RESEARCHES CONCERNING THE GROWTH OF THE SIBERIAN STURION (*ACIPENSER BAERII BRANDT, 1869*) IN THE PONDS FROM THE MOLDOVA AREA

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Abstract

This study presents aspects related to the technology of growth of the Siberian sturgeon, in semi-intensive system, and its ability to adapt to the conditions of the fishing facilities in the area of Moldova. Researches has spread over a longer period of about 18 months, including wintering in the pond where they were introduced and raised. The biological material consisted of 1,000 seedlings with an average weight of 5.3 g / piece, stored in a 500 m² pond, resulting in 2 pcs / m². During the period prior to flooding and stocking, the pond was properly prepared by maintenance and disinfection. A constant flow rate of water of 200 liter / min was ensured and at the level of the spillway, the water outlet was provided with a small mesh sieve (5x5 mm), knowing the sturgeon's tendency to migrate over the water streams. Monthly fishing was conducted to determine the growth rate and health status of sturgeon juveniles. The first stage of the study began on 19.04.2016, when the pond was populated with biological material and ended on 30.09.2016, when the water temperature did not allow the feeding of the sturgeon juvenile, and in this case they were prepared for wintering. The second phase of the research theme has evolved since 03.04.2017, ending in the first decade of October, exactly on 08.10.2017. This study was carried out within the private farm, "Valea Morii Farm". The administration of the extruded combined feed was carried out using a feeding system and in the first growth stage ,increase in 5 portions / day of the total amount of feed, after which it was reduced to 3 portions / day and maintained at that time until the end of the research. Throughout the experimental period, all physico-chemical parameters of the water were monitored and samples were periodically collected for chemical analysis.

Key words: fish, siberian sturgeon, semi-intensive, fodder

INTRODUCTION

Since the 1940s, the Siberian sturgeon is a species that attracted attention due to its plasticity, its increase in captivity starting in the former USSR in the 1970s (1,7). In addition to the Russian Federation, the growth of this sturgeon has grown to a large extent in other countries, including in Europe (Belgium, France, Italy, Germany, Hungary, Poland and Spain), (USA, Uruguay) and Asia (China) and possibly present in other countries, the culture of this species being in the experimental phase (2). In terms of caviar, currently among the important species producing of black caviar, the sturgeon species that offer the highest expectations, include the Siberian sturgeon (*Acipenser baerii*) (4). Siberian sturgeon is a species of fresh water, migrating long distances into the rivers where it lives, sexual maturity installs late due to slower growth in cold conditions, between 10-17 years in males and 12-20 years in females, depending of their origin. This species adapts well to temperatures ranging from 1°C to 25-26°C and has a high resistance to lower oxygen content (1,2). With the growth of the Siberian sturgeon on farms, where the water parameters are constantly monitored, it finds more favorable conditions than in the natural environment, and therefore sex maturity occurs much earlier, 6 years in males and 7 years in females.

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MATERIAL AND METHOD

Biologically grown material in a semi-intensive system, under the environmental conditions encountered in the ponds in the Moldavian area, was represented by a number of 1000 specimens of Siberian sturgeon - Acipenser baerii - with an average weight of 5.3 gr / specimen. The researches was carried out over a period of 18 months, starting on 19.04.2016, including the wintering period of about 6 months, from October to the end of March, and finalized on 08.10.2017.

The pond, with a total area of 500 m², has been leveled by filling its gate with a sort of stone. The water depth is 1.5 m at feed and 2.0 m at the water discharge. The water supply was pumped by means of a 290 W centrifugal pump from the Gorovei stream. The basin was secured against all pests (otter, gray stork) by closing the perimeter fence and using 10x10cm anti-bird netting mesh. In the first stage, feed was started when the water temperature was 12°C, with the Aller Futura EX extruded combined feed compound, 1.3-1.5 mm grain size, 0.84% of the total biomass. Table 1 summarizes the chemical composition of the extruded combined feed.

Table 1 The chemical compozition of **ALLER FUTURA EX** feed

Chemical compozition	
Crude protein %	58
Crude fat %	17
NFE %	6
Ash %	10,1
Fiber %	0,9
P (%)	
Energetic value	
Gross energie Kcal/MJ	21,6
Digestible energy MJ	20,1
Vitamins added per Kg	
Vitamin A (IE)	10000
Vitamin D3 (IE)	1000
Vitamin E (mg)	200

When the juvenile reached the weight of 20 grams per piece, has been fed to the 45% 15% Aller Bronze extruded compound fodder with a 2 mm grain size, 4.5% of the total fish weight estimated at the time of the water. The nutritional values of the Aller Bronze extruded combined feed are listed in Table 2.

Table2 The chemical compozition of **ALLER BRONZE** feed

Chemical compozition	
Crude protein %	45
Crude fat %	15
NFE %	23,8
Ash %	6,9
Fiber %	3,3
P (%)	0,9
Energetic value	
Gross energie Kcal/MJ	21,2
Digestible energy MJ	17,6
Vitamins added per Kg	
Vitamin A (IE)	10000
Vitamin D3 (IE)	1000
Vitamin E (mg)	200

The feed was spread out in four portions, being before wetted with a little water for a quick diving. Its administration was done manually, one meter of shore, until a 2 mm grain was used, when two automatic feeders were placed equidistantly between each other to cover as large a surface as possible of the water. When the Siberian sturgeon juveniles reached the average weight of 60 grams / pieces, they were fed with a 3 mm grain, fed with the same chemical composition as the 2 mm. Control fishing was performed every month to determine the growth rate. At the end of the growing season, when the water temperature dropped below 12°C, the feed was stopped, the last control fishing was done and the preparation of the juveniles for the wintering was started. In the following year, after a more rigorous control fishing to determine winter mortality and weight loss percentage, when the water temperature reached 12°C, extruded combined feed was started. In the last phase of the research, the

biological material received extruded granules of 4.5 mm, Aller Bronze 45/15. Throughout the research period, the water quality parameters were monitored and measured with farm equipment thermometer, oximeter, pH meter, spectrophotometer.

RESULTS AND DISCUSSIONS

On 27.05.216 the first control fishing tooked place, where, from all the trapped specimens, 25 individuals with the smallest dimensions and 25 individuals considered as peaks, were sorted to determine the biometric measurements. The average weight was set at 12 g / ex, with a total body length of 8 to 11 cm. In the first period, 16 deaths were recorded, due in large part to the change in the environment and the stress that occurred during transport. Control fishing was conducted approximately 30 days, with 50 specimens for biometric measurements. The determinations made on 29.06.2016 indicated a good evolution of the increase in growth, with an average body weight of 27.6 g with a minimum of 17.2 g and specimens weighing 38 g and lengths between 12, 3 and 17 cm.

On July 21, 2016, specimens in the fishing group were found to have a weight between 22.5 g and 85.7 g, resulting in an average body weight of 54.1 g / piece. For body length, values ranging from 18.2 cm to 27.8 cm were determined. Due to these weight differences, was carried on feeding with 1.5 mm grains, and was not chosen the 2 mm as recommended by the manufacturer.

On 21.08.2016, 125 days after the start of the study, the Siberian sturgeon juvenile reached an average body weight of 115 g / pcs. Were fished specimens weighing between 42.7 g and 187.3 g and body lengths, minimum 22.6 cm and maximum 39.14 cm. Throughout this period, the median parameters have been maintained in the optimum for sturgeon growth.

The next control fishing tooked place on 20.09.2016, the fished specimens being subjected to biometric measurements, resulting in weights between 72 g and 284 g with a mean body weight of 178 g and an average length of 28.6 cm. During this period, the feed rate was reduced from 4.5% to 2.1% of the total biomass, and the grain was reduced to 2 mm.

The last control fishing took place on October 23, 2016, making the last measurements before the fish entered in the wintering season. Weights ranging from 96.3 g to 464.1 g were established, averaging 280.2 g.

In 2016, I delivered a total of 284.86 kg of extruded combined fodder throughout the feed, resulting in a real increase of 249.76 kg of fish with a conversion factor of 1.14: 1. During this period, a total of 45 deaths were recorded. A total amount of sturgeon at the entrance to wintering was calculated of about 268 kg. The environmental conditions in the basin have been monitored and samples were tooked for chemical analysis. Further, the resistance of Siberian sturgeon juvenile to wintering was followed, given the very good conditions status of the growing season.

The following year, at the end of the wintering, after a control fishing to check of the physiological status of sturgeon juvenile and to determine the weight loss of specimens, the feed was taken starting with April 3, 2017. Winter weight loss was at 3.2%, indicating that wintering conditions were adequate in the pond, and it was found that out of a total of 955 specimens entering the winter at the end of the wintering, 18 deaths were recorded.

The first control fishing took place on 11.05.2017, when the captured fish had weights between 140 g and 573 g with an average of 356.5 g.

On June 11, 2017, the average body weight of the fished specimens was set at 477.9 g / pcs. and the average body length of 34.6 cm. During this period a decrease in the oxygen concentration in the water was observed and, in order to avoid unpleasant situations, I intervened by increasing the water flow, from 200l / min to 300l / min, for a better watering of the pool.

Analyzing the values obtained from the biometric measurements of 07.07.2017, we can observe that there is a good correlation between the length and the body mass of the biological material. Average weights of 620 g were recorded, which concludes a good evolution of the body weight, implicitly of the environmental conditions ensured in the pond.

The next control fishing, dated on 10.08.2017, shows an increase in body mass weighing between 386 g and 1201 g with an average of 793.5 g.

At the end of the research period, September 30, 2017, the total discharge of the water from the basin was made, all the fish were caught in order to make the final calculations regarding the evolution of the Siberian sturgeon. At the end of the growing season, 954 kg of fish were harvested, with 1215.5 kg of combined extruded fodder for the entire period, resulting in a real increase of 915.07 kg of sturgeon meat.

For the total study period, a conversion factor (FCR) of 1.28: 1 was determined. Table 3 lists the biotechnological indicators resulting from the growth evolution of Siberian sturgeon in the pond.

The median parameters fit into the optimal recommended values for sturgeon growth, with a few small exceptions. Of the 1000 populated specimens, 878 pieces were harvested, which indicates a good survival of the biological material from the beginning to the end of the research period, resulting in a 12% share.

Table 3 Biotechnological indicators of the growth of the Siberian sturgeon

Growth calendar period	Losses (pcs.)	Nr. copies	Evolution of body mass (g)	Total biomass at inlet in period (kg)	Daily feed rate% of total biomass	Kg of feed / day	Kg of feed / period	Kg increase during growth	Total biomass at end of period (kg)	Body mass at the end of the period (Kg)
2016										
19.04-27.05.2016	16	1000	5.3	5.30	4.0	0.2	7.4	6.7	12.0	12.0
28.05-29.06.2016	12	984	12.0	12.0	4.3	0.52	16.64	15.13	27.13	27.6
30.06-21.07.2016		972	27.6	27.13	4,6	1.25	26.25	25.00	52.60	54.1
22.07-21.08.2016	6	966	54.1	52.60	4.5	2.36	68.44	57.03	111.13	115.0
22.08-20.09.2016	4	962	115.0	111.13	2.1	2.33	67.57	56.30	171.30	178.0
21.09-23.10.2016	7	955	178.0	171.30	1.8	3.08	98.56	89.60	267.60	280.2
TOTAL			280.2				284.86	249.76	267.60	
24.10.2016-02.04.2017	Wintering period									
2017										
03.04-11.05.2017	18	937	271.1	253.92	1.0	2.53	96.14	80.11	334.03	356.5
12.05-11.06.2017	10	927	356.5	334.03	1.1	3.67	110.10	109.00	443.03	477.9
12.06-07.07.2017	6	921	477.9	443.03	1.1	4.87	121.75	93.65	571.55	620.6
08.07-10.08.2017	19	902	620.6	571.55	1.3	7.43	245.19	144.22	715.77	793.5
11.08-30.09.2017	24	878	793.5	715.77	1.0	7.15	357.50	238.33	954.10	1086.0
TOTAL			1086				930.68	665.31	954.10	
TOTAL experimental period			1086				1215.54	915.07	954.10	

CONCLUSIONS

After an analysis of this study, an assessment can be made of the growth of crop biomass and the total consumption of extruded combined fodder, and conclusions can be drawn on the efficiency and profitability of the Siberian sturgeon culture in the pond.

At the age of 19 months, the Siberian sturgeon reached an average weight of 1086g and an average body length of 48.4 cm. The individual minimum and maximum body weight values were placed between 528 g and 1644 g.

By recording the weight differences that occur between the specimens raised in the same pond, it is necessary, if there is a possibility, at certain time intervals, to perform a sorting of the specimens from the point of view of the body development or the continuation of the administration of the small grain feed even if the fish exceeded the weight that would cause the change of a larger grain of the feed.

The Siberian sturgeon has a good wintering resistance, which is why it does not require extra operations in the cold season, depending on the physiological maintenance status of the growing season.

I recommend the growth of this sturgeon species in ponds with small areas up to 1000 m², which can be effectively monitored from all points of view, intervening immediately to prevent crisis situations.

Depending on the water flow rate, we can obtain quantities of 1.9 kg / m² of sturgeon for consumption, as it results from this study, without requiring additional investment compared to other applied systems.

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