

**PERSPECTIVES REGARDING THE DEVELOPMENT OF
INTENSIVE REARING TECHNOLOGY FOR *SILURUS
GLANIS* SPECIES IN ROMANIA**

**PERSPECTIVE PRIVIND DEZVOLTAREA TEHNOLOGIEI
DE CRESTERE INTENSIVA A SPECIEI *SILURUS GLANIS* IN
ROMANIA**

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*This work represents the early development of a new rearing system of species *Silurus glanis* in Romania, meaning the growth cycle of biological material from 1 g/ex. - fry to 1.2 kg / ex. - average weight. These are achieved in the first phase of development into a "flow-through" system type, then during a cold season, within a recirculating system.*

Keywords : aquaculture, catfish, intensive , "Flow-Through system recirculating system

Introduction

In Romania, the fish culture as a part of aquaculture, is still influenced by extensive or semi-intensive rearing systems using a large land surfaces and volumes of water to produce a unit of fishmeat. The most of activities are geared to produce fish species like East Asian cyprinids species which are not agreed in line with consumers preferences in European Community, either in the domestic market. The valuable fish species, as *Silurus glanis* (catfish) and *Stizostedion lucioperca* (pikeperch) is subject to fish culture only in a proportion of 15.8%, the difference being assured from commercial fishing practiced in natural stocks as results negative effects on wild populations.

The current strategy of the Public Authorities responsible for Fishing and Aquaculture has as priority direction the aquaculture development through the introduction of systems and intensive rearing technologies of valuable fish species. The two priority directions aim the production efficiency per unit of area or volume, increasing the market competitiveness of local fish products which are made in the quality and safety conditions and also, the conservation of fish species from natural environment.

Systems and intensive rearing technologies for *Silurus glanis* are a novelty in Romanian aquaculture. Currently, *Silurus glanis* species is reproduced in a controlled-natural conditions and is farmed as complementary species up to 5-10% in polyculture with cyprinids species. On the fish market this species produced in this systematic units, only provide a percentage of 15.8%, and the difference is provided from commercial fishing practiced in natural assets.

This work represents the early development of a new rearing system of this species in Romania, meaning the growth cycle from 1 g / ex. fry to 1.2 kg / ex. - average weight of biological material, achieved in the first phase of development into a "flow-through" system type, then during a cold season, within a recirculating system.

Materials and Methods

The rearing experiments were conducted on the descendants of *Silurus glanis* which were obtained through natural-controlled reproduction by a team of researchers from ICDEAPA Galați.

The experiments lasted 365 days and began when catfish larva recorded 1g/ex. weight.

The rearing system for the first growth phase of biological material from 1 g / ex. to 33 g / ex. has been operated in open system, and then for the second phase - up to 1.2 kg / ex. an average mass of catfish' juvenile – the operation has been realized by recirculation of technological water.

Configuration of the technological rearing system for *Silurus glanis* involved the integration of equipments for technological water treatment (mechanical and biological filters, chemical and bacteriological treatment units and climatization units of technological water) with rearing units as the figure shown below.

Components of the rearing system for *Silurus glanis* species has the following characteristics:

Nr. crt.	Type	Technical characteristics
1	2	3
1.	Rearing tanks in the stage 1g/ex – 33g/ex	Interior diameter of tank - 1,5 m; Height of tank - 0,4m ;
2.	Rearing tanks in the stage 33g/ex – 1,2 kg/ex	Interior diameter of tank - 2 m; Height of tank - 0,8m ;
3.	The supply of technological water	
3.1	Tank supply	Lenght - 230 cm; Wide - 70 cm; Height - 185 cm; Volume - 3 m ³
3.2	Pumping group	Output–3.6 m ³ /h;P -1,25 kw;Maximum height-36 m

1	2	3
3.3	Filtration module with sand bed FCV 03/T	Normal flow - 1,7 m ³ /h; Maximum flow - 3,4 m ³ /h; Wash reverse flow - 2,5 m ³ /h; Speed of filtration at nominal flow - 20 m/h;
3.4	Filtration module based on active charcoal	Nominal flow - 1,7 m ³ /h; Maximum flow - 3,4 m ³ /h; Wash reverse flow - 2,5 m ³ /h; Speed of filtration at nominal flow - 20 m/h
3.5	Buffer reservoir	Diameter - 1 m ; Length - 3 m ; Volume - 2,35m ³
3.6	Sterilizing lamp	Sterilizing lamp UV, type MINIREX 2000 Maximum flow - 2 m ³ /h Maximum working pressure - 6 bar
3.7	Heat exchanger	Capacity – 12000 l
3.8	The longitudinal horizontal decanter	Flow of waste water - 0,02 m ³ /s; Suspensions in water - 250 mg/dm ³ ; Speed of accumulation - 0,35mm/s; Length of decanter - 4,2 m
4.	Automatic feeding device	Capacity - 200g

Managing the system has achieved in a manner of efficient use of its capacity in the moment of populating and has pursued that the number and biomass quantity does not reach the threshold at which technological stress can be installed.

In respect with the two conditions presented above, the populating system, in line with the growth stages of biological material, has been following:

- **Stage I** - from 1 g / ex. to 33 g / ex - body weight
 - quantity of populated biomass – 0,84 kg/m²;
 - exchange flow of technological water - 7 l/min.
- **Stage II** – from 33g/ex to 1.2 kg/ex. – body weight
 - quantity of populated biomass – 3,6 kg/m²;
 - exchange flow of technological water - 10 – 15 l/min.

The process of rearing has been accomplished due to a feeding scheme that involved the administration of live food during the first 7-8 days of growth and then on a fodder diet.

Exclusive feeding with natural food was based on the use of either simple or combined of *Artemia sp.* and *Tubifex sp.* and *Chironomus sp.*, organisms collected from the wild or obtained in culture.

Food ration has been determined periodically, depending on the lot's weight. Natural food ration administered within 24 hours was calculated as a percentage of 120% by weight of the lot. Food ration has been determined according to the growth stage of juveniles and according to the scheme below. Protein level of food was 46%.

- For the growth period from 1g/ex to 2g/ex average weight - 25% -35% from lot's weight;
- For the growth period from 2g/ex to 5 g/ex average weight - 10% - 15% from lot's weight;
- For the growth period from 5g/ex to 33 g/ex average weight - 5% from lot's weight;
- For the growth period from 33 g/ex to 1,2 kg - 2,5% from lot's weight.

Equal parts of rations have been distributed at every 3 hours during the day and during the night. Biotechnological indicators, average weight, gain of weight, daily growth rate and specific growth rate were set at regular intervals of 10 days by monitoring three samples with 15 exemplars each. Percentage of survival has been determined at the end of each stage of growth.

Results and Discussion

The results have enabled estimations, findings and assessments of biological material in the context of aquatic environment and its specific conditions.

By analysis one can appreciate that the quality of water from rearing system was ranged, generally, within the admissible and recommended limits for water used in fish culture, respectively into the II-III(second-third) quality category according to Order MMGA No. 161/2006. Exceptions were recorded to the ammonium, nitrite and nitrate ions, which have slight overrun the requirements of II(second) quality category for fish waters, due to presence of a large quantity of nitrogen compounds (especially nitrates), which undergo changes as effect of biochemical processes taking place inside the rearing tank, plus the products of metabolism as effect of physiological activity.

Biotechnological indicators obtained within these two experimental cycles (Table 1) on catfish reared one reveal the fact that technology applied within the system provide a juvenile catfish production by approximately 89,66 kg/m³ and 170 kg/m³ respectively, according to chemical conditions and type of fodder used.

Through a good management it is possible to short the production cycle and obtain fish for consumption after one year rearing period.

Table no. 1

Biotechnological indicators obtained for juveniles of *Silurus glanis*

Technological indicators	Rearing cycle – from 1g/ex to 33 g/ex	Rearing cycle – from 33 g/ex to 1,2 kg
Populating		
Volume of rearing tank - m ³	0, 600	2,2
Exemplars/rearing tank	2400	350
Initial biomass – Kg -	1,68	11,55
Average weight – g -	0,7	33
Fishing		
Exemplars / rearing tank	1632	322
Survival %	68	92
Final biomass – Kg-	53,8	386,4
Final average weight – g/ex -	33	1.200
Quantity of fodder consumed	75,32	423
Parameters of rearing		
Number of days	120	245
Individual gain weight – g -	32,3	1.167
Total gain weight – Kg -	52,17	374,85
Average daily growth - g/day	0,269	1,53
Specific growth rate - % /day	2,8	
Coefficient of conversion of feed – kg/kg gain	1,44	1,128451
Biochemical parameters of meat		
Raw initial protein g%	13,61	15,97
Initial fats - g%	0,19	0,68
Raw final protein - g%	15,97	29,26
Final fats – g%	0,68	2,2
Efficiency of nutrients absorption from fodder		
Coefficient of proteic efficiency PER - g/g	1,68	3,4
Productive value of protein - %	27	55

Conclusions

From researches and experiments made result that rearing *Silurus glanis* must be seen, currently, as a potential alternative for intensive aquaculture in Romania, and the experimental results of this project highlights a number of issues which recommends this species for the fisheries sector in Romania.

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