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ON THE SUMMER PHYTO- AND ZOOPLANKTON OF LAKE PALAEOSTOMI

III. Different groups of zooplankton

The survey of Lake Palaeostomi, sample spots, species composition of its phyto- and zooplankton as well as the quantitative data of its zooplankton are presented in the first and second parts of the article (Haberman, Laugaste, 1982; Haberman, 1982).

Rotatoria

Tables 1 and 2 reveal that rotifers formed the most important group of zooplankton in L. Palaeostomi. Their role in L. Maloye Palaeostomi was much lower.

Of the rotifers, the first place is occupied by *Brachionus plicatilis* which occurs in masses, the second — by *Hexarthra fennica* although its role is much smaller than that of *Brachionus plicatilis*. The rest of the rotifer species (38) occur scantily, only as single specimens in the plankton, and mainly in the littoral region.

Brachionus plicatilis Müller is a brackish-water species, found in brackish-water lakes as well as in the marine waters near the sea-shore which are freshed by the inflowing rivers. It also occurs in the near-shore parts of the Black, Azov and Caspian Sea and in the continental water bodies in the basin of the above-mentioned seas (Кутикова, 1970). It may occur at a rather high salinity, i. e. in L. Sudochye at 24.5‰, in L. Kara-Teren at 31.6‰ (Дарибаев, 1969). According to A. Ruttner-Kolisko (1979) it prefers salinity over 10 000 mg/l. It dominates in the mesohaline limans of the Kuban Region (3—9 g/l) and never dominates in the oligohaline (0.02—2.60 g/l) limans (Проскурина, 1970). In the Ukraine it has been found in ponds where salinity is 3000 mg/l or greater (Пидгайко, 1967).

The materials collected in the 1930s reveal that *B. plicatilis* occurred in L. Palaeostomi in July and October, at a water temperature of 19—28 °C. In July (at the salinity of 0.5—1.5‰) it was very scanty, while in October (at 5.52—10.48‰) it dominated in the plankton. The absence of *B. plicatilis* in the spring is probably connected with the very low water salinity in that period (Куделина, 1940).

In July and August of 1977, at the water salinity of 2.65—6.62‰ (Тийдор, 1983), *B. plicatilis* occurred in masses in L. Palaeostomi. The average number in July and August fluctuated between 5 000—2 567 000 ind./m^3, biomass 0.010—5.134 g/m^3. Of the number of rotifers it formed 71.1—100% (on the average 83.9%), and of the biomass — 90.5—100% (91.8%). Its number formed 49.2% of the total zooplankton, and its biomass — 33.8% of the total zooplankton biomass, being thus the dominating species in the plankton.

The number (ind./m³) and biomass (g/m³) of different groups

Groups	Month	Number (N), biomass (B)	Sample 1	2	3	4	5	6	7
Rotatoria	VII	N	19 000	201 000	115 000	104 000	15 800	786 000	61 000
		B	0.034	0.400	0.215	0.205	0.020	1.186	1.200
	VIII	N	—	22 000	—	405 000	137 000	845 000	—
		B	—	0.037	—	0.769	0.259	1.285	—
Cladocera	VII	N	1 000	1 000	0	0	0	0	0
		B	0.008	0.006	0	0	0	0	0
	VIII	N	—	0	—	1 000	0	0	—
		B	—	0	—	0.008	0	0	—
Copepoda	VII	N	20 000	1 500	8 000	2 000	10 800	153 000	22 000
		B	0.188	0.003	0.031	0.004	0.111	0.328	0.044
	VIII	N	—	0	—	53 000	30 500	152 000	—
		B	—	0	—	0.106	0.261	0.349	—
Polychaeta juv.	VII	N	41 000	61 000	45 000	44 000	166 500	23 000	40 000
		B	0.164	0.244	1.800	0,176	0.666	0.092	0.160
	VIII	N	—	0	—	47 000	264 000	10 000	—
		B	—	0	—	0.188	1.056	0.040	—
Balanus juv.	VII	N	0	0	0	0	0	0	0
		B	0	0	0	0	0	0	0
	VIII	N	—	0	—	0	0	5 000	—
		B	—	0	—	0	0	0.018	—
Gastropoda juv.	VII	N	0	0	0	0	0	0	0
		B	0	0	0	0	0	0	0
	VIII	N	—	0	—	0	0	0	—
		B	—	0	—	0	0	0	—
Moerisia maeotica	VII	N	2 500	4 000	7 000	3 000	8 400	4 000	0
		B	0.750	1.200	2.100	0.900	2.498	1.200	0
	VIII	N	—	2 000	—	0	0	0	—
		B	—	0.600	—	0	0	0	—

Note: Sample spots 1, 3, 6, 7, 9, 10 — littoral zone; 2, 4, 5, 8 — river-mouths; 11—15 — pelagic zone; 16 — L. Maloye Palaeostomi.

In the fresh water of L. Maloye Palaeostomi, *B. plicatilis* was much more modestly represented. In August 1977 its number was 25 000 ind./m³, biomass 0.050 g/m³. Of the number of the group it formed 4.7%, of the biomass — 2.8%. Its role in the total zooplankton was negligible.

Clear connections can be observed between the occurrence of *B. plicatilis* and salinity. It is more numerous in the pelagic part where salinity is higher (6.47—6.60‰) than in the littoral freshed by rivers, in river-mouths and in L. Maloye Palaeostomi. The more abundant occurrence of *B. plicatilis* in the summer of 1977 as compared to that of 1933 is explained by a higher salinity of the water of L. Palaeostomi in 1977.

Copepoda

As for their number and biomass (Tables 1 and 2), copepods occupy a relatively modest place among the other groups of zooplankton (third —

Table 1

of zooplankton in July and August, 1977

spots								
8	9	10	11	12	13	14	15	16
—	77 000	465 000	2 385 000	2 590 800	1 167 500	2 445 000	1 917 500	—
—	0.134	0.730	4.124	4.749	2.054	3.765	3.798	—
5 000	—	339 000	1 407 500	2 970 000	1 162 500	2 040 000	2 085 000	82 500
0.010	—	0.613	2.805	5.651	1.581	4.012	4.028	0.388
—	0	0	0	0	0	0	0	—
—	0	0	0	0	0	0	0	—
0	—	0	0	0	0	0	0	2 500
0	—	0	0	0	0	0	0	0.075
—	0	13 000	445 000	30 000	22 500	495 000	42 500	—
—	0	0.059	1.205	0.090	0.115	1.215	0.108	—
17 000	—	21 000	67 500	420 000	422 500	450 000	152 500	445 000
0.038	—	0.059	0.280	0.920	1.078	1.405	0.348	1.280
—	44 000	46 000	600 000	266 800	750 000	425 000	472 500	—
—	0.176	0.184	2.400	1.067	3.000	1.700	1.890	—
66 000	—	90 000	500 000	230 000	420 000	745 000	930 000	2 500
0.264	—	0.360	2.000	0.920	1.680	2.980	3.720	0.010
—	7 000	1 000	0	3 300	2 500	0	0	—
—	0.025	0.004	0	0.012	0.009	0	0	—
0	—	2 000	2 500	0	0	5 000	0	0
0	—	0.007	0.009	0	0	0.018	0	0
—	1 000	1 000	5 000	0	2 500	0	0	—
—	0.002	0.002	0.010	0	0.005	0	0	—
0	—	1 000	5 000	0	0	0	2 500	0
0	—	0.002	0.010	0	0	0	0.005	0
—	9 000	2 000	0	0	0	0	0	—
—	2.700	0.600	0	0	0	0	0	—
3 500	—	0	0	0	0	10 000	0	0
1.050	—	0	0	0	0	3.000	0	0

as for the number, fourth — biomass), but considering the importance of the group as feed for fishes, its role in L. Palaeostomi is quite noticeable. The main part of the copepods in the summer plankton of L. Palaeostomi is made up of juvenile forms, while the adult copepods are relatively few. The most numerous and most important species in L. Palaeostomi is *Calanipeda aquae dulcis*.

Calanipeda aquae dulcis (Kritschagin) is a typical brackish-water species. In the Black, Azov and Caspian Sea common, clearly preferring the freshed parts of the littoral zone and occurring even in fresh water (Определитель фауны Черного и Азовского морей, 1960). In the South-Caspian the biomass of *C. aquae dulcis* does not usually exceed 0.005 g/m^3 but it may, in some places, rise to 0.050 g/m^3, even up to 0.120 g/m^3. Of the biomass of the total zooplankton *C. aquae dulcis* forms here, as a rule, 1—5%, and never over 18—20%. Only in some single littoral samples its role has been 40—53% (Лазарева, 1969). In the North-Caspian the role of *C. aquae dulcis* is higher, forming, on the average, 50% of the biomass of the total zooplankton from February to

Table 2

The role (%) of different groups of zooplankton in the summer zooplankton of L. Palaeostomi

Groups	Number (N), biomass (B)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Average
Rotatoria	N	22.7	83.3	65.7	74.0	19.8	82.5	49.6	5.5	55.8	81.5	70.2	85.8	59.0	67.8	72.2	15.5	56.9
	B	3.0	13.7	5.2	43.9	8.5	59.1	85.5	0.7	4.4	52.6	54.2	77.8	38.0	45.8	57.6	22.1	35.8
Cladocera	N	1.2	0.2	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0.5	0.1
	B	0.7	0.2	0	0.4	0	0	0	0	0	0	0	0	0	0	0	4.3	0.4
Copepoda	N	24.0	0.3	4.6	5.9	6.2	15.4	17.9	18.6	0	3.5	8.2	6.3	11.1	14.3	3.2	83.5	13.9
	B	16.4	0.1	0.8	5.1	10.0	16.2	3.1	2.8	0	4.8	10.5	6.9	13.5	15.3	3.1	73.0	11.3
Polychaeta juv.	N	49.1	4.3	25.7	19.0	71.9	1.7	32.5	72.1	31.9	14.3	21.3	7.8	29.7	17.7	24.5	0.5	27.0
	B	14.4	6.6	43.4	15.6	43.6	2.8	11.4	19.4	5.8	23.1	35.1	15.2	48.3	25.7	39.2	0.6	21.9
Balanus juv.	N	0	0	0	0	0	0.2	0	0	5.1	0.3	0.1	0.1	0.1	0.1	0	0	0.4
	B	0	0	0	0	0	0.5	0	0	0.8	0.4	0.1	0.1	0.1	0.1	0	0	0.1
Gastropoda juv.	N	0	0	0	0	0	0	0	0	0.7	0.2	0.2	0	0.1	0	0.1	0	0.1
	B	0	0	0	0	0	0	0	0	0.1	0.1	0.1	0	0.1	0	0.1	0	0.0
Moerisia maeotica	N	3.0	4.9	4.0	1.0	2.1	0.2	0	3.8	6.5	0.2	0	0	0	0.1	0	0	1.6
	B	65.5	79.4	50.6	35.0	37.9	21.4	0	77.1	88.9	19.0	0	0	0	13.1	0	0	30.5

Note: Sample spots 1, 3, 6, 7, 9, 10 — littoral zone; 2, 4, 5, 8 — river-mouths; 11—15 — pelagic zone; 16 — L. Maloye Palaeostomi.

November. At the salinity of 7—12‰ its role in summer even equals 80%. The most suitable habitats for *C. aquae dulcis* are the places where the fresh and the marine water get mixed, e.g. the river-mouths of the Volga and the Ural, the salinity there being 8—9‰. Farther from these places the number of *C. aquae dulcis* decreases.

C. aquae dulcis is a typical representative of the fresh-water limans of the Danube. Sporadically it may even be found in the R. Danube (Пидгайко, 1957). It is more numerous in the liman of Kitai where salinity is higher than in the other limans. It stands well the high organic matter content in the liman of Kitai.

In the limans of the Danube the average biomass of *C. aquae dulcis* fluctuates between 0.006—0.400 g/m^3, the length of a specimen being 0.84—1.5 mm (sexually mature males on the average 1.0 mm, females — 1.27 mm, *Calanipeda aquae dulcis* juv. — 0.6 mm, *Nauplii* — 0.25 mm). *C. aquae dulcis* reaches its maximum number (50 750 ind./m^3) and biomass (2.03 g/m^3) in July. The adult forms can mainly be found in the layers near to the bottom, *Nauplii* and the juvenile forms mostly in the surface water. Therefore juvenile forms always dominate in the samples taken by a net. Among the population found near the bottom of the limans of the Danube, 94% were sexually mature in July.

Eurytherm. It gives its maximum in July-August at the water temperature of 25—27°, but it is quite active even in February at the water temperature of 3.5° (Пидгайко, 1957).

In the plankton *C. aquae dulcis* can be found all the year round as it is polycyclic, reproducing from April till November. Therefore the juvenile forms occur in the plankton samples throughout the year.

The limit concentration of oxygen for *C. aquae dulcis* is 1.5—4.1 mg/l, depending highly on the water temperature. At 17—25° it does not exceed 2 mg/l, while at 27° it reaches 3.5 mg/l. At high water temperatures the species may die as a result of oxygen deficiency. In the southern water bodies temperatures like 27—30° are quite common in summer. If the oxygen content in the water is low, the death of *C. aquae dulcis* may follow. Under experimental conditions *C. aquae dulcis* dies when the water temperature exceeds 25° and the oxygen content in water is less than 4 mg/l.

C. aquae dulcis is an extremely euryhaline species. The optimum salinity of water for it is 2—15‰. If the salinity suddenly changes, this causes the death of *C. aquae dulcis*. Even the salinity of 10‰ may in such a case become fatal. On the other hand, if the salinity increases gradually, *C. aquae dulcis* may live at the salinity of 20‰ and even more (Крылова, 1969). In the water bodies connected with the sea, the changes in salinity may take place quite suddenly, depending on the strength and direction of the wind; however, as it mostly happens in restricted areas, the changes do not result in essential damages of the feed of fishes (Крылова, 1967).

A. Krylova (Крылова, 1967) has mentioned the occurrence of *C. aquae dulcis* in the water, the salinity of which is 62‰ — which is improbable. A known fact is that at the time when the liman of Grigorjevsky was separated from the Black Sea, *C. aquae dulcis* occurred there. When the canal connecting the liman with the sea was built and the salinity of water rose to 18‰, *C. aquae dulcis* disappeared from the liman (Коваль et al., 1977). It dominates in the oligohaline limans of the Kuban Region (0.02—2.60 g/l), but not in the mesohaline ones (3—8 g/l) (Проскурина, 1970).

C. aquae dulcis is a favourite feed of fishes. In order to improve the feed supply for fishes, attempts have been made to introduce *C. aquae dulcis* into several water bodies. For example, *C. aquae dulcis* from the

limans of the Azov Sea was introduced into the bays of the southern part of the Aral Sea (Казахбаев, 1974). It has been recommended to introduce *C. aquae dulcis* from the Azov Sea into L. Balkhash in the course of 3—4 years, 1.5 million specimens annually (Садуакасова, 1979).

According to E. Kudelina (Куделина, 1940) *Calanipeda aquae dulcis* was the dominating form of L. Palaeostomi. In spring, at the water temperature of 13—21°, *C. aquae dulcis* was scanty and occurred mainly as *Nauplii* and juvenile forms. In summer, at the water temperature of 26—28°, sexually mature specimens dominated in the plankton and in such amounts that, in some places, the plankton of L. Palaeostomi could be characterized as «the *Calanipeda* plankton».

In July and August, 1977, *C. aquae dulcis* occurred in L. Palaeostomi rather scantily and mainly as juvenile forms. The number of *C. aquae dulcis* (sexually mature and juvenile forms together) fluctuated from 500—45 000 ind./m^3, biomass — 0.006—0.495 g/m^3. It formed 8.5% of the number and 23.5% of the biomass of copepods, 0.7% of the number of the total zooplankton and 2.2% of the biomass of the latter. A somewhat lower number of *C. aquae dulcis* in 1977 as compared to 1933 (Куделина, 1940) may have been partly due to the abundant occurrence of the predatory form *Moerisia maeotica,* or very active feeding of fishes in that period. It is not excluded that the sexually mature forms preferring the layers near the bottom were not caught by the plankton net.

Cladocera

According to E. Kudelina (Куделина, 1940), cladocerans occur in L. Palaeostomi mainly in summer. In spring and autumn only single specimens were found or they were completely absent. In the July of 1933 the number of *Diaphanosoma brachyurum* was high (Куделина, 1940). I. Puzanov (Пузанов, 1940) also mentions the species as very typical of the plankton of L. Palaeostomi.

R. Chkhaidze (Чхаидзе et al., 1976) has pointed out that the cladocerans occur namely in autumn, while in spring and summer they are practically absent in the plankton. In the summer of 1977 the cladocerans were of no significance in the plankton of L. Palaeostomi (L. Maloye Palaeostomi included) (Table 2), their number and biomass were negligible (Table 1). One specimen of *Bosmina longirostris* was found in the river-mouth of the R. Gurinka, two specimens of *Ceriodaphnia pulchella* and one specimen of *Diaphanosoma brachyurum* in the mouth of the R. Chornaya, one specimen of *Chydorus sphaericus* — in sample spot 1. *Alona rectangula* was somewhat more numerous. It was found in several sample spots, though as single specimens.

The more numerous occurrence of the fresh water cladocerans in July of 1933 as compared to the summer of 1977 is obviously explained by a lower salinity in 1933 (there existed no direct connection with the sea). The water salinity of 2.65—6.62‰, as it was measured in August of 1977, is obviously too high for the cladocerans although it is a well-known fact that *Diaphanosoma brachyurum* is a rather typical cladoceran of brackish water bodies where the salinity reaches even 10‰ (Козлова, 1979). *Alona rectangula* and *Chydorus sphaericus* also stand the brackish water well. At the salinity of 7‰ *Alona rectangula* may even be a dominating species (Дехтяр, 1968). *Ceriodaphnia pulchella* also tolerates the water with increased salinity well (Мануйлова, 1964). The low numbers of the cladocerans may to some extent be explained by the occurrence of the predatory form *Moerisia maeotica* in the lake.

Polychaeta juv.

The larvae of *Polychaeta* are an important feed for fishes (Rose, 1978). In the Black Sea they are common, occurring all the year round. From the Black Sea they penetrate into the brackish water bodies connected with the sea (Мелиян, 1970). In 1933 *Polychaeta* juv. occurred all over the lake, but they were not numerous (Куделина, 1940), while in the summer of 1977 they occurred in masses (Table 1), being the dominating group in the zooplankton (Table 2).

Polychaeta juv. is more numerous in the pelagic zone with a higher salinity than in the littoral or in the river-mouths. In the fresh-water of L. Maloye Palaeostomi only single specimens of *Polychaeta* juv. were found. In comparison with 1933 the number of *Polychaeta* juv. in L. Palaeostomi was considerably higher in 1977. The reason lies in the higher water salinity in 1977.

Balanus juv.

Balanus juv. was found to occur in L. Palaeostomi long ago. In 1933 it was found in the lake but its number was low (Куделина, 1940). After the establishment of a direct connection between the lake and the sea in December, 1933, the water salinity in L. Palaeostomi has constantly been rather high (up to 13‰), but the role of *Balanus* juv. in it was negligible, even in the summer of 1977 (Table 2).

According to literature, *Balanus* juv. even dominates in brackish water bodies. For example, it dominates in spring in the liman of Sasyk connected with the Black Sea, its number being 92 300 ind./m^3 and biomass 1.266 g/m^3 (Мелиян, 1970). Obviously the water salinity in L. Palaeostomi is too low for a mass occurrence of *Balanus* juv.

Gastropoda juv.

The penetration of *Gastropoda* juv. into the brackish water bodies connected with the sea is a known fact (Мелиян, 1970). According to E. Kudelina (Куделина, 1940) only single specimens of *Gastropoda* juv. occurred in L. Palaeostomi in the 1930s. It was more numerous in the R. Kaparcha with its higher salinity.

In the summer of 1977 very few representatives of *Gastropoda* juv. occurred in L. Palaeostomi while it was completely absent in river-mouths and in L. Maloye Palaeostomi (Tables 1 and 2). For *Gastropoda* juv. the water salinity of L. Palaeostomi is too low.

Moerisia maeotica (Ostroumov)

Moerisia maeotica is a brackish-water jellyfish, occurring in the Black Sea and penetrating into L. Palaeostomi. E. Kudelina (Куделина, 1940) has stated the existence of two species of jellyfish in L. Palaeostomi — *Aurelia aurita* and *Pilema pulmo*. B. Ilyin (Куделина, 1940) comes to the conclusion that it is namely *Thaumanthias maeotica* (=*Moerisia maeotica*) or *Eugenia cimmeria* which is found in the lake. On the basis of the material collected in the summer of 1977 the occurrence of *Moerisia maeotica* in L. Palaeostomi was confirmed.

As Table 1 reveals, *M. maeotica* occurs almost all over the lake, being more numerous in the littoral than in the pelagic part. Its role in the biomass of the total zooplankton is quite noticeable (Table 2). *M. maeotica* was not found in L. Maloye Palaeostomi. *M. maeotica* is a predatory

form and a serious feed rival for fishes. Its occurrence in the plankton is a negative phenomenon.

The most important zooplankton group in the summer plankton of L. Palaeostomi is *Rotatoria* followed by *Polychaeta* juv. in number and jellyfish *Moerisia maeotica* in biomass. The third in number are copepods, in biomass *Polychaeta* juv. Cladocerans were found as single specimens only. *Balanus* juv. and *Gastropoda* juv. were represented very scantily, too. The water salinity in L. Palaeostomi is evidently favourable to brackish-water *B. plicatilis* and to marine *Polychaeta* juv. too, while it is too high for chadocerans and too low for *Balanus* juv. and Gastropoda juv.

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PALEOSTOMI JÄRVE SUVINE FÜTO- JA ZOOPLANKTON

III. Zooplanktoni rühmad

On esitatud zooplanktoni eri rühmade (*Rotatoria, Cladocera, Copepoda, Polychaeta* juv., *Balanus* juv., *Gastropoda* juv., *Moerisia maeotica*) arvukus ja biomass Paleostomi järves 1977. aasta juulis ja augustis (tab. 1) ning nende rühmade osatähtsus zooplanktonis (tab. 2).

Suvise zooplanktoni domineeriv rühm on rotatoorid. Neist on kõige massilisem *Brachionus plicatilis*, mis moodustab rotatooride arvukusest 83,9 ja biomassist 91,8% ning kogu zooplanktoni arvukusest 49,2 ja biomassist 33,8%.

Arvukuse poolest on rühmadest teisel kohal *Polychaeta* juv., biomassi hulgalt meduus *Moerisia maeotica*. Polüheetide kui väärtusliku kalatoidu rikkalik esinemine järves on positiivne, röövvormi *M. maeotica* esinemine negatiivne nähtus.

Kopepoodid on esindatud suhteliselt tagasihoidlikult, kuid nende (eriti *Calanipeda aquae dulcis*'e) kui väärtusliku kalatoidu tähtsus on küllalt suur. Kladotseere leiti vaid üksikuid isendeid, ka *Balanus* juv. ja *Gastropoda* juv. on väikesearvuline. Ilmselt on Paleostomi järve vee soolsus (2,65—6,62‰) sobiv riimveelisele *Brachionus plicatilis*'ele ja polüheetide vastseile, kuid liiga kõrge kladotseeridele ja liiga madal *Balanus*'e ja *Gastropoda* vastseile.

Юта ХАБЕРМАН

ЛЕТНИЙ ФИТО- И ЗООПЛАНКТОН ОЗЕРА ПАЛЕОСТОМИ

III. Различные группы зоопланктона

Приводятся численность и биомасса разных групп зоопланктона (*Rotatoria, Cladocera, Copepoda, Polychaeta* juv., *Balanus* juv., *Gastropoda* juv., *Moerisia maeotica*) в оз. Палеостоми в июле и августе 1977 г. (табл. 1) и удельный вес их в общей численности и биомассе зоопланктона (табл. 2).

В зоопланктоне озера летом наибольшее значение имеют коловратки, причем доминирует массовый вид *Brachionus plicatilis*, составляющий 83,9% от численности и 91,8% от биомассы коловраток и 49,2% от численности и 33,8% от биомассы всего зоопланктона. По численности на втором месте стоит *Polychaeta* juv., по биомассе — *Moerisia maeotica*. С точки зрения рыбного хозяйства обильность полихет как ценного корма для рыб — явление положительное, а частая встречаемость хищной *M. maeotica* — отрицательное.

Веслоногие в оз. Палеостоми представлены относительно скромно, но роль их (особенно *Calanipeda aquae dulcis*) как ценного корма для рыб довольно большая. Ветвистоусые встречались только единичными особями, мало было также *Balanus* juv. и *Gastropoda* juv. Соленость озера (2,65—6,62‰) явно подходит солоноватоводным личинкам полихет и *Brachionus plicatilis*, но слишком высокая для ветвистоусых и слишком низкая для личинок *Balanus* и *Gastropoda*.