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A FOOD STUDY OF CATOSTOMUS COMMERSONNII FRY FROM FIRST CHAMCOOK LAKE, N.B., CANADA.

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A FOOD STUDY OF CATOSTOMUS COMMERSONNII FRY FROM FIRST CHAMCOOK LAKE, N.B.

by

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Part I

Though the common sucker Catostomus commersomii is one of the most widely distributed fresh-water fishes in North America, it has practically no sporting or commercial value, and therefore little attention has been paid to its biology. Many persons claim that suckers are harmful to other fishes as competitors or that they are destructive to spawn of other species and therefore should be destroyed. Attempts have been made to destroy in a wholesale fashion the sucker population of various waters. There are of course different opinions on this matter among ichthyologists.

The present paper deals with food of sucker fry only, and a considerable amount of time has been spent on the accurate determination of the feeding habits of the young stages of this fish in Chamcook lake and for the identification of as many species as was possible to the author. However, in order to understand wholly the food habits of this fish similar investigations are necessary in other waters.

It is hoped that the present account will be interesting for those who desire to study the biology of this species in the future.

The sucker fry are distributed in First Chamcook lake in shallow places to the depth of one metre, they prefer sandy or muddy bottom and have not as yet been found in other places during the summer. For the food study they have been captured by means of a small minnow seine and immediately preserved. The analyses of their stomachs show that probably no other fry are feeding on such a tremendous variety of organisms. They grow comparatively fast and attain at the end of the first summer a

length of about sixty millimetres. No empty stomachs were observed during the course of investigation.

Due to the small size of organisms which serve as food for sucker fry, it was found impossible to count accurately all the organisms, but it was found that some stomachs contained several hundred or even more small crustaceans mostly Rhynchotalona falcata. It seems also that sucker fry select certain groups of organisms and avoid others. Fo example, they prefer certain cladocerans to copepods and entirely avoid certain rotifers and algae which abound in their habitat. Though such species as Diaptomus minutus, Asterionella formosa, Synura uvella etc. are common in First Chamcook lake, they practically were not found in the alimentary tract of sucker fry.

The analyses of their stomachs show that sucker fry in Chamcook lake prefer the following groups. Among the crustaceans: Rhynochotalona falcata, Bosmina longirostris and certain ostracods as well as nauplii of Copepods; among the amoeboid protozoans; several species of Difflugia, Euglypha and others; among green algae practically all species of desmids occurring in the lake together with a few other minute algae as Pediastrum, Dictyosphaerium, etc. In all stomachs examined Botryococcus braunii has also been found. Blue-green algae do not play such an important role as the green. On the other hand diatoms expecially the bottom forms of Navicula, Stauroneis, Pinnularia, Surirella and many others play a very important role as food organisms for these fry. Insect larvae, with the exception of some very small Chironomidae, though they are very important for adult s suckers, seem to be taken but sparingly by the fry stage of this fish.

The results of analyses of the stomach content of sucker fry are expressed by means of the following table. The mark X indicates that the organisms have been found in the alimentary tract of fish. The organisms are figures in the plate under the same number as they are arranged in the table.

It is interesting to mention here that in spite of many plankton and bottom samples examined from Chamcook lake quite a large proportion of organisms which occur in the stomachs of sucker fry have not been observed in these samples.

CRUSTACEA

1. Acropterus harpae
2. Alona guttata
3. Alona sp.
4. Alonella nana
5. Bosmina longirostris
6. Canthocamptus minutus
7. Chydorus sphaericus
8. Cypris sp.
9. Daphnia pulex retrocurva
10. " longispina hyalina
11. Cyclops sp.
12. Diaptomus minutus
13. Eurycercus lamellatus
14. Holopedium gibberum
15. Hyalella knickerbockeri
16. Nauplii
17. Oxyurella sp.
18. Pleuroxus denticulatus
19. Pleuroxus hamulatus
20. Latona setifera
21. Rhynchotalona falcata

PROTOZOA

22. Arcella discoides
23. Cyphoderia ampulla
24. Difflugia acuminata
25. Difflugia corona
26. Difflugia lebes
27. Difflugia piriformis
28. Difflugia sp.
29. Centropyrix aculeata
30. Euglypha ciliata
31. Euglypha sp.
32. Lacquereusia modesta
33. Nebella sp.
34. Pseudodifflugia gracilis
35. Quadrurella simmetrica

ROTATORIA

36. Anapus ovalis
37. Anapus testudo
38. Cathypna luna
39. Colurus grallator

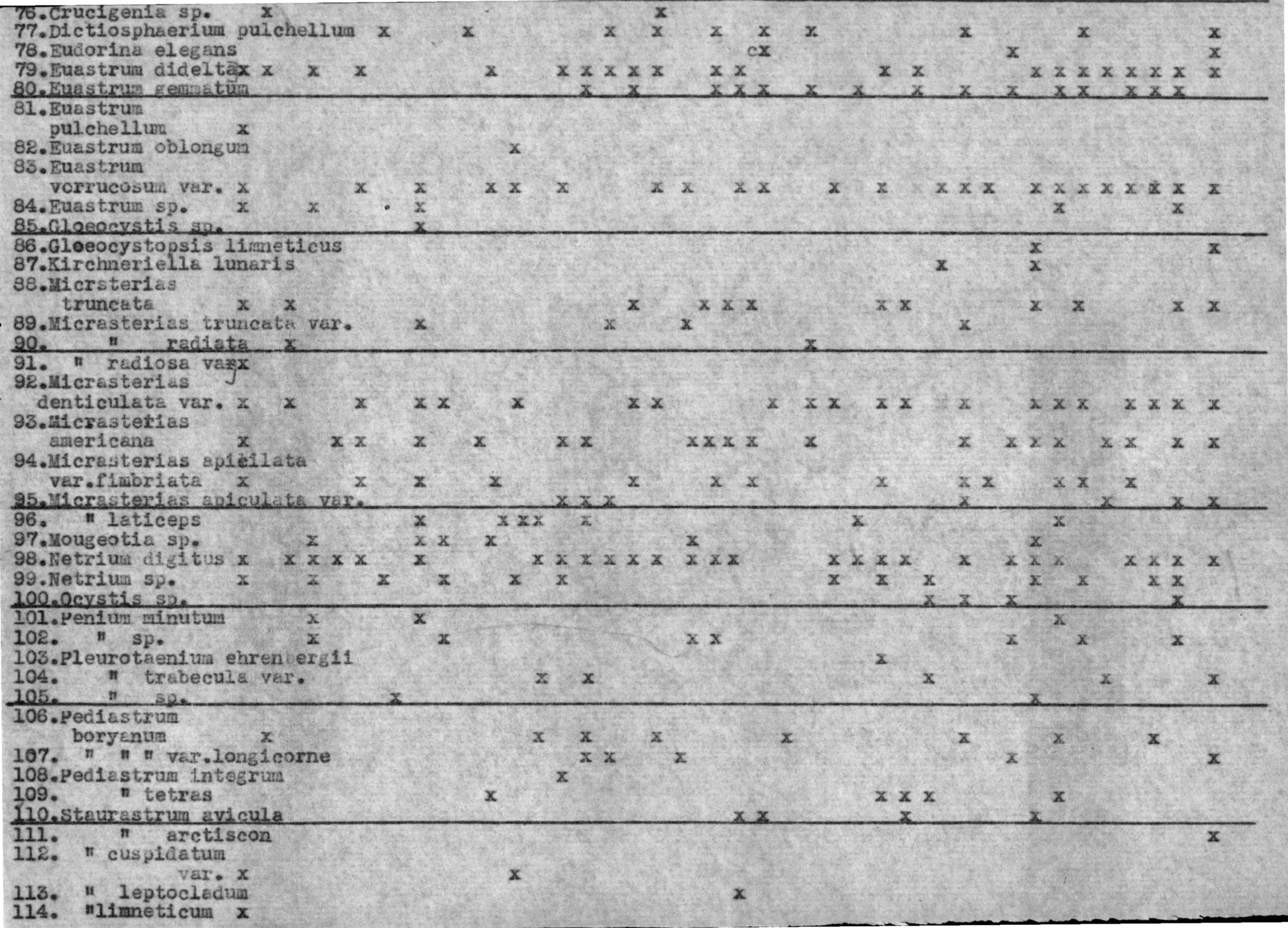
40. Colurus sp.
41. Anuraea cochlearis
42. Caloneis sp.
43. Diaschiza hpodi (?)
44. Diurella sp.
45. Diplois sp.
46. Diplax sp.
47. Diurella tigris
48. Dinochris pucillum
49. Dinocharis sp.
50. Monostyla lunaris
51. Monostyla sp.
52. Metopidia sp.
53. Notholca longispina
54. Notholca sp.(labis)
55. Polychaetus collinsii var.
56. Rattulus cylindricus
57. Rattulus latus
58. Rattulus longiseta var.
59. Rattulus rattus
60. Rattulus sp.

HETEROCONTAE

61. Botryococcus braunii

CHLOROPHYCEAE

62. Asterococcus limneticus
63. Characium sp.
64. Closterium moniliferum
65. Closterium sp.
66. Cosmarium contractum var.
67. Cosmarium botrytis
68. Cosmarium ovale var.
69. Cosmarium partianum
70. Cosmarium punctulatum var.
71. Cosmarium circulare
72. Cosmarium sp.
73. Coelastrum cambricum
74. Coelastrum reticulatum
75. Coelastrum sp.


76.Crucigenia sp.
77.Dictiosphaerium pulchellum
78.Eudorina elegans
79.Euastrum dideltã
80.Euastrum gemmatum
81.Euastrum pulchellum
82.Euastrum oblongum
83.Euastrum verrucosum var.
84.Euastrum sp.
85.Gloeocystis sp.
86.Gloeocystopsis limneticus
87.Kirchneriella lunaris
88.Micrsterias truncata
89.Micrasterias truncata var.
90. " radiata
91. " radiosa var.
92.Micrasterias denticulata var.
93.Micrasterias americana
94.Micrasterias apiculata var.fimbriata
95.Micrasterias apiculata var.
96. " laticeps
97.Mougeotia sp.
98.Netrium digitus
99.Netrium sp.
100.Ocystis sp.
101.Penium minutum
102. " sp.
103.Pleurotaenium ehrenbergii
104. " trabecula var.
105. " sp.
106.Pediastrum boryanum
107. " " " var.longicorne
108.Pediastrum integrum
109. " tetras
110.Staurastrum avicula
111. " arctiscon
112. " cuspidatum var.
113. " leptocladum
114. "limneticum

115.Staurastrum minnesotense	x						x	x		x	x	x			x	x			x	x	x	x		x		x			x		x	x		x	x	x			x
116. " pentacerum	x	x								x																						x							
117. " setigerum var.			x	x												x																							
118. " furcigerum "										x																													
119. " grande										x		x																x							x				
120. " curvatum																				x																			
121. " gracile																								x							x								
122. " ophiura																		x																					
123. " sp.													x	x		x														x		x			x				
124.Spondylosium planum													x						x							x													
125. Sphaerozoma exigum	x																																						
126.Sphaerocystis sp.						x																																	
127.Scenedesmus quadricauda var.					x							x				x		x							x							x							x
128.Spirogyra sp.								x					x						x		x			x		x	x	x			x		x			x	x		x
129.Tetmemorus brebissoni	x									x				x			x	x	x	x				x	x	x	x	x					x	x					
130.Tetraedron minimum											x								x						x		x												
131.Ulothryx sp.												x	x	x												x										x			x
132.Xanthidium antilopaemum var.										x			x	x																				x					
133.Zygnema sp.	x																																						
MYXOPHYCEAE																																							
134.Aphanothece sp.																	x	x															x						
135.Chroococcus minutus							x																																
136. " turgidus																	x	x																				x	x
137. " limneticus	x										x			x												x		x											x
138. " sp.																				x							x										x		
139.Clathrocystis aeruginosa		x		x				x	x	x	x	x		x			x		x	x		x	x			x	x	x								x		x	
140. " " " var.major													x					x																					
141.Coelosphaerium kuetzingianum													x			x		x		x			x																
~~142.Gomphosphaeria aponina~~									x																								x						
142.Coelosphaerium sp.									x																								x						
143.Gomphosphaeria aponina			x																													x							
144.Merismopedia glauca																	x																	x					x
145. " sp.					x							x		x																									
BACILLARIEAE																																							
146.Amphora ovalis		x			x	x		x					x					x	x	x		x					x									x		x	
147.Asterionella formosa																												x	x										

148.Brebissonia sp.
149.Cymbella spp.
150.Caloneis sp.
151.Cyclotella compta
152.Cocconema sp.
153.Cocconeis sp.
154.Coscinodiscus subtilis
155.Coscinodiscus sp.
156.Cocconeis pediculus
157.Diatoma elongatum
158.Eunotia sp.
159.Fragularia crotonensis
160.Fragilaria sp.
161.Gomphonema sp.(acuminatum)
162.Gyrosigma sp.
163.Melosira varians
164.M " granulata
165.Mastogloia sp.
166.Navicula spp. (about 5 ")
167.Nitzschia sp.
168.Orthosira sp.
169.Pinnularia viridis
170.P " sp.
171.Pleurosigma attenuatum
172.Stauroneis sp.
173.Stephanodiscus niagaroe
174.Synedra sp.
175.Surirella spp.

FLAGELLATA

176.Dinobryon sp.
177.Hyalobryon muticula
178.Peridinium cinctum
179.P er " tabullatum
180. " sp.

181. Chironomidae(larvæ)
182.Arrhenurus sp.(nymph)
183.Hydracarina (small)
184.Nematoda (free living)
185.Coleopteraimago(small)
186.Insect eggs
187.Pollen of trees

Explanation of plate:

The typical organisms from the stomach of sucker fry.

X 50.

Part II.

This deals with the feeding habits of adult suckers and it is hoped that it throws some light on that role which this fish plays in general biology of our waters. It is the opinion of many people dealing with fish and fisheries, that suckers are "mud eaters". However, our examination based on one hundred and one suckers selected from gill-net catches in Chamcook lake during August and September 1935 show that opinion is not necessarily correct. Upon opening the guts of our specimens the first impression was that these guts were filled with "mud" but after diluting this "mud" with water and examining it under the microscope we were surprised to find that this "mud" consisted of thousands of perfectly selected organisms. A very insignificant amount of real mud could be found and our impression is that the mud-like substances found in certain stomachs is the digested food, as chironomid larvae, rather than indigested organic and inorganic debries. In the majority of cases of adult suckers examined the intestines were filled with microscopic larvae of Chironomidae which, as showing in our bottom analyses, are not present in large quantities in any sample taken from the feeding grounds of the suckers in Chamcook lakes. It is suggested that these chironomids as well as other organisms are selected not by the gills of the fish but by the extremely sensitive tubercles, or taste organs, which cover the thick lips of all species of Catostomus, and that each microscopic chironomid larva, or still smaller Acantholeberis curvirostris, are swallowed individually.

A fact that in the intestine of sucker we can never find the shells of dead mollusks, particularly Pisidium and Valvata

which are more abundant than living mollusks in the bottom deposits seem to prove also that the food of Catostomus is strictly selected. In comparison with younger stages, the adult suckers are not herbivorous but animal-eaters and the items of their food are much more limited in number of species. In the stomachs of young Catostromus from the same lake we can often observe more than an hundred different algae, crustaceans and rotifers, but the food of adult fish consists very often of only three of four and even in some cases of only one species. Indeed in each alimentary canal of large suckers there is always present a certain amount of diatoms but these diatoms are eaten by chironomid larvae (the intestines of which are often filled with Surirella, Amphora, Navicula etc.), and after digestion of these chironomid the diatom shells remain among the other food. In any single case we did not find vegetable debris in the intestine of suckers but in all cases the food of adult Catostomus consisted chiefly of chironomid larvae, Eurycercus lamellatus, Acantholeberis curvirostris, Hyalella knickerbockeri, Latona setifera, Cyclops viridis, Leptodora kindtii and other phillpods as well as certain Hydracarina and Mollusca. It is interesting to note again that Eurycercus, Acantholeberis, Latona and Cyclops viridis which were observed by thousands in the guts of suckers were not found at all in any numberous plankton or bottom samples from this lake.

Other items of minor importance, as nymphs of Hexagenia and Ephemera, larvae of Molanna and other phyganids, also Sialis, ostracods, water spiders, oligohaets, adult stages of Diptera, Canthocamptus staphylinoides, certain protozoans and algae were

also observed as food of certain individuals. No rotifers and no Diaptomus minutus so com on everywhere in Chamcook lake were found in the intestine of adult suckers.

Another interesting feature of the feeding habits of this fish is that the food is not uniform for all size groups but differs according to the length and age of the fish. The difference of food in different sized fish we explain by bathymetrical distribution of certain organisms, and the older fish feed in deeper strata than the younger ones.

It is not necessary to su mit the entire analyses of each alimentary tract contents as the number of organisms has been estimated by thousands in each case but we choose the following expression of our results.

Table showing the relative number of ten most important food items of Catostomus commerson ii from First Chamcook Lake

	Length of fish in mm. 250-300 mm (41 specim.)	300-350 (52 specim)	350-400 (8 spec)	Average (101 spec)	Maximal number
CHIRONOMIDAE (sev.species) larvae & pupp.	1770 98%	3280 100%	5550 100%	2841 2841	16,000
EURYCERCUS LAMELLATUS	500 50%	860 85%	160 38%	658 658	6.000
Acantholeberis Curvirostris	1650 88%	2000 83%	450 25%	1735	7.000
LATONA SETIFERA	100 40%	230 56%	0 0%	159	3.600
LEPTODORA KINDTII	26 7%	19 6%	0 0%	19	800
OTHER PHYLLOPODA	55 42%	55 33%	6 12%	51	800

	Length of fish in mm. 250-300mm (41 specim.)	300-350 (52 spec)	350-400 (8 spec)	Average (101 spec)	Maximal number
CYCLOPS VIRIDIS and other species	310 70%	310 83%	22 25%	187	4.500
HYALELLA KNICKERBOCKERI	80 18%	28 3%	0 0%	47	1.100
HYDRACARINA	57 48%	65 46%	50 38%	60	560
MOLLUSKS	16 10%	13 12%	12 12%	12	340

These are the average number of forms per fish and the percentage of stomachs in which the form occurred.

It must be pointed out also that in the case of "other Phyllopoda", Alona, Chydorus and Acropterus occurred principally in the smaller size group, but in the intermediate and the large size groups the genus Daphnia predominated.

Comparing the relative number of organisms in these three different size groups we must remember also that the total volume of intestine is not the same in small and large fish, but it is evident, however, that the chironomid larvae play a more important role in the diet of older fish. On the other hand the food of younger individuals consist of several mixed items in a form of different planktonic and none planktonic organisms, mostly crustaceans.

In order to give the best picture of the food of adult Catostomus in Chamcook lake during the summer, the following volumetrical graphs are submitted, where the size of different

organisms are taken into consideration. The following ratio of volumes were estimated: Chironomidae - 1; Eurycercus - 2; Acantholeberis - 1/3; other phyllopods - 1/3; Leptodora - 2; Cyclops - 1/10; Hylella - 5; Hydracarina - 1; molluscs, (mostly Valvata tricarinata and Valvata sp.) - 4.

The volumetric ratio of various food items in diet of tree size groups of Catostomus commersonnii from First Chamcook Lake.