

## The growth characteristics of common carp (*Cyprinus carpio*) in the northern part of the Small Island of Brăila Natural Park

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**Abstract.** In this paper are presented the results of the growth parameters for the carp population. The study was realized in the 2006-2009 period on a total number of 367 carp specimens caught into the Danube river km 170-196 (the arms: Cravia, Calia, and Fundu Mare Island). In order to estimate the population growth characteristic of the carp population the following relationship was determined: length - weight (L-W) using equation  $W = a * L^b$ . The value of the coefficient b indicates an allometric increase, meaning the length increases faster than weight. Moreover, the good value of this coefficient, considered also as a condition factor ( $b = 2.845$ ), shows us good growth conditions for this species in the researched area. Estimation of the growth parameters (*von Bertalanffy*)  $L_{\infty}$ ,  $k$ ,  $t_0$ , led to obtaining of comparable values with other nearby regions carp populations.

**Key words:** common carp, growth, condition factor, weight-length relationship.

**Rezumat.** În această lucrare sunt prezentate rezultatele estimării parametrilor de creștere pentru populația de crap. Studiul a fost realizat în perioada 2006-2009 pe un număr de 367 exemplare crap capturate în Dunăre, km 170-196 (brațele Cravia, Calia, și Ostrovu Fundu Mare). În vederea estimării caracteristicilor de creștere a populației de crap s-a determinat relația lungime-masă (L-W) utilizând ecuația  $W = a * L^b$ . Valoarea coeficientului b, a indicat o creștere alometrică în sensul creșterii în lungime mai rapid decât în greutate. De asemenea, valoarea bună a acestui coeficient, considerat și factor de condiție ( $b = 2,845$ ), ne indică condiții bune de creștere pentru această specie în zona cercetată. Estimarea parametrilor de creștere (*von Bertalanffy*)  $L_{\infty}$ ,  $k$ ,  $t_0$ , au condus la obținerea unor valori comparabile cu ale altor populații de crap din regiuni apropiate.

**Cuvinte cheie:** crap, creștere, factor de condiție, relație lungime-masă.

**Introduction.** The common carp (*Cyprinus carpio* L., 1758) is the most important fresh water species in Romania from economical point of view. It lives in all types of water from the plain zone reaching up to the hills. Due to the reducing of the deposition and growth surfaces of the spawn (Covaliov et al 2010), the common carp populations suffered a regression in the last half century, becoming vulnerable species.

The studied area represents the northern part of Brăila Natural Park, a wetland of international concern (Ramsar site), the last remaining vestige in natural regime of flooding on the Lower Danube Delta after draining former of Interior's Danube Delta (Balta Brăila and Ialomita) which currently conserve aquatic and terrestrial ecosystems complex in a form similar to the original.

**Material and Method.** The scientific fishing was made with trap and gillnets type served by a boat of 17 crivace. The tools used were specific habitat type, as follows: in the pond have used cornel tree baskets (varse in Romanian) from fishermen's string (with  $a = 28$  mm) and static gillnets with different meshes from fishermen's string with different meshes ( $a = 40$  mm - 50 mm) and in the channel river, gillnets (with  $a = 12$  mm - 32 mm).

The fishing was realized in 2006-2009 period in Fundu Mare Island, Cravia and Calia branch.

The number of individuals caught was of 367 and total biomass of 930.25 kg. After the collection, the captured specimens were examined to biometric and gravimetric measurements.

Total length ( $L_t \pm 1 \text{ mm}$ ) and weight ( $W \pm 1 \text{ g}$ ) were measured. In order to determine the age the scales were collected from mature specimens. Harvesting these scales was made by scraping with a scalpel in the dorsal fin, above and below the lateral line region. The sampled scales were cleaned with distilled water and degreased in alcohol (70%). Samples thus prepared were read using binocular microscope.

A series of quantitative and qualitative data on common carp's populations were obtained in the area of the Danube, as follows.

The length-weight relationship determination (L-W) was made using the equation  $W = a * L^b$ , where W represents the individual weight (g), L - total length (cm), a and b - regression constant.

The growth parameters estimation ( $L_{\infty}$ ,  $k$ ,  $t_0$ ) was realised by using the graphic methods: Gulland Holt ( $\Delta L / \Delta t = a + b * L_t$ ) and the von Bertalanffy graphic method ( $\ln(1 - L_t / L_{\infty}) = -k * t_0 + k * t$ ) (Gulland 1969; Sparre et al 1989).

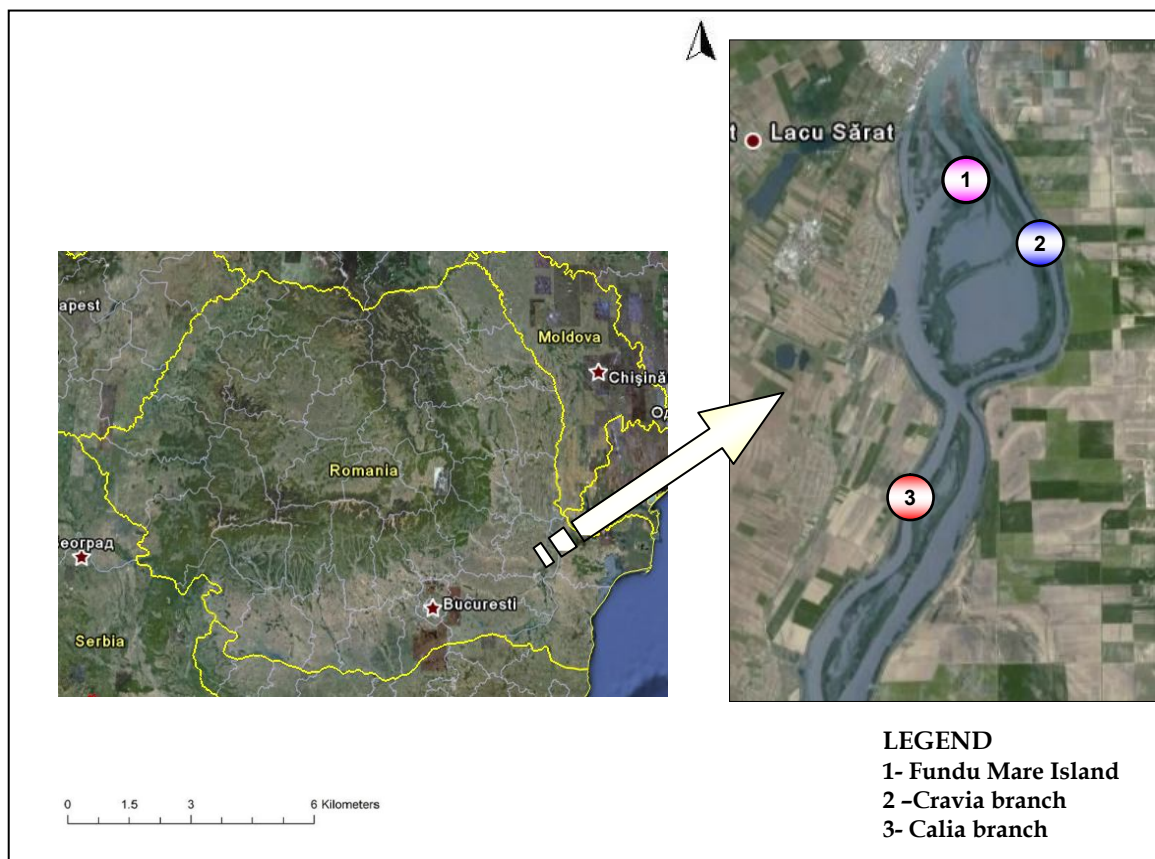


Figure 1. The study area.

**Results and Discussion.** The common carp individuals sampled in the study period had the total length interval between 23 cm - 86 cm and weight values interval between 432.67g - 9000 g (see Table 1).

The averages for length and weight are calculated for the entire population with a level of confidence of 95%.

The "a" and "b" coefficients values are determined from the regression between length and weight (Figure 2).

Table 1

Minimum values, maximum and average length and weight of the common carp population

Year	$L_{tmin}-L_{tmax}$ (cm)	$W_{min}-W_{max}$ (g)
2006	<b>23-49</b>	<b>150-1800</b>
	$\bar{L} = 29.55 - 31.43$	$\bar{W} = 432.67 - 555.74$
2008	<b>31-86</b>	<b>200-9000</b>
	$\bar{L} = 57.95 - 61.32$	$\bar{W} = 3135.77 - 3606.94$
2009	<b>30-76</b>	<b>590-6800</b>
	$\bar{L} = 55.52 - 60.27$	$\bar{W} = 2787.13 - 3495.57$

Lt – Total length (cm), W – weight (g)

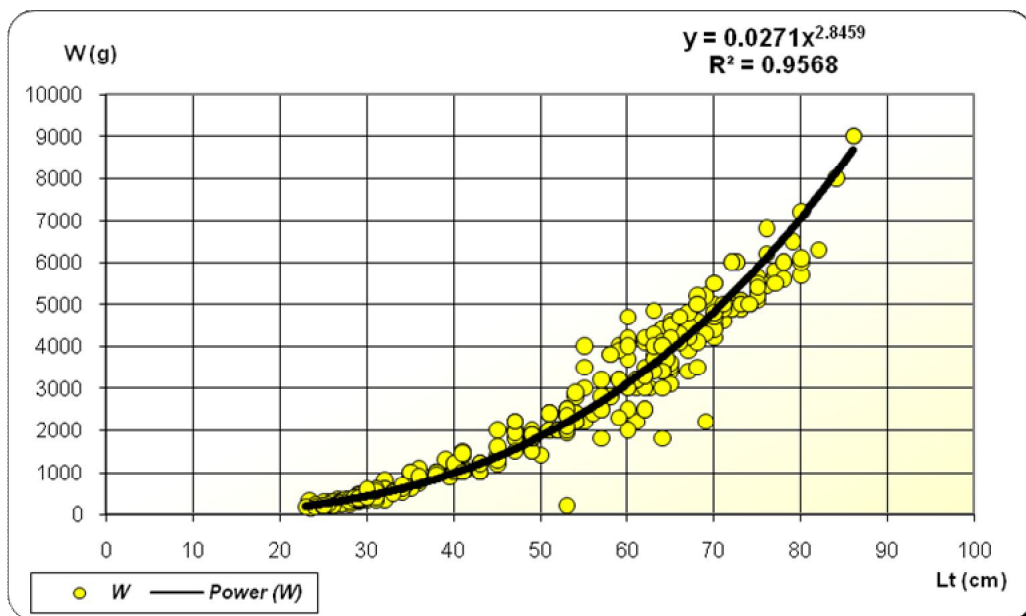


Figure 2. Correlation length - weight of carp population.

The relationship between Lt and W for the carp population in the sector and the period of study is:  $W = 0.0271 * Lt^{2.845}$  ( $r=0.978$ ).

The growth character revealed by the "b" coefficient value (2.845) shows us an allometrical growth of the carp population meaning that the increase in weight is being made faster than the growth in length.

In general, the coefficient b from length - weight relationship takes over the values in range 2-4 (Weatherley 1972) and is considered a measure of the conditions offered by the environment as a generalization of the Fulton coefficient (Moreau 1975; Pitcher 1990).

Also, the condition factor value (b) is used to get information about feeding status of the fish in its environment and to make comparisons among population living in different habitats (Demirkalp 2007).

To estimate the growth parameters ( $L_{\infty}$ ,  $k$ ,  $t_0$ ) we used data of length-age and also the two graphic methods Gulland Holt and von Bertalanffy (see Figs 3-4).

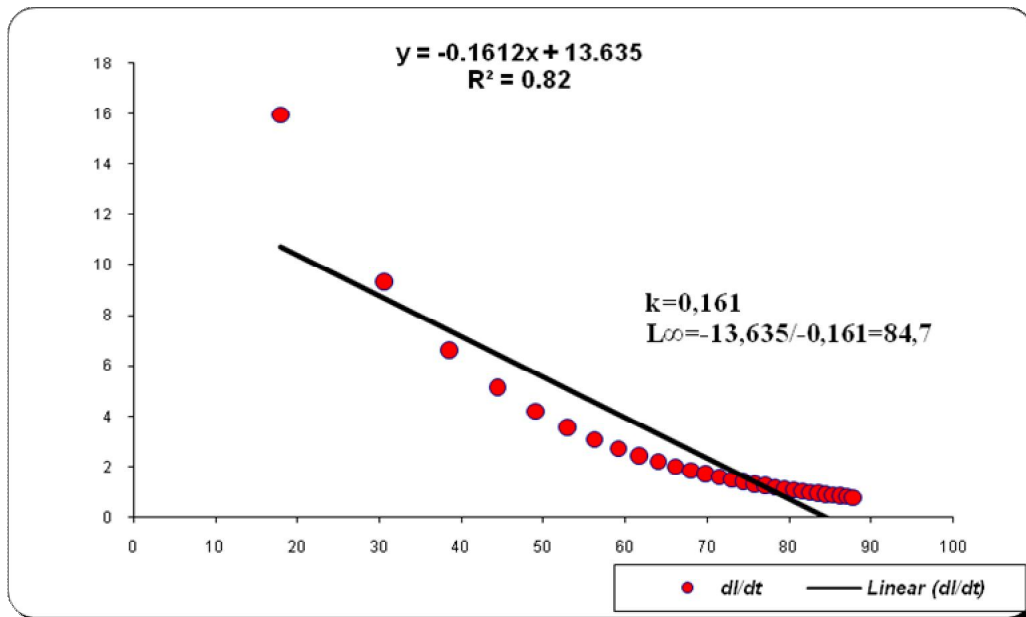


Figure 3. Graphical method Gulland-Holt for estimating the  $k$  and  $L_{\infty}$  constants of common carp population

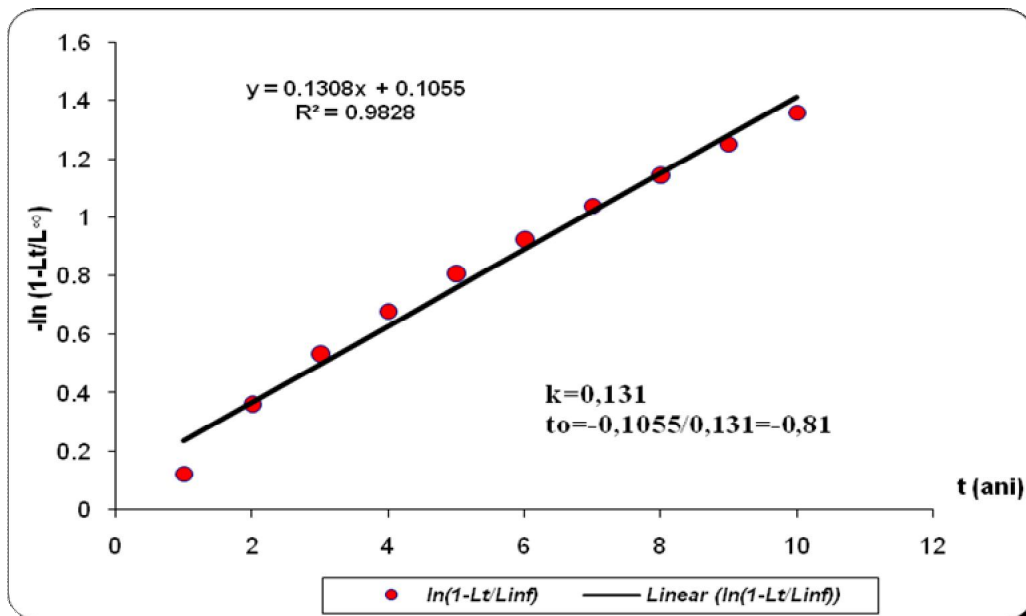


Figure 4. Graphical method von Bertalanffy for estimating the  $t_0$  constants of common carp population

Estimated values of the growth parameters are presented in Table 2.

Table 2

The values of growth parameters  $L_{\infty}$ ,  $k$  and  $t_0$  the population of carp

$L_{\infty}$	$k$	$t_0$
84.7	0.161	-0.81

**Conclusions.** The studied area presents a special importance for the fish populations, being a central wetland type where the ichthyofauna found good breeding conditions and growth of the juveniles.

The common carps sampled in the studied period had the total length interval between 23 cm - 86 cm and weight values interval between 432.67 g - 9000 g.

The values of the coefficient  $b$  (2.84) from the length-weight equation (L-W) for the studied carp population show us that this has an allometrical increase, the increase in length being made faster than the increase in mass.

Also, the coefficient  $b$  (condition factor), considered a measure of the conditions offered by the environment, demonstrates us that in the studied sector exists good growing conditions for the common carp.

$k$  - Is the growth constant, which indicates us the speed a fish approaches the asymptotical length (theoretical maximum) and has been also demonstrated that is linked to longevity's fish (Beverton & Holt 1959). The bigger the value of this constant, the smaller the longevity is.

The estimated value of this constant is relatively small ( $k=0.1308$ ) which demonstrates that the species longevity is quite big; the maximum age reported for this species being that of 38 years (see Froese & Pauly 2010 and citations therein).

The asymptotical length ( $L_{\infty}=84.7\text{cm}$ ) which was determined, indicates good growing conditions for the common carp population from this sector of the river, comparably with dimensions at which could the carp population from similar ecosystems reach.

The estimated asymptotical length has good values for which is framed in the limits met in literature.

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