FISH GROWTH RATE IN THE TISA DEAD-ARM (ČURUG—BISERNO OSTRVO) DEPENDING ON TYPE OF NUTRITION

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Abstract

The growth of 8 fish species, belonging to different types of nutrition (planktophagous: *Scardinius erythrophthalmus* and *Rutilus rutilus.*, planktobenthophagous (benthoplanktophagous): *Abramis brama, Carassius carassius* and *Carassius auratus gibelio* and fish of pray: *Esox lucius, Perca fluviatilis* and *Stizostedion lucioperca)* was studied, based on the material caught during 1987. It was shown that in this eutrophic lake tested fish species had different rate and constant of growth, which is undoubtedly closely related to the type of nutrition, although the importance of other factorsaffecting the growth of some fish species within their ecologic valence should not be ignored.

Introduction

During the past ten years (1979—1988) within complex ichthyological studies in the Tisa river basin, we have analysed body mass and longitudinal growth of the several fish species of variable economic value (MALETIN et BUDAKOV 1983, 1984, 1986). Detailed studies have been especially carried out in the Mrtva Tisa, Biserno Ostrvo/lake, considering the trophic level (eutrophic) of this hydroecosystem which shows a tendency of futher acceleration. An interesting question has arisen regarding the growth intensity of some fish species with different types of nutrition, during past five to ten years, due to a constant increase in the trophic level, inspite of the fact that water quality remained within acceptable levels. This applies to oxygen regime, pH value, hydrological conditions in this water basin and lack of considerable pollutants (this being one of a rare water basins which receives neither industrial nor large volumes of sewerage waters (MALETIN et al. 1987). Similar studies have been already performed in some other lakes ecosystem HARTMAN (1978) for example, analysing the growth of fish species from some regions of the lake Constance found a correlation between the growth and the lake trophic level changes (from oligo-over mezo — to eutrophic level) during the past fifty years.

Materials and Methods

During the last decade studied were fish collected with fishing net, trap (40—70 mm mash openning), and by electric fishing (3 KW and up to 280 V).

The growth of body mass, standard lenght (measured and calculated), and growth rate, constant and characteristic of 8 fish species were analysed. These fish belonged to different nutrition types: planktophagous: *Scardinius erythrophthalmus* and *Rutilus rutilus.* planktobenthophagous (benthoplanktophagous) *Abramis brama, Carassius carassius, C. auratus gibelio* and fish of pray *Perca fluviatilis, Exos lucius and Stizostedion lucioperca.*

The age of tested specimen varied from 0+ to 4+, and was determined along with the reconstruction of longitudinal growth, on the basis of generation zones on the scales.

Results and discussion

Specimen aging from 1+to 4+were used to analyse *S. erythrophthalmus* body growth. Body mass growth ranged from 5 to 22 g with most intensive growth recorded between the third and the fourth year (Fig. 1). *P. fluviatilis* mass growth ranged from 4 to 31 g (age 0+to 2+) with high rate clearly expressed after the first year. *R. rutilus* showed very dynamic body mass growth, reaching 300 g in its fifth year. *C. auratus gibelio*, however showed surprisingly low body mass growth intensity (after the age of 2+). The same has been recently found in some other waters in this part of the Pannonian plane. This phenomenon may be explained by general stagation in the population dynamics, which occurs after fish introduction in most alochtonous species, following the initial explosion and expansion in the expanded part of an are. However, the possibility of a complex infraspecies chategories of different dimensions, first of all body mass and standard length may not be excluded. The growth of *C. carassius* was somewhat slower compared to the growth of *C. auratus gibelio* (more intensive period was noticed between the third and the fourth year of age). Satisfactory growth was shown by *A. brama.*

It reached 300 g at the age of 3+. The body mass growth of inchthyophaga is the most impressive. *E. lucius* and *S. lucioperca* in particular proved very good results in this ecosystem (the first fish of pray weighted 1300 g and the second weighted 1800 g at the age of 3+).

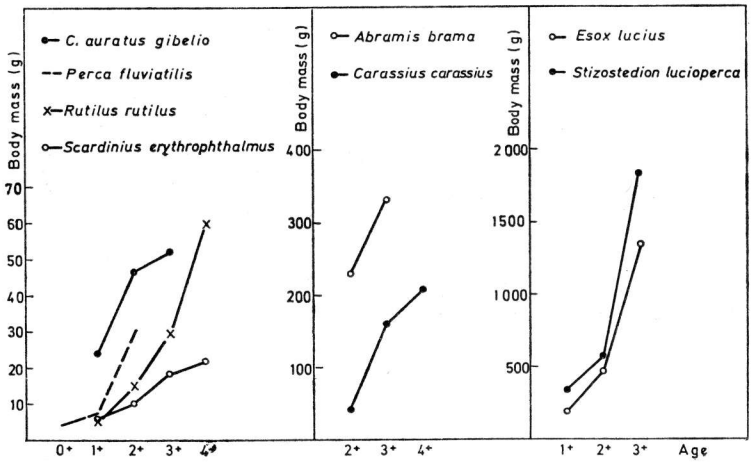

Fig. 1 Body mass growth of fish in dependence on age

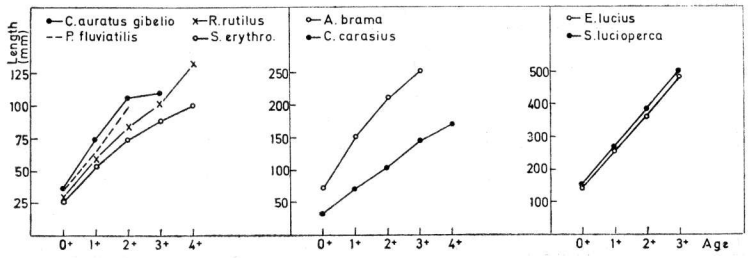

Fig. 2a Length growth of fish in dependence on age (measured values)

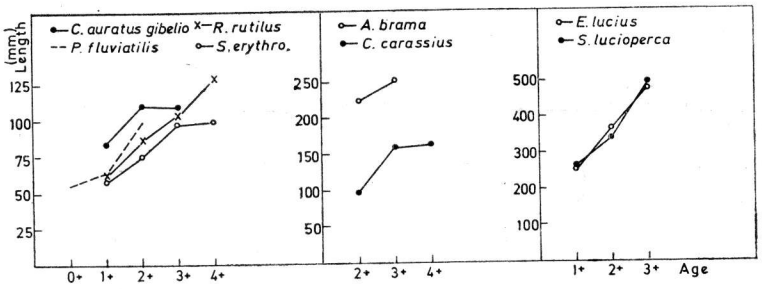

Fig. 2b Length growth of fish in dependence on age (calculated values)

The analysis of longitudinal growth (measured and calculated values) showed similar tendency and relation between fish species within tested groups according to types of nutrition (Fig. 2 and 2a). Insignificant difference was found in standard lenght values in particular years of fish existence between *E. lucius* and *S. lucioperca.* The most planktophagous fish also proved good longitudinal growth, except *C. auratus gibelio,* which showed considerable stagnation after the age of 2+. *A. brama, R. rutilus, P. fluviatilis* and *S. erythrophthalmus* had the best longitudinal growth.

The analysis of rate, constant and growth property added to more consise survey of fish longitudinal growth (Fig. 3). The growth rate in most studied species had a common decreasing tendency in relation to an age increase. Moreover, two specific periods may be distignuished in species in which longitudinal growth was analysed over a period of several years (3—4 years), with the exception of *R. rutilus* (cyprinids) and *S. lucioperca* (fish of pray) which manifested an increased growth rate in the fourth i.e. in the third year of age.

The growth constant manifested similar results. With regard to this parameter, *R. rutilus, A. brama* and especially fish of pray (first of all *S. lucius*) had a tendency of a constant increase. These values, however, reflected upon the growth characteristic with similar increasing and decreasing tendency for the aforementioned fish species. Further analysis was directed towards the comparison of growth values and their tendencies between samples caught in 1987 and samples caught five or ten years before that. (Fig. 4). For this purpose the aforementioned parameters of longitudinal growth in two benthoplanktophagous fish *(A. brama* and *C. auratus gibelio)* and two ichthyophagous fish *(E. lucius* and *S. lucioperca).*

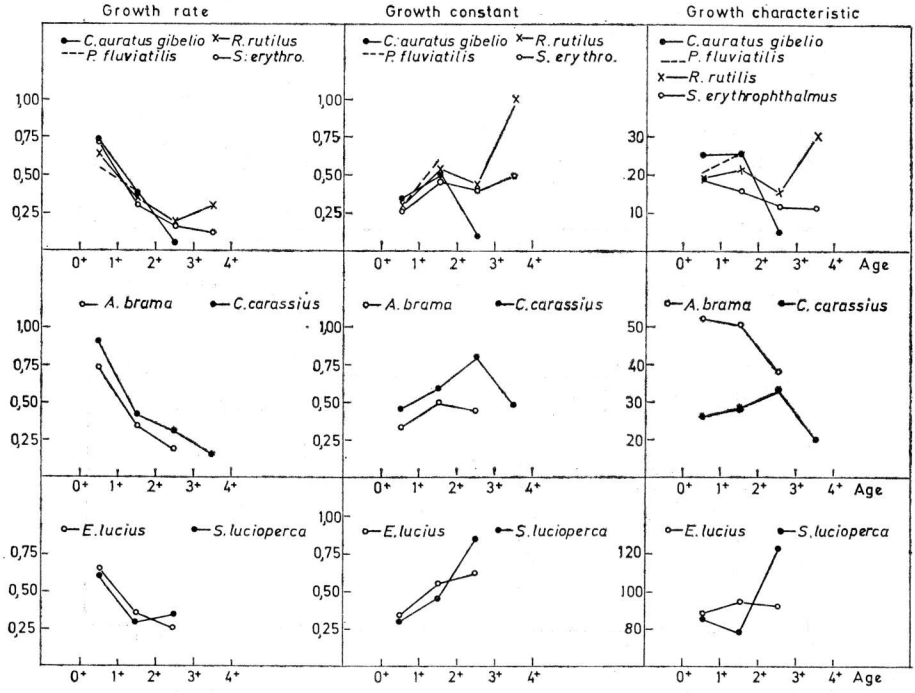

Fig. 3 Growth rate, constant and characteristic of fish

C. auratus gibelio samples caught in 1987 leged considerably behind samples caught in 1983 and 1984., with respect to longitudinal growth mean values (difference between two last samples in certain age categories was insignificant).

Eventhough sample from 1987 showed higher growth rate, compared to samples collected before that time, differences were insignificant. On the other hand, growth constant and characteristic leged considerably behind in most recently collected samples, thus again explaining the position of this subspecies population in this water basin. The growth of *A. brama* sample, caught in 1987 was more satisfactory compared to samples collected in the previous years (1979—1982). This was related to values at age 2+ and 3+ and was based on the rate and growth characteristic. Growth constant was also manifested with higher values for the same sample in different age groups and uniformity without great fluctuations. Better longitudinal growth was also recorded for *E. lucius* and *S. lucioperca* ichthyophagous species, analysed in 1987., when compared to the same species in the Mrtva Tisa, collected eight to ten years before that. In both species, after the first two years of life with approximately the same standard length values, sudden rise in the growth intensity was manifested, with further increase in the following two year period with considerable difference.

Rate values and growth characteristics indicated constant increasing tendency, compared to previously fished samples, in which these parameters varied either as flactuations *(E. lucius)*, or decreasing tendency *(S. lucioperca)*.

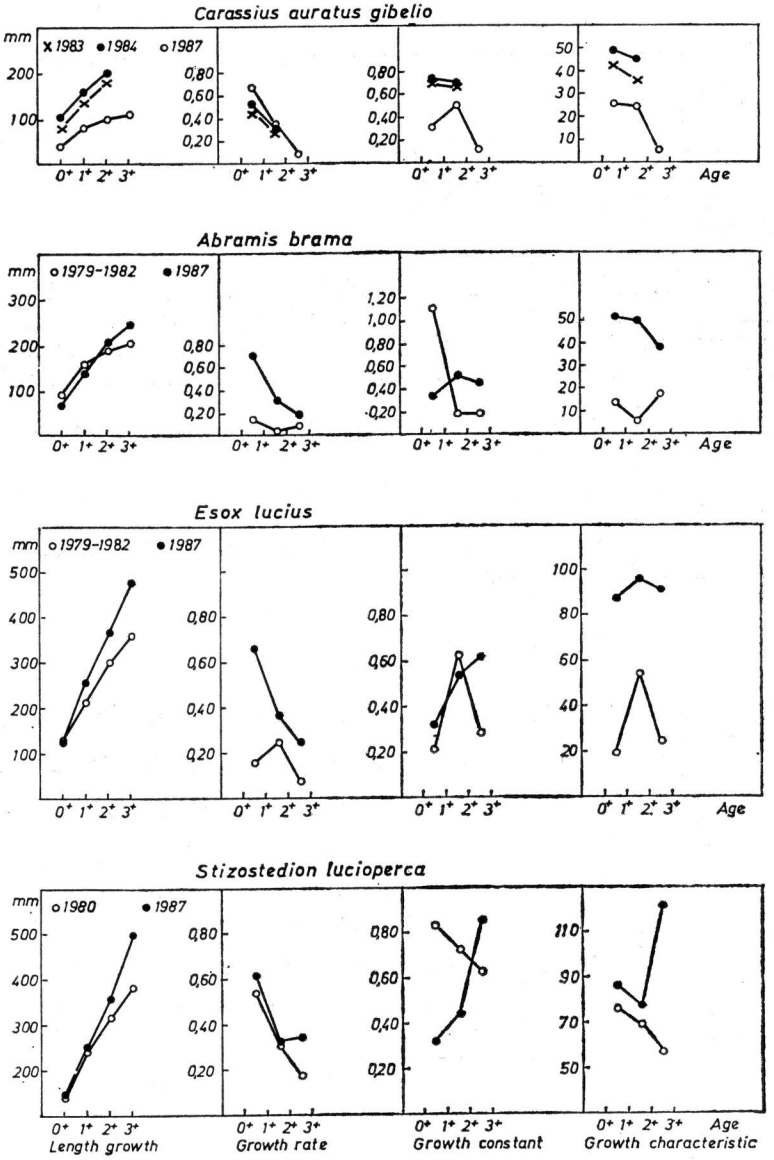

Fig. 4 Some length growth parameters of fish during eutrofic status (Period 1979—1987)

Body mass and longitudinal growth of these fish of pray, caught in the Mrtva Tisa during 1987 had values similar to those stated by HARKA (1983) for *E. lucius*, or even surpassed them (for *S. lucioperca*, HARKA 1977) of Hungarian Tisa section. It would be interested to compare the growth results of *S. lucioperca* from the Mrtva Tisa with recent data of this fish from the middle Tisa basin, in order to evaluate a trophic level in this part of the river flow.

Conclusion

Based on the growth analysis of 8 fish species in the Mrtva Tisa — Biserno Ostrvo Lake, belonging to different types of nutrition (planktophagous, planktobenthophagous, and ichthyophagous) it may be concluded that the best growth was manifested by *R. rutilus, A. brama, E. lucius* and *S. lucioperca.*

P. fluviatilis and *S. erythrophthalmus* species showed good body mass and longitudinal growth, while *C. carassius* and *C. auratus gibelio* in particular, as typical representatives of benthophagous fish manifested modest growth results in this ecosystem. The growth of fish of pray, living in two different living space is particularly impressive. This confirmed that in addition to sufficient quantities of food, these ichthyophagous fish were adopted to other environment conditions. Out of four species used for comparing the growth among samples caught in 1987 and five to ten years before that, only *C. auratus gibelio* showed slower growth during the surveyed period.

Samples of other three species *(A. brama, E. lucius,* and *S. lucioperca)* caught in 1987 manifested better growth then earlier collected samples.

Such results may point to the inferior environment quality in the benthos zone, especially in the section with muddy bottom, compared to other zones, first of all with shallow sections and macrophyte vegetation (habitat of *E. lucius)*, or solid bottom (habitat of *S. lucioperca).*

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