

## PHENOTYPIC CHARACTERIZATION OF FOUR BREEDING STOCK RAINBOW TROUT POPULATIONS (*ONCORHYNCHUS MYKISS*) FROM FIAD TROUT FARM, BISTRIȚA-NĂȘĂUD COUNTY

D. Cocan, Vioara Mireșan, R. Constantinescu, Camelia Răducu, Iulia Feștilă

*University of Agricultural Sciences and Veterinary Medicine,  
Faculty of Animal Science and Biotechnologies, Cluj-Napoca, Romania  
e-mail: cocandaniel@yahoo.com*

### Abstract

*Statistical data of last years reveal a significant fish consumption increase by human, but also of other aquatic organisms, which are over 400 species, from which fishes represent about 200 species [10]. Because natural resources are more and more reduced, the aquaculture has an ascendant trend and inside it the salmoniculture detains a forehead place. In this context, it is necessary to be permanently perfected salmonid breeding methods and technologies, following to obtain some production qualitatively as great and appropriate as possible, by maximum exploitation of the biological potential of culture material. Inside this experiment, the authors determined the body weight and main morpho-physiological indices on a number of 80 rainbow trout (*Oncorhynchus mykiss*) breeding stock individuals, taking in study randomly 20 individuals (10 males and 10 females) from the existent four breeding stock populations inside Fiad trout farm, Bistrița-Năsăud County. Description of these body weight indices and those of body frame ones, by age categories, will permit inside this trout farm the optimal age, body weight and body frame determination that breeding stock must have in view to obtain some viable and valuable offspring, both qualitatively and also quantitatively. Finally, the obtained data were statistically processed and interpreted.*

**Key words:** rainbow trout, morphological indices, body weight, reproduction

### INTRODUCTION

The vertiginous increasing of aquatic products' consumption (fishes, mollusks, crustaceans etc.) made the modern human to understand better and more conscious that the fish and fish products or sub products must be treated with more attention and responsibility, in conditions when animal protein from aquatic environment has a very important role for the human organism, health development and maintenance [3].

The main countries with aquatic resources search to make their efforts to obtain more increased fish productions, in conditions of maximal efficiency. In this context, the salmoniculture represents one of the most important branches of pisciculture.

The rainbow trout (*Oncorhynchus mykiss*) is the main specie exploited in salmonid farms, due to plasticity and resistance against variation of environmental

factors and diseases, as well as to the rapid breeding rhythm obtained as result of selection and improvement processes to which the specie was submitted [5].

In order to obtain some more increased productions with an appropriate quality, inside the trout farms a special role have the breeding stock lots and their performances.

Besides environment and nutrition conditions, very important are also the other morpho-physiological characteristics, which compete to obtain some valuable aquatic productions: breeding stock age, physiological state and morphological indices [1]. In this context, the authors propose to characterize four breeding stock populations, taking in study the age, body weight and main morphological indices. The experiment evolved inside Fiad trout farm, Bistrița-Năsăud County.

## MATERIALS AND METHODS

The experiment evolved during June 2009, inside Fiad trout farm, Bistrița-Năsăud County. The Fiad trout farm was established in 1983, and the main activity object was represented by salmonid reproduction and obtaining of biological material destined for mountain zone water re-population. In aim to make activity efficient, in this unit exist also basins populated with biological material destined for consumption. With 1.7 Ha surface, the Fiad trout farm is situated to 452 m altitude, and the water necessary is assured from two sources: Sălăuța Valley with 200 Liters/sec debit and Fiad Valley with 100 liters/sec debit. The water temperature in this salmonid farm presents very large variations in last years, presenting a minimum of 0.5°C in January and a maximum about 26.5°C in August. In the last years was observed an increasing of day number during summer period when the water reached values over 20°C.

The Fiad trout farm is one of few Romanian salmonid units in which are developed artificial reproduction activities in trout. The quality of biological material obtained in this unit is many time superior to those one derived from importations, but to face out to competence are necessary programs of improvement and re-technology [7].

There were followed main morpho-productive indices on 80 rainbow trouts (*Oncorhynchus mykiss*) breeding stocks, by 20 individuals, analyzing the body weight and the main conformation indices at different ages. The individuals taken in study were retained randomly from breeding basins, the only selection criteria being represented by an equal male and female retained number.

The characters taken in study are: age, body weight, total length, maxim height, and great perimeter. The description of these body weight accumulation indices and of body frame indices by age categories will permit us in near future to determine inside this salmonid unit the optimal age, body weight and body frame, which a breeding stock must accomplish in view to obtain

some viable and valuable offspring, both qualitatively and quantitatively [8]. Also, basis on obtained results, the salmonid unit will shall form a valuable breeding stock nucleus.

The statistical processing of registered data was done by known usual methods.

## RESULTS AND DISCUSSION

The four population of breeding stock rainbow trout (*Oncorhynchus mykiss*) inside Fiad trout farm are exploited in separated basins, by age categories. The environmental factors are identical for all four basins, and the feeding of the four populations is also identical, using same feed and same feeding frequency [2]. In the four tables are presented the average values and variability of the main analyzed characters.

In the 3 years ages category of breeding, regarding at the characteristics considered for the study, result a low variability, with a value of only 3.82% for the total length character and a maximum variability of 10.71% for the body weight character. The conclusion is that, the breeding stock population is very homogeneous (Table 1).

Table 1  
Average values and variability of morphological indices in fish breeding stock population (3 years of age)

Character	n	$\bar{X} \pm s_x$	s	V%
Body weight (g)	20	983.45 $\pm$ 23.55	105.31	10.71
Total length (cm)	20	40.19 $\pm$ 0.34	1.54	3.82
Maxim height (cm)	20	10.56 $\pm$ 0.12	0.53	4.97
Great perimeter (cm)	20	25.32 $\pm$ 0.29	1.31	5.17

Similarly, as in 3 years ages breeding stock, in the 3.5 years ages breeding stock population, find a low variability with a minimum of 4.48% at the total length character, and a maximum of 12.35% to the body weight character. The conclusion is the same, this breeding stock is homogeneous (Table 2).

Table 2  
Average values and variability of morphological indices in fish breeding stock population (3.5 years age)

Character	n	$\bar{X} \pm s_x$	s	V%
Body weight (g)	20	1419.75±39.20	175.32	12.35
Total length (cm)	20	46.25±0.46	2.07	4.48
Maxim height (cm)	20	11.45±0.14	0.60	5.28
Great perimeter (cm)	20	26.83±0.31	1.39	5.18

This trend of uniformity stores also at the 4 years ages breeding stock, where the variability is reduces on all four characters studied, with a minimum of 3.12% to the total length character and a maximum of 9.98% to the body weight character (Table 3).

Table 3  
Average values and variability of morphological indices in fish breeding stock population (4 years age)

Character	n	$\bar{X} \pm s_x$	s	V%
Body weight (g)	20	1140.40±24.64	110.18	9.98
Total length (cm)	20	43.45±0.31	1.38	3.17
Maxim height (cm)	20	10.48±0.20	0.88	8.41
Great perimeter (cm)	20	25.03±0.34	1.50	5.99

Table 5  
Values of key indices in rainbow trout (*Oncorhynchus mykiss*) body

Body index	Females				Males			
	3 years	3.5 years	4 years	8-10 years	3 years	3.5 years	4 years	8-10 years
Profile index ( $I_p$ )	2.953	3.136	3.163	3.147	3.099	3.238	3.276	3.238
Body depth (Bd)	18.037	16.573	16.091	15.212	17.337	16.042	16.257	15.811
Quality index (IC)	1.246	1.323	1.333	1.332	1.277	1.398	1.361	1.390
Meat quantity proportion index ( $I_c$ )	28.797	27.247	27.011	31.767	28.173	29.679	31.288	29.487

Analyzing the profile index values for females and males, for all four age categories, we found that they frame within 2.953 and 3.163 for the females and between 3.099 and 3.238 for the males, values who fall study population in normal livestock ranges for this species.

As expected, also body depth and quality index values, in both females and males, frame within normal values, cited by literature. So, body depth recorded values between 15.212 in females of 8-10 years of

In the category of breeding stock aged between 8 and 10 years, is showed a higher variability to the body weight character. The rest of the characters studied, presents a low variability. The high variability for the body weight character, can be explained to the age difference of the specimens that make up this population and to the differential acumulation of muscle mass (Table 4).

Table 4  
Average values and variability of morphological indices in fish breeding stock population (8-10 years age)

Character	n	$\bar{X} \pm s_x$	s	V%
Body weight (g)	20	2835.75±118.32	529.16	18.66
Total length (cm)	20	57.65±0.63	2.81	4.88
Maxim height (cm)	20	14.33±0.23	1.03	7.19
Great perimeter (cm)	20	33.60±0.50	2.26	6.72

Values for key indices in rainbow trout (*Oncorhynchus mykiss*) body, are given in table 5. Were followed the main indices for the 80 specimens who forming breeding stock population of the Fiad trout hatchery: profile index ( $I_p$ ), body depth (Bd), quality index (IC) and meat quantity proportion index ( $I_c$ ) [4].

age and 18.037 in the females of 3 years of age. Males have values of body depth between 15.811 for 8 - 10 years of age and 17.337 for 3 years of age. These decreasing values in the mean time with age, can be explained by reducing gonadosomatic index with aging [6].

Meat quantity proportion index has values who employing study population in the normal ranges value, cited by literature [9]. This parameter has values between 27,011 for those females aged of 4 years and

31,288 for those males of the same age. This parameters show meat weight in carcass (about 30%).

### CONCLUSIONS

The rainbow trout (*Oncorhynchus mykiss*) is the main specie exploited in salmonid farms, this fact being the result of plasticity and resistance to variation of medial factors and diseases, as well as of the rapid breeding rhythm obtained as result to selection and improvement processes to which was submitted the specie.

Biometric measurements and body index review, show then that the four populations are homogeneous in terms of phenotype and lies within the range cited by literature, for this species.

### ACKNOWLEDGEMENT

Thanks to mister engineer Ioan Sărmaș, head of Fiad-Telcișor trout hatchery complex, Bistrița – Năsăud County, for all the support and goodwill which proved for the performance of our research.

### REFERENCES

[1] Bilal A., Temel Ş., Nilgün A., Muharrem A.. Effect of Initial Size on Growth Rate of Rainbow Trout, *Oncorhynchus mykiss*, Reared in Cages on the Turkish Black Sea Coast. Turkish Journal of

Fisheries and Aquatic Sciences 2:133-136, 2002.

[2] Bud I., Boaru Anca, Petrescu-Mag V. Influence of food and age on breeding and reproductive performances in a rainbow trout population. AACL BIOFLUX, 2008.

[3] Bud I., Ionescu O., Vlădău V., Pop S. Peștii din apele reci. Păstrăvii. Ed. Risoprint, Cluj – Napoca, 2007.

[4] Bud I., Vlădău V. Ghid de lucrări practice în piscicultură. Ed. Risoprint, Cluj – Napoca, 2004.

[5] Cocan D. Creșterea păstrăvului curcubeu (*Oncorhynchus mykiss*) în sistem recirculant și condiții controlate de mediu. Ed. Bioflux, Cluj – Napoca, 2008.

[6] Hutchings J.A., Pickle A. Influence of sex, body size and reproduction on overwinter lipid depletion in brook trout. Journal of fish biology. Vol. 55, pages 1.020-1.028.

[7] Kindschi G., Barrows F.T. Effects and Interaction of Phenotype and Rearing Density on Growth and Fin Erosion in Rainbow Trout. North American journal of aquaculture ISSN 1522-2055, vol. 71, pag. 79-86, 2009.

[8] Porto-Foresti F., Oliveira C., Tabata Y., Rigolino M., Foresti F. Relationships among growth and different NOR phenotypes in a specific stock of rainbow trout (*Oncorhynchus mykiss*). Brazilian Journal of Biology ISSN 1519-6984, vol. 67, 2007.

[9] Rutz D.S. Age and Size for Rainbow Trout (*Ocorhynchus mykiss*) Collected in the Susitna River Drainage During 1992, Alaska Department of Fish and Game, 1993.

[10] FAO Fishstat, 2007.