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Species Composition of Algae in the Food Tract of Common Silver Carp (*Hypophtalmichthys molitrix* vab.) in Growing Conditions

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Abstract:
Recently, herbivorous fish, such as common silver carp and grass carp, have been successfully introduced into the water bodies of Uzbekistan. This is extremely important for obtaining additional fish products by using the plant part of the natural forage base of water bodies. However, for the successful completion of this task, a detailed study of the compliance of environmental conditions with the development needs of these fish in our reservoirs, as well as the condition of the food supply for them is necessary. It is also necessary to know the extent to which the new settlers eat the available feed base.

Keywords: Silver Carp, Intestinal Tract, Algae, Phytoplankton.

INTRODUCTION

An important place of herbivorous fish in aquaculture is due to their diet, a positive effect on the ecosystem of water bodies, which allows optimizing the composition of artificial and natural ichthyocenoses (Prokopkin, 2009). In this regard, the introduction of fish in the Samarkand region of the Republic of Uzbekistan was associated with the solution of important problems - increasing the fish productivity of ponds due to a more complete use of pond food resources and obtaining high-quality fish products is provided by their ability to efficiently utilize primary products, is not used by carp, turning it into valuable ichthyomas (Pilipenko, 2002). Considering the nutritional characteristics of herbivorous fish, their use for biomelioration is the most effective for reducing the area th overgrowing and "bloom" of water. This article presents the results of a study of the contents of the intestinal tracts of a significant number of specimens of common silver carp introduced by larvae in 2017 in the ponds of the Payarik fish farm in the Samarkand region.

Purpose of the study to identify the composition of the algae flora of the alimentary tract of the white silver carp of fish ponds in the Samarkand region of the Republic of Uzbekistan.

MATERIAL AND METHODS

Ponds Payaryk fish farm is located in the southwestern part of Samarkand region. The area is about 122 hectares. Used for 25 years. In the fish farm, herbivorous white carp is introduced. The catch of fish was carried out using nets and net. The species composition, distribution and development of algae have been well studied by Y. Tashpulatov in different years (Tashpulatov, 2018; Tashpulatov & Kobulova, 2020). The collection of material began in 2018 in the second year of life of these fish and continued until September 2019 inclusive. During the study, 118 specimens of fish intestines were studied, which were captured in different seasons of 2018-2019. To analyze fish for food, the absolute length (*L*) and weight (*Q*) were pre-measured. The gastrointestinal tract was fixed with 2% formalin. The degree of filling the gastrointestinal tract with food was determined on a six-point scale: 0 -

empty, 1 - singly, 2 - low filling, 3 - medium, 4 - a lot (full stomach-intestines), 5 - weight (extended). At this time, the temperature of water and air, transparency, pH are also determined (Borutsky, 1955; Kirillov, 2002; Romanov, Petlina & Babkina, 2012). To determine the species quantity, a Carl Zeiss microscope was used. The species composition was determined using determinants (Gollerbah & Polyanskiy, 1951; Zabelina, Kiselev, Proshkina-Lavrenko & Scheshukova, 1951; Muzafarov, Ergashev & Khalilov, 1987, 1988a, 1988b; Ergashev, 1979; Khalilov, Shoyakubov, Temirov & Kozirahimova, 2009).

RESULTS AND DISCUSSION

Planktonic algae are the main food source for silver carp in the water bodies of the Samarkand region. The occurrence of phytoplankton in the intestines we studied was 100%. In the food spectrum of 45 specimens of white silver carp we examined, 102 species and varieties of planktonic algae were found, of which Cyanoprocaryota - 8, Bacillariophyta - 14, Chrysophyta - 1, Dinophyta - 1, Euglenophyta - 27, Volvocophyceae - 3, Chlorophyta - 45 and Desmidiales. The same ratio of diversity of the main groups of planktonic algae is also characteristic of our ponds, including the ponds of the Payaryk fish farm, where the studied fish are grown. The prevailing variety of algae groups in the silver carp diet were protococcal and euglenae algae. These groups also prevail in the phytoplankton of most of our ponds.

In relation to biomass, the dominant groups of algae in the food spectrum of silver carp were euglena and blue-green, often causing intense “bloom” of water in our ponds. Only at the beginning of September 2018, the diatom *Cyclotella meneghiniana* prevailed in the food spectrum of silver carp, the average weight of which in the intestines exceeded 8g (Table 1). In the intestines of individual fish specimens, the weight of diatoms for this period was about 16g. Or 91% of the weight of the food lump.

Table 1: The change in the composition of food in the white silver carp by years

Food Lump Components	**2018 year**			**2019 year**				
	VI	**VIII**	**IX**	**V**	**VI**	**VIII**	**IX**	**XII**
Average weight of fish, g	58	182	381.5	455	350	597	523	359
Lump weight, g	3.5	9.5	19.2	17	8	25	29	3,2
Average filling index, %	563	524	428	376	221	421	556	89
The ratio of the weight of algae to the weight of the food lump, %	7.3	2	46	14	7	1,4	1,6	0,3
Algae								
Cyanoprocaryota	0.04	0.03	0.03	0.02	0.03	0.07	0.07	0.0003
Bacillariophyta	0.001	0.02	8.02	—	0.06	0.03	0.02	0.0005
Euglenophyta	0.26	0.10	2.54	1.82	0.28	0.16	0.03	0.0002
Chlorophyta	0.005	0.01	0.05	0.40	0.07	0.04	0.03	—
Total algae, g	0.30	0.19	9.58	2.37	0.53	0.32	0.35	0.01

Note that in the food spectrum of silver carp caught at the end of September, diatoms were noticeably inferior in weight to the same euglenas and blue-green algae. In the intestinal tracts of fish caught in April, the species composition of phytoplankton was very poor, and the average weight of algae in the food coma did not exceed 0.038 g on average, with fluctuations in individual specimens from 0.011 to 0.064g with an average weight of fish of 1317g. that the weight of zooplankton in the food coma reached its maximum precisely at this period - 0.047g. Euglena were the dominant algae in the silver carp feeding spectrum in spring. In May, the number of algae species in the food spectrum of silver carp increases markedly, and species such as *Scenedesmus quadricauda*, *S. bijugatus, S. arcuatus* var. *platydiscus*, *Crucigenia quadrata* from protococcal become its integral part and dominant in the number of individuals. With respect to biomass, in May 2019, euglena algae clearly prevailed on average 1.824, mainly due to species such as *Euglena acus, E. texta, E. oxyuris, Stromobmonas acuminata* var. *verrucosa*, *Trachelomonas intermedia, Phacus orbicularis*, etc. The total weight of algae in May 2018 in the intestines of fish averaged 2,371g or 14% of the total weight of the food lump with an average weight of fish of 455g. In May 2019, the average weight of algae in the food lump was 23.475g, or 46.2% of its total weight.

Note that in the intestines of individual specimens the amount of algae reached 46.388g, or 91% of the weight of the food coma. The weight of the fish in this case did not exceed 1500 g. The predominant group of algae in the food of silver carp in May 2019 were blue-green, mainly *Oscillatoria* sp., Whose weight averaged 22.237g with fluctuations from 0.122 to 44.352g in the food lump at the index of intestinal fillings according to Zenkevich 24-321%. It is worth noting that the same kind of blue-green algae prevailed in the food of silver carp in July of that year. Their maximum weight in this case was 27g with a total weight of algae in the intestines of 28g and fish weight of 1800g. In June, the amount of algae in the food spectrum of silver carp is insignificant. This is due to the fact that during this period a noticeable decline occurs in the development of phytoplankton in water bodies of the Samarkand region, associated with deterioration in meteorological and hydrological conditions. The main part of the food coma during this period consisted of silt particles and oilcake. The predominant place among the algae in the intestines of silver carp caught in June was occupied by *Scenedesmus quadricauda, S. acuminatus, Coelastrum sphaericum, Cyclotella* sp., *Synedra ulna*, species *Euglena, Phacus, trachelomonas*, and the most common blue-green species were *Merismopedia tenuissima*. All these species by this time are dominant in the phytoplankton of ponds.

In July, August and especially in September, a blue-green alga - *Aphanizomenon flos-aquae* - begins to massively develop in phytoplankton and, as a result of this; it also becomes dominant in the food lumps of silver carp. So, for example, in September 2019, the weight of this alga together with *Microcystis aeruginosa*, as can be seen from the Table 1, averaged 2,338 g. And in individual intestines, their weight reached 4,672 g with an average weight of 3,000 g. All this suggests that, in any case, the white silver carp indiscriminately ate all types of algae found in plankton in the reservoirs we studied. Mass species of phytoplankton are always dominant in the food spectrum of the fish studied by us.

It was not possible to detect any selectivity of silver carp to certain types of algae, and indeed it hardly exists. In winter, according to observations conducted in December 2019, the weight of algae in the intestines of fish did not exceed 10 mg. The diversity of algae in the winter feeding spectrum of silver carp was only four species: *Lobomonas denticulata, Cyclotella sp., Trachelomonas sp*. and *Oscillatoris sp.* Note that phytoplankton in these ponds was extremely poor in winter, and the species indicated here are characteristic for them during this period. Thus, the change in the feeding spectrum of silver carp by season depends entirely on the seasonal changes in phytoplankton in the ponds. This position is also confirmed by a change in the filling index, which reaches the maximum values during the period of mass development of phytoplankton (Table 2).

Table 2: List of algae found in the intestines of common silver carp and their percentage of occurrence

Algae	Occurrence %	Algae	Occurrence %
Cyanoprocariota		**Chlorophyta**	
Daclylococcopsis irregularis G. M. Smith	2	*Schroederia setigera* (Schroed) Lemm.	51
Merismopedia tenuissima Lenim	37	*Sch. spiralis* (Printz) Korschik.	2
Microcystis aeruginosa Kütz. emend. Elenk	22	*Lambertia ocellata* Korschik.	2
M. pulverea (Wood) Forti emend. Elenk	7	*Pediastrum boryanum* (Turp.) Menegh.	7
Gomphosphaeria lacustris Chod	14	*P. duplex* Meyen	4

Aphanizomenon flos-aquae (L) Ralfs	40	*Tetraedron caudatum* (Corda) Hansg.	4
Oscillatoria sp.	100	*T. minutissimum* Korchik	4
Romeria leopoliensis (Racib.) Koczw.	2	*T. incus* (Teiling) G. M. Smith.	2
Bacillariophyta		*Oocystis borgei* Snow	4
Melosira granulata (Ehr.) Ralfs	2	*Oocystis* sp	24
Melosira sp.	2	*Ankistrodesmus iongissimus* (Lemm.) Wille	20
Cyclotella meneghiniana Kütz	90	*A. acicularis* (A. Br.) Korschik.	40
Synedra actinastroides Lemn	2	*A. arcuatus* Korschik.	33
S. ulna (Nitzsch) Ehr.	9	*A. angustus* Born.	61
Rhoicosphenia curvata (Kütz.) Grun.	2	*A. falcatus* (Corda) Ralfs	4
Navicula sp.	20	*Hyaloraphidium rectum* Korschik.	15
Pinnularia sp.	2	*H. contorlum* Pasch. et Korschik.	4
Caloneis amphisbaena (Bory) Cl.	2	*H. contortum* var. *tenuissiimum* Korschik.	4
Gyrosigma sp.	2	*Kirchneriella obesa* (West) Schmidle	20
Nitzschia acicularis W. Sm.	4	*K. lunaris* (Kirchn.) Moeb.	9
N. reversa W. Sm.	3	*Dispora crucigenioides* Printz.	2
Nitzschia sp.	50	*Dictyosphaerium pulchellum* Wood.-D.	11
Surirella ovata Kütz.	14	*Coelastrum sphaericum* Naeg.	13
Chrysophyta		*C. microporum* Naeg.	16
Goniochloris fallax Fott	7	*Crucigenia apiculala* Schmidle	15
Dinophyta		*C. fenestrata* Schmidle	15
Glenodinium sp.	4	*C. tetrapedia* (Kirch.) W. et W.	37
Euglenophyta		*C. quadrata* Morren	4
Trachelomonas volvocina Ehr.	2	*Tetrastrum staurogeniaeforme* (Schroed.) Lemm.	4
T. intermedia Dang.	31	*T. glabrum* (Roll) Ahlstr. ef Tiff.	13
T. abrupta Swir.	19	*Actinastrum hantzschii* var. *fluviatile* Schroed.	9
T. planctonica Swir.	29	*A. hantzschii* var. *gracile* Roll	33
T. asymmetrica Roll.	15	*Scenedesmus obliquus* (Turp) Kütz.	7
T. bernandinensis W.Vischer	4	*S. acuminatus* (Lagerh.) Chod.	64
Trachelomonas sp.	80	*S. acuminatus* var. *biseriatus* Reinh	23
Strombomonas acuminata var. *verrucosa* Teod.	15	*S. acuminatus var. elongatus* Smith	7
S. deflandrei (Roll) Defl.	2	*S. bijugatus* (Turp.) Kütz.	33

S. fluviatilis (Lemm.) Defl.	11	*S. arcuatus* var. *platydiscus* Smith.	7
S. treubii (Wolosz.) Defl.	2	*S. apiculatus* (W. et W.) Chod	2
Euglena polymorpha Dang.	2	*S. brasiliensis* Bohl	2
E. spathirhyncha Skuja	4	*S. quadricauda* (Turp) Breb	73
E. texta (Duj.) Hübner	24	*S. quadricauda* var. *eualternans* Proschk.	2
E. vermicularis Prosch. Lavr.	2	*S. opoliensis* Richt	9
E. acus Ehr.	73	*S. opoliensis* var. *alatus* Deduss.	2
E. oxyuris Schmarda	25	*S. protuberans* Fritsch.	17
Euglena sp.	40	**Desmidiales**	
Lepocinclis ovum (Ehr.) Mink.	2	*Closterium acicularis*	2
Lepocinclis sp.	7	*Closterium* sp.	26
Phacus curvicauda Swir.	22	*Cosmarium* sp.	2
Ph. arnoldii Swir.	29		
Phacus pleuronectes (Ehr.) Duj.	4		
Ph. orbicularis Hübner	29		
Ph. longicauda (Ehr.) Duj.	4		
Ph. longicauda var. *tortus* Lemm.	9		
Phacus sp.	33		
Volvociphyceae			
Lobomonas denticulata Korsch.	4		
Phacotus coccifer Korsch.	11		
Pandorina morum (Müll.) Bory	4		

CONCLUSION

The fact that the silver carp uses all types of algae found in plankton as food, reveals the wide possibilities for the further introduction of these valuable fish species into the water bodies of the Samarkand region, the phytoplankton of which is exceptionally rich in both qualitative and quantitative terms.

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