and 2.5mm in diameter [1,14,17]. The North American Sturgeon (*Polyodon spathula*) has been acclimatized in Romanian, at SCDP Nucet since 1992. Between 1992-1999, a number of 5000-20000 embryonated eggs and/or larvae were imported annually from the USA. Starting from 2002, when artificial reproduction was first achieved, both domestic and foreign economic agents annually purchase embryonated eggs, larvae, pre-developed fry and of different ages from the *P. spathula* species [16]. The growth rate is dependent on environmental conditions, variation in water flow, food abundance, density [10]. According to the research carried out the economic importance of the species is particularly high due to the fact that it presents large dimensions and growth rate; it has a planktonophore trophic regime (zooplanktonophore); it is a disease-resistant species; does not present the risk of a major ecological impact on natural aquatic ecosystems from Romania; constitutes a valuable support for an organic (ecological) fish culture [19].

Material and method

The growth experiments in the post-embryonic development stage of the species *Polyodon spathula* took place during 30 days from the moment of stocking in 10 Ewos tanks (flow-trough system). The useful volume/tank was 1500 liters.

Stock material - 5-day-old larvae of *Polyodon spathula* (mean \pm SE initial mass of 0.0014 \pm 0.003 g) was obtained by artificial reproduction at SCDP Nucet. To test the stocking density in the post-embryonic development stage, two experimental variants were established: first variant: 1000 ex/m³, respectively 1500 specimens/tank; 2nd variant: 2000 ex/m³ respectively, 3000 ex/tank. Five repetitions were made for each variant. At the beginning of the experiment, an optimal water level in the tanks was established at 0.40 - 0.50 m, after which it was gradually raised until the end of the experiment. The tanks were supplied with pond water; the initial flow rate was set at 7-15 liters/minute, being modified according to needs.

In both experimental variants, the larvae were fed both natural food (zooplankton) and artificial feed.

• Results and discussions

The growth of larvae and fry of paddlefish up to the age of 30 days, it is the most delicate technological phase, because it includes the period of transition from the mixed type of feeding - to active feeding, at which point, a decrease in the abundance of specific food could have negative consequences. In the first 10 days after the fry stocking of paddlefish were active in the whole water mass presenting a lively oriented swimming, more in the water current. They feed actively, by hunting and grabbing, but the food is mostly sought on the edges or in the bottom area of the tanks. This feeding behavior is determined by the concentration of zooplankton (*Daphnia longispina*, *D. pulex* and *D. magna* juveniles) in the respective areas.

The technological indicators obtained at the end of the post-embryonic development experiment were as follows: in version 1 (V1) fry were obtained with an average weight of 6.95 g/ex (survival rate of 19.8 %) and in version 2 (V2) fry recorded an average weight of 4.8 g/ex (survival rate 12.3 %). The results are presented in Table 1.

Table 1. Technological indicators obtained at the end of the post-embryonic development period (30 days)

Technological indicators	Variant 1		Variant 2	
	Stocking	Harvest	Stocking	Harvest
Total ex/tank	1500	297	3000	369
Useful tank volume (m ³)	1.5		1.5	
Ex. /m ³	1000	198	2000	246
Average mass (g/ex)	0.025	6.95	0.025	4.8
Fish biomass (g/ tank)	37.5	2064	75	1771
Fish biomass (g/m ³)	25	1376	50	1180
Survival (%)	-	19.8	-	12.3

Conclusions

Experiments testing high densities during post-embryonic growth have confirmed that the most important factors contributing to growth and survival are water quality and natural food density. Administration of large amounts of zooplankton causes rapid growth, the daily growth rate is 2-4 mm/day [11]. The differences in survival between the two experimental versions of the rearing density test arise because not all larvae adapt quickly to feed feeding and the large differences between individuals that appear against the background of typical manifestations of overcrowding favor cannibalism. After sorting the fry, the phenomenon of cannibalism is reduced.