

Morphologic Characteristics and Fulfilment of White Chub (*Leuciscus cephalus albus*) (*Osteichthyes, cyprinidae*) Digestive Tract

Marijana Krivokapic

*Faculty of Science and Mathematics, Department of biology, Podgorica
Montenegro, Yugoslavia*

Abstract: In this work morphologic characteristics of digestive tract were established, fulfilment, as well as relation between the length of digestive tract and standard body length. By analysing the food fulfilment of the white chub intestinal tract, it was established that this subspecies in Skadar Lake has intensive nutrition during the all four seasons. Research of relative tract length included both sexes, in the scope of five length groups.

Key words: *Leuciscus cephalus albus*, fulfilment, scale of fulfilment, digestive tract, intensive nutrition, zoophytophagus group.

Introduction

White chub (*Leuciscus cephalus albus*, Bonaparte, 1838) represents economical very important kind of cyprinid and very interesting sport fish in Skadar Lake. Because of the width of the living area, diffusion, the way of living, different methods of catch, because of greed, and all of it, in the conditions of growing number of devastating waters and reduced number of salmon species, white chub is considered important fish of future.

Considering the fact that published data, about this subspecies are analysed partially nutrition, detailed researches was needed.

Material and Methods of Work

In order to analyse the fulfilment of intestinal tracts, in total, were analysed for all four seasons, while in order to analyse the relation between the digestive tract and standard length of body, 106 samples of white chub were analysed, that is 106 digestive tracts. Amplitudae of length groups juvenile and adult forms of the analysed fish goes from 60 to 360 mm.

Conservation of digestive tract was done with the 4 % mixture of phor-mol. Fulfilment of intestinal tract was analysed according to scale:

- 1- empty intestinal tract;
- 1- 2-half-empty intestinal tract;
- 2- medium fulfilment intestinal tract;
- 2-3 - full intestinal tract;
- 3- completely fulfilment intestinal tract.

Results and Discussion

Morphologic characteristics of digestive tract. Morphology of digestive tract of white chub, as well as of many cyprinid kinds of fish, has very simple form. oral cavity continues into pharynx. The subspecies has only gill teeth, with teeth formula 5.2-2.5. Front part of digestive tract is wider, when compared to the middle and back part, where there is no clear transition, what would mean that esophagus and pharynx are not clearly differentiated.

In the total intestinal mass there are two curves of intestinal tract. White chub intestine is of middle stoutness, and it is not very elastic. It varies in relation to relative length and mass, and it depends on belonging to a certain age group.

In the process of food digestion, a big annex intestinal gland has a very important part: liver has a multiple function (deposition of glycogen; regulating of blood structure etc.); function of gall is emulsion of fat (dissolving of fat acids), and at the same time it stimulates peristaltic movements of intestines (Jankovic, 1965).

Concerning the fact that the white chub, according to its way of nutrition, belongs to omnivore group, with a great percentage of animal consumption when compared to vegetative component, it is included in the fish group with a shorter intestinal tract.

Fulfillment of intestinal tracts. By analysing the food fulfillment of the white chub intestinal tract, it was established that this subspecies in the Skadar Lake has intensive nutrition all along the year. Data in the Tab. 1.2.a and Figs. 1.2.A, 1.2.B, 1.2.C and 1.2.D show that the number of individuals with the empty intestines is very small, and that is during the spawn period of summer season (24.7%). Presence of individuals with intestinal tract which is between empty and half empty is 7.5%, and there is 29.0% of individuals with half-empty intestinal tract, what, with previously mentioned percentage (24.7%) of noted individuals with empty tract, makes more than 1/2 of unfatten up individuals (56.9

%) along this period. An adequate appearance connected to the spawn period, was noted and with other rinds of fish especially with salmonid ones (Stefanovic, 1948). High percentage of empty stomachs (44.74 %) during the spawn season for the *Leuciscus souffia* species (Risso, 1826) was established by Vukovic (1985).

Of all the caught individuals in the winter period, 41.9% of individuals, had complete fulfillment of intestinal tract, while the individuals with the empty intestinal tract in this season were not noted. Although, with some fish species from the Skadar Lake (Ivanovic, 1968) the weaker intensity of nutrition was noted, that is, some species don't even eat during the winter, chub, as omnivore and grasping subspecies posses "rich menu". Beside the above-mentioned facts, the nutrition of white chub during the winter period represents coordination of the subspecies with very mild and favorable temperature conditions, which exist in this typically cyprinid biotope.

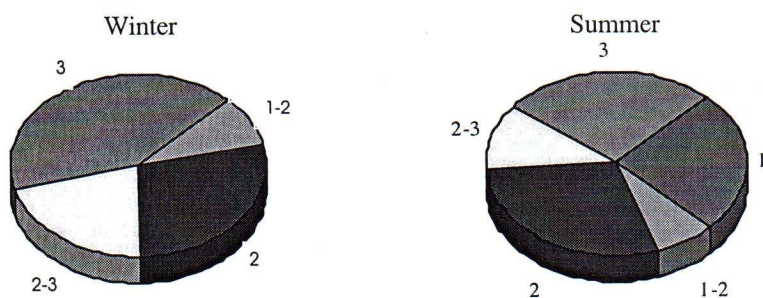


Fig. 1.2.A and 1.2.B. - Fulfilment of intestinal tract of white chub along the winter and spring period

Intensive nutrition all along the year for the introduced subspecies *Carrasius auratus gibelio* (Bloch, 1783) from the Skadar Lake, was established by Maric (1998). This way of nutrition, author explains by adaptation of the silver carp for the favorable climate conditions of the Skadar Lake Basin, which are present in the continental areas, which are usually populated by this species.

Stankovic - Trivunac (1981) explain that the competition of some *Cyprinid* kinds of fish of the Skadar Lake concerning nutrition in the winter period, is very expressed, that is, that the particularity in nutrition is extremely expressed.

In the summer season, 66.9% of the totally 139 analysed individuals, had almost full and completely full intestinal tract. In the autumn season, ratio of the given intestinal tract fulfillment is 78.3% (54.4% is fulfilled and 23.9%, almost fulfilled intestinal tract) what is in coordination to the increased intensity of nutrition in the post-spawn season.

Vukovic (1985) explained for *Leuciscus souffia agassizi*, that after the spawn had been finished (after the summer season) when this fish in full vegetative phase of life, a reached and more different contents was characteristics for the consumed food. In that period during the summer and autumn months, this species took increased amount of food in.

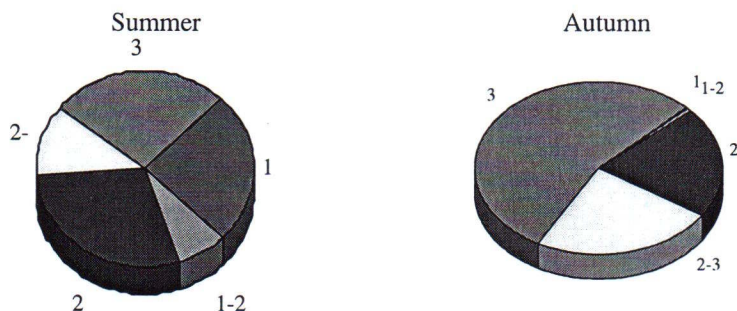


Fig. 1.2.B and 1.2.D - Fulfilment of intestinal tract of white chub during the summer and autumn period

Tab. 1.2.a - Fulfilment of intestinal tract of white chub along the seasons

Fulfilment of intestinal tract	Seasons			
	Winter (%); (n=43)	Spring (%); (n=93)	Summer (%); (n=139)	Autumn (%); (n=272)
1	0.0	24.7	2.2	0.4
1-2	9.3	7.5	11.5	0.7
2	27.9	29.0	19.4	20.6
2-3	20.9	11.8	36.0	23.9
3	41.9	26.9	30.9	54.4

Ratio of digestive tract length and standard body length. Examination of the relative tract length of the white chub included 106 analysed individuals, of both sexes, in the scope of five length groups.

The average value of the digestive tract length has the lowest value with youngest individuals (0^+) of the average value of the digestive tract length, expressed in percentages from the standard body length, also shows the highest value in the first group. The same fact was established for the endemic subspecies *Leuciscus souffia montenegrinus*, too, (Krivokapic, 1992) from the river Moraca.

Tab. 1.3.a - Ratio of the digestive tract length and standard body length

Length classes (mm)	Number of samples	The average value of the standard body length	The average value of the digestive tract length (mm)	The average value of the digestive tract length (mm) in percentages of standard length	Correlation
60.1-120.0	52	86.58	107.03	123.91	0.7232
120.1-180.0	9	147.57	169.11	114.75	0.9578
180.1-240.0	20	207.32	235.95	114.04	0.3347
240.1-300.0	17	271.43	291.47	107.44	0.8747
300.1-360.0	8	323.85	340.75	105.23	0.5207
					0.9829

In the next two groups certain increase of average digestive tract length is noted, and that is 169.11 mm for the individuals of the second length class, age 1⁺, and 207.32 mm, for the individuals of the third length groups, length class 2⁺. However percentage values of the second and third (114.75%), as well as, of the following two length groups, the fourth (107.4%) and the fifth (105.23%), of the length class 3⁺ to 5⁺, show slow decrease, instead of expected increase. Data show, that the changes of the analysed values, established in the older length classes, are not regular.

According to the results of researches, it can be concluded that in the younger growth classes, with the increase of body length, relative intestinal tract length is increased, too, what is manifested by the average value of correlation ($r=0.98$), with the exception of the older, that is, of the oldest established growth class, in which the ratio of the body length and the length of the intestinal tract, is more or less stabilised. Similar data were given by Vukovic (1985), and he supposed that the noted occurrence was related to the changes in the nutrition content, during the ontogenetic development of the fish, that is, with the increase of body dimensions.

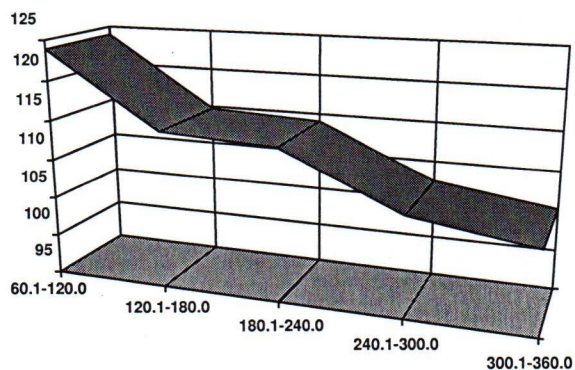


Fig. 1.4.A - Ratio of the digestive tract length and standard body length

The average value of the relative intestinal tract length of all the analysed individuals of 113.74 %. shows very well that the examined subspecies belongs to zoophytophaga group, in which the participation of the vegetable component in the nutrition is not very present.

The next element of the nutrition, as well as, the ratio between the length of intestinal tract and body length, for the chub from the river Turija (*Leuciscus cephalus macedonicus*) Ivlev & Dzineva (1974) according to the obtained results, put the chub in the zoophytophaga group.

Generally accepted opinion among the researches workers is that zoophaga fish, when compared phytophaga fish, have shorter intestinal tract (Nikolskij, 1950), so, according to the length of intestinal tract, too, conclusions on the nutrition of the certain species can be made (Maric, 1998).

Conclusions

Morphology of digestive tract of white chub, has very simple form. Part of front digestive tract is wider, when compared to the middle and back part. Esophagus and pharynx are not clearly differentiated.

Complete fulfilment intestinal tract in winter period had 41.9% of all caught individuals. Individuals with the empty intestinal tract in this season were not noted. In the summer season, 66.9% of analysed individuals had almost full and completely full intestinal tract. In the autumn season, ratio of the given intestinal tract fulfilment is 78.3%, what is in coordination to the increased intensity of nutrition in the post-spawn season. With the empty intestines, number of analysed individuals is very small, and that is during the spawn period of spring season. Individuals with intestinal tract between empty and half empty is 7.5%; with half empty intestinal tract was 29.0%;

In the younger growth classes, with the increase of body length, relative intestinal tract length increased too. In the oldest established growth class, ratio of the body length and the length of the intestinal tract is more or less stabilised.

Average value of the relative intestinal tract length, of all analysed individuals of 113.74% shows that examined subspecies belongs to zoophytophagus group, in which the participation of the vegetable component in the nutrition is not very present.

References

- Iliev, M., Dzineva, L. (1974): Odnos medju dolzinata na crevniot trakt i dolzinata na teloto kaj mrenata (*Barbus cyclolepis strumicae* i klenot (*Leuciscus cephalus macedonicus*) od rekata Turija, Skopje. Folia balcanica. Tom III, No. 4.
- Ivanovic, B. (1968): Ekologija *Alburnus albidus alborella* (Skadarskog jezera. Godisnjak Bioloskog instituta, Univerziteta u Sarajevu, 21:5-70.
- Jankovic, D. (1978): Kompetitivni odnosi u ishrani ekonomski znacajnih ciprinidnih vrsta riba u Skadarskom jezeru. Ekologija, serija D. Vol.13, No. 2 (111-120). Beograd, Srbija, Yu.
- Krivokapic, M. (1992): Ishrana endemicne podvrste jelsovke *Leuciscus souffia montenegrinus* (Vukovic, 1963) iz rijeke Morace (Crna Gora, Jugoslavija). Glasnik Republickog zavoda zastite prirode - Prirodnjackog muzeja u Podgorici, 25, 93-103.
- Maric, D. (1998.): Adaptacija introdukovanog srebrnog krasa (*Carassius auratus gibelio* Bloch, 1783) u Skadarskom jezeru. Doktorska disertacija. Krajujevac, 1998 (1-252).
- Stankovic, Đ., Trivunac, M. (1981): Food and age of *Leuciscus cephalus albus* in Lake Skadar. The biota and Limnology of Lake Skadar (1-468). Totograd, Montenegro.
- Vukovic, N. (1985): Ekoloske i biosistematske karakteristike *Leuciscus souffia* Risso, 1826 iz gornjeg toka rijeke Drine. Doktorska disertacija. PMF, Sarajevo.

**MORFOLOŠKE KARAKTERISTIKE I ISPUNJENOST
DIGESTIVNOG TRAKTA BIJELOG KLIJENA
(*LEUCISCUS SOUFFIA MONTENEGRINUS*)
(*OSTEICHTHYES, CYPRINIDAE*)**

-originalni naučni rad-

Marijana Krivokapić

Prirodno-matematički fakultet, Odsek za biologiju, Podgorica

Rezime

U ovom radu analizirane su morfološke karakteristike digestivnog trakta, ispunjenost, kao i odnos dužine digestivnog trakta i standardne dužine tijela. Analizom ispunjenosti hranom, utvrđeno je da se ova podvrsta u Skadarskom jezeru, intenzivno hrani tokom cijele godine.

Proučavanje relativne dužine digestivnog trakta bijelog klijena obuhvatilo je jedinke oba pola, u okviru pet dužinskih grupa. Srednja vrijednost relativne dužine crijevnog trakta svih analiziranih jedinki od 113.74 %, pokazatelj je da ispitivana podvrsta pripada grupi zoofitofaga, kod kojih učešće biljne komponente u ishrani nije naročito zastupljeno.