Allometric Assessment of Some Morphological Characters of Rainbow Trout (*Oncorhynchus mykiss*) Reared in Different Farming Systems from Transylvania, Romania

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Abstract

Whereas the growth dynamics of fish in recirculating systems is superior to conventional systems, we performed based on allometric scaling techniques, an estimate of future fisheries production in both systems. Based on the somatic measurements and body size indices, were calculated correlations (r), the regression lines (y) and determination coefficients (R^2). All the values obtained, are favorable to production obtained in a recirculating system (experimental group – E).

Keywords: *allometry, rainbow trout, farming systems*

Introduction. Fish morphometry is used since the Middle Ages, but if it was used only as a basic research, today presents a highly practical character.

Allometric relationship reflects the change ratios (or relative organ weight) during ontogenetic and phylogenetic development. This science is commonly used in fisheries area to determine the future fish production (Post and Parkinson, 2001; Howland *et al.*, 2004).

Randall (2002), considers that the ratio of annual production rate to average biomass (P/B) is sometimes used as a shortcut method of estimating production if biomass is known. P/B ratios vary among salmonid populations in different areas depending on the species, fish size and growing conditions.

Aims and objectives. The aim of this study was to determine the future fishery production based on allometric relationships, according to the system growth of rainbow trout (*Oncorhynchus*

mykiss). Our objectives were to determine the links between body weight of trout and different phenotypic characters, by calculating correlations, regression lines and coefficients of determination.

Materials and methods. Were taken into studied two experimental groups, each of them containing 600 specimens of rainbow trout (*Oncorhynchus mykiss*). First group (C-control group) has been reared in classical trout farm from Fiad, Bistrița-Năsăud County. The second group (E-experimental group) was reared in a superintensive recirculating system in Cluj-Napoca, Cluj County. Both groups have common origin and benefited from the same feed structure.

Results and Discussion. Due to optimal environmental conditions from recirculating system, the specimens from group E have superior growth dynamic, compared to group C. Because of this, have resulted superior values for group E, in terms of body size indices. Using allometric techniques, we determined correlations (r), the

Tab. 1. Correlations, regression lines and determination coefficients obtained between body weight and different phenotypic characters of rainbow trout rearing in different farming systems (2012)

Allometric data - 2012						
Specification	r		y		R ²	
	C group	E group	C group	E group	C group	E group
Bw-Sl	0.978	0.975	0.0775x + 10.332	0.0451x + 12.629	0.9570	0.9507
Bw-Bd	0.996	0.950	0.0187x + 0.9478	0.0089x + 1.6886	0.9921	0.9041
Bw-H	0.990	0.953	0.0303x + 2.1249	0.0134x + 3.4178	0.9818	0.9095
Bw-P	0.994	0.960	0.0887x + 5.7393	0.0397x + 9.0394	0.9888	0.9220
Bw-Hl	0.953	0.990	0.0119x + 2.5015	0.0092x + 2.7158	0.9097	0.9820
Bw-Cpl	0.775	0.980	0.0084x + 2.1830	0.0067x + 2.2208	0.6014	0.9622

Note: Bw – body weight; Sl – standard length; Bd – Body depth; H – maximum height; P – great perimeter; Hl – head length; Cpl – caudal peduncle length; r – correlations; y – regression lines; R² – coefficients of determination; C – control group; E – experimental group.

Tab. 2. Correlations, regression lines and determination coefficients obtained between body weight and different phenotypic characters of rainbow trout rearing in different farming systems (2013)

Allometric data - 2013						
Specification	r		y		R ²	
	C group	E group	C group	E group	C group	E group
Bw-Sl	0.973	0.972	0.0703x + 10.756	0.0445x + 12.633	0.9477	0.9453
Bw-Bd	0.987	0.956	0.0165x + 1.0606	0.0087x + 1.7099	0.9743	0.9147
Bw-H	0.978	0.952	0.0266x + 2.3383	0.0131x + 3.446	0.9573	0.9081
Bw-P	0.981	0.960	0.0769x + 6.3621	0.0388x + 9.1217	0.9624	0.9216
Bw-Hl	0.954	0.989	0.0115x + 2.5461	0.0091x + 2.7059	0.9106	0.9797
Bw-Cpl	0.8261	0.9759	0.0078x + 2.2252	0.0067x + 2.1792	0.6825	0.9525

Note: Bw – body weight; Sl – standard length; Bd – Body depth; H – maximum height; P – great perimeter; Hl – head length; Cpl – caudal peduncle length; r – correlations; y – regression lines; R² – coefficients of determination; C – control group; E – experimental group.

regression lines (y) and determination coefficients (R²) (Tab. 1, 2), between body weight (Bw) and body standard length (Sl): group C (r=0.9780; y=0.0775x+10.332; R²=0.9570), vs. group E (r=0.9570; y=0.0451x+12.629; R²=0.9507); body weight (Bw) and body depth (Bd): group C (r=0.9960; y=0.0187x+0.9478; R²=0.9921), vs. group E (r=0.9500; y=0.0089x+1.6886; R²=0.9041); body weight (Bw) and maximum body height (H): group C (r=0.9900; y=0.0303x+2.1249; R²=0.9818), vs. group E (r=0.9530; y=0.0134x+3.4178; R²=0.9095); body weight (Bw) and body great perimeter (P): group C (r=0.9930; y=0.0887x+5.7393; R²=0.9866), vs. group E (r=0.9600; y=0.0397x+9.0394; R²=0.9220); body weight (Bw) and head length (Hl): group C (r=0.9530; y=0.0119x+2.5015; R²=0.9097), vs. group E (r=0.9900; y=0.0092x+2.7158; R²=0.9820); body weight (Bw) and caudal peduncle length (Cpl): group

C (r=0.7750; y=0.0084x+2.183; R²=0.6014), vs. group E (r=0.980; y=0.0067x+2.2208; R²=0.9622).

Conclusion. The obtained values in this study, conducted in 2012, were confirmed by repeating the experiment in 2013, in the same conditions. In conclusion, we can say that based on data of the growth, development, changes in body form indices and growth density, can be estimated the future production of trout, with specific reference to the farming system used.

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