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Phylum MOLLUSCA—Mollusks

Members of two of the six classes of phylum Mollusca, i. e., gastropods or snails (Gastropoda) and lamellibranchiates or bivalved mollusks (Lamellibranchia or Bivalvia), differing in structure of body and shell, inhabit U. S. S. R. fresh waters. Larvae of bivalves (pearl mussels, Swan mussels, ridged pearl mussels, pearl shells), termed glochidia, parasitize fish for some time following their development from fertilized eggs within gills of mollusk itself. Glochidia bear thin shells differing in size, structure and form in most species. Sharp hooks beset with teeth line anterior edge of each valve. Valves connected by ligament located internally and closed by embryonic adductor muscle. Internal face of valve lined by cellular mass covered by sensorial cells. Most glochidia of family Unionidae characterized by adhesive filament termed provisional byssus extending from opening of byssus gland (Figure 1550 A). Byssus filament absent in *Anadonta complanata* and *A. arcaeiiformis*.

627 Mollusks propel larvae into surrounding water through exhalant siphon when fish approach. Glochidium attaches to gills, fins or skin of fish by means of byssus filament while snapping shut its toothed valves (Figure 1550, B, C). Irritated epithelium of fish in vicinity of glochidium proliferates and gradually covers parasite. Glochidium in tumor forming in this way feeds osmotically at expense of host, grows somewhat, develops into young mollusk and enters water when tumor walls burst. Mass shedding of glochidia of this kind occurs in various seasons, in swan mussels in May and June, pearl shells in August, and pearl mussels from middle of May to beginning of August. Glochidia parasitize fish for about one month (Zhadin, 1938).

Glochidia of pearl mussels and swan mussels parasitize numerous fish: perch, saber fish, ide, ruff, bleak, sterlet, silver bream, roach, Azov-Pontine roach, pike, etc. (Zhadin, 1938). Glochidia of pearl shells occur on minnow gills, totalling as many as 450 per fish. Infestation particularly high in perch in Leningrad Region, in saber fish, ide and ruff in Oka River, and in gobiids in Don delta.

New methods have recently been developed to intensify the natural infestation of fish by pearl mussel larvae in order to increase the reproductive capacity of commercial pearl mussels and so boost stores of mother-of-pearl raw material in inland Soviet waters (Vlastov, 1962).

Key to Genera and Species of Glochidia Parasitic in Fish*

- 1 (20). Glochidia relatively large (at least 0.14 mm long).
2 (11). Length of valves at least 0.24 mm (generally more).
3 (10). Beak present.
4 (5). Beak short. *Cristaria*.
. *C. plicata* (Leach) - Ridged pearl mussel (Figure 1551, A).

Size 0.26-0.32x0.24-0.28 mm. Form roundedly triangular, shell bulging, valves somewhat asymmetrical.
Basin of Amur River.

- 5 (4). Beak long *Anodonta*.
6 (9). Valves of shell longitudinally elongated.
7 (8). Range covers European Part of U. S. S. R. and Siberia to Lake Baikal. .
. *A. cygnea* L. - Fish swan mussel (Figure 1551, B).

(Synonym: *A. piscinalis* Nilss.)

Size to 0.34x0.28 mm. Ovals elongated lateral surfaces converge in round tip, modified into sharp beak provided with thick teeth.

- 8 (7). Range covers Amur basin. *A. woodiana* Lea - Wood's swan mussel.

Size 0.28-0.30x0.25-0.28 mm. Round or triangular with large beak covered with spines.

- 623 9 (6). Valves of shell elongated transversely.
. *A. complanata* (Ziegler) - Narrow swan mussel (Figure 1551, C).

Size 0.23x0.33 mm. Lateral planes of shell round, somewhat compressed towards apex, so that apex becomes distended into rounded triangle. Long sharp beak.
European Part of U. S. S. R.

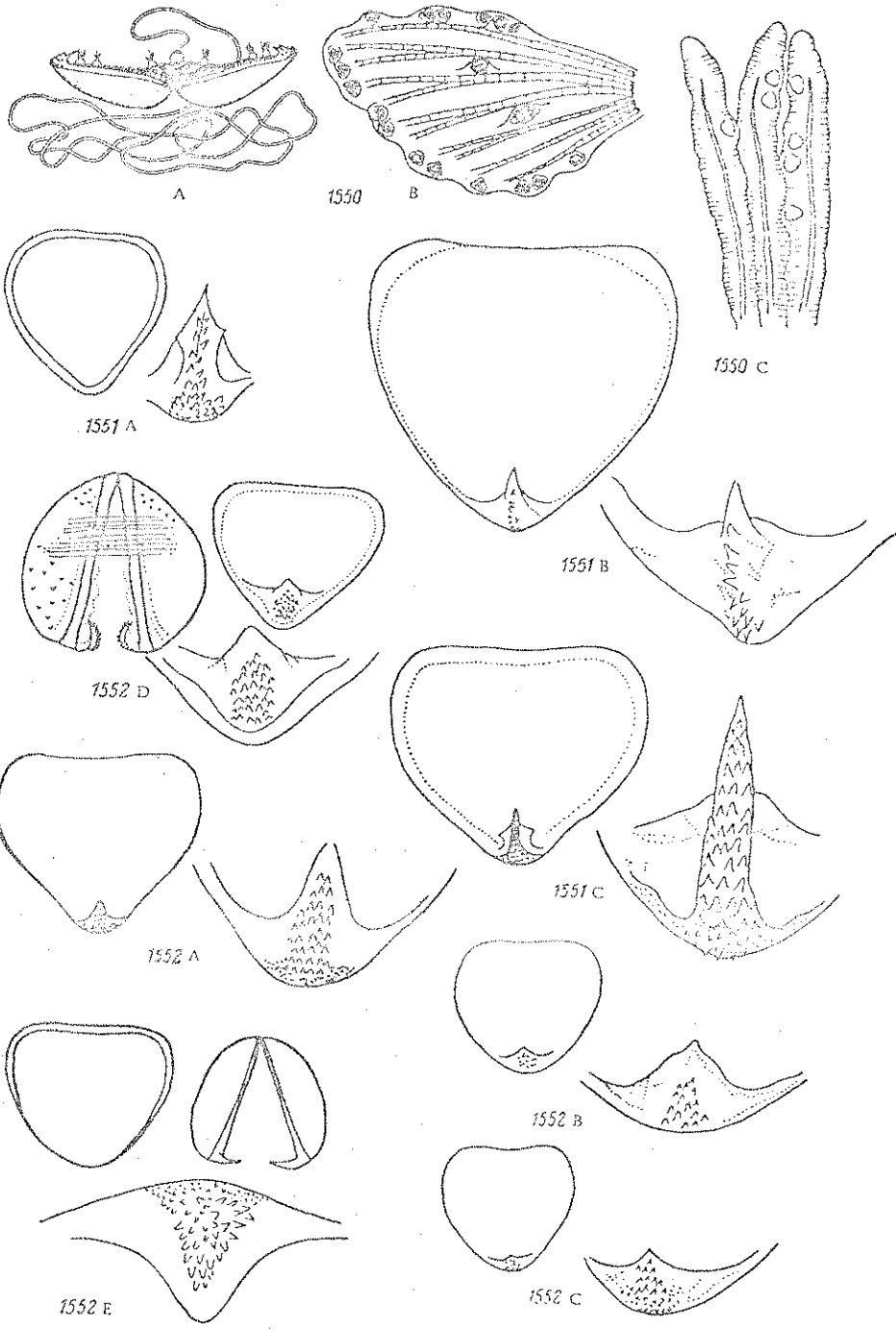
- 10 (3). Beak absent, replaced by plate covered with teeth.
. *A. arcaiformis* (Heude) - Vaulted swan mussel.

Size 0.35-0.36x0.38 mm. Bulging. Larval filament not discovered. Suputinka River (Far East).

* In measuring glochidia the length is taken as the perpendicular from the tip of the valves to the hinge line and the width as the line, parallel to the base, joining the most widely separated points on the lateral surfaces.

FIGURES 1550-1552

1550 - glochidia of mollusks: A - open glochidium with byssus filament; B - glochidia on fin (from Kocylowski and Miaczynski, 1960); C - glochidia on gills (from Zhadin, 1933); 1551 - glochidia of mollusks *Cristaria* and *Anodonta* (from Zhadin, 1933): A - *Cristaria plicata*; B - *Anodonta cygnea*; C - *A. complanata*; 1552 - glochidia of mollusks of genus *Unio* (Zhadin, 1933): A - *U. pictorum*; B - *U. tumidus*; C - *U. crassus*; D - *U. douglasiae*; E - *U. sieversi*



- 11 (2). Valves no longer than 0.22 mm (usually less). Unio.
 12 (13). Valves about 0.22 mm long, somewhat elongated longitudinally,
 their apex somewhat extended.
 U. pictorum L. - Common pearl mussel (Figure 1552, A).

Largest representatives of Unio, size 0.220 X 0.195 mm. Form of valve roundedly triangular, with somewhat distended tip terminating in extremely long beak beset with small teeth curving internally.

In perch, silver bream and roach; from Arkhangelsk in north to Caucasus in south and east to Urals.

- 13 (12). Valves at most 0.185 mm, expanded transversely or in form of equilateral triangle with tip not exceptionally extended.
 14 (15). Valves 0.160-0.185, extended transversely.
 U. tumidus Reiz - Wedge pearl mussel (Figure 1152, B).

Size 0.160-0.162 X 0.168-0.180 mm. Convex lateral surfaces converge in rounded tip terminating in broad obtuse-angled beak covered with minute teeth.

From Arkhangelsk in north to Caucasus in south, east to Urals.

- 15 (14). Valves 0.140-0.180 X 0.150-0.125 mm, in form of isosceles triangle or cordate.
 16 (17). Ranging in European Part of U.S.S.R.
 U. crassus Reiz - Thickpearl mussel (Figure 1552, C).

Size 0.145 X 0.145 mm. Form of valves triangular, with straight base. Convex sides converge in slightly pointed tip provided with broad beak covered with teeth.

- 17 (16). Range different.
 18 (19). Ranging in Amur basin and Primorje Territory rivers
 U. douglasiae Griffiths and Pidgeon - Far Eastern pearl mussel.
 (Figure 1552, D).

Size 0.145-0.180 X 0.150-0.185 mm. Extremely convex valves somewhat asymmetrical, heart-shaped. Tip of valve rounded, somewhat extended. Beak broad, pointed terminally, minutely spinose.

- 19 (18). Ranging in Caucasus.
 U. sieversi Dr. - Siever's pearl mussel (Figure 1552, E)

Size 0.175 X 0.184 mm. Moderately bulging valves almost in form of isosceles triangle with slightly wavy base line and curved lateral edges converging into broadly rounded tip. Valves join in mobile articulated beak 0.042 mm long, minutely spinose.

- 20 (1). Glochidia extremely small (about 0.05 mm).
 . . . Margaritana, M. margaritifera L. - Freshwater pearl shell.