Danube Crayfish *Astacus leptodactylus* (Eschscholtz, 1823) from Țaga Mare Lake – Size and Population Structure

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Abstract

In this study the structure of the Danube crayfish (*Astacus leptodactylus*) population from Țaga Mare Lake, Cluj County was analyzed. According to the study results, three age categories (2+, 3+ and 4+) were identified for the Danube crayfish specimens. Numerically, females are more numerous than males, the sex ratio between males and females being as follows: $SR_{2+} = 0.33$; $SR_{3+} = 0.33$; $SR_{4+} = 0.86$. In terms of body size, males are better developed, except for their abdominal segments, where females are better developed due to the female reproductive function.

Keywords: *Astacus leptodactylus*, morphometry, population structure

INTRODUCTION

Țaga Mare Lake is part of a series of lakes and ponds (Fizeș Valley), stretching over 40 km between Cămărașu and Gherla localities, Cluj County. Initially, the lake was meant for intensive fish farming and now it is in an extensive process of eutrophication because of organic substance leakage from the surrounding agricultural lands (Battes, 2010), as well as limited human intervention in terms of technological works. The chemical composition of the water and relatively large amounts of calcium, especially in the benthic area of the lake (Sorocovschi, 2009), favour the development of crayfish populations.

The distribution area of the Danube crayfish includes, in particular, the southern, eastern and western parts of Romania (Pârvulescu, 2009), but stable populations are found also in the Transylvania Plateau. Environmental conditions and the lack of culinary interest in this species lead to increasing crayfish population numbers in the Fizeș Valley.

AIMS AND OBJECTIVES

The aim of the study was to provide a phenotypic characterization of the Danube crayfish from Țaga Mare Lake and to establish the age and sex structure of the population.

MATERIAL AND METHODS

The experiments were carried out between August and September 2014. With the use of traps, 73 crayfish specimens (27 males and 46 females) were captured. Bait used in the traps was represented by chunks of fish. The traps were launched at different points on the lake and recovered after 24 hours. The age and sex structure were based on the determination keys, crayfish age being directly correlated with their length (Pârvulescu, 2009). In this study, the phenotypic characterization of the Danube crayfish was based on 18 morphological characters. All the data were statistically interpreted using GraphPad Prism vs. 6.07.

Tab. 1. Structure population of Danube crayfish (*Astacus leptodactylus*) from Țaga Mare Lake, by age and sex

Age (years)	Sex	n	SR (M/F)	EP (%)	SC (%)	Length (mm)			Weight (g)		
						Min	Max	Mean	Min	Max	Mean
2+	M	2	0.33	2.739	7.407	52.00	85.50	68.75	18.12	35.92	27.02
	F	6		8.219	13.0433	78.20	94.30	87.98	11.48	21.46	17.07
3+	M	6	0.33	8.219	22.222	107.00	111.70	110.67	36.49	64.31	48.44
	F	18		24.657	39.130	103.00	112.00	109.72	22.74	44.22	33.12
4+	M	19	0.86	26.027	70.370	112.44	137.80	124.31	48.22	104.52	71.53
	F	22		30.137	47.826	112.00	143.40	121.67	30.63	71.93	45.66

Note: M-male; F-female; SR-sex ratio; EP-percent from the entire population; SC-percent from the sex category

Tab.2. Mean values and variability indices of the phenotypic characters of Danube crayfish (*Astacus leptodactylus*) from Țaga Mare Lake

Phenotypic character	Abr.	MU	Male (n = 27)			Female (n = 46)		
			X ± sx	s	V%	X ± sx	s	V%
Body weight	Bw	g	63.1±1.907	19.070	30.22	37.09±1.222	12.217	32.94
Total length	Tl	mm	117.17±1.696	16.962	14.48	112.62±1.272	12.718	11.29
Cephalothorax length	Cl	mm	62.78±0.924	9.236	14.71	55.77±0.688	6.880	12.34
Cephalothorax depth	Cd	mm	32.04±0.429	4.289	13.38	28.15±0.363	3.634	12.91
Depth of abdominal segment 1	Das1	mm	22.1±0.192	1.922	8.70	20.39±0.226	2.256	11.07
Depth of abdominal segment 2	Das2	mm	25.59±0.228	2.277	8.90	29.64±0.443	4.428	14.94
Depth of abdominal segment 3	Das3	mm	25.59± 0.242	2.416	9.44	29.75±0.463	4.635	15.58
Depth of abdominal segment 4	Das4	mm	25.04± 0.238	2.376	9.49	28.39±0.433	4.333	15.26
Depth of abdominal segment 5	Das5	mm	24.29± 0.219	2.190	9.02	26.74±0.385	3.846	14.38
Depth of abdominal segment 6	Das6	mm	23.31± 0.22	2.204	9.45	24.03±0.337	3.374	14.04
Telson depth	Td	mm	14.17± 0.126	1.257	8.87	13.85±0.187	1.869	13.50
Rostrum length	Rl	mm	17.64±0.195	11.04	1.948	16.15±0.223	2.230	13.81
Left propodite width	LPv	mm	21.21±0.51	24.020	5.096	13.39±0.285	2.846	21.26
Right propodite width	RPv	mm	21.71±0.407	18.750	4.072	13.54±0.243	17.92	2.427
Left propodite length	Lpl	mm	61.17± 1.623	16.233	26.54	35.15±0.754	21.44	7.537
Right propodite length	RPl	mm	63.53± 1.357	21.350	13.566	35.85±0.687	19.16	6.868
Left dactylopodite length	LDl	mm	36.11±1.019	10.191	28.22	20.46±0.442	21.58	4.417
Right dactylopodite length	RDL	mm	36.94± 0.786	21.270	7.857	20.32±0.449	4.488	22.09

Note: X-mean; s_x -standard error; V%-coefficient of variation; s-standard deviation

RESULTS AND DISCUSSION

As seen in Table 1, three age categories of Danube crayfish (2+, 3+ and 4+) were identified in Țaga Mare Lake.

We do not exclude the possible presence of other age categories, but we believe that younger age categories require different techniques for capture.

In terms of numbers, females were more numerous regardless of the age group, the results being similar to those obtained by other

researchers (Györe *et al.*, 2013). They represented in total, a percentage of 63.01% of the entire population. Also, this is confirmed by the sex ratio ($SR_{2+} = 0.33$; $SR_{3+} = 0.33$; $SR_{4+} = 0.86$). Analysing the study results, it appears that males have a higher body mass compared to females ($M_{2+} = 27.02$ g vs. $F_{2+} = 17.07$ g; $M_{3+} = 48.44$ g vs. $F_{3+} = 33.12$ g; $M_{4+} = 71.53$ g vs. $F_{4+} = 46.66$ g). The same situation is found in the case of body length, excluding the first age category, where males had a smaller average

length than females ($M_{2+}=68.75$ mm vs. $F_{2+}=87.98$ mm).

The average values and the variability coefficients of phenotypic characters shown in Table 2 also indicate that males have a better developed body than females. The exceptions are only the depths of the body segments (Das2, Das3, Das4, Das5 and Das6), which are more developed in females. Their sizes are directly related to the reproductive function of females.

CONCLUSION

According to the obtained results, in Țăga Mare Lake, the crayfish population is structured in several age categories. This indicates a good adaptability of the species to the environmental conditions. Females are more numerous than males, regardless of their age, but in terms of body dimensions, males are more developed.

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