The Plasticity of *Acipenser Baeri* (Brandt, 1869) Species Expressed in Technological Bio-Indicators in Different Breeding Systems

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Abstract
The undergoing of two experiments of breeding *Acipenser baeri* seedlings, in two intensive systems of sturgeon growing, placed in different locations, led to the establishment of sturgeons' growing rates and of their survival percentages. During the 60 experimental days, the experimental lot of Black Sea sturgeon bred at Timisoara Station has reached a real breeding increase of 17,102 g, and for the samples from Brates Station a real breeding increase of 20,884 g, and the average coefficient of artificial food conversion is 1,3 g/g breeding increase.

Keywords: sturgeons, breeding, feeding, growing rates, intensive systems, technological indicators

1. Introduction

Within the two intensive breeding systems places in two different locations, more particularly in the south-east part of the country – Galati and in the west part – Timisoara, it was carried on, in the same time, two experiments concerning the breeding of the *Acipenser baeri specie* (Brandt, 1869), in order to quantify the technological performances and to observe a possible breeding difference at the two studied lots.
The experimental period was of 60 days, during the period 31.05.2009 and 31.07.2009. The Black Sea Siberian sturgeons' seedling was obtained in the reproduction and post-embrionary development Station within the Research - Development Livestock Farm Brates, which belongs to the Reasearch – Development Institute for the Aquatic Ecology, Fishing and Aquaculture Galati.

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2. Materials and methods

For the experiment, the breeding modules of the sturgeons lot within the technological systems are made from a battery of four breeding places, destined to the growing of larvae and juvenile**.**
The breeding places of juvenile have a rectangular shape and are made of glass fibre. The places are equipped with a device of level adjustment placed outside it. The feeding breeding places is done through a pipe, in free fall, in a single point. The evacuation system of the technologic water is central. The height of the water column in the breeding places of larvae and juvenile does not go beyond 0,4 m.
Technique characteristics of breeding places of the sturgeons are presented in the table no.1.
For a high percentage of survival of the sturgeons, it is needed a fit culture system and a complete nutritional schedule [1].
Food ratio is established on a daily basis in accordance to the weight of the lot. The administered ratio in 24 hours is calculated in percentage of 100% out of the total weight of the

lot in that respective day. Equal fractions out of this ratio are distributed at a period of 3 hours, both during the day and during night. During the feeding, the electric power of the breeding place stops maximum 20 minutes. This has as purpose the avoidance of the food loss through its training by the circular current of evacuation.

The fodder's granulation during the first 8-10 feeding days must be of 0, 2-0,3 mm, and at 20-30 days, this grows at 0,3-0,5 mm. The periodicity of administering the food is 4-6 times per day.

A critical time in the artificial feeding is that of transition between the two types of fodder, from one granulation to the other. Larvae need a period of adaptation to the new time of food, ([2], [3]). During the first feeding period, it was given granulated fodder Nutra 4, with a higher percentage of protein and with a measure of the pellets of 0,2-0,4 mm.

Subsequent, after the age of 25 days, it was administered two types of fodder: at the breeding sturgeons Station in Timisoara, it was given Coppens fodder, and at the reproduction and post-embrionary development of the sturgeons within the Research-Development Brates, it was given Nutra 3, [4].

Table 1 Technique characteristics of breeding places of the sturgeons

Type of place	Shape	Measures	Capacity of the biologic material
Breeding places for larvae and chicks	Rectangulare	1400 mm x 600 mm	4,5 – 5 kg biologic mass / m^3

In table 2 there are presented the main characteristics of pellets used in the nutrition of the siberian sturgeon, during the entire experiment. The transition was progressive, carefully, respecting the following succession: 75% current diet – 25% new diet; 50% current diet – 50% new diet; 25% current diet – 75% new diet; 100% new diet. During the development of the experiments the physico-chemical parameters of the technological water have been monitored, in order to assure optimal conditions for development of the biological material. The dissolved oxygen and the temperature have been determined directly from the experimental modules.

Table 2 Characteristics of pellets used in the nutrition of the siberian sturgeon

Fodder Name		Coppens	Nutra 3
Pellets (mm)		0,3 – 0,5	0,3 – 0,5
Chemical Composition	Proteins (%)	56	55
	Fat (%)	15	15
Conversion Rate		0,6 – 0,9	0,6 – 0,9

3. Results and discussion

The technological indicators in the two locations that have been obtained by breeding the Black Sea Siberian sturgeon seedling are presented in table no.3.

Growth increase (dW) of the sturgeons lot, expressed in grams, was calculated for a period of 60 days, as a difference between the final mass (Wt) and the initial one (Wo), resulting from graphic no.1, a total breeding increase of 20, 884 at the experimental lot from Brates Station, and in Timişoara the increase growth is 17, 102 g (figure no.1).

The calculus formula used is the following:

dW = Wt –Wo, [g]

Growth Rate (GR) is determined with the help of the following formula:

GR = (Wt - Wo) / t, [g/zi]

Where, Wt – final average mass, (g); Wo – average initial mass, (g); T – time of the breeding cycle.

According to figure no.2, the average growth rate of the sturgeons sample put to experiment is of 0,35g/day concerning the lot bred at Brates and 0, 29g/day at Timisoara.

From the figure no.2 representations, you can see how the growth increase and growth rate of the biologic material, during the experimental period, forms a growing curve of the corporal weight, a sigmoid curve.

The specific growth rate, (SGR) – is determined as percentage from the average weight per day, using the formula, [5]:

SGR = (ln Wt – ln Wo) / t x 100% , [%BW/zi]

Where, Wt, Wo – the average final and initial mass of the lot, (g), T – the time of the growth cycle, (days)

The average mass weight (B Wg), is calculated using the formula:

B Wg = exp ((ln Wt + ln Wo) / 2) , [g]

Where: Wt, Wo – the final and initial average mass of the lot, [g], T – the breeding cycle time, [days]

You can see from figure no.4, a rise of the average corporal weight, (BWg) being expressed as a geometric mean of the corporal weight, which better reflects the breeding rhythm of the sturgeons, for this reason being highly recommended.

Metabolic weight (Wqm) means the corporal weight (B Wg) at the 0, 8 power and most common expressed in $kg^{0,8}$.

Wqm = B $Wg^{0,8}$, [$kg^{0,8}$]

In figure no.5 it is represented the metabolic weight of the seedling, bearing in mind the annihilation of the size differences at the level of the experimental lots.

The relative increase rate of the metabolic weight (RGRn), represents a part of the average final and initial corporal weight, on a time period of 60 days of experiments.

RGRn = (Wt – Wo)/t/ $BWg^{0,8}$, [g/$kg^{0,8}$/zi]

Where: Wt, Wo – the final and initial mass of the lot, [g]; T – the breeding time cycle, (days); B Wg – the corporal weight, (g)

You can see from figure no.6 how the relative increase rate falls down in time in the same time with the increase of the corporal weight. Therefore, at the end of the breeding experiment, at a final mass of 21,34 g/ex, the relative increase rate is of 0,000 (g/ $kg^{0,8}$/day) – at the siberian sturgeons bred in Brates, and of 0, 011 (g/$kg^{0,8}$/day) at the samples bred in Timisoara, that reached a final mass of 17, 56 g.

The survival percentage (%) – is determined with the formula:

Nf / Ni x 100

Where: Nf and Ni – final and initial number of samples

The samples bred at the Timisoara Station, have a bigger survival percentage at the end of the breeding experiment – 90%, in comparison with the ones bred at Brates Station – 75%.

A close monitoring of the physico-chemical parameters of the technological water, thus their maintenance in optimal limits, and also to respect the popular density, lead to the reduction of the technological losses.

From table no.4 it is indicated that the average temperature of the technological water has registered higher values in rates Station in comparison with the average temperature registered at Timisoara Station, during the experimental period.

The quantity of oxygen dissolved in water is inversely proportional with temperature, so that when the water temperatures were higher, the oxygen quantity dissolved from water was less.

In the breeding places of the sturgeons from the Brates Station, the average temperature of the technological water has reached a maximum in July – 26, 87 ^oC, as it was expected, and the average value of the oxygen fit the experimental period, between 5,95 and 7,63 mg/l O_2.

In Timisoara , the average value of the dissolved oxygen from water has reached a maximum in May 9,96 mg/l O_2, at a temperature of 15,1^oC.

Table 3 Bio-technological indicators for breeding the *Acipenser baeri* seedling

Location	Brateş	Timişoara
Survival %	75	90
Individual final mass – g -	21,34	17,56
Growth increase – g -	20,884	17,102
Daily growth rate - g/zi	0,35	0,29

Table no. 4- Variation parameters physico -chemical in water

Nr. Crt.	Month	Temperature (^oC)		Dissolved oxygen (mg/l)	
		Brateş	Timişoara	Brateş	Timişoara
1.	May	20,12	15,1	7,63	9,96
2.	June	24,48	14,1	5,95	8,98
3.	July	26,87	13,8	6,18	8,87

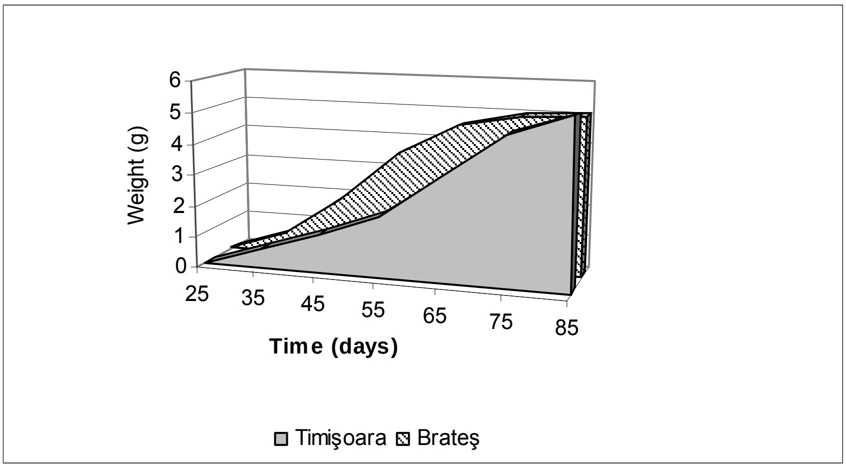

Figure 1 – Growth increase – dW (g)

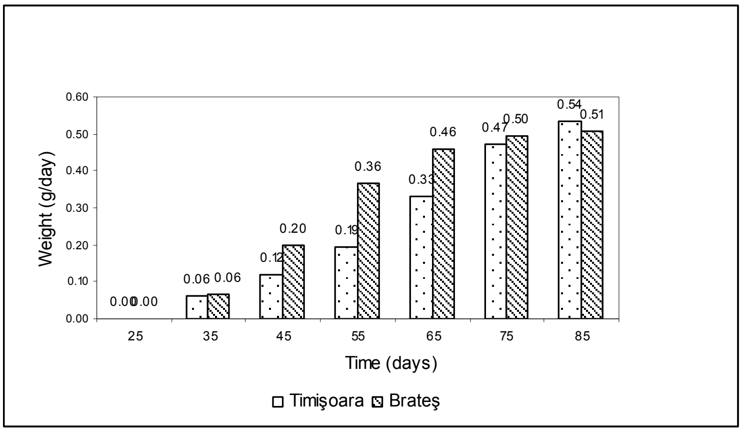

Figure 2 – Growth rate – GR

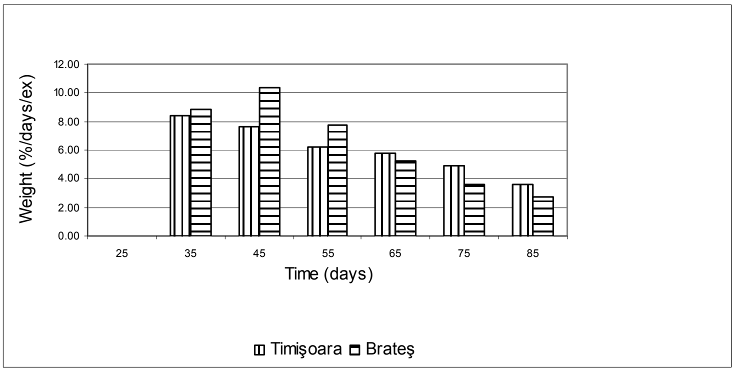

Figure 3 Specific growth rate (SGR) –(%BW/day)

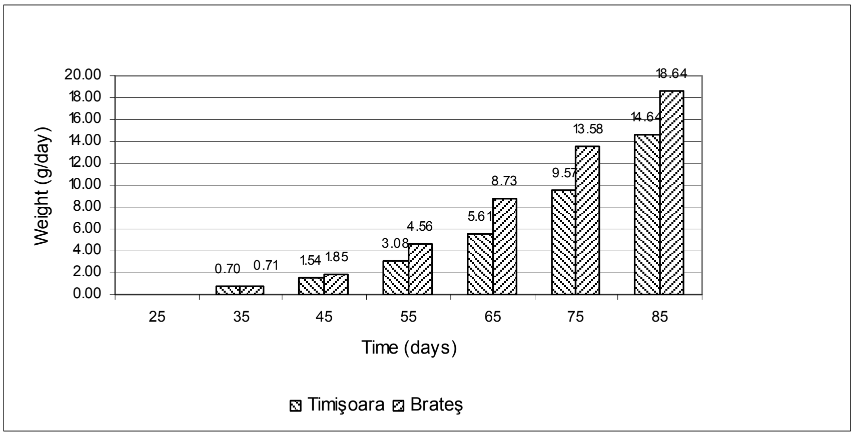

Figure 4 - The average mass weight (BWg)

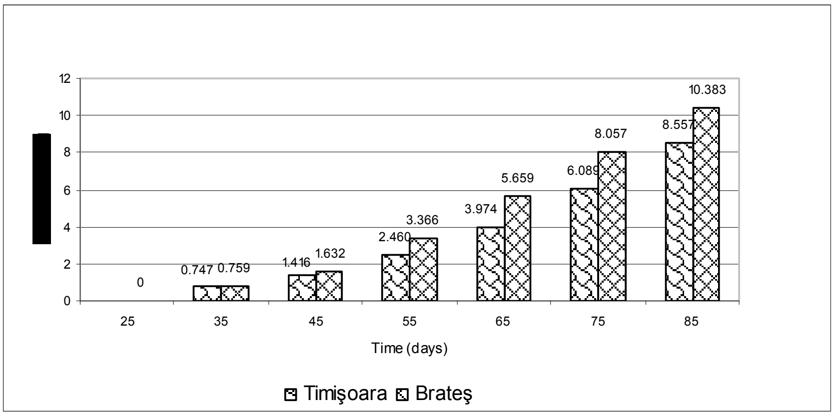

Figure 5 - Metabolic weight (Wqm)

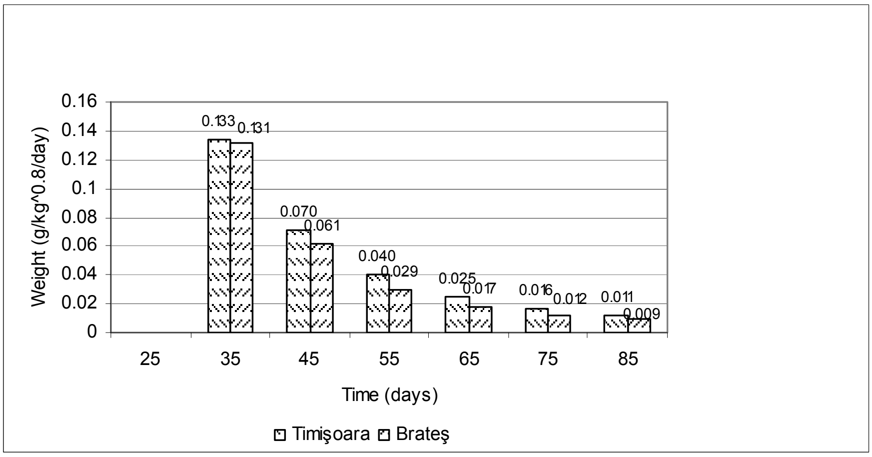

Figure 6 - The relative increase rate of the metabolic weight (RGRn)

4. Conclusions

In the two technological systems of sturgeons breeding, of intensive type, it has been created and controlled the optimal life condition, aiming to obtained fast results in breeding and developing the siberian sturgeon (*Acipenser baeri*).

To make this biomass accumulation more efficient during a time period of 60 days, beginning at the age of 25 days, it was administered two types of granulated fodder, with pellets of 0,3-0,5 mm, and a high value of proteins. At Brates Station, the experimental lot was fed with Nutra 3 fodder and the breeding rate is of 0, 35 g/day. In concern to the lot bred at Timisoara, where it was distributed Coppens fodder, GR equals 0,29 g/day.

The lower values in water's temperature, thus the bigger quantity of dissolved oxygen in breeding places of the sturgeons lot from Timisoara Station, have contributed to the obtaining of a higher percentage of survival – 90%, in comparison with the percentage obtained at Brates Station – 75%, where the temperatures of the technologic water were higher during the experimental period.

Although the composition of the two types of administered fodders does not differ that much, and the fodder ratio is the same in both locations, at the end of the experiment, you can observe a slight difference in the biomass accumulation at the *Acipenser baeri* samples bred in Brates Station, reaching an average weight of 21,34 g/sample, in comparison with 17,56 g/sample average mass of the Black Sea Siberian sturgeon bred in Timisoara Station; right now, this is the moment in which the relative increase rate reaches a minimal value.

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