

STUDY REGARDING THE CAPACITY OF STURGEON ADAPTATION IN FISHERY DEVELOPMENTS IN THE MOLDAVIAN AREA

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Abstract

By approaching this theme, I have been looking at the way and the capability of adapting several species of sturgeons from the family Acipenseridae, Siberian sturgeon - *Acipenser baerii*, *Acipenser gueldenstaedtii*, mackerels - *Acipenser stellatus* and starlet - *Acipenser ruthenus*, to the environmental conditions of fish facilities in the area of Moldova. The biological material subjected to this study was represented by four species of sturgeon, of which three native species (sturgeon - *A. Gueldenstaedtii* in 200 pieces with an average weight of 10 gr./p., Mackerels - *A. stellatus* 100 pieces with an average weight of 70 gr./p. and Starlet- *A. Ruthenus*, 100 pieces with an average of 38 gr / piece), and an imported species (Siberian sturgeon - *A. Baers*, 200 pieces with an average weight of 30 gr / p). For the study to be relevant, as regards adaptation and acclimatization, sturgeon brood was distributed in a single basin with a total area of 500 m² and a depth of 1.5 m to simulate the same growth conditions in terms of media parameters. Monthly control fishing has been carried out to determine the growth rate and the adaptability of sturgeon brood, but also to correct any possible mistakes during the growing season. The proposed research started on 10.05.2015 and took place for a period of 175 days, until 31.10.2015, at my private fish farm, called "Valea Morii". At the beginning of May, when the water reached 14°C, after the basin was prior prepared, it was flooded, ensuring a constant flow of water of 50 l / min. The administration of extruded combined fodder was done three times a day, in the morning, at noon and in the evening, at a table marked with a pointer pillar. During the study, environmental conditions were monitored by sampling for chemical analyzes.

Key words: fish, sturgeon, feed, adaptation

INTRODUCTION

In aquaculture activities in Romania, the presence of sturgeons in the concerns of specialists in this field is becoming more and more topical, this being due, on the one hand, to the nutritional and commercial value of the meat of the various sturgeon species, but also, to the enlargement known in the last years to the concerns of growing them in fish farms. Due to the continuous regression of the sturgeon species in our country, on the strength of the hydropower constructions along the Danube, the high degree of pollution and the fishing intensification, the chances of restoring the stock of these valuable fish species are becoming smaller.

Under the conditions, the caviar from wild sturgeons has become increasingly scarce since international trade has been suspended since 2011, the high demand for this product is largely met by aquaculture caviar (1,4). Farms that are specialized in growing sturgeon are representing now a rapidly growing sector, both, regionally and globally level.

MATERIAL AND METHOD

As is evident from the title of the study discussed in this context, we used four species of sturgeon, which has been followed during the 175 days, to design the technological parameters based on the knowledge of the eco-physiological requirements and species ethology, the feeding behavior, but especially the adaptation to the environmental conditions in the ponds situated in the Moldavian area. In

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this experiment, were used 600 pieces of sturgeons, out of which: 200 pieces Siberian sturgeon (*A. baerii*), (30 grams / piece), 200 pieces sturgeon (*A. gueldenstaedtii*), (10 gr / piece), 100 pieces mackerels (*A. stellatus*), (70 gr./piece) and 100 pieces starlet (*A. ruthenus*), (38 grams / piece).

The sturgeons were populated in a pond with a surface area of 500 m², of rectangular shape, which provides an optimal circulation of the water in the pond, a good oxygenation of the growing environment; - water depth 1.5 m at the feed - 2, 0 m to evacuation. The bottom of the basin is arranged so that the water discharge is fully realized, the basin showing a small slope from the feed to the evacuation. The water supply of the basin is made gravitationally from the Gorovei stream and in order to prevent the escape of the sturgeons from the pond, a grill was fitted in the front of the monk. The extruded combined feed fodder for sturgeons during the experimental period, consisted of 45/20 ALLER SILVER, fodder purchased from SC DYNAVIT IMPEX SRL, with a 2 mm granulation and a chemical composition as shown in Table 1. The feed was divided into three portions, in the morning, at noon and in the evening, at first in a single marked place, and after the second fishing control, it was administered on the entire surface of the growing basin.

Table 1 Chemical composition of **ALLER45/15** feed

Chemical composition	
Crude protein %	45
Crude fat %	20
NFE %	16
Ash %	8
Fiber %	2
Energetic value	
Gross energie Kcal/MJ	5171/21,6
Digestible energy MJ	19,7
Vitamins added per Kg	
Vitamin A (IE)	10000
Vitamin D3 (IE)	1000
Vitamin E (mg)	200

In the first month of study, feeding was not carried out, following the feeding behavior in captivity, just on the basis of natural food, food digestion being only the final result of the

interaction and influence of several factors such as temperature, light intensity, stocking density, structure formula of popular existence and abundance of specific food. Sturgeon juvenile has been continuously monitored through monthly control fishing, weighing to determine the growth rate, and it has been observed that during the experimental period, the main parameters of water quality should be kept in optimal values. All water quality parameters were measured with farm equipment; thermometer, oximeter, pH meter, spectrophotometer.

Of all four sturgeon species subject to this study, the Siberian sturgeon has particularly attracted attention through the rapid adaptation to the new environment and the very good growth rate compared to the other three sturgeon species.

RESULTS AND DISCUSSIONS

After the first control fishing on 29.05.2015, a gastrointestinal content analysis was carried out on several specimens of sturgeon from the four populated species to determine the variability of the content in planktonic and benthic organisms, as well to determine variations in the growth rate in pond conditions. Among the identified organisms, *Chironomus plumosus* (Tubifex-Diptera), *Gammarus pulex*, cladocere, the conclusion was that the sturgeon juveniles adapted quickly to the new environmental conditions, at least in terms of the availability of natural food offered by a pond. To a closer analysis, it was observed that both of the juvenile - Siberian sturgeon (*A. baerii*) and also sturgeon (*A. gueldenstaedtii*)- best utilizes the zooplanktonic species (cladocerele), and in the mackerels digestive tract, predominates with preponderance, the zoobenthos.

Table 2 shows the weights determined at the date when the first control fishing took place.

Table 2 Control fishing 29.05.2015

Species	Nr. pieces	Fished kg	Gr./pc.
Sturgeon	46	0,598	13
Siberian sturgeon	65	2,665	41
Mackerels	21	1,638	78
Starlet	18	0,882	49

The water temperature was 17°C, dissolved oxygen 8.7 mg / l and pH 7. On June 1, 2015, the actual feed was started, with extruded compound feed in the morning, at noon and in the evening, at a single point (fodder mass) and at the exact hours, establishing a feed rate of 2% day of total biomass. On 28 June 2015, second fishing control was carried out to determine the growth and health status of sturgeons. The monthly average water temperature was determined to be 19°C, the dissolved oxygen level was 8.2 mg / l and the pH 7.8.

The data recorded as a result of fishing control are shown in Table 3.

Table 3 Control fishing 28.06.2015

Species	Nr. pieces	Fished Kg	Gr./pc.
Sturgeon	68	2,040	30
Siberian sturgeon	28	1,960	70
Mackerels	18	1,692	94
Starlet	32	1,792	56

After the first feeding period we can see a good degree of adaptability to the conditions of growth in the ponds of all the sturgeon species that was studied. Based on the biometric measurements taken on crop biomass to determine the main performance parameters of growth, some differences were found between the fished specimens.

The next control fishing, took place on 31.07.2015, the recorded data are listed in Table 4.

Table 4 Control fishing 31.07.2015

Species	Nr. pieces	Fished Kg	Gr./pc.
Sturgeon	52	2,184	42
Siberian sturgeon	21	1,849	88
Mackerels	16	1,568	98
Starlet	10	0,580	58

During July the average temperature did not exceed 24°C, the dissolved oxygen had the value of 6.9 mg / l and the pH 7.8. In the case of the Siberian sturgeon, were fished 21 specimens, 19 specimens with an average weight of 70 grams and two specimens weighing 359 grams / pieces. There was a

predominance of larger specimens of Siberian sturgeon in the feed area, and therefore the compound feed in one place was given up and distributed over the entire surface of the basin. On 28.08.2015, a number of 75 specimens of sturgeons fished from the experimental basin were again evaluated by biometric measurements. During the month, at that time, a water temperature of 22°C was recorded. The results obtained are shown in Table 5.

Table 5 Control fishing 28.08.2015

Species	Nr. pieces	Fished Kg	Gr./pc.
Sturgeon	31	1,700	54
Siberian sturgeon	22	4,100	186
Mackerels	12	1,330	111
Starlet	10	0,660	66

Of the analyzed fish, there are large differences in biometric measurements, as follows: in the case of 20 Sturgeons, the average weights were 42 grams per piece and 11 specimens of 78.2 grams per piece, the Siberian sturgeon with 10 specimens, with an average weight of 71 gr, 10 specimens with 241 gr. and 2 specimens with 490 gr., Mackerels with 10 pieces with average weight of 97 gr. and 2 specimens with 180 gr., and Starlet with 10 more specimens developed more evenly, with an average of 66 gr /piece. On the next control fishing of 30.09.2015 the sturgeon juvenile submitted to the study had the following weights in the case of the sturgeon, we could observe a non-uniformity of individuals in terms of weight and body dimensions, 46 specimens were fished, of which 35 with an average weight of 48 gr / pcs., and 11 specimens of 83 gr / pcs. Out of a total of 72 specimens of Siberian sturgeon, 44 had a weight of 78 gr / pcs and 28 specimens had an average weight of 480 grams / pieces. It was found that the 22 starlet juveniles, weighed 68 grams / piece, showing a uniform increase of the individuals. The 23 mackerel specimens, 18 had an average weight of 99 gr / piece. and 5 individuals with an average weight of 240 g / piece. All measured water parameters were within the allowable limits with small exceptions to the pH level, which, at some point, recorded values were 8.2 over several days. Recorded data are shown in Table 6.

Table 6 Control fishing 30.09.2015

Species	Nr. pieces	Fished Kg	Gr./pc.
Sturgeon	46	2,595	56
Siberian sturgeon	72	16,872	234
Mackerels	23	2,982	129
Starlet	22	1,496	68

On October 31, 2015, the entire batch of sturgeons was harvested to analyze all the individuals, by species, and starting their preparation for wintering.

Table 7 Performance indicators obtained

Indicators	Units of measure	Species of sturgeon			
		Sturgeon	Siberian sturgeon	Stellatus	Sterlet
Initial biomass	kg	2	6	7	3,8
Populated specimens	piece	200	200	100	100
Harvested specimens	piece	110	120	42	80
Final biomass	kg	8,288	32,456	5,327	6,480
Survival rate	%	55	60	42	80
Initial average mass	gr.	10	30	70	38
Final average mass	gr.	75,3	270	126,8	81

CONCLUSIONS

Of the four sturgeon species studied, the Siberian sturgeon was noted as one of the best sturgeons, suited to growing in different culture environments, with a high growth rate and a high degree of adaptation to environmental conditions in the area of Moldova.

This species, in contrast to the other three, grown in the same environment, has a great advantage due to its ability to adapt to pond growth, fresh water, and at water temperatures of 17-22°C, with the maximum of 26-27°C. Another aspect to be considered is the flexibility of species character, in terms of natural food, especially in the juvenile stage, when they consumes much of the planktonic and benthic organisms available in the ponds in our area.

It also responds very well to the intake of dried food (extruded feed) that is administered daily, compared to other species, which, after a month, some individuals stopped feeding themselves with extruded compound feeds, preferring only natural food.

A good survival rate was also found, at the end of the research period, somewhere at 60%, out of a total of 200 originally populated fish, reaching a total of 124 specimens with an average weight of 261.7 gr / piece.

A total of 54 kg of extruded combined fodder was administered throughout the growing period. Table 7, lists all the growth performance indicators for the four sturgeon species subject study. The water temperature dropped to 10°C and in October the consumption of extruded combined fodder also decreased. A total of 52,551 kg of sturgeon meat was obtained on a surface of 500 m² of water, an encouraging result, to take into account the growth of certain sturgeon species in the ponds in the Moldavian area under semi- intensive or intensive conditions.

As a result of these researches it can be concluded that this species deserves special attention due to the high degree of adaptability to the aquatic environment in the area of Moldova, being one of the few sturgeons that would be expected to grow in a semi-intensive system, in polyculture with other species, and intensively in ponds.

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