

Phenotypic Characterization of Four Breeding Stock Rainbow Trout Populations (*Oncorhynchus mykiss*) from Fiad Trout Farm, Bistrița-Năsăud County

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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. 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 40 rainbow trout (*Oncorhynchus mykiss*) breeding stock individuals, taking in study randomly 10 individuals (5 males and 5 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, on 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.

Keywords: 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.

The main countries with aquatic resources search to make their efforts in direction to obtain some 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 species exploited in salmonid farms, this fact being due to plasticity and resistance to variation of medial factors and diseases, as well the rapid breeding rhythm obtained pursuant to selection and improvement processes to which was submitted the species.

In view 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. 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.

There were followed main morpho-productive indices on 40 rainbow trout (*Oncorhynchus mykiss*) breeding stocks, by 10 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, standard length, commercial length, maxim height, minim height, body thickness, great perimeter, small perimeter and head length.

The description of these body weight accumulation indices and of body frame indices on 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. 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, on age categories. The environment factors are identical for all four basins, and the alimentation of the four populations is also identical, using same fodder and same feeding frequency. In the four tables are presented the average values and variability of the main analyzed characters.

Tab. 1

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

Character	n	Males			Females			Significance test	
		$\bar{X} \pm s_x$	s	V%	$\bar{X} \pm s_x$	s	V%	t	signific.
Body weight (kg)	5	0.961±0.04	0.08	8.54	0.989±0.07	0.15	14.89	0.21	N.S.
Total length (cm)	5	40.20±0.37	0.84	2.08	39.60±1.12	2.51	6.34	0.50	N.S.
Standard length (cm)	5	32.30±0.49	1.10	3.39	31.60±1.07	2.38	7.54	0.59	N.S.
Commercial length (cm)	5	37.50±0.39	0.87	2.31	36.60±1.02	2.28	6.28	0.82	N.S.
Maxim height (cm)	5	10.40±0.19	0.42	4.02	10.60±0.29	0.65	6.15	0.59	N.S.
Minim height (cm)	5	4.10±0.10	0.22	5.45	4.10±0.10	0.22	5.45	0	0
Body thickness (cm)	5	5.60±0.29	0.65	11.64	5.70±0.25	0.57	10.00	0.014	N.S.
Great perimeter (cm)	5	21.10±0.48	1.08	4.32	25.20±0.66	1.48	5.89	2.009	+
Small perimeter (cm)	5	9.60±0.19	0.42	4.36	9.60±0.19	0.42	4.36	0	0
Head length (cm)	5	9.10±0.19	0.42	4.60	9.10±0.19	0.42	9.03	0	0

Analyzing the data from table 1, at three years age for the characters taken in study are not signalized differences statistically significant between males and females, excepting an easy superiority of females for the great perimeter that is normal situation kipping account of roes' presence.

At 3.5 years age (table 2) were observed differences statistically significant in male favor for total length and head length, and for the rest-analyzed characters do not exist differences statistically ensured. In this age all followed characters present a very good homogeneity both in females and males, the variability coefficient being comprised between 3.56% and 15.53%.

Tab. 2

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

Character	n	Males			Females			Significance test	
		$\bar{X} \pm s_x$	s	V%	$\bar{X} \pm s_x$	s	V%	t	signific.
Body weight (kg)	5	1.40±0.11	0.24	17.03	1.39±0.10	0.22	15.53	0.07	N.S.
Total length (cm)	5	47.90±1.25	2.79	5.83	45.20±0.58	1.30	2.88	1.97	+
Standard length (cm)	5	37.40±1.36	3.05	8.15	35.60±0.68	1.52	4.26	1.18	N.S.
Commercial length (cm)	5	43.40±1.36	3.05	7.03	41.40±0.66	1.47	3.56	1.32	N.S.
Maxim height (cm)	5	11.50±0.37	0.71	6.15	11.20±0.34	0.76	6.77	0.65	N.S.
Minim height (cm)	5	4.70±0.12	0.27	5.83	4.80±0.12	0.27	5.71	0.58	N.S.
Body thickness (cm)	5	6.00±0.22	0.50	8.33	5.90±0.33	0.74	12.57	0.25	N.S.
Great perimeter (cm)	5	26.80±0.82	1.82	6.80	27.20±0.75	1.68	6.18	0.36	N.S.
Small perimeter (cm)	5	11.10±0.29	0.65	5.87	11.20±0.30	0.67	5.99	0.23	N.S.
Head length (cm)	5	11.10±0.56	1.24	11.22	9.70±0.25	0.57	5.88	2.29	+

In table 3, in the analyzed biological material having 4 years age comes out that exist differences statistically significant in females' favor for the body weight, total length, total height, great and small perimeter.

Tab. 3

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

Character	n	Males			Females			Significance test	
		$X \pm s_x$	s	V%	$X \pm s_x$	s	V%	t	signific.
Body weight (kg)	5	1.01±0.05	0.11	11.11	1.183±0.03	0.07	5.62	2.96	+
Total length (cm)	5	42.00±0.71	1.58	3.76	44.00±0.55	1.22	2.78	2.24	+
Standard length (cm)	5	32.60±0.81	1.82	5.57	34.80±0.86	1.92	5.53	1.85	N.S.
Commercial length (cm)	5	38.40±1.17	2.61	6.79	40.10±0.64	1.43	3.57	0.54	N.S.
Maxim height (cm)	5	9.50±0.35	0.79	8.32	10.90±0.40	0.89	8.21	2.63	+
Minim height (cm)	5	4.00±0.27	0.61	15.31	4.30±0.34	0.76	17.63	0.68	N.S.
Body thickness (cm)	5	5.30±0.37	0.84	15.79	5.60±0.37	0.82	14.67	0.57	N.S.
Great perimeter (cm)	5	23.70±0.58	1.30	5.50	25.90±0.58	1.29	5.00	2.71	+
Small perimeter (cm)	5	9.00±0.45	1.00	11.11	10.20±0.34	0.76	7.43	2.13	+
Head length (cm)	5	10.20±0.37	0.84	8.20	9.40±0.24	0.55	5.83	1.78	N.S.

Tab. 4

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

Character	n	Males			Females			Significance test	
		$X \pm s_x$	s	V%	$X \pm s_x$	s	V%	t	signific
Body weight (kg)	5	2.85±0.93	14.48	158.16	2.74±0.18	0.41	14.92	0.011	N.S.
Total length (cm)	5	58.80±2.03	4.55	7.74	56.70±0.86	1.92	3.39	0.95	N.S.
Standard length (cm)	5	46.80±1.62	3.64	7.76	44.70±1.26	2.82	6.31	1.01	N.S.
Commercial length (cm)	5	55.00±1.64	3.67	6.68	52.40±0.51	1.14	2.18	1.52	N.S.
Maxim height (cm)	5	14.40±0.73	1.64	11.36	14.00±0.42	0.94	6.68	0.47	N.S.
Minim height (cm)	5	5.80±0.25	0.57	9.83	5.69±0.29	0.65	11.64	0.02	N.S.
Body thickness (cm)	5	7.40±0.86	1.92	25.91	6.80±0.20	0.45	6.58	0.68	N.S.
Great perimeter (cm)	5	33.30±1.83	4.10	12.32	33.80±0.90	2.02	5.97	0.24	N.S.
Small perimeter (cm)	5	13.50±0.50	1.12	8.28	13.00±0.57	1.27	9.81	0.66	N.S.
Head length (cm)	5	13.80±0.37	0.84	6.06	14.20±0.20	0.45	3.15	0.95	N.S.

The average values and variability of morpho-physiological indices analyzed in the rainbow trout of 8-10 years age (table 4) put into evidence a very good homogeneity of population in both sexes and emphasis average weights of 2.74 kg in females and 2.85 kg in males, which prove that these weight are positively appreciated for the breeding stocks. In all analyzed characters the differences are statistically insignificant.

CONCLUSIONS

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

At three years age population, for the characters taken in study are not signalized differences statistically significant between males and females, excepting an easy superiority of females for the great perimeter that is normal situation kipping account of roes' presence.

At 3.5 years age were observed differences statistically significant in male favor for total length and head length, and for the rest-analyzed characters do not exist differences statistically ensured.

In the analyzed biological material having 4 years age comes out that exist differences statistically significant in females' favor for the body weight, total length, total height, great and small perimeter.

The average values and variability of morpho-physiological indices analyzed in the rainbow trout of 8-10 years age put into evidence a very good homogeneity of population in both sexes.

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