

<https://doi.org/10.3176/biol.1976.1.06>

УДК 594.1 Pisidiidae : (285.2)

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## ON THE *PISIDIIDAE* OF LAKE PEIPSI-PIHKVA

### Material and methods

In the present paper molluscs of the family *Pisidiidae* Gray, 1857, from samples of zoobenthos taken during several expeditions organized by the Institute of Zoology and Botany of the Academy of Sciences of the Estonian SSR are under observation. The samples were taken at the beginning of June (1964—1974, from 22 sample spots every year, except for 1964 when the number of sample spots was 21), and in July and August of 1970. In the midsummer of 1970, in addition to annual sample spots, benthos was taken from 50 shallow-water profiles at the depth of 0—4 m around the whole lake. *Pisidiidae* occurred in 573 samples out of 1,000. 2538 specimens were investigated.

The samples were taken by a grab sampler of the Borutski or Zabolotski type (grasp area 225 sq. cms), in some cases by a cylindrical sampler of the Mordukhai-Boltovskoi type (grasp area 100 sq. cms). The samples were washed on sieve No. 14 or 17. At first molluscs were fixed in about 40% alcohol in order to get the shells of small clams opened at slight maceration. Afterwards they were preserved in 70% alcohol.

The molluscs were weighed on torsion scales (gross weight) and identified, measured and sketched by means of a binocular microscope МБС-1 (ocular 8, objective lens 1, 2, 4, 7). The length (L), height (H) and width (D) of all specimens were measured. The indices H/L and D/L were calculated for each specimen separately. Table 1 presents the limits and arithmetical means ( $A_{H/L}$  and  $A_{D/L}$ ) of the indices. The indices of many species coincide, since the variability turned out to be very great. Permanent indices for one species, as has often been stated in literature (Пирогов, 1972; Пирогов, Старобогатов, 1974; Timm, 1975), do not exist for the material under observation. The size of specimens changes during their life, and thus the average size and the indices calculated on that basis depend on the age composition of the population in samples. Still, in the identification of close species the difference in the indices of adult specimens may be of some use.

In the case of each species the curve of the outer contour of the biggest cross-section of the shell was sketched by means of the *camera lucida* (PA-4). The curve is invariable within the limits of a species. The outer contour of each specimen was compared with the standard curve of the respective species. Even in the case of very similar species the curves are entirely different (Логвиненко, Старобогатов, 1971). The comparison of the curves facilitates the division of specimens into groups according to their outer shape without opening the shell. In addition to the curves, other morphological characters of the species must also be taken into account for a detailed identification.

The nomenclature of the taxa is given on the basis of Pirogov's and Starobogatov's paper (Пирогов, Старобогатов, 1974).

Measures and indices of the *Pisidiidae* of L. Peipsi-Pihkva

Species	Number of Specim.	L	H	D	H/L	D/L	A <sub>H</sub> /L	A <sub>D</sub> /L
<i>Sphaerium corneum</i>	62	1.8-9.3	1.5-6.5	1.4-6.0	0.68-0.95	0.37-0.78	0.78	0.57
<i>Musculium ryckholtii</i>	4	4.1-6.0	3.7-5.0	2.0-3.6	0.83-0.90	0.49-0.60	0.86	0.54
<i>Amesoda scaldiana</i>	8	4.1-8.6	3.0-6.4	2.0-5.0	0.74-0.80	0.49-0.58	0.76	0.54
<i>Pisidium annicum</i>	312	1.6-8.3	1.3-6.1	0.7-4.6	0.67-0.89	0.35-0.67	0.75	0.50
<i>P. inflatum</i>	236	1.8-8.6	1.4-6.5	0.9-4.6	0.68-0.89	0.36-0.63	0.78	0.55
<i>Euglesa nitida</i>	386	1.0-2.9	0.8-2.6	0.5-1.7	0.70-0.91	0.32-0.65	0.82	0.48
<i>E. fedderseni</i>	26	1.8-3.5	1.5-2.8	1.0-1.9	0.77-0.94	0.47-0.64	0.83	0.55
<i>E. ruut</i>	17	2.0-3.1	1.7-2.7	1.1-1.7	0.77-0.94	0.48-0.59	0.87	0.54
<i>E. crassa</i>	90	1.4-2.5	1.2-2.2	0.7-1.3	0.78-0.90	0.42-0.64	0.83	0.53
<i>E. tanuga</i>	31	1.2-3.0	1.1-2.6	0.7-1.8	0.80-0.95	0.51-0.67	0.87	0.65
<i>E. pulchella</i>	30	1.5-3.6	1.3-3.0	0.9-2.5	0.74-0.88	0.46-0.69	0.82	0.57
<i>E. humerosa</i>	15	1.6-2.4	1.3-2.0	0.9-1.2	0.79-0.84	0.50-0.63	0.82	0.57
<i>E. pihkva</i>	10	1.7-3.6	1.5-3.1	1.4-2.4	0.83-0.90	0.59-0.69	0.87	0.66
<i>E. henslowana</i>	322	1.4-4.8	1.0-3.6	0.7-2.6	0.69-0.94	0.42-0.68	0.81	0.56
<i>E. duputiana</i>	202	1.8-4.3	1.4-3.6	1.0-2.9	0.70-0.94	0.45-0.67	0.83	0.55
<i>E. suecica</i>	233	1.3-2.8	1.0-2.5	0.5-1.6	0.71-0.96	0.43-0.68	0.83	0.55
<i>E. volgensis</i>	3	3.9	3.5	2.4	—	—	0.89	0.60
<i>E. tenuisculpta</i>	67	1.8-4.0	1.5-3.0	1.2-2.6	0.75-0.95	0.50-0.67	0.84	0.58
<i>E. difficilis</i>	63	1.4-2.9	1.2-2.3	0.9-1.6	0.70-0.95	0.45-0.70	0.81	0.58
<i>E. pepsi</i>	39	1.6-4.2	1.2-3.6	0.9-2.7	0.77-0.91	0.46-0.65	0.84	0.56
<i>E. supina</i>	6	3.1-4.2	2.6-3.7	1.9-2.8	0.83-0.89	0.62-0.68	0.86	0.66
<i>E. conica</i>	2	3.6	3.1	2.2	—	—	0.86	0.61
<i>E. ponderosa</i>	80	1.9-4.5	1.7-3.9	1.2-3.0	0.74-0.96	0.45-0.71	0.86	0.61
<i>E. globularis</i>	15	1.9-2.5	1.6-2.0	0.9-1.4	0.79-0.95	0.50-0.66	0.87	0.60
<i>E. acuminata</i>	56	1.5-2.6	1.2-1.9	0.6-1.2	0.72-0.88	0.41-0.60	0.80	0.49
<i>E. fossarina</i>	71	1.3-3.3	1.0-2.6	0.6-1.6	0.71-0.94	0.41-0.63	0.83	0.51
<i>E. rivularis</i>	79	1.5-3.6	1.3-3.0	0.8-1.9	0.71-0.93	0.41-0.68	0.82	0.55
<i>Neopisidium torquatum</i>	43	1.2-2.2	0.9-1.9	0.7-1.2	0.72-0.96	0.48-0.67	0.85	0.58
<i>N. alpinum</i>	18	1.4-2.2	1.2-1.7	0.7-1.2	0.79-0.90	0.51-0.67	0.84	0.56
<i>N. steifoxi</i>	12	1.1-1.6	0.9-1.2	0.6-1.0	0.77-0.89	0.51-0.62	0.85	0.59

## Characterization of the lake

L. Peipsi-Pihkva occupies the fifth place among the lakes of Europe as regards the area — 3,566 sq. km. The lake is approximately 150 km long and is situated on the eastern border of the Estonian SSR. It consists of three parts: L. Peipsi (average depth — 7.8 m, maximum — 12.4 m), L. Lämmijärv (“Warm Lake”) (3.3 and 15.2 m) and L. Pihkva (3.8 and 5 m). About 30 rivers (the biggest of them being the Velikaya and the Suur-Emajõgi) flow into the lake, while one — the River Narva — flows out of it. The bottom of L. Peipsi is even, covered mostly with sand in the littoral and sublittoral part, with sandy mud in deeper parts, and with grey mud in the profundal part. The borderline between the sublittoral and profundal parts in L. Peipsi lies at the depth of about 9 m, in L. Pihkva and Lämmijärv it is mostly at 2.5 m.

The lake is covered with ice from December till April. The thermal and chemical stratification is weak, especially in L. Pihkva and L. Lämmijärv. The oxygen content of water near the bottom is rather high throughout the year — 63—104 per cent; pH at the bottom is lowest in February and March (7.7) and highest in September (8.15). As regards the chemical composition, the water belongs to the hydrocarbonate class (calcium group). The mineral content of water in L. Peipsi is 160—200 mg/l, the average calcium content being 31.7 mg/l, that of hydrocarbonate ions 125.9 mg/l, while the average hardness of water equals 2.2 mg equivalents. The water in the lake is changed on the average during 2—2.5 years (Куллус, Мерила, 1966).

Practically no macrophytes occur in the northern part of L. Peipsi. In the other parts, in the vicinity of the shore, reed, club-rush and pond weed (mainly *Potamogeton perfoliatus*) can often be found. As for the zooplankton content and that of bacterioplankton, L. Peipsi may be considered mesotrophic, while L. Lämmijärv and L. Pihkva are eutrophic. As regards the production of phytoplankton, the lake is eutrophic with a certain inclination towards mesotrophy (Лайрасте, 1968).

The lake is rich in zoobenthos, while the most characteristic forms are the larvae of *Chironomus plumosus* and the clams of *Dreissena polymorpha*. During 10 years (1964—1973) the number of bottom fauna in the lake in June (big clams excluded) was on the average 2,412 sp./sq. m and its biomass 11.15 g/sq. m. Of them, *Pisidiidae* formed 117 sp./sq. m (5%) and 0.99 g/sq. m (9%). The corresponding figures for big clams (*Dreissena*, *Unio*, *Anodonta*) were 117 sp./sq. m and 111.35 g/sq. m. Figures of the same order on the biomass of zoobenthos have also been given by Strugach (Стругач, 1966, 1974).

In the midsummer of 1970 there were on the average (big clams excluded) 3,069 sp./sq. m (weight 12.18 g/sq. m) of bottom fauna in the shallow-water zone, including 147 sp./sq. m (5%) and 1.48 g/sq. m (12%) made up by *Pisidiidae*. The corresponding figures for big clams in the littoral zone were 288 sp./sq. m and 257.49 g/sq. m.

According to the data in literature, 7 species of *Pisidiidae* have been found in the lake so far: *Sphaerium corneum*, *S. subsolidum*, *Pisidium amnicum*, *P. henslowanum*, *P. casertanum*, *P. ponderosum* and *P. subtruncatum*. They all have been mentioned in Joffe's work (Юффе, 1948) and identified by Zhadin. Four of them — *S. corneum*, *P. amnicum*, *P. henslowanum* and *P. subtruncatum* — have later been found also by Tõlp (Тыльп, 1966) and Strugach (Стругач, 1966, 1974).

## Survey of the found species

### *Sphaerium corneum* (L., 1758)

Mostly in L. Peipsi, in some places as deep as 10 m. Abundant in the littoral zone of the Bay of Raskopel at the depth of 0—1 m. Occurs also in the littoral of L. Pihkva from R. Velikaya up to the river-mouth of the Piusa. Prefers muddy sand. Found also on peat, sand and mud.

According to Joffe (Юоффе, 1948), *S. corneum* has been found in the vegetation and muddy bottom of L. Peipsi and in the vegetation of L. Pihkva. *S. corneum* has been mentioned by Tõlp (Тыльп, 1966) and Strugach (Стругач, 1966, 1974).

### *Musculium ryckholti* (Norm., 1844)

Two finds in the Bay of Raskopel, on muddy sand and dense roots of macrophytes, at the depth of 0—1 m; one find in L. Pihkva near the Isle of Kamenka, on peat, at the depth of 2 m. First find in Estonian waters.

### *Amesoda scaldiana* (Norm., 1844)

Prefers river-mouths or their vicinity. Found near the river-mouth of the Suur-Emajõgi, on mud at the depth of 3 m, also near the mouth of the R. Velikaya, on muddy sand, at the depth of 2 m and in L. Pihkva, near the western coast of the Isle of Kamenka, in a river-like strait, at the depth of 3 m, on peat.

### *Pisidium amnicum* (O. F. Müller, 1774)

*P. amnicum* in L. Peipsi-Pihkva has been mentioned by Joffe (Юоффе, 1948), Tõlp (Тыльп, 1966) and Strugach (Стругач, 1966, 1974) but in a wider sense. Recently a variety of *P. amnicum* — *inflatum* — has been distinguished as a separate species (Пирогов, 1972; Timm, 1975). The two species have quite a few different characters, but their curves are quite different.

Occurs frequently. The frequency of occurrence was highest in 1967 and 1968. Prefers muddy sand or mud; rarely on sand, in the Bay of Raskopel it was found on dense roots of macrophytes. In L. Peipsi and L. Lämmijärv it is most abundant at the depth of 1 m and deeper than 6 m, in L. Pihkva mostly at depths less than 1 m, although it occurs up to the depth of 5 m. In littoral samples of L. Peipsi it was found between Piirissaare and Kallaste only, while in the littoral samples of L. Pihkva it is almost never absent.

The longest specimens were found in L. Lämmijärv, with the length exceeding 7 mm (in 1971 up to 8.3 mm). In L. Pihkva the length was up to 7.5 mm and in L. Peipsi up to 7 mm (mostly less than 6 mm).

### *Pisidium inflatum* Megerle, 1868

Rather abundant. It was found every year in L. Peipsi. In L. Lämmijärv and L. Pihkva there were no occurrences in 1966, 1968 and 1972. The same is true of the samples of L. Pihkva in 1969. 1968 was the year of the maximum occurrence of *P. amnicum* and the minimum occurrence of *P. inflatum*. When occurring side by side, no transition forms were found.

*P. inflatum* prefers muddy-sandy or sandy bottom and occurs a little less frequently on mud. Abundant at the depth of 1 m in L. Peipsi and L. Pihkva, at the depth of 2 m in L. Lämmijärv. Rather abundant also at the depth of 6—10 m in L. Peipsi, and at the depth of 14—15 m in L. Lämmijärv.

The length of the longest specimens found in L. Peipsi equalled 8.6 mm, 8.1 mm in L. Lämmijärv and 7.6 mm in L. Pihkva (in L. Pihkva they were almost exclusively adults).

*Euglesa nitida* (Jenyns, 1832)

Abundant. In samples taken from L. Peipsi and L. Pihkva it was found every year. In L. Lämmijärv no finds in 1966 and 1972. Least numerous in the samples of 1964, most numerous in those of 1971. Prefers muddy sand or muddy bottom, but in L. Peipsi it often occurs even on pure sand. Less frequent on peat, gravel or stones. In L. Peipsi frequent at the depth of 0—1 m, also deeper than 11 m. In L. Lämmijärv and L. Pihkva also most abundant near the water surface, although found even in the deepest spots of the lakes.

Many young specimens with the length less than 2 mm were found. The biggest length in L. Peipsi was 2.9 mm, and in L. Lämmijärv and L. Pihkva 2.8 and 2.6 mm, respectively.

*Euglesa fedderseni* (Westerlund, 1890)

Dispersed and rare in all three parts of the lake. No occurrences in the bottom samples of 1969, 1971 and 1972. Prefers muddy sand. In L. Peipsi it has also occurred on mud and once on pure sand. In L. Lämmijärv and L. Pihkva found mostly at the depth of 2 m, in L. Peipsi deeper than 10 m.

*Euglesa ruut* Timm, 1975

Rare, individual specimens on muddy sand, sand, mud and peat. In L. Peipsi at the depth of 0—3 m, in L. Pihkva up to 4 m. Described from L. Võrtsjärv where it occurs on muddy sand in the littoral (Timm, 1975).

Shell ventricose, tetragonal — hence the name “ruut” which means “square” in Estonian. Umbones very broad and rounded, located on the 0.45L from the posterior edge.

Anterior margin nearly straight, rather abrupt in the upper part, rounded below and forming a slight angle with ventral margin. Posterior margin forms a straight line, only a little curved below, joined with ventral margin by an obtuse angle. Ventral margin smoothly arched. Dorsal margin rather long and straight, forming noticeable angles in front and backwards. The most prominent points of the anterior and posterior margins are located a little below the centre of the shell.

In L. Võrtsjärv: L = 2.4—3.0; H = 1.8—2.6; D = 1.3—1.9; H/L = 0.80; D/L = 0.57.

In L. Peipsi-Pihkva: L = 2.0—3.1; H = 1.7—2.7; D = 1.1—1.7; H/L = 0.77—0.94; D/L = 0.48—0.59.

Periostracum yellowish-white to brownish-yellow, finely and irregularly striated. Hinge-plate short and weak.

Cardinals: C<sub>2</sub> — almost straight, C<sub>4</sub> — parallel to C<sub>2</sub>, noticeably longer, often straight; C<sub>3</sub> — narrow, weakly curved, (b) a little thickened and indistinctly forked, located very near to the lower edge of the hinge-plate.

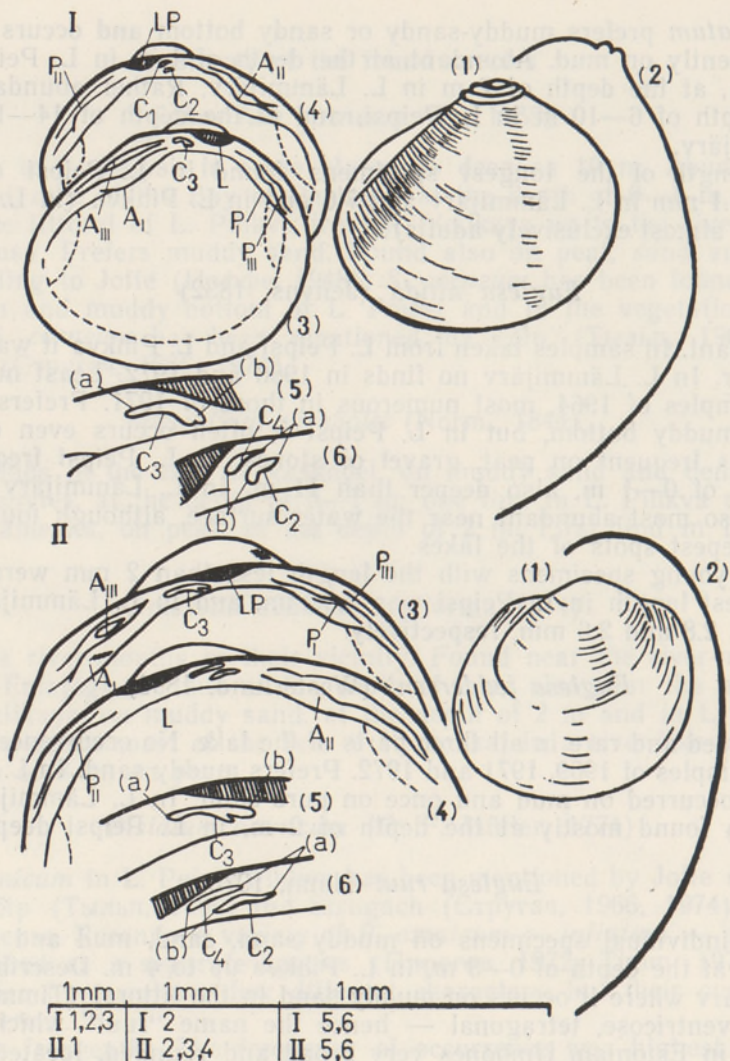


Fig. 1. *Euglesa tanuga* (I) and *Euglesa ruut* (II).

Figures are as follows: (1) — exterior, (2) — curve (external contour of the right valve), (3) — right valve, (4) — left valve, (5) — cardinal tooth of right valve, (6) — cardinal teeth of left valve.

Abbreviations used in figures and in text:  $A_I$ ,  $A_{III}$  — anterior lateral teeth of right valve,  $A_{II}$  — anterior lateral tooth of left valve,  $P_I$ ,  $P_{III}$  — posterior lateral teeth of right valve,  $P_{II}$  — posterior lateral tooth of left valve,  $C_2$ ,  $C_4$  — cardinal teeth of left valve,  $C_3$  — cardinal tooth of right valve, (a), (b) — anterior and posterior part of cardinal, LP — ligament-pit.

Laterals:  $A_{II}$  and  $P_{II}$  thin and short;  $A_I$  and  $A_{III}$  a little narrowed in the form of weak platelets;  $P_I$  thin and short;  $P_{III}$  very weak. Ligament-pit long and rather broad.

Holotype (L = 2.8 mm; H = 2.2 mm; D = 1.5 mm) and two paratypes from L. Vörtsjärv, deposited in the collection of molluscs at the Vörtsjärv Limnological Station.

*Euglesa crassa* (Stelfox, 1918)

Rather common, although not especially abundant. Found every year, though not simultaneously in all the three parts of the lake. Prefers muddy sand or muddy bottom. In L. Peipsi and especially in L. Lämmijärv it occurred rather abundantly on pure sand. Rare finds on stones and in vegetation on turf. Most numerous at the depth over 10 m in L. Peipsi, over 4 m in L. Pihkva and at 1—5 m in L. Lämmijärv.

*Euglesa tanuga* Timm, 1975

Not very frequent. Absent in littoral samples of 1970, no occurrences in 1964 and 1965. Prefers mud and muddy sand, found also in pure sand. Always at a greater depth than 1 m. In L. Peipsi most frequent at 8—10 m, in L. Pihkva found at the depth of 4—5 m only. First description in L. Vörtsjärv where it occurs both in littoral and profundal zone (Timm, 1975).

Shell rounded-oval, ventricose; umbones conical, prominent, narrow, oval, surrounded by a rather strong concentric fold which is thinner towards the ends. The fold reminds an Estonian woman's national coif "tanu" — hence *Euglesa tanuga*. Most prominent point of umbo on the 0.33L from the posterior end.

Anterior margin rather straight in the upper part, more curved below. Posterior margin tumid and curved. Ventral margin long, smoothly curved, joined to anterior and posterior margins without angles. Dorsal margin short, almost curved by umbones, forms an obtuse angle with anterior margin. The most prominent points of the anterior and posterior margins are located at  $\frac{1}{3}$  of the height of the shell (at the ventral edge). In L. Vörtsjärv: L = 2.2—3.4; H = 2.1—2.9; D = 1.6—2.5; H/L = 0.88; D/L = 0.67.

In L. Peipsi-Pihkva: L = 1.2—3.0; H = 1.1—2.6; D = 0.7—1.8; H/L = 0.80—0.95; D/L = 0.51—0.67.

Periostracum shiny, greyish-yellow to brownish-yellow, distinctly ribbed. Hinge-plate strong.

Cardinals: short;  $C_2$  — very curved and directed below at right angle, (b) shorter than (a), both ends a little thickened;  $C_4$  — parallel to  $C_2$ , thickened in the posterior part only, slightly and evenly curved;  $C_3$  — (a) horizontal and narrow, (b) shorter, broader, more or less clearly forked, sloping below and forming an obtuse angle.

Laterals: well developed;  $A_{II}$  long, very prominent,  $P_{II}$  shorter than  $A_{II}$ ;  $A_I$  massive, strongly prominent and sloping,  $A_{III}$  smaller than  $A_I$ , most prominent parts of  $A_{III}$  and  $A_I$  are located side by side, while the base of  $A_{III}$  is directed to  $C_3$  as a long and narrow wedge;  $P_I$  and  $P_{III}$  long, narrow and parallel,  $P_{III}$  a little shorter than  $P_I$ . Ligament-pit short and not very broad.

Holotype (L = 3.2 mm; H = 2.8; D = 1.8 mm) and four paratypes from L. Vörtsjärv, deposited in the collection of molluscs at the Vörtsjärv Limnological Station.

*Euglesa pulchella* (Jenyns, 1832)

Individual specimens. Entirely absent in the samples of 1965 and 1971. Most finds on muddy bottom, less on muddy sand, in one case on pure sand and peat. In L. Peipsi most frequent at the depth of 8—10 m, in L. Lämmijärv — up to 15 m. Some finds come from the littoral zone at the depth of less than 1 m.

*Euglesa humerosa* Pirogov et Starobogatov, 1974

Very rare. Found in L. Peipsi only, with the exception of three specimens from L. Lämmijärv. On various bottoms, at the depth of 7—10 m.

*Euglesa pihkva* sp. nov.

Individual specimens. Found in the littoral of L. Pihkva and L. Peipsi, on muddy sand, sand and turf, at the depth of less than 1 m, in the midsummer of 1970 only. The name "*pihkva*" goes back to the lake name.

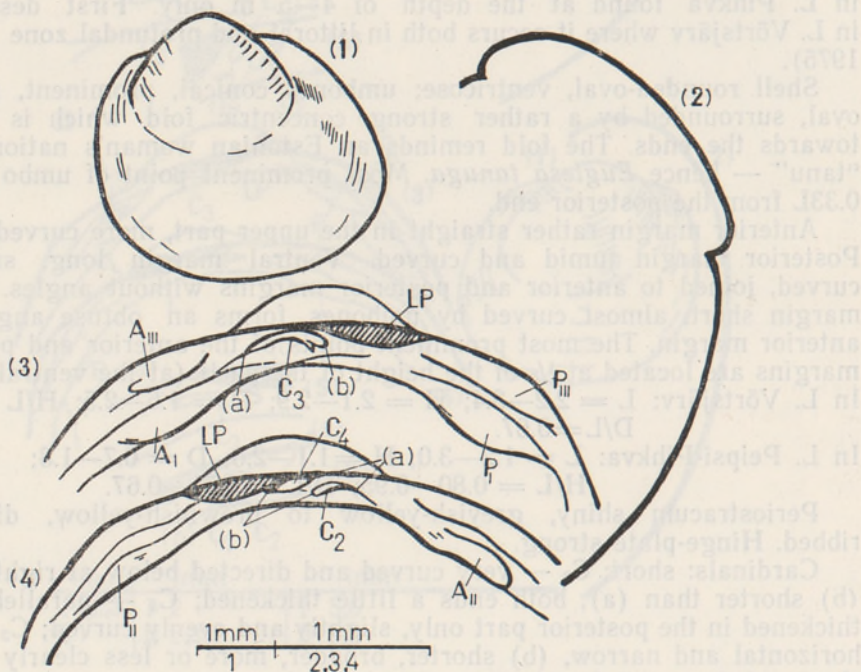


Fig. 2. *Euglesa pihkva*. Marks and abbreviations in Fig. 1.

Shell very ventricose, triangularly oval, umbones very strongly prominent and especially conspicuous because of a surrounding furrow. Umbones are located on the 0.37L from the posterior margin.

Anterior margin sloping below, slightly convex, a little narrowed. Posterior margin evenly obtuse, convex. Dorsal margin almost straight, forming clearly distinct obtuse angles both with anterior and posterior margins. Ventral margin evenly rounded, forming a hardly noticeable obtuse angle with posterior edge. The most prominent point of the anterior margin lies below the central line, while that of the posterior margin is located nearly on the central line.

$L = 1.7-3.6$ ;  $H = 1.5-3.1$ ;  $D = 1.4-2.4$ ;  $H/L = 0.83-0.90$ ;  
 $D/L = 0.59-0.69$ .



Colour yellowish, horny, finely and unevenly striated. Hinge-plate rather short and broad.

Cardinals:  $C_2$  — curved, (a) almost parallel to the outer edge of hinge-plate, (b) sloping, a little thickened;  $C_4$  — rather straight, may be located very near to the outer edge of the hinge-plate.  $C_3$  — curved, obtusely bent, (b) widened and forked.

Laterals:  $A_{II}$  and  $P_{II}$  strong, prominent;  $A_{III}$  much thinner and shorter than  $A_I$ ;  $P_{III}$  a little shorter and thinner than  $P_I$ , the latter being clearly prominent. Ligament rather narrow and short.

It differs from *E. humerosa* by a more ventricose shell and very prominent umbones.  $C_2$  and especially  $C_4$  are not similar, the laterals of *E. pihkva* are slender, in particular  $P_{II}$  and  $A_{II}$ .

Holotype (L = 3.6 mm; H = 3.1 mm; D = 2.4 mm, taken on August 7, 1970) and three paratypes from L. Pihkva deposited in the collection of molluscs at the Vörtsjärv Limnological Station.

### *Euglesa henslowana* (Shepp., 1823)

Rather frequent. Never absent, except for L. Pihkva in 1964—1966. Prefers muddy sand or mud, fewer finds on sand, one on gravel. Most abundant at a greater depth than 7 m in L. Peipsi, deeper than 5 m in L. Lämmijärv and at the depth of over 4 m in L. Pihkva; found also in shallower water, even at the depth of less than 1 m.

Adult specimens reach the following maximum lengths: 4.7 mm in L. Peipsi, 4.8 mm in L. Lämmijärv and 4.2 mm in L. Pihkva.

Earlier the specimens with a fold were probably considered *Pisidium henslowanum* (Июффе, 1948; Стругач, 1966, 1974; Тыльп, 1966). Subdivisions were not differentiated. Here two more similar species are treated: *E. dupuiana* and *E. suecica*, the umbones of all of which have a peculiar fold (the fold may in some cases be absent, although no such specimens were found in L. Peipsi-Pihkva), differences occurring in their outer shape, form and placing of cardinals and in the form of the curve. It is not excluded that some other species with a fold, such as *E. supina*, *E. tanuga*, *E. peipsi*, etc., were earlier identified as *Pisidium henslowanum*.

Descriptions and figures of *Euglesa henslowana*, *E. dupuiana* and *E. suecica* have been published (Timm, 1975). All the mentioned species could occur together in the same samples or were found in a common site during several years running, but no transition forms have been detected. The absence of transition forms is also assumed by Pirogov and Starobogatov (Пирогов, Старобогатов, 1974) as regards *E. henslowana* and *E. dupuiana* in the river-mouth of the Volga.

### *Euglesa dupuiana* (Norm., 1854)

Rather abundant. Was absent in the samples of 1969 and 1972 in L. Peipsi, and in those of 1964, 1968 and 1969 of L. Lämmijärv. On the other hand, in L. Pihkva it was found only in 1969, 1970, 1973 and 1974. Prefers muddy sand or mud, innumerable on sand, single finds on gravel, peat and stones. Most numerous at a greater depth than 3 m, in some places rather abundant at the depth of 1 m; at the depth of less than 1 m only in L. Pihkva.

A little smaller than *E. henslowana*. Biggest specimens in L. Peipsi 4.3 mm long, 4.2 mm in L. Lämmijärv and 4.1 mm in L. Pihkva.

*Euglesa suecica* (Clessin, 1873)

Rather numerous. In L. Peipsi found every year; in L. Lämmijärv no finds in 1965 and 1966, in L. Pihkva — 1967 and 1971. Most frequently found on muddy sand. Sand and mud follow. Much rarer on clay, single finds on turf and stones. It occurred mostly at the depth of 0—2 m, rather often also deeper than 5 m, especially in L. Peipsi. Many young specimens.

*Euglesa volgensis* Pirogov et Starobogatov, 1974

Three specimens found in L. Peipsi, at the depth of about 1 m, on sandy and stony-sandy bottom in the littoral without vegetation.

*Euglesa tenuisculpta* Pirogov et Starobogatov, 1974

Common, although not especially numerous. In samples of L. Peipsi it was absent only in 1964 and 1966. Rarer in other parts. Prefers muddy sand or mud, less frequent on sand, one find on gravel. Mostly at the depth of over 5 m (in L. Peipsi up to 10 m, in L. Lämmijärv up to 15 m). Occurs also in shallow littoral water.

*Euglesa difficilis* Pirogov et Starobogatov, 1974

Not especially numerous. Entirely absent in 1964 and 1973. No finds in the samples of L. Peipsi in 1966 and 1969 and in those of L. Pihkva in 1966 and 1967. Rarer in L. Lämmijärv. On different bottoms. Frequent

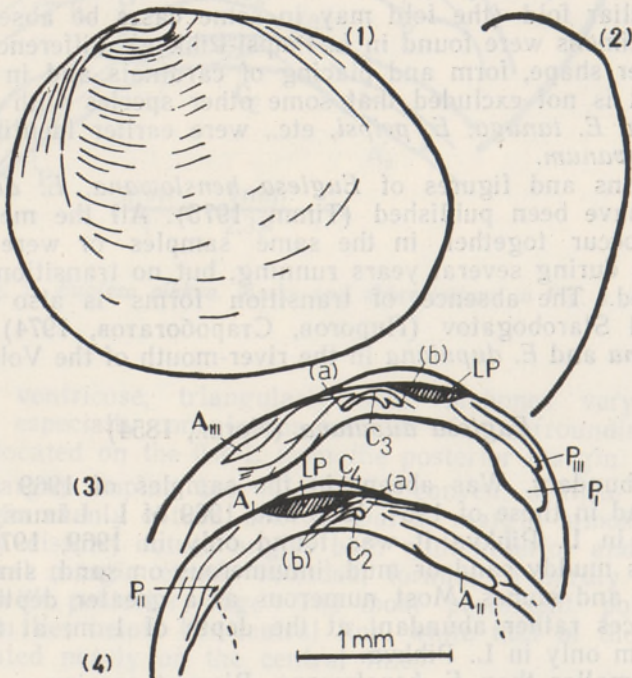


Fig. 3. *Euglesa peipsi*. Marks and abbreviations in Fig. 1.

on muddy sand and mud, found also on sand and dense roots of macrophytes. In L. Peipsi mostly at the depth of 8—10 m, in L. Pihkva deeper than 4 m. In L. Lämmijärv found even in places shallower than 1 m.

*Euglesa peipsi* sp. nov.

Found in the southern part of L. Peipsi, also in L. Lämmijärv and L. Pihkva. Not frequent. Prefers sandy bottom, rarer on muddy sand and mud. Mostly at the depth of 1—4 m, found also deeper than 10 m. In samples both together with other species having a fold and separately. The name "*peipsi*" goes back to the lake name.

Shell shortened, triangularly oval, moderately ventricose, with a somewhat prominent umbo, the top of which is located on the 0.33L from the posterior margin. At the lower part it has a sigmoid fold under which the umbo is often surrounded by some stronger striae.

Anterior margin a little narrowed, in the upper part sloping, almost straight, in the lower part convex. Posterior margin equally convex. Dorsal margin between umbones a little curved, forming noticeable obtuse angles both with anterior and posterior margins. Ventral margin evenly rounded, forming a hardly noticeable obtuse angle with posterior margin. The most prominent points of anterior and posterior margins are located a little below the central line.

L = 1.6—4.2; H = 1.2—3.6; D = 0.9—2.7; H/L = 0.77—0.91; D/L = 0.46—0.65.

Colour yellowish-grey, finely and unevenly striated. Hinge-plate rather broad.

Cardinals: C<sub>4</sub> — very little curved, almost straight, long and thin, with sharpened ends, not parallel to edges of hinge-plate; C<sub>2</sub> — strongly, almost rectangularly bent, (a) short, obtuse, (b) long and sharpened; C<sub>3</sub> — strong, (a) and (b) form obtuse angle, (b) strongly forked and widened.

Laterals: P<sub>II</sub> and A<sub>II</sub> short, prominent, A<sub>III</sub> very small, A<sub>I</sub> big, strongly prominent, P<sub>III</sub> thinner and shorter than rather strong and prominent P<sub>I</sub>. Ligament rather broad and short.

Holotype (L = 2.6 mm; H = 2.3 mm; D = 1.5 mm, taken on July 13, 1970) and three paratypes from L. Peipsi deposited in the collection of molluscs at the Võrtsjärv Limnological Station.

*E. peipsi* is not very ventricose, but its cardinals are strongly curved and the laterals are as prominent as those of *E. supina*, *E. ponderosa* or some other species of that group. Young specimens of *E. peipsi* may resemble *E. suecica* or *E. dupuiana*, but their hinge-plates (especially cardinals) and the curves of outer contour are very different.

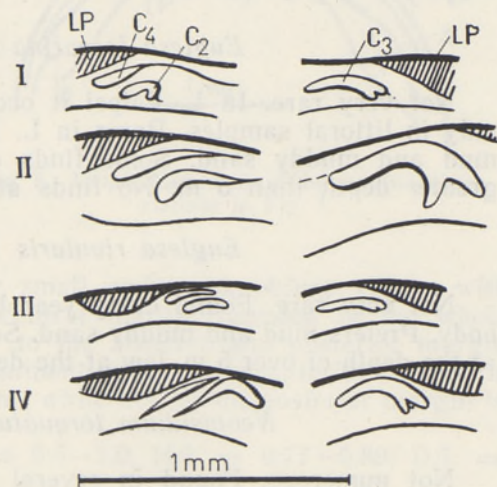


Fig. 4. Cardinal teeth of *Euglesa henslowana* (I), *E. dupuiana* (II), *E. suecica* (III) and *E. peipsi* (IV).

*Euglesa supina* (Schmidt, 1850)

Six specimens from three samples of L. Peipsi (all of them in different years) found at the depth of 1—2 m, on pure or a little muddy sand. Twice near the river-mouth of the Suur-Emajõgi, one place of finding lies a little farther northwards.

*Euglesa conica* (Baudon, 1857)

Two specimens found in L. Peipsi, on sandy bottom, at the depth of 1 and 1.8 m near the river-mouth of the Suur-Emajõgi. The same places of finding as in the case of *E. supina*. First find in Estonian waters.

*Euglesa ponderosa* (Stelfox, 1918)

Rather common, although not especially numerous. Fully absent in 1965. No finds in the samples of L. Peipsi of 1969 and 1972 and in those of L. Lämmijärv in 1966, 1971 and 1972. Much rarer in L. Pihkva. Prefers mud and muddy sand, rather abundant even on sand, single finds on gravel and clay. Found at very different depths — from the water surface to the deepest points of the profundal zone. According to Joffe (Июффе, 1948) on mud in L. Peipsi.

*Euglesa globularis* (Clessin, 1873)

Individual specimens in L. Peipsi and one specimen in L. Pihkva. In the profundal zone on muddy bottom, in the Bay of Raskopel in the littoral on sand.

*Euglesa acuminata* (Clessin, 1873)

Not especially numerous. Fully absent in 1969. No finds in the samples of L. Peipsi in 1966. In other parts rarer. Prefers mud, although occurs also on muddy sand. Rarer on sand, gravel and stony bottom. In L. Peipsi and Pihkva mostly at a greater depth than 4 m, in L. Lämmijärv at the depth of 15 m.

*Euglesa fossarina* (Clessin, 1873)

Not very rare. In L. Peipsi it occurred every year and was absent only in littoral samples. Rarer in L. Pihkva and L. Lämmijärv. Prefers mud and muddy sand. Some finds on sand and turf. Frequent at a greater depth than 5 m. No finds at a depth less than 1 m.

*Euglesa rivularis* (Clessin, 1874)

Not very rare. Found every year but in different parts of the water body. Prefers mud and muddy sand. Some finds on sand. Most specimens at the depth of over 5 m, few at the depth of 1 m or less.

*Neopisidium torquatum* (Stelfox, 1918)

Not numerous. Found in several parts of the water body. Absent only in the samples of 1968. Frequently on muddy sand and mud, rarely on sand and gravel. Prefers greater depths, in L. Peipsi up to 10 m, in L. Pihkva over 4 m, in L. Lämmijärv also in shallow places — 1—5 m.

*Neopisidium alpinum* (Odhner, 1938)

Individual specimens. Frequent on mud, found also on muddy sand and sand. Mostly at depths of over 3 m. In L. Peipsi abundant at the depth of 6–10 m. In littoral zone in L. Pihkva and L. Lämmijärv only.

*Neopisidium stelfoxi* Pirogov et Starobogatov sp. nov.

Although the author Stelfox (1918) refers to some differences between the specimens of *Pisidium tenuilineatum* (Fig. 6–13), he does not give any other description. So Figs. 10–13 are in accordance with the description, but Figs. 6–9 are not.

Pirogov has found some specimens corresponding to those depicted in Figs. 6–9 in fresh-water bodies of the northern area of the Caspian (Пирогов, Старобогатов, 1974). They have been described by Pirogov and Starobogatov (Leningrad Institute of Zoology) as *Neopisidium stelfoxi* (so far in manuscript only). The specimens found in L. Peipsi have been compared with their holotype. The description of *N. stelfoxi* is given on the basis of Pirogov's and Starobogatov's description.

In L. Peipsi 12 specimens in one sample from the littoral of the Bay of Raskopel, on sandy bottom at the depth of 0.5 m, have been found.

Shell oval, umbones broad and not prominent, tops located on the 0.33L from the posterior margin.

Anterior margin a little narrowed and slightly sharpened. Posterior margin broad, convex, a little obtuse in the middle part. Dorsal margin smoothly curved, forming small and weak obtuse angles with anterior and posterior margins. Ventral margin rounded in the whole length of the shell and goes over to the anterior and posterior margin without any angles. The most prominent point of the anterior margin is located a little below the central line, while that of the posterior margin is located on the central line.

$L = 1.1-1.6$ ;  $H = 0.9-1.2$ ;  $D = 0.6-1.0$ ;  $H/L = 0.77-0.89$ ;  $D/L = 0.51-0.62$ .

Greyish-white, frequently ribbed, the striae are more noticeable near the ventral margin.

Cardinals:  $C_4$  — very little curved, (a) somewhat reduced and more

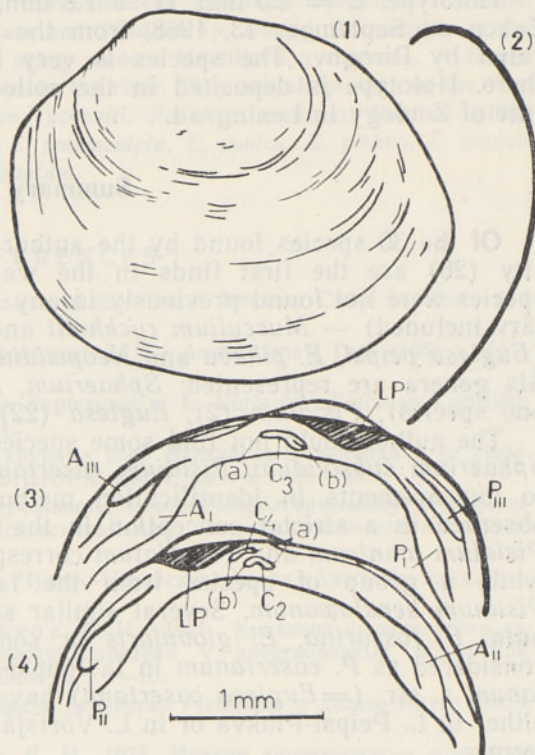


Fig. 5. *Neopisidium stelfoxi*. Marks and abbreviations in Fig. 1.

slender than (b);  $C_2$  — curved, its weakly prominent narrow ridge emerges at anterior end;  $C_3$  — smoothly curved, (b) a little forked and widened.

Laterals:  $P_{II}$  and  $A_{II}$  strongly prominent,  $A_{II}$  a little bigger than  $P_{II}$ ,  $A_I$  well developed and prominent, a little slope toward the interior of the shell;  $A_{III}$  finer and shorter than  $A_I$ .  $P_I$  and  $P_{III}$  a little prominent, narrow,  $P_{III}$  somewhat weaker than  $P_I$ . Ligament-pit short and broad.

*Neopisidium stelfoxi* is lower and has a more sloping shell than *N. tenuilineatum*. Their curves are different. The top of the angle of the tooth  $C_2$  lies somewhat forward from the centre of the umbones contour (*N. tenuilineatum*), or on the edge of the umbones contour (*N. stelfoxi*). The cardinals of *N. stelfoxi* are more curved and the shell is more ventricose than those of *N. alpinum* and *N. tenuilineatum*.

Holotype: L = 1.5 mm; H = 1.3 mm; D = 0.5 mm (one half only). Taken on September 13, 1968, from the North Caspian in the Kirovskii canal by Pirogov. The species is very frequent (up to 200 sp./sq.m) there. Holotype is deposited in the collection of molluscs at the Institute of Zoology in Leningrad.

### Summary

Of the 30 species found by the author in L. Peipsi-Pihkva, the majority (26) are the first finds in the water body discussed, while two species were not found previously in any Estonian water body (L. Võrtsjärv included) — *Musculium ryckholti* and *Euglesa conica*. Three species (*Euglesa peipsi*, *E. pihkva* and *Neopisidium stelfoxi*) are new in science. Six genera are represented: *Sphaerium*, *Amesoda*, *Musculium* (each by one species), *Pisidium* (2), *Euglesa* (22) and *Neopisidium* (3 species).

The author could not find some species mentioned by earlier authors: *Sphaerium subsolidum*, *Pisidium casertanum* and *P. subtruncatum*. Due to improvements in identification methods, several species have been observed in a stricter conception in the present paper. Two species — *Pisidium amnicum* and *P. inflatum* correspond to the earlier *P. amnicum*, while a group of species from the family *Euglesa* corresponds to *Pisidium henslowanum*. Several similar species, such as *Euglesa acuminata*, *E. fossarina*, *E. globularis* or some others, have probably been considered as *P. casertanum* in L. Peipsi-Pihkva. Specimens of *P. casertanum* s. str. (= *Euglesa casertana*) have not been found by the author either in L. Peipsi-Pihkva or in L. Võrtsjärv located in the vicinity of the former.

Species of *Pisidiidae* occurred abundantly in different parts and zones of the lake. In L. Peipsi all the 30 species were found, in L. Lämmijärv — 23 and in L. Pihkva — 26 species. Living conditions for the group, on the whole, are favourable everywhere. The species *Sphaerium corneum*, *Musculium ryckholti*, *Amesoda scaldiana*, *Euglesa ruut*, *E. pihkva*, *E. volgensis* and *Neopisidium stelfoxi* occurred exclusively or almost exclusively in the littoral. *Euglesa supina*, *E. conica* and also *Amesoda scaldiana* prefer the neighbourhood of river-mouths. *Euglesa acuminata* and *Neopisidium torquatum* seem to prefer the profundal, while no species specific of the profundal zone have been detected.

In the whole water-body the following species were most abundant: *Pisidium amnicum*, *P. inflatum*, *Euglesa nitida*, *E. henslowana*, *E. dupuiana* and *E. suecica*.

As compared with the species investigated in L. Võrtsjärv (Timm, 1975) earlier, six more were found in L. Peipsi-Pihkva. In neither lake

did any species of *Pisidiidae* occur on a mass scale, but the general population density of the group in L. Peipsi-Pihkva in June (mean values for several years) is about 13 times and biomass 11 times higher than those in L. Võrtsjärv. *Euglesa nitida* and *E. suecica* are numerous in both lakes, while *E. ponderosa*, *E. acuminata* and *E. crassa* which are abundant in L. Võrtsjärv are not very numerous in L. Peipsi-Pihkva. Most of the species occurring in L. Võrtsjärv were found in the littoral. Only *E. ponderosa*, *E. crassa* and *Neopisidium torquatum* preferred the profundal zone there.

### Appendix

When considering the benthos of the River Narva which flows out from L. Peipsi-Pihkva, the author (Timm, 1967) has mentioned the *Pisidiidae* *Sphaerium corneum*, *S. solidum*, *S. lacustre*, *Pisidium amnicum* and *Pisidium* sp. During the revision of the same material, collected in 1962, and using modern identification methods, it turned out that 13 species of *Pisidiidae* occurred in the river. They are all present in the lake as well: *Amesoda scaldiana*, *Musculium ryckholti*, *Pisidium amnicum*, *Euglesa nitida*, *E. pulchella*, *E. henslowana*, *E. peipsi*, *E. tenuisculpta*, *E. conica*, *E. pihkva*, *E. acuminata*, *E. rivularis* and *Neopisidium torquatum*.

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Received  
Nov. 5, 1974

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## PEIPSI-PIHKVA JÄRVE HERNESKARPLASTEST

Resüme

Aastail 1964—1974 leiti järve faunas 30 liiki *Pisidiidae* sugukonda kuuluvaid limuseid. Esindatud on 6 perekonda: *Sphaerium* (1 liik), *Amesoda* (1), *Musculium* (1), *Pisidium* (2), *Euglesa* (22) ja *Neopisidium* (3). 26 liiki on selles veekogus esmasleiud, neist 2 liiki esmasleiud Eesti mageveekogudes üldse ja 3 liiki (*Euglesa peipsi*, *E. pihkva* ja *Neopisidium stelfoxi*) kirjeldatakse teadusele uutena.

Tuukse andmeid herneskarplaste leviku kohta järve põhjast ja sügavusest sõltuvalt. Elutingimused on kirjeldatud rühmale tervikuna soodsad, enamik liike on levinud üle kogu järve, kuid ühtki ei esine massiliselt.

Eesti NSV Teaduste Akadeemia  
Zooloogia ja Botaanika Instituut

Toimetusse saabunud  
5. XI 1974

Viivi TIMM

## О ПИСИДИИДАЕ ЧУДСКО-ПСКОВСКОГО ОЗЕРА

Резюме

В 1964—1974 гг. в фауне озера обнаружено 30 видов *Pisidiidae*, принадлежащих к 6 родам: *Sphaerium* (1), *Amesoda* (1), *Musculium* (1), *Pisidium* (2), *Euglesa* (22), *Neopisidium* (3 вида). 26 видов обнаружены в водоеме впервые, причем 2 — впервые в Эстонской ССР, а 3 (*Euglesa peipsi*, *E. pihkva* и *Neopisidium stelfoxi*) описываются как новые для науки.

Приводятся данные о распространении группы и отдельных видов в Чудско-Псковском озере.

Условия жизни для группы благоприятны, и большинство видов распространено по всему водоему, причем ни один вид не является массовым.

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Поступила в редакцию  
5/XI 1974