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DIET OF PRUSSIAN CARP (CARASSIUS AURATUS GIBELIO BLOCH) IN THE CARSKA BARA

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Abstract

Diet of Prussian carp, introduced from the waters of the Far East was studied on 209 specimen, collected in spring and summer period of 1984—1985. Analyzed exemplars were 113—248 mm of standard length, 42—415 g of body mass and 2—5 years of age. Their diet consisted of both plant and animal components. The diet contained the following algae: Cyanobacteria, Diatomophyta, Euglenophyta and Chlorophyta. Parts of makrophyta were also present. Animal component consisted of Rotatoria, Cladocera, Copepoda, Oligochaeta, Chironomidae and some other larvae of insects, not precisely defined. The highest frequency was noted for Cladocera and Copepoda (100%), followed by Rotatoria (90% in spring time, 80% in summer time) and Oligochaeta (75%/85% respectively). Diatomorphyta (80/90%) were the most frequent amon algae. As regards relative abundance these groups would also play a significant role in Prussian carp diet. However, if the biomass of aforementioned organisms was taken into consideration, Oligochaeta, Cladocera and Copepoda had the highest incidence. Similar results were obtained when other water Ecosystems in Vojvodina were investigated, eventhough differences related to food availability were noted.

Introduction

Lately, Prussian carp (*Carassius auratus gibelio* BLOCH) has become a subject of many studies in Vojvodina (BUDAKOV et *al.* 1979; MALETIN et *al.* 1979, PUJINET BUDAKOV 1979, MALETIN et *al.* 1981, MALETIN et BUDAKOV 1982, 1983, BUDAKOV et *al.* 1983, 1983a and KOSTIĆ 1985). The main reason for this interest is its presence in many water system, where it reaches high population density, eventhough it was introduced to our waters from the Far East at the middle of this century. It is constantly present in the Carska Bara. The objective of this study was to investigate the food composition of this type of fish within the complex ecological studies, with special reference to available supply.

Materials and Methods

Material used to investigate Prussian carp diet in Carska Bara was collected in spring April and summer June, July period in the course of 1984/85. The analysis encompassed 209 specimens, 113—248 mm of standard length, 42—415 g of body mass and 2—5 years of age. Complete intestine tract was observed and 1 cm^3 of the content from various regions of the intestine tract was analyzed. With this procedure 5 cm^3 of each sample was analyzed. On the basis of examined contents, the frequency of individual components expressed in percentage along with relative abundance in percentage was defined. This was based on numerical availability of components in the analyzed intestine contents.

Results and discussion

Both plant and animal components were found in the analyzed intestine contents. The following algae were present: Cyanobacteria, Diatomophyta, Euglenophyta and Chlorophyta. Parts of makrophyta were also detected. Animal organisms found were: Rotatoria, Cledocera, Copepoda, Oligochaeta, Chironomidae, as well as some other larvae of insects which were not precisely defined.

All analyzed intestine contents were filled with food, thus indicating nutrition intensity in the investigated period. Diet spectrum was very diversified (Table 1).

In spring the incidence of Diatomophyta species was the highest, while in summer period Chlorophyta species were in greater number. Other groups of algae were present only with few species. Analysing this portion of nutrition spectrum with qualitative content of phytoplancton in the same period, reflection of food offered and its use can be noted. This, however, does not appy to all algae species. Some species are found in pond, but not in any intestine content. This applies specificly to algae appearing only in certain periods such as Chrysophyta, Xanthophyta and Pyrrophyta (PUJIN et *al.* 1985).

Only 12 species of Rotatoria were found in the qualitative composition of the animal diet component, eventhough their number in pond is considerably greater. Their incidence in summer period is greater than in spring, which again suits their dynymics in the pond. It is worth mentioning that some Rotatoria appears in abundance in the pond, while no trace was noted in the intestine content *(Lecane quadridentata, Mytilina mucronata)*. Cladocera and Copepoda species are found both in the pond and intestine content. This especially to *Chydorus sphaericus,* constantly present in the intestine content and very often in high number. Similar Prussian carp diet spectrum was found in other water ecosystem in Vojvodina, eventhough some differences were noted. In Mrtva Tisa, for example, few Diatomophyta species (2) were found, in Jegrička (13) and in Koviljski rit (22) (PUJIN et *al.* 1985a).

Contrary to algae, content of animal component was rather similar in these studies. Aforementioned components in the analyzed intestine content were found in different frequencies. Only Cladocera and Copepoda (frequency 100%) were present constantly in all analyzed contents. Diatomophyta, Rotatoria and Oligochaeta were also present with high frequency. Other groups were found only in few numbers in intestine content (Fig. 1).

The abundance of species present in intestine content varied. In spring time, for example, Rotatoria recorded the highest relative abundance (40%), Oligochaeta and Copepoda (30%) and Diatomophyta (20%). In summer time relative abundance of Cladocera reaches 50%, Copepoda 20% and Oligochaeta 10% (Fig. 2).

Eventhough reconstruction in relation to biomass of stated components was not conducted, it is known that Rotatoria and algae regardless of their presence in large numbers leg behind Cladocera, Copepoda and especially Oligochaeta in the biomass. Therefore a conclusion could be drown on the basis of analyzed contents, that the main components in Prussian carp diet are Oligochaeta, Cladocera and Copepoda. Other components with higher frequency and relative abundance could be considered as complementary and those with low frequency and relative abundance as accidental. Similar results were obtained with studies conducted in other ecosystems in Vojvodina. The frequency of Oligochaeta in Jegrička was 27,5%, in Mrtva Tisa 49% and in Koviljski rit 44%. Differences in relative abundance were also noted (PUJIN et *al.* 1985a). These differences, however do not change the picture about the main com-

Table 1. *Spectrum of nutrition of Prussian carp (Carassius auratus gibelio* BLOCH) *in Carska bara*

Species	Spring	Summer
Cyanophyta (Cyanobacteria)		
Microcystis flos-aque		+
Oscillatoria sp.	+	
Bacillariophyta (Diatomophyta)		
Cymatopleura solea		+
Fragilaria crotonensis	+	+
Navycula ctyptocephala	+	+
N. cuspidata	+	
N. rhynchocephala	+	
Nitzschia sigmoidea	+	
N. palea	+	
Melosira granulata	+	
M. varians	+	+
Synedra acus	+	+
S. ulna	+	+
Euglenophyta		
Euglena spiroides		+
E. viridis		+
Phacus pleuronectes	+	
Chlorophyta		
Coelastrom microporum		+
Closterium moniliferum	+	
Eudorina elegans		+
Pandorina morum	+	+
Pediastrum borianum	+	+
P. duplex		+
P. simplex		+
Scenedesmus acuminatus	+	+
S. obliquus		+
S. quadricauda		+
Makrophyta		+
Rotatoria		
Asplanchna brightwelli		+
Brachionus angularis	+	+
B. calyciflorus		+
B. diversicornis		+
B. quadridentatus cluniorbicularis	+	+
Epiphanes senta		+
Keratella cochlearis	+	+
K. cochlearis tecta	+	+
K. quadrata		+
Polyarthra euryptera		+
P. vulgaris		+
Rotatoria rotatoria		+
Cladocera		
Alona costata		+
A. quadrangularis		+
Bosmina longirostris	+	+
Chydorus sphaericus	+	+
Daphnia longispina		+
Diaphanosoma brachyurum		+
Copepoda		
Acanthocyclops vernalis	+	+
Cyclops vicinus		+
Eudiaptomus gracilis		+
Oligochaeta	+	+
Chironomidae	+	+
Other Insects		+

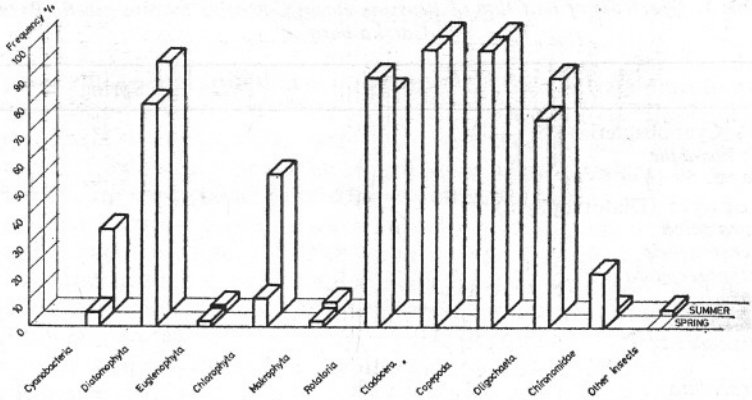

Fig. 1. Frequency of the food components (%) of Prussian carp (*Carassius auratus gibelio* BLOCH) in Carska bara

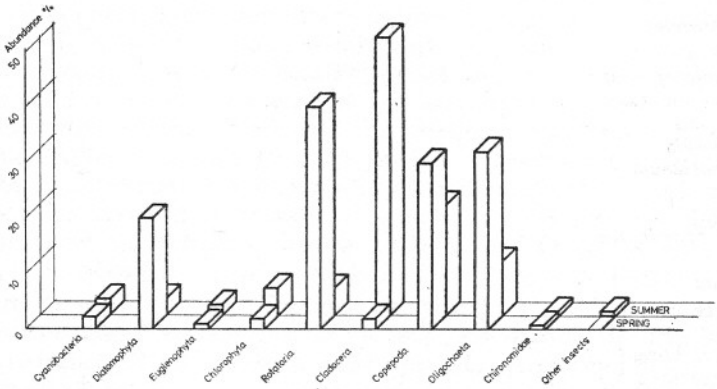

Fig. 2. Relative abundance of the food components (%) of Prussian carp (*Carassius auratus gibelio* BLOCH) in Carska bara

ponents in Prussian carp diet, but are related to the immediate food supply in aforementioned ecosystems.

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Az ezüst kárász (Carassius auratus gibelio Bloch) táplálkozása a Carska bara-ban

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Kivonat

A szerzők az 1984—85 év tavaszán és nyarán gyűjtött 209 ezüst kárász egyeden végeztek táplálkozásbiológiai vizsgálatot. A 2—5 éves korosztályú példányok nagysága 113—248 mm, tömege pedig 42—415 g között oszlott meg. Táplálékukat növényi és állati eredetű komponensek képezik. A *Cyanobacteria, Diatomophyta, Euglenophyta* és *Chlorophyta* algákon kívül makrofita elemek is jelen vannak. Az állati eredetű táplálékot a: *Rotatoria, Cledocera, Copeopoda, Oligochaeta, Chironomidae,* valamint egyes rovarok lárvái tették ki.

Az előkerült táplálék gyakorisága különböző volt: a *Cladocera* és *Copepoda* 100%, a Rotatoria 90% tavaszi és 80% nyári, valamint az *Oligochaeta* 75%, illetve 85%. Az algák közül a *Diatomophyta* gyakorisága a legnagyobb (80%, 90%),így a viszonylagos abundancia alapján a legnagyobb jelentőséggel bírnak. Azonban a nevezett szervezetek tömegét véve figyelembe, az *Oligochaeta,* majd a *Cladocera* és *Copepodá*-k kerülnek előtérbe az ezüst kárász táplálkozásában. Vajdaság más vízi ökoszisztémáiban is hasonlóak az eredmények. Az észlelt különbségek a rendelkezésre álló táplálékkal vannak összefüggésbe.

Ishrana srebrnog karaša (Carassius auratus gibelio Bloch) u Carskoj Bari

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Abstrakt

Na 209 primeraka srebrnog karaša, sakupljenih u proleće i leto 1984—1985. godine, analizirana je ishrana ove vrste ribe, unesene iz voda Dalekog Istoka. Analizirani primerci su bili standardne dužine 113—248 mm, mase tela 42—415 g i 2—5 godina starosti. U sastavu hrane bile su zastupljene kako biljne, tako i životinjske komponente. Od algi u sastavu hrane bile su prisutne: Cyanobacteria, Diatomophyta, Euglenophyta i Chlorophyta. Bilo je prisutnih i delova makrofita. Životinjska komponenta se sastojala od Rotatoria, Cladocera, Copepoda, Oligochaeta, Chironomidae i još nekih

larava insekata, koje nisu detaljnije determinisane. Najveću frekventnost su imale Cladocera i Copepoda (100%), a zatim dolaze Rotatoria (90% u proleće, 80% u leto) i Oligochaeta (75, odn 85%). Medju algama najfrekvantnije su bile Diatomophyta (80, odn. 90%). Po relativnoj abundanci ove grupe bi takodje imale najznačajniju ulogu u ishrani srebrnog karaša. Medjutim, ako uzmemo u obzir masu navedenih organizama, onda bi prvo mesto zauzimale Oligochaeta, zatim Cledocera i Copepoda. Slični rezultati su dobijeni ispitivanjima u drugim vodenim ekosistemima u Vojvodini, iako su uočene i razlike koje su u vezi sa raspoloživom hranom.

Питание серебристого карася (Carassius auratus gibelio Bloch) в Царска баре

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Резюме

Авторы проводили исследования биологии питания 209 особей серебристого карася, собранных весной и летом 1984—1985 годов. Длина особей в возрасте 2—5 лет находилась в пределах 113—248 мм, их масса — в пределах 42—415 г. Их пища состояла из компонентов растительного и животного происхождения. Кроме водорослей Cyanobacteria, Diatomophyta, Euglenophyta Chlorophyta имелись в наличии макрофильные элементы. Пищу животного происхождения составляли Rotatoria, Cladocera, Copepoda, Oligochaeta, Chironomidae и личинки некоторых насекомых.

Распространенность определенного вида пищи была различной: у Cladocera и Copepoda 100%, у Rotatoria весной 90%, летом 80%, у Oligochaeta соответственно 75% и 85%. Чаще всего обнаруживалась из водорослей Diatomophyta (80—90%), таким образом, исходя из относительной абунданции, они имеют наибольшее значение. Однако, с учетом массы указанных организмов, в питании серебристого карася преобладают виды Oligochaeta, а также Cladocera и Copepoda. Такие же результаты получены и в других экосистемах водоемов Воеводины. Установленные различия зависят от имеющейся пищи.