RESEARCHES ON THE REPRODUCTIVE PERFORMANCE OF CULTIVATED CARP (*CYPRINUS CARPIO*, LINNE, 1758), VARIETY WITHOUT SCALES MOLDOVA - PODU ILOAIE GROWN IN FISH FARMS IN NORTHERN MOLDOVA

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Abstract

The biological material used for this work was represented by breeders of Romanian cultured carp (Cyprinus carpio) variety without scales Moldova - Podu Iloaie, of different ages exploited and reproduced in the conditions offered by fish farms in northern Moldova. In this sense, at the beginning of 2019, 6 experimental groups of carp breeders of different ages were formed, which were monitored throughout the period of naturally directed reproduction, in two fish farms in Iași County. The present paper aims to make a comparative analysis of the results obtained from the natural directed reproduction of carp (Cyprinus carpio, Linne, 1758) variety without scales Moldova - Podu Iloaie, from the 6 experimental groups. In this sense, it was determined the weight and some body indices in carp breeders, the determination of female prolificacy, the survival rate of the pre-developed brood obtained from breeders in the six groups.

Key words: body indexes, breeders, carp, pre-developed brood

INTRODUCTION

Reproduction of carp takes place in spring, when the water has a temperature of 18-20°C, moment when the carp breeders lay their first roes being the most important, which represents up to 75% of its total [1, 3, 7]. The prolificacy of females depends very much on a number of factors, the most important of which are represented by the age and body mass of females. A 5-8 year old female carp lays between 600,000-800,000 roes. In general, it is estimated that the number of roes per 1 kg body weight varies between 120,000-200,000 pieces [2, 5].

The Moldovan carp variety "Podu Iloaiei" was obtained in the second half of the nineteenth century, following research conducted at the research stations Nucet and Podu Iloaiei - Iasi [6].

MATERIALS AND METHODS

To carry out this work, the biological material used was represented by carp breeders (*Cyprinus carpio*) variety "Podu Iloaiei" without scales exploited for two fish farms in Iasi County. Breeders were pre-checked, sorted by sex and fed, at which time the breeding pools were prepared for flooding.

The launching of the breeders was done at a low water level (30-40 cm), the flooding of the pools taking place approximately 24 hours before the launching of the breeders. After breeding, the water level in the breeding ponds gradually increased to the normal retention level (approximately 1 m deep). After the completion of the reproduction process, the breeders were fished from the pond in order not to affect the roes by their detachment from plants.

The present research was carried out during 2019 and had as objective the comparative analysis of the results obtained from the naturally directed reproduction of 6 groups of breeders of Romanian cultured carp (*Cyprinus carpio*) variety without scales Moldova - Podu Iloaie and monitoring the

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growth performance of brood of this carp variety, thus populating 6 breeding ponds (R_1, R_2, R_3, R_4, R_5 and R_6) with an area of 0.5 ha each.

The differences between the 6 groups consist in the age of the breeders, in the food administered to them and in their population density in the breeding pools.

The breeders used for this study were of different ages, being represented by very well developed, sexually mature specimens. The age of carp breeders has been between 4-6 years for males and 5-7 years for females. Thus the R_1 pond was populated with 8 families of carp breeders, consisting of 2 males aged 4 years and a female aged 5 years in which concentrated granular feed was administered, pond R_2 was populated with an equal number of breeders of carp, of the same age, the difference being given by the fact that in the case of this pond the development of plankton was stimulated and fodder from cereals conceived on the farm was administered. In the R_3 and R_4 ponds were populated 7 families of carp breeders, consisting of 6-year-old females and 5-year-old males, which were fed only with concentrated granular feed in the case of R_3 pond, respectively grain feed designed on the farm and mineral and organic fertilizers for plankton development in the case of R_4 pond.

The breeding ponds R_5 and R_6 were populated with 6 carp families, consisting of 6-year-old males and 7-year-old females, which were also fed with concentrated granular feed (R_5), respectively farm-fed cereal feed and minerals and organic fertilizers for plankton development (R_6). The weighing of the carp breeders was done at the time of the population of the 6 breeding ponds and at the time of their fishing, after the reproduction.

For the feeding of carp breeders, two types of feed were used, namely a combined granular feed and one of cereals designed on the farm, which were administered twice a day, manually, on the feed table. Also in 3 of the breeding ponds, the development of plankton was stimulated by the administration of organic and mineral fertilizers.

The profile index highlights the body format of fish and allows the classification of individuals of a population in a certain type of profile [1].

The following relation was used to calculate this index:

$$Ip = l/H$$

l - standard body length

H - maximum body height

The assessment of the gonadosomatic index in carp females was made by relating the weight of the ovaries to the total weight of the females.

GSI = (ovarian weight / body weight) × 100

The method consists in weighing the females before and after laying the roes, then by the difference between the 2 values the weight of the ovaries was obtained.

In order to determine the prolificacy of carp females, the method of weighing roes and counting them from representative samples was used. Thus, a certain amount of roes was harvested from each female, which was weighed and counted.

The survival of the carp brood was determined at the age of 45 days in the pre-developed brood stage and at the age of 6 months, at the end of the first year of growth.

In order to determine the growth performance of the young obtained from the 6 breeding groups, it was monitored throughout the growing period in summer I, determining the growth rate (by weight at the age of 45 days and at the age of 6 months), respectively the sanitary condition.

RESULTS AND DISCUSSIONS

Carp breeders prefer to consume natural food, which favors the development of the gonads, which requires the systematic fertilization of the pools in which breeders grow [4].

The quantity and quality of organisms consumed by cyprinid breeders depends to a large extent on the natural biogenic capacity of the ponds in which they are maintained and secondly on the quantity, quality and mode of administration of mineral and organic fertilizers. Thus, in 3 of the 6 ponds the development of plankton was stimulated and cereal feed designed on the farm with 27% protein was administered, and in the other 3 maintenance ponds only concentrated

granulated feed with 30% protein was administered.

The feeding of carp breeders in the 6 ponds began in the spring, immediately after the water temperature reached a value of about 18°C, with two types of feed, one of which is granular combined, with a diameter of 8 mm and one made on the farm in the form of a crumb, having the characteristics shown in table 1.

Table 1 Characteristics and structure of feed used to feed breeders

Characteristics of F1 concentrated granular feed		Characteristics of F2 concentrated granular feed	
Crude protein%	30	Crude protein%	27
Gross fat%	9	Gross fat%	10
Humidity%	12,1	Humidity%	14
Cellulose%	3,5	Cellulose%	4,1
Content		Content	
SD blood meal Fish meal SP Fish oil Animal protein sources Cereal distillate Rapeseed cakes Wheat flour		Soybean meal Fish meal Sunflower grit Maize Wheat Vitamin-mineral premix	

The feed was distributed manually, in two daily portions. Throughout the research period, the degree of feed consumption was monitored. The interval between the meals was established according to the water temperature and the body mass of the fish.

When determining the amount of feed administered daily, a number of factors were taken into account, such as fish biomass in the pond, water temperature and the amount of dissolved oxygen, which represents between 2-4% of the total spawning biomass of the 6 ponds. Data on the age and weight of the breeders are presented in table 2.

The weighing of the breeders was done at the beginning of May, when they were fished from the ponds where they were maintained and populated in the breeding ponds. The population of the breeding pools was made on May 9 and 10, when the carp families were made, which were populated in the 6 ponds.

Table 2 Body weight of breeders in the 6 batches

Pond	Date of population	Number of families	Age of females (years)	Age of males (years)	Weight of females (kg)	Weight of males (kg)	Food administered
R_1	9th of May	8	5	4	5.98	5.21	concentrated granular feed
R_2	9th of May	8	5	4	6.47	4.75	stimulating plankton + cereals
R_3	9th of May	7	6	5	8.32	6.07	concentrated granular feed
R_4	May 10	7	6	5	8.74	6.48	stimulating plankton + cereals
R_5	May 10	6	7	6	9.45	7.25	concentrated granular feed
R_6	May 10	6	7	6	9.18	7.12	stimulating plankton + cereals

At the time of population, the average weight of carp breeders was between 5.98 kg and 9.45 kg / ex in the case of females, respectively between 4.75 kg and 7.25 kg in the case of males. The carp families consisted of 2 males and one female.

The prolificacy of carp as a species is high, but in order to obtain good reproduction results, the emphasis must be on improving the conditions of maintenance of breeders and the improvement of breeding technologies.

The assessment of prolificacy was made by determining the gonadosomatic index, which in this case showed values between 26.27% and 31.43%, respectively by determining the absolute prolificacy, represented by the total number of roes in the ovary, a number that varied between 711.700 roes per ovary in the case of 5-year-old females from pond R_2 and 1.237.950 roes per ovary, as many as were obtained from females in pond R_5, according to the data presented in table 3.

Table 3 Calculated prolificacy for carp females from the 6 lots

Species	*Cyprinus carpio*	*Cyprinus carpio*	*Cyprinus carpio*	*Cyprinus carpio*	*Cyprinus carpio*	*Cyprinus carpio*
Pond	R_1	R_2	R_3	R_4	R_3	R_4
Body weight (Kg)	5.98	6.47	8.32	8.74	9.45	9.88
Ovarian weight (Kg)	1.63	1.70	2.36	2.54	2.97	2.95
Gonadosomatic index (%)	27.26	26.27	28.37	29.06	31.43	29.86
Prolificity (roes)	77740	711700	990080	952660	1237950	1146080

According to the data in table 3, the weight of the ovaries was between 1.63 kg and 1.70 kg in the case of 5-year-old carp females, between 2.36 kg and 2.54 kg in the case of carp females aged 6 years, respectively between 2.95 kg and 2.97 kg, as obtained in females aged 7 years.

The results obtained from the determination of the profile index for the breeders from the 6 groups were within the optimal limits for this carp variety, the data obtained being presented in table 4. Thus, the lowest value obtained for males was 2.39, and the highest of 2.54.

Table 4 Profile index calculated for breeders in the 6 batches

Species	*Cyprinus carpio*		*Cyprinus carpio*		*Cyprinus carpio*		*Cyprinus carpio*		*Cyprinus carpio*		*Cyprinus carpio*	
Pond	R_1		R_2		R_3		R_4		R_3		R_4	
Sex	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂
Profile index	2.35	2.54	2.32	2.48	2.23	2.51	2.29	2.44	2.21	2.39	2.18	2.43

In the case of females, the values of the profile index were lower (between 2.18 and 2.35), which reflects a pronounced convexity of the upper body line, as they have a bulging back. In the practice of selection, breeders with a low profile index are preferred, because the bulging appearance of the back is correlated with a rich muscle mass. During and at the end of the growing period of the carp brood obtained from the 6 ponds, the losses from the herd were determined, so the carp brood was transferred to the breeding basins (summer I) at the age of 45 days but also at the end of the growing season, in the last decade of October.

Table 5 Herd losses recorded for carp brood in the 4 lots

Species	*Cyprinus carpio*	*Cyprinus carpio*	*Cyprinus carpio*	*Cyprinus carpio*	*Cyprinus carpio*	*Cyprinus carpio*
Pond	R_1	R_2	R_3	R_4	R_3	R_4
Losses of brood 45 days (%)	48.26	50.64	43.14	52.11	46.31	44.11
Losses of brood in summer I (%)	26.23	32.15	28.61	29.14	24.34	23.88

According to the data in table 5, the losses in the herd were between 44.11% and 52.11% at the age of 45 days, respectively between 23.88% and 29.14% at the end of the growth period. The values obtained are considered normal for these age groups.

CONCLUSIONS

The best results for prolificacy and gonadosomatic index were obtained in group R_3, consisting of 7-year-old females. The gonadosomatic index showed the maximum value of 31.43%, and the prolificacy of 1,237,950 roes.

For the profile index, the calculated values for males ranged from 2.39 to 2.54, and for females between 2.18 and 2.35, which indicates a more pronounced convexity of the upper body line in females.

Herd losses were normal for this species, both at the age of 45 days and at the end of the growing season.

Through this study, the influence of the age of breeders on the reproductive performance of the *Cyprinus carpio* species was highlighted.

REFERENCES

[1] Bura M., Grozea A., 1995: Establishment of a carp farm (Cyprinus carpio). Agriculture of Banat, Year II, no. 4, U.S.A.M.V.B. Timisoara.
[2] Cuvinciuc M., 2002: Contributions to the improvement of summer I breeding technologies of farmed fish. Doctoral thesis "Dunărea de Jos" University of Galați.
[3] Hossain MY, Hossen MA, Islam MS, Jasmine S, Nawer F, Rahman MM., 2017: Reproductive biology of Pethia ticto (Cyprinidae) from the Gorai River (SW Bangladesh). J Appl Ichthyol. 33: 1007-1014.
[4] Huian Gh., Cristea V., 2007: Genotypic characterization of the new variety of Topless carp, Annals of the "Dunărea de Jos" University of Galați, Fishing - Aquaculture Issue.
[5] Kaszoni Z., 1974: Raising fish in ponds and ponds. Ed. Ceres, Bucharest.
[6] Matei D., Matei Cleopatra, 1990: Research on increasing fish production in Moldova, by acclimatizing new species and introducing valuable local fish in culture, Piscicultura Moldovei - Homage volume - SCPP Iași, pp. 99-127.
[7] Temesgen M., 2017: Status and trends of fish and fisheries in a tropical rift valley lake, Lake Langeno, Ethiopia. PhD dissertation, Department of Zoological Sciences. Addis Ababa: Addis Ababa University.