Government of Canada Gouvernement du Canada

ISSN 0704-3716

Canadian Translation of Fisheries and Aquatic Sciences

No. 5673

Fauna of the USSR. New Series No. 109. Leeches. Vol.1 Leeches of Fresh and Brackish Water Bodies

E. I. Lukin

Original title: Fauna SSR. Novaya Seriya No. 109. Piyavki. Tom 1
In: Academy of Sciences, Zoological Institute, 1976, pp.266-303

Published by: Nauka Publishers

Original language: Russian

Available from:
Canada Institute for Scientific and Technical Information
National Research Council
Ottawa, Ontario, Canada K1A 0S2

2009

86 typescript pages

Canada

Secretary of State Secrétariat d'État Lukin, E.I.

9

MULTILINGUAL SERVICES DIVISION — DIVISION DES SERVICES MULTILINGUES

TRANSLATION BUREAU BUREAU DES TRADUCTIONS

Client's No.—N° du client	Department — Ministère	Division/Branch — Division/Direction	City — Ville
	N.M.N.S.	Inv. Zool.	Ottawa
Bureau No.—N° du bureau	Language — Langue	Translator (Initials) — Traducteur (Initiales)	
324900/6	Russian	D. B.	MAY 30 1990

Source: Fauna SSSR. Novaya Seriya No. 109. Piyavki. Tom 1.
[Fauna of the USSR. New Series No. 109. Leeches. Vol.1].
Academy of Sciences, Zoological Institute].
Nauka Publishers, Leningrad, 1976. Pp. 266-303.

ACADEMY OF SCIENCES OF THE USSR

ZOOLOGICAL INSTITUTE

New Series No. 109

FAUNA OF THE USSR

LEECHES

v.1.

LEECHES OF FRESH AND BRACKISH WATER BODIES

by

E. I. Lukin

"NAUKA" PUBLISHERS
Leningrad Branch
Leningrad, 1976

SEC 5-25 (Rev. 82/11)

Canada

Genus HELOBDELLA Blanchard, 1896.

266[1]

Standard species *Helobdella stagnalis* (L., 1758).

These leeches are of a small size. In comparison to other glossiphoniids, the body is moderately wide. The smooth dorsal surface of the body has no visible papillae. Several species feature a chitinoid plate on the back. The color of the body is whitish. The usual number of eyes is one pair (except *H. nuda*, which has two pairs). A complete somite consists of three annuli. The mouth is situated in the middle of the front sucker. The proboscis is well developed. While most species have six crop caeca, some feature seven. Crop caeca show a marked tendency for reduction; in certain non-Palaearctic species their number drops to five or four. *Helobdella* leeches suck body fluids and swallow pieces of tissue of various invertebrates. They are common in all zoogeographical regions except for the Australian region; the vast majority of species live in South America.

The Palaearctic is inhabited by two species: a very common *H. stagnalis* 267 and *H. nuda* Moore. The latter species, which in the USSR occurs only in the Amur basin, differs from the typical species of the genus in several aspects and probably belongs to a distinct genus (see description of *H. nuda*). It is possible that in due course certain other *Helobdella* species (dwelling outside the Palaearctic) will also be excluded from this genus.

---

[1] Figures in the right-hand margin indicate page numbers in the original - Tr.

GUIDE TO SPECIES OF THE GENUS HELOBDELLA

1 (2). One pair of large eyes; a small chitinoid plate on the back (in the front part of the body) ....1. *H. stagnalis* (L.).

2 (1). Two pairs of small eyes (often fused); no chitinoid plate on the back. Occurs only in the Amur basin..........2. *H. nuda* (Moore).

1. *Helobdella stagnalis* (L., 1758).

Bergman, 1757 : Tab. VI, Fig. 9-11 (*Hirudo bioculata*); Linnaeus, 1758 : 649 (*H. stagnalis*); Daudin, 1800 : 19-22, Tab. 1, Fig. 1-3 (*H. pulligera*); Johnson, 1816 : 26 (*Glossiphonia perata*); 1817 : 346, Tab. 17, Fig. 11-13 (*Glossopora punctata*); Lamarck, 1818 : 296 (*Erpobdella bioculata*); Moquin-Tandon, 1827 : 102 - 103, pl. 4, Fig. 2 (*Clepsine bioculata*); 107 (*C. sowerbyi*); Blainville, 1827 : 266, pl. XXXVII, Fig. 6 (*Hirudo (Glossobdella) pulligera*); 1828 : 565, pl. XXXVII, Figs. 3, 3a, 3b (*Glossobdella bioculata*); Filippi, 1837 : 27 (*Clepsina*)?; Moquin-Tandon, 1846 : 366-369, pl. XIII, Figs. 16-26 (*Glossiphonia bioculata*); 384-385 (*G. circulans*); Vaillant, 1890 : 519 (*G. modesta*); Blanchard, 1894 : 25-26 (*Glossiphonia*); 1896i : 4-5; Castle, 1900b: 21-33, pl. I, Fig. 1-3, pl. II, Fig. 4, pl. III, Fig. 7-10, pl. VIII, Fig. 34 (*Glossiphonia*); Harding, 1910 : 162-164, Fig. 8, pl. XIV, Fig. 13-17; Weber, 1915: 25-26; Harding and Moore, 1927 : 67-70, Fig. 27; Lukin, 1929 : 51-53; Autrum, 1936 : 24-26, Abb. 4a, 16; Pawlowski, 1936a : 131-133, rys. 92; Bennike, 1943 : 71-73; Schegolev, 1949 : 137, Fig. 76, 5; Mann, 1953 : 384, Fig. 18; 1955a : 114-115, Fig. 3,4; Jung, 1955a : 117; Mann, 1957b : 171-177, Fig. 1, 2, 3; Autrum, 1958 : 7, Abb. 17; Lukin, 1962b : 107-109, Fig. 5b, 47, 68; 1962e: 198; Kalbe, 1966 : 243 -277.

Body size. Length 15 to 20 mm, width 3 to 5 mm (Moquin-Tandon, 1846); length 8 to 12 mm, width 3 to 4 mm (Blanchard, 1894); length 8 to 12 mm, width 4 mm (at rest), length when completely stretched up to 23-26 mm (Harding, 1910); length 9 to 10 mm, width 5 mm (at medium contraction), length 20-25 mm, width 2 mm when stretched completely (Pawlowski, 1936a); length 5 to 10 mm, width 3 to 5 mm, length when completely stretched up to 25 mm (Autrum, 1936). These data apparently refer to live leeches (though the authors do not specify this) collected in water bodies of Western Europe. G.G. Shchegolev's survey of leeches of the USSR (1949) gives the following data on the size of *H. stagnalis*: length 5 to 10 mm, width 2 to 4 mm. The [present] author studied numerous preserved samples from various regions of this country and found no leeches longer than 10 mm or wider than 4 mm. As a rule, preserved mature helobdellids were 5 to 7 mm long and 2 to 3 (rarely 4) mm wide. It might seem that *H. stagnalis* from Western Europe are larger than their counterparts from Eastern Europe and Central Asia. However, since the data we have compared were obtained using different methods, this conclusion can not be regarded as final. At the same time we should note that while decreasing the length of the body, preservation somewhat increases its width. Yet specimens of *Helobdella stagnalis* from various areas of the USSR are not wider than those from Western Europe, which also testifies to a larger size of West European helobdellids. No geographical trends could be established in the size of *H. stagnalis* from various areas of the USSR.

Body shape (Fig. 120, A, B). At rest the body is an oblong oval strongly tapering towards the front end, moderately wide (see data on the length and width of the body). The widest point is slightly below the middle of the body. Towards the rear end, the body also tapers, though less so than towards the front. While in motion, leeches can stretch markedly. Body edges are visibly serrated (Fig. 7), but no secondary serratedness is observed. Preserved specimens appear more serrated than live ones. The front end of preserved leeches is often curved up.

The caudal sucker is small; its diameter is less than half the greatest width of the body. For the most part, it is covered by the ventral side of the body. Its length slightly exceeds its width.

Body consistency rather firm, though softer than in *Glossiphonia* species.

Body surface smooth, without any papillae.

Body coloring light grey or yellowish-grey, sometimes with a greenish 268 tint. Preserved leeches are usually dirty white. Dark (brownish) spots (dots) scattered all over the body are far less numerous along the dorsal median stripe than elsewhere. Thus an irregular bright longitudinal line shows on the dorsal side of the body.

Dorsal plate. *H. stagnalis* differs from all Palaearctic leeches in having a lens-shaped dark yellow (sometimes almost brown) dorsal plate on its back, close to the front end of the body (between the 12th and the 13th annuli) . This chitinoid formation evolves from the vestigial embryonic organ used by developing leeches to attach themselves to the body of their mother before their posterior sucker is developed. The size and shape of the plate may vary quite considerably. Occasional specimens have a very small plate. In rare cases of its complete obliteration, a minor depression is well visible instead of the plate. It is possible that in some water bodies these aberrant forms are somewhat more common than elsewhere. The plate is often populated by ciliate infusoria (see ("Ecological Survey").

Eyes (Fig. 11, G, 120, C). There is one pair of rather large eyes clearly separated from each other. They are situated on the third annulus, sometimes quite close to its front edge and even almost in the furrow separating it from the second annulus. In contrast to other glossiphoniids, the eyes of this leech are less variable, i.e. their number and shape are relatively constant.

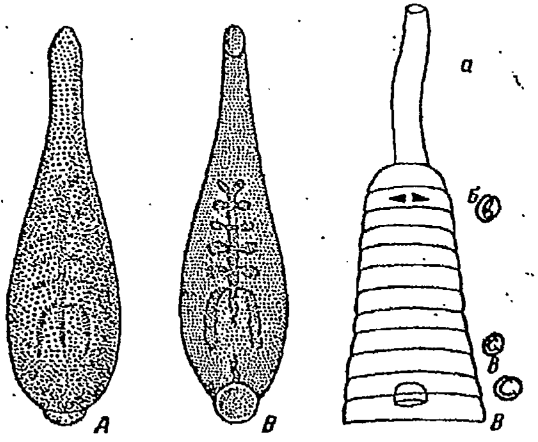


Рис. 120. *Helobdella stagnalis*. *А*, *Б* — пиявка со спинной и брюшной стороны; *В* — передний отдел тела пиявки: *а* — хобот, *б* — глаза, *в* — хитиноидная пластинка. (Moquin-Tandon, 1846).

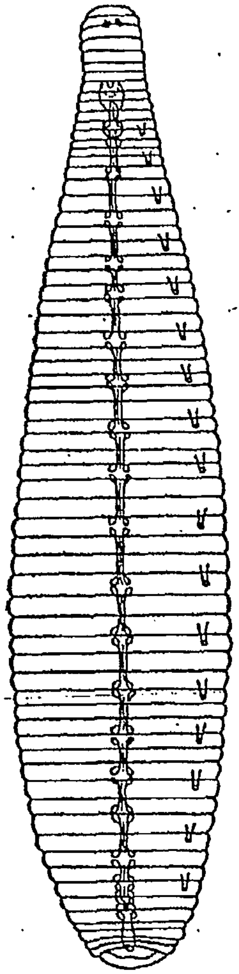
Fig. 120. Helobdella stagnalis. A, B - dorsal and ventral views of the leech, C - front section of the body: a - proboscis, b - eyes, c - chitinoid plate (Moquin-Tandon, 1846).

Somite composition. According to Castle (1900b), the first five somites are represented by five annuli, VI - XXIV : 3; XXV - XXVII contain five annuli. These data are repeated by Harding (Harding and Moore, 1927, pp. 68 and 70). Pawlowski (1936a, p. 132) interprets the same data as follows (Fig. 121): I-II : 1 (long annulus); III-IV : 1; V : 2; VI-XXIV : 3; XXV-XXVI : 2 (the first annulus of each somite is longer than the second one); XXVII : 1. Unlike these authors, Autrum (1936a, p.25) does not regard the prostomium as the first somite. He gives the following formula for the somite composition of *H. stagnalis*: I : 1; II-III : 1; IV : 2; V-XXIII : 3; XXIV-XXV : 2 (the second annulus of somite XXV is often obscure); XXVI : 1. Therefore, all these authors obviously have no serious argument, since all of them agree that this leech has a total of 67 annuli.

Alimentary canal. Of the six pairs of crop caeca, only the last one is well developed, whereas the others are more or less reduced (Fig. 122). Conversely, all the four pairs of intestine processes are well pronounced and reach a considerable length. In hungry worms the front pairs of crop caeca are barely discernible (Autrum, 1936, p. 26). Such a structure of the digestive tract may well be due to the fact that *H. stagnalis*, as opposed to most glossiphoniids (whose crop caeca, for the most part, are usually well developed and exceed the intestine processes in length), sucks not only the blood but also the entire body content of its prey (see below). The anal opening is situated below the last annulus.

<u>Genital system</u>. The male genital opening is situated between the first and second annuli, the female opening between the second and the third annuli of the XIth somite, i.e. the distance between the openings is one annulus. Very rarely, these openings are situated in the middle of the annuli rather than in the furrows. The structure of the genital system is shown in Fig. 122.

<u>Life cycle</u>. This leech appears to breed almost throughout the warm season. The beginning and end of this process obviously depend on the climate of 269 the area where the species dwells. For example, in Central Europe *H. stagnalis* with eggs, embryos and the young may be found from April to September (see, for instance, Herter, 1932, p. 127), in North-Western Ukraine from the end of April till September inclusive (Lukin, 1929, p. 53), in Denmark - from mid-May till September 10 (Bennike, 1943, p. 72). Similar findings have been reported for the USA (Castle, 1900b). It is interesting that in Iceland leeches with their young were found from March till late August (Bruun, 1938, p. 3). These early-breeding herpobdelids were probably dwelling in a warm spring. Indeed, Bennike reported (1943, p. 72) that the breeding of this leech in a certain small pond in Denmark [also] started as early as in mid-April. The same author (Bennike, 1940) found helobdellids with eggs in collections made in Iran in the beginning of February. On the other hand, Zschokke (1900) reported than in Alpian water bodies at an altitude of 2500 m, *H. stagnalis* breeds in the end of July and the beginning of August, i.e. over a very limited period.



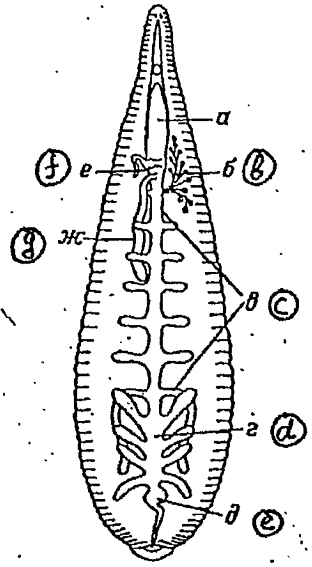


Рис. 122. *Helobdella stagnalis.* Пищеварительный аппарат и некоторые части полового аппарата. *а* — хобот; *б* — слюнные железы; *в* — желудок с отростками; *г* — кишка с отростками; *д* — задняя кишка; *е* — атриум; *ж* — яйцевой мешок. (Harding, 1910).

←

Рис. 121. *Helobdella stagnalis.* Расчленение тела. (Pawłowski, 1936a).

Fig. 121. *Helobdella stagnalis.* Body segmentation (Pawlowski, 1936a).

Fig. 122. *Helobdella stagnalis.* Digestive tract and certain parts of the genital system. a - proboscis. b - salivary glands. c - crop with caeca. d - intestine with processes. e - hind intestine. f - atrium. g - ovisac (Harding, 1910).

The eggs are of a greenish color. They are contained in one or two 270
cocoons (Bennike, 1943). Data on the number of eggs laid by one leech vary: up to 68 (Moquin-Tandon, (1846, p. 369), 20-25 (Herter, 1932, p. 127), from 7 to 37 (20 on the average) (Bennike, 1943, p. 73).

The cocoons are attached, as is the case with *Glossiphonia heteroclita*, to the ventral surface of the parent's body. The shells of the cocoons soon break and the embryos attach themselves to the abdomen of their mother by means of secretion from the dorsal gland and later by the rear sucker, once it is formed. The newly hatched leeches are whitish and transparent. Occasionally they may attach themselves to other leeches (glossiphoniids and arhynchobdellids).

The life cycle of *H. stagnalis* was studied by Mann (1957b) who spent two years observing these leeches in a small eutrophic water body in Southern England.

After wintering, the population, which consists of leeches hatched in May-June and in July-August of the previous year breeds in April and in May to die afterwards. Newly hatched leeches start breeding as early as July; their brood occur in collections made in August and September. A part of the spring brood of leeches (which probably did not breed in the summer) winters. Therefore, in the spring the population consists of two groups, i.e. those developed from eggs in May-June and those hatched in July-August of the previous year. Only a few leeches live for more than a year, while most of them die at the end of the first year or even earlier. According to Mann, the population density of *H. stagnalis* is the highest in July and August and the lowest after spring breeding, as the helobdellids die after egg deposition. Leeches hatched in the spring and breeding in the summer of the same year are especially short-lived. Writes Mann: "A hypothetical population consisting of 1600 leeches hatched in April, decreases to 50 by July, to 17 by August and 15 by September" (Mann, 1957b, p. 175). Despite such a striking mortality, *H. stagnalis*, owing to rapid development of newly hatched leeches, to its capacity for breeding during the entire season as well as to its ability to survive under a variety of conditions, belongs to the most common and numerous leeches in the Palaearctic.

Mann believes that in the water body he studied, the life cycle of *H. stagnalis* is closely associated with that of sweet flag [*Acorus calamus L.*], which hosts numerous animals (primarily chirodonomid larvae) providing nutrition for this leech. There is little doubt, however, that in other areas and water bodies *H. stagnalis* exists under different ecological conditions, and that it can be quite numerous in habitats where higher vegetation is poor or absent because of pollution or for other reasons (see below).

Ecology. According to the literature and the author's examination of vast evidence from various areas of the USSR, *H. stagnalis* is one of the most common and numerous leeches in this country. It occurs most often in small, stagnant, heavily overgrown water bodies. It is also fairly common in slow river sections with thick vegetation. At the same time, it was also found in large rivers and lakes where vegetation was relatively scarce. Occasionally *H. stagnalis* occurs in long-standing transient water bodies, as well as in dischargeable ponds. However, in these water bodies it is not typical, gets there accidentally and obviously may remain viable only in very humid soil.

Bennike (1943, p. 73) stresses "a pronounced euribiontic character"of *H. stagnalis* and mentions that in Denmark, "sphagnum bogs... were the only type of water bodies where it did not occur". According to the same author, it was even found in an extremely dystrophic lake (though in just one area).

Mann (1953, p. 390) writes that in Southern England where he conducted his studies, this helobdellid was the most numerous leech in artificial eutrophic lakes. At the same time he emphasizes that it was absent in dystrophic ponds (where silt is acidic and water is poor in alkaline substances), and scarce in low-acidity lakes and rapid brooks with stony bottoms. To sum up, 271 we should stress, on the one hand, that *H. stagnalis* is euribiontic, and, on the other hand, that it proliferates best in small eutrophic water bodies (see also Kalbe, 1966).[1]

The author (Lukin, 1929, p. 52) demonstrated that H. stagnalis is quite common in river sections heavily polluted with sewage from the city of Kharkov and occurs far less frequently in river areas not reached by this sewage. He suggested, therefore, that the saprobic characteristic of H. stagnalis (which was listed by Kolwitz and Marson (1909) as a beta-mesosaprobic or oligosaprobic leech) should be revised so that this leech is regarded as a more alpha-mesosaprobic animal. Mann notes that this helobdellid was quite common in heavily polluted ditches. He also reports that *H. stagnalis* dwells in waters with a broad range of alkali content (from 8 to 242 mg/l), being somewhat more common in waters of higher alkalinity (Mann, 1955a, p. 108). New studies by Kalbe (1966) demonstrated that H. stagnalis is somewhat more common in the alpha- as opposed to beta-mesosaprobic zone. This author did not investigate oligosaprobic water bodies, and found no helobdellids in the polysaprobic zone.

Data on the nutrition of *H. stagnalis* are numerous and, to an extent, contradictory. In an early study (1912) Moore claimed that apart from its usual sources of nutrition (small oligochaetae, insect larvae, gastropods and small bivalvians) it may feed on dead bodies of crayfish, fish and amphibians, and sometimes suck blood from blisters on the skin of fish, frogs, amphibians, other vertebrates and even bathing children. This broad description, which was

---

[1] Tilman and Barnes (1973) arrived at a different conclusion regarding the life cycle of *H. stagnalis*. They studied the biology of this leech in a shallow eutrophic water body in Utah, USA. According to their opinion, after wintering helobdellids breed twice, in May and in June, while of the young leeches hatched in spring, only 3% were breeding at the end of August. On the other hand, Learner and Potter (1974), who studied the life cycle of *H. stagnalis* in a certain water body in South Wales, England, basically confirmed Mann's findings. Different populations may have different life cycles, yet in this particular case the discrepancy between the American authors and Mann is probably due to different interpretation of the data.

obviously based on evidence supplied by a variety of authors and not always confirmed by precise investigations, appears doubtful at some points, especially where vertebrates are concerned. Harding (Harding and Moore, 1927) repeated approximately the same description. He believed, however, that this leech feeds primarily on gastropods. Subsequent investigations did not confirm this opinion.

Pawlowski's (1936c) laboratory observations demonstrated that helobdellids preferred various oligochaetae (*Limnodrilus hoffmeistrei, Tubifex* sp., *Lumbriculus variegatus, Enchytraeus* sp.), insect larvae (*Cleoon dipterum, C. simile, Chironomus* and *Chaoborus*), *Asellus aguaticus* along with other leeches, e.g. *Herpobdella octoculata.* At the same time this author mentions that the helobdellids did not suck *Tropidiscus planorbis*, though these mollusks proliferate in certain water bodies inhabited by *H. stagnalis.*

Herter (1936a, p.133) does not deny that the leeches in question suck gastropods. Yet he writes that their main source of nutrition is other small invertebrates, primarily chironomid larvae. He mentions that in the laboratory helobdellids attacked even *Daphnia*, and sucked the complete body content of *Asellus* [lit. water donkeys - Tr.], if the integument of these crustaceans was damaged.

Bennike (1943, p.73) reports that in aquariums helobdellids suck out chironomid larvae and Asellus, and attack such gastropod mollusks as *Planorbis albus.* In special studies on the nutrition of common Palaearctic leech species, Jung (1955a) found that gastropods were an involuntary source of nutrition for helobdellids, who otherwise preferred to feed on oligochaetae and insect larvae. They could actually feed on *Prozobranchia* and *Bivalvia* mollusks only when these animals were wounded. In all cases, helobdellids disregarded *Coelenterata*, lower worms, mature insects and vertebrates.

The above-cited evidence indicates, therefore, that *H. stagnalis* specializes primarily in sucking out the entire body content of small aquatic arthropods covered with a relatively thin cuticle or having more vulnerable areas on their integument. These animals also become available for helobdellids due to occasional damage on their integuments (see above). Finally, it is possible that these leeches attack arthropods more often during molting periods. Feeding on arthropods for helobdellids is facilitated, as assumed by Bennike (1943), by the fact that the leeches inject digestive enzymes into the body of their prey. These enzymes dissolve all the tissues of the prey. However, along with the dissolved content of their victim, helobdellids also swallow individual pieces (see, for instance, the description of *Glossiphonia complanata*). *H. stagnalis*, therefore, is not a blood sucker. Its digestion is fast, and its intestine processes (which in blood-sucking leeches serve for long-term storage of swallowed blood) are very short and during some periods of life almost obliterated. The nutrition pattern of *H. stagnalis* accounts for its continuous search of prey and highly active mode of life. As far as the sangui- 272 vorous leeches are concerned, they stay at rest for long periods when their crop is full of blood. All the above-said on the nutrition of *H. stagnalis* characterizes it as a true predator rather than an ectoparasite.

Geographical occurrence. *H. stagnalis* is believed to be one of the most common leeches in the world and is often referred to as cosmopolitan. While the first part of this opinion is basically true, the second part (regarding its cosmopolitism) appears erroneous.

H. stagnalis occurs throughout the Palaearctic and ranks among the most numerous leeches in this region, in some areas being the most numerous leech. The same situation is observed in the North of North America (Canada and Alaska), where it is the most common and numerous leech species (Moore and Meyer, 1951; Meyer and Moore, 1954; Oliver, 1958 and other authors). In water bodies of the USA the glossiphoniid in question appears to be common, though it occurs less frequently than a number of other typical Nearctic species. It seems that in Mexico it is even less frequent, though no more or less reliable evidence on this issue has been reported. It is difficult to say anything about its distribution in Mexico, since the leech fauna in this country has not been adequately studied. Finally, *H. stagnalis* was reported in several countries of South America, but, as it appears from numerous articles by Ringuelet, its distribution in this area is clearly sporadic. It is to be recalled in this connection that the genus *Helobdella* in South America is represented by many endemic species (see "Zoogeographical Survey").

A more or less reliable area reported for *H. stagnalis* in the Ethiopian region is Ethiopia (Sciacchitano, 1963a). It seems fairly clear, however, that this leech was brought to Ethiopia accidentally (see "Zoogeographical Survey"). It was not found in other African countries south of the Sahara desert.

H. stagnalis does not live in South Asia. In the well-known monograph by Harding and Moore (1927) on the leeches of India and other countries of South Asia, it is mentioned for Kashmir only. This areain the north of India, however, borders on the Palaearctic and belongs to it in terms of leech fauna . *H. stagnalis* is listed among the leeches of China and Japan. Yet at the north of these countries it is not as common as in the Palaearctic. Moreover, in the southern areas of these countries it is apparently absent or very rare. It should be mentioned that while *H. stagnalis* is so numerous in various areas of the Palaearctic, in the Amur basin it is vastly outnumbered by *Herpobdella octoculata* as well as by *Hemiclepsis marginata* and *Glossiphonia heteroclita*. Thus in a large collection from the Amur basin we have determined 161 specimens of *Herpobdella octoculata*, 116 specimens of *Hemiclepsis marginata*, 104 specimens of

Glossiphonia heteroclita and 55 specimens of *Helobdella stagnalis* (Lukin, 1962f). Such a ratio between the second and third species, on the one hand, and between the first and fourth species, on the other hand, is observed nowhere else in the Palaearctic. It seems quite likely, therefore, that even in the north of China and Japan *H. stagnalis* is more rare than in the Amur basin within the USSR. It is certainly absent in the Malayan archipelago and was never reported for the Australian region (see "Zoogeographical Survey").

Therefore, *H. stagnalis* is not at all cosmopolitan. It is widespread in northern zoogeographical areas, especially in the Palaearctic, but dwells in only one southern zoogeographical region (the Neotropical region) and is not very typical there.

In the light of the above facts on the geographical distribution of *H. stagnalis* it may be safely assumed that this species emerged in the Palaearctic region and then penetrated into America, probably to give rise to a number of other species (see "Zoogeographical Survey").

Blanchard (1896i, p.4) acknowledged that *H. stagnalis* is a very common leech. At the same time he wrote that it "seems to prefer moderate climates and so far has not been encountered in warm countries of the Old World". This opinion was supported by Autrum (1963). However, this leech was found in the hottest regions of the Palaearctic (in hot European countries, in such areas of the USSR as Turkmenia and the Transcaucasus, etc.). Therefore, its absence in the Ethiopian and the Indo-Malayan regions is due primarily to historical reasons rather than to its ecological preferences.

As we have already said, *H. stagnalis* dwells throughout the Palaearctic. Its area of distribution is broader than that of *Herpobdella octoculata*, which, however, outnumbers *H. stagnalis* in most areas of the Palaearctic. For instance, in a large collection from various areas of Western Siberia the author

(Lukin, 1955c) found 254 specimens of *Herpobdella octoculata* and only 107 specimens of *H. stagnalis.* A similar picture was observed in Eastern Siberia (Lukin, 1955b), in the Amur basin (Lukin, 1962e), in certain water bodies of the Transcaucasus (Lukin, 1953, 1962g) and elsewhere. In contrast to *H. octoculata*, however, *H. stagnalis* has penetrated into the Kamchatka, is certainly common in the Crimea, where the herpobdellid leech has yet to be found, is far more widespread, as mentioned above, in the southernmost areas of the Palaearctic, where *H. octoculata* is rare or absent (see, for instance, data on 273 Turkmenia in Shchegolev and Shchegoleva, on Iran in Bennike, 1940). There is no doubt that in terms of its capacity for spreading, *H. stagnalis* is greatly superior to any other Palaearctic leech, including *H. octoculata.* Its only rival in this capacity is probably the avian parasite *Protoclepsis tessulata.* whose ecological opportunities, however, are more limited.

Possible identification errors. The dorsal plate of *H. stagnalis* makes it impossible to confuse it with any other leech species in this country. If the plate is obliterated, which happens very rarely, one should look for a small depression in this area. Two large, non-fused eyes are also a highly distinctive feature of *H. stagnalis.* If the eyes were destroyed under the effect of preservatives, *H. stagnalis* may be distinguished from *Glossiphonia* species by the fact that the front body of these leeches in a preserved condition typically curves up (with *Glossiphonia* species, the front end of the body in preservatives may occasionally be drawn down, but never goes up). *H. stagnalis* also differs from *G. complanata* and *G. concolor* by the absence of papillae and dotted dorsal lines (if the eyes did not preserve), from *Glossiphonia heteroclita* by highly serrated body edges and other features, from *Batracobdella algira* (which also has two eyes and in the USSR occurs only in the Crimea) by its whitish color, etc.

Features which distinguish it from *Helobdella (?) nuda*, its co-habitant in the Amur basin, are briefly described in the Guide to the species of this genus.

2. Helobdella (?) nuda (Moore, 1924).

Moore, 1924a : 354-357, pl. XIX, Fig. 3,4 pl. XXI, Fig. 2023 *(Glossiphonia (Helobdella))*; 1930 : 175-176 *(Glossiphonia (Helobdella))*; Wu, 1930 : 45 *(Glossiphonia)*; Autrum, 1936 : 42 *(Batracobdella)*; Lukin, 1960a : Fig. A, B, C; 1962e : 198; Chen, 1962 : 322-324 *(Glossiphonia)*; Soós, 1967b : 247, 253, Fig. 3, 13, 17 *(Batracobdella)*.

Only preserved specimens have been studied.

Body dimensions. Glossiphoniids of a small size. The largest specimen from China (Suzhou) had the following dimensions: length (at moderate extension) 13.5 mm, greatest width 3.5 mm (Moore, 1924a). Specimens from the Amur basin (within the USSR) were 7 mm long and 1.5-2 mm wide, though one specimen was 3 mm wide (Lukin 1960a and unpublished). Since Moore had access to a rather large body of material (he refers to this species as "very common" in China), and the author himself inspected as many as about 30 specimens from the Amur basin, it may be assumed that in the south of its geographical area *H. nuda* is larger than in the north.

Body shape. These glossiphoniids have a rather elongated body, and some specimens from the Amur basin, as evidenced by the above figures on the width and length of the body, may be even called narrow. According to Moore (1924a), the body width near somite VII increases sharply, shows a further gradual increase towards the caudal end to reach a maximum shown on his drawings in the area of somites XVIII-XX and gradually decrease afterwards.

With the Amur specimen, this sharp increase in body width occurs somewhat higher (around the somite V?), probably due to rougher preservation. At any rate, in both the Chinese and the Amur specimens of this leech in preserved condition, the round front edge of the body (the "head", as Moore puts it) is typically clearly distinct from the rest of the body (Fig. 123, 125). However, this feature is probably less pronounced in live worms. It should be added that certain Amur specimens featured other "necks" closer to the middle of the body. The posterior part of the body is wide and round.

The front sucker is small (in Moore's words, miniature). The posterior sucker is round and well developed, though less in diameter than half the maximum body width. In live specimens this sucker probably has a greater relative width. Therefore Moore's observation that "the caudal sucker is very small" (1924a, p.355) may well be disputed. The sucker is closely linked to the caudal end of the body and only its small fragment is visible from the back (one third, according to Moore).

The body edges are markedly serrated (Fig. 124). This is still enhanced by the fact that starting from segment VIII (as reported by Moore) each annulus features transverse "ridges" becoming more prominent towards the end of the body. It is possible that with live leeches the serratedness of body edges and especially the ridges are less pronounced than in preserved specimens.

The dorsal side is slightly convex, the ventral side almost flat. This means the body is fairly flattened, though Moore emphasizes that it can not be called leaf-like. In the preserved condition the leeches look brittle. Maybe it was this feature which made Moore write that the appearance of *H. nuda* is "neat and trim".

Body surface smooth, "skin papillae are totally lacking and no sensillae are visible..." (Moore, 1924a, p.356).

Body consistency appears to be moderately firm.

Body color. As a result of preservation, all the specimens studied were largely depigmented. However, most Chinese leeches reported by Moore were uniformly greenish-yellow, while most Amur leeches were light brown, with a few whitish grey specimens. It is possible that there was no significant color difference between the groups, the discrepancy being due to inevitable subjectivity in color descriptions and, to an even greater extent, to different methods of preservation. Moore writes that after clarification "one could observe dark reserve cells all over the body which beyond doubt were the source of pigmentation" (Moore, 1924a, p.356).

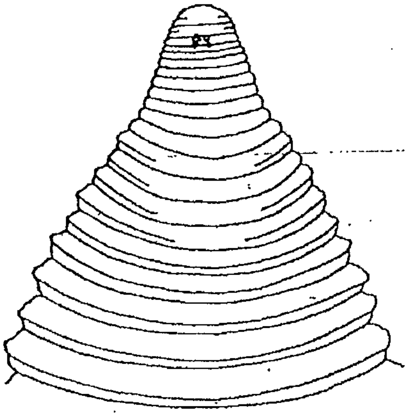


Рис. 124. *Helobdella nuda.* Края тела. (Лукин, 1960а).

Fig. 124. *Helobdella nuda.* Body edges (Lukin, 1960a).

Рис. 123. *Helobdella nuda.* Передняя часть тела. (Лукин, 1960а).

Fig. 123. *Helobdella nuda.* Front end of the body (Lukin, 1960a).

The integuments of the Chinese specimens were transparent, so that one could see "twenty six longitudinal muscle lengths on each side" (ibid). The Amur specimens apparently had less transparent integuments, yet the contours of the digestive system in some leeches were quite visible.

Eyes. There are two pairs of eyes situated on the first and second annuli of somite IV (Fig. 125). They are small and show significant variability (Fig. 126). Two-eyed specimens also exist, though they appear to be rare. Each of their eyes results from the fusion of the eyes belonging to the first and second pair on each side. Chen (1962) believes these leeches usually have two eyes, and claims that Moore supported this viewpoint, which he in fact never did. Quite the opposite, in his articles he justly maintains that the impression of two eyes results only from superficial examination of the worms through a magnifying glass (Moore, 1924a, p. 355).

Somite composition, according to Moore, is as follows: somites I and II fused to form a lip, the posterior one third of the fused somites is partially separated from the anterior two thirds by an incomplete furrow; III : 1 (with a small incomplete transverse furrow); IV : 2 (the first annulus is longer than the second and the eyes are situated on it for the most part; one specimen had traces of an a1/b2 furrow); V : 3 (the first and the second annuli are fused on the ventral side); VI-XXIV : 3 (the third annulus of the last somite may be shorter); XXV : 2 (the first annulus is longer); XXVI - XXVII : 1. Therefore, the total annuli count is about 67. Moore writes that the complete somite annuli situated before the genital openings increase in size from the first to the third one (a1<a2<a3), while in the mid-body the annuli of complete somites are of one and the same size.

Digestive system (Fig. 127). The mouth is small and hidden inside the sucker behind the lower lip. The proboscis extends from the VII to the XIII or even XIV somite, its front (free) end may be retracted to the VIII or even IX somite. The number and size of crop caeca may vary on a large scale. Specimens similar in this respect to that described as typical (whose crop was well filled with blood) had seven pairs of developed processes. The last pair, as is the usual case with glossiphoniids, is the longest. It extends far backwards, to the XXII or XXIII somite. However, in many leeches the first and second pair of processes are not visible at all, while the other pairs are much smaller and the third pair may be obliterated. Whereas Moore attributed these structural

variations to changes in the amount of blood in the stomach, they are also quite likely to be genetic. Amur specimens in which crop caeca were visible had six or seven pairs. In some young leeches these processes were well developed 275
with their distal ends almost reaching the edges of the body. As for the four pairs of gut processes, these are described by Moore as invariably prominent.

The genital system was studied in detail by Moore. The male genital opening is situated in the furrow between the first and second annulus of somite XII, the female opening between the second and third annulus of that same somite. Thus the two openings are separated with only one annulus. The clitellum and the aggregates of clitellar glands are not well pronounced. The six pairs of seminal vesicles are situated between the somites starting from XIII/XIV to XVIII/XIX. The vas deferens are very thin. In the XIII somite they transform into long filiate loops of testisacs which extend to somites XVII-XIX. The small atrium is located near the ganglion of the XII somite. The ovisacs are long and at the rear end extend to somites XIX-XXII (Fig. 127).

Life cycle has not been studied.

Ecology is largely obscure. In the Amur basin this leech was found in collections from the bottom of lakes and one river sleeve (?). This seems to indicate dwelling in silt. It is possible that this way of life contributes to the obliteration of eyes.

Geographical distribution: China (Suzhou, Nankin), the Amur basin within the USSR (Lake Khanka, Lake Udyl', Lake Bolon', sleeve Siy). According to Moore (1930) and Chen (1962) it is very common in the above-mentioned areas of China. The American author thinks that in China it occupies the position of Helobdella stag nalis. Indeed, Chen makes no mention of H. stagnalis in the Nankin area, while the number of H. nuda he investigated exceed a hundred. Both species dwell in the Amur basin, but *H. stagnalis* is far less numerous there than elsewhere in the Palaearctic, while *H. nuda* appears to be rarer than in China. Future investigations will likely confirm the wide occurrence of the latter in China. It is especially interesting to determine the southern border of its area, since in Southern Asia, where hirudofauna is far better studied than in China, this leech has not been observed. It is quite possible, therefore, that in Southern China, an area penetrated by South Asian leech species, it does not dwell either. In the Amur basin most *H. nuda* specimens were collected in the lower Amur, while no such leeches occurred in the tributaries of Ussuri and in the Vladivostok area from where numerous collections were supplied to the author. On the hand, as we mentioned above, it dwells in Lake Khanka. Benthic collections from the Ussuri basin water bodies[1] will probably demonstrate that *H. nuda* occurs there in rather large numbers as well. Thus we cannot so far say that the area of *H. nuda* is disrupted in the Ussuri basin. It would be also intriguing to find out the northern and western borders of the area of *H. nuda* in the upper and middle Amur basin. In Japan, whose leech fauna has been studied more than once, it has not been observed so far. Incidentally, the proportion of South Asian leeches in Japan is significantly higher than in China. The available evidence thus suggests that *H. nuda* belongs to the elements of Chinese-Amur fauna, which used to be common in the major part of the Asian continent (with some of its members penetrating to the American continent), and once ambient conditions changed, were replaced by common Palaearctic species in the North and by Indo-Malayan species in the South (see "Zoogeographical Survey").

Possible errors in the identification of *H. nuda*. In a superficial examination this species (especially the two-eyed specimens) may be confused with

---

[1] The author had very few of these collections.

H. stagnalis. However, it can be easily distinguished from the latter by the absence of the chitinoid plate. Moreover, preserved specimens of *H. nuda* have the following specific features: the round, narrow "head" is very distinct from the rest of the body; body edges are markedly serrated; many annuli have "ridges", the smaller size of eyes (which usually number more than two), seven pairs of stomach processes in many specimens. The same features distinguish it from Glossiphonia heteroclita and G. weberi lata, which also have no chitinoid plate.

Рис. 125. *Helobdella nuda.* Передний конец тела. (Лукин, 1960а).

Рис. 126. *Helobdella nuda.* Изменчивость глаз. (Лукин, 1960а).

Fig. 125. Helobdella nuda. Front end of the body (Lukin, 1960a).

Fig. 126. Helobdella nuda. Variability of eyes (Lukin, 1960a).

<u>Taxonomic position</u>. *H. nuda* is beyond any doubt an independent species. However, its generic identity has not been positively established. To begin with, Moore (1924a, 1930) refers to this leech under a surprising name, *Glossiphonia (Helobdella) nuda*. As is well-known, it is the name of the subgenus which they usually put in brackets. Yet in the modern literature the genus *Helobdella* is never regarded as a subgenus of *Glossiphonia* from which it was isolated already in 1896 by Blanchard. Specifically, in the fundamental monograph on South Eastern leeches by Harding and Moore (1927) *Helobdella* is described as an independent genus. Moreover, *H. nuda* differs sharply from *Glossiphonia* species; in a number of features it is more remote from them than other *Helobdella* species. Thus Moore's name of the leech in question appears unacceptable. On the other hand, its affiliation with the genus *Helobdella* is also highly doubtful. 276

H. nuda differs from other *Helobdella* in a number of ways. As a rule, it has two pairs of very small eyes (other species have two pairs), the complete somite annuli are not equal to each other (in contrast to other species), the number of crop caeca reaches seven (with other species, six). These differences suffice to identify this species as belonging to an individual genus. This conclusion is supported by the fact that the Amur-Chinese fauna consists of a number of endemic species whose members are now almost completely concentrated in the Amur basin (within the USSR), in China and in Japan. Thus a special genus for H. nuda would be justified by zoogeographical considerations as well (see "Zoogeographical Survey"). It is quite possible that further comprehensive studies will furnish new evidence of significant differences between *H. nuda* and other *Helobdella* species. So far it seems wiser to abstain from setting up a new genus for this leech.

While Autrum (1936, p. 42) also thought that *H. nuda* should be excluded from the genus *Helobdella*, he included it in the genus *Batracobdella*. This opinion is impossible to agree with. The German author attributed a large number of glossiphoniid species to the genus *Batracobdella* exclusively because of the presence of seven pairs of crop caeca. Therefore *Batracobdella*, in the volume established by Autrum, is a very heterogeneous genus. As we have demonstrated in this book, the genus *Batracobdella* should include glossiphoniids whose body contains a green and a brown pigment, whose nutrition totally or completely depends on amphibians (from this point of view, the name of the genus seems very appropriate) and whose origin is connected with the Ethiopian region. The leech in question has none of these features. At the same time it can hardly be attributed to any other existing genus of the family Glossiphoniidae.

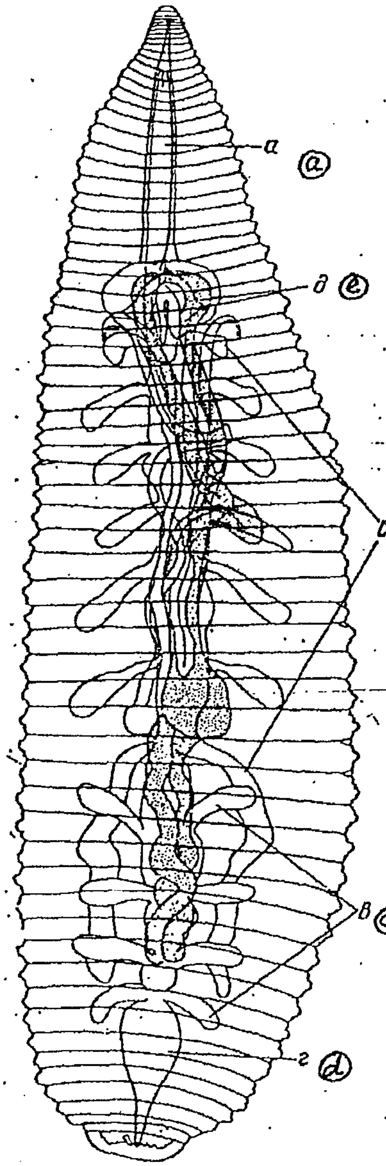


Fig. 127. *Helobdella nuda.* Digestive system and ovisacs. a - alimentary canal, b - crop with caeca, c - intestine with processes, d - hind intestine, e - ovisac (Moore, 1924a)

Рис. 127. *Helobdella nuda.* Пищеварительный аппарат и яйцевые мешки. *а* — пищевод; *б* — желудок с отростками; *в* — кишка с отростками; *г* — задняя кишка; *д* — яйцевой мешок. (Moore, 1924a).

Subfamily TORICINAE Lukin et Epstein, 1960

The size of these leeches is small (maximum length 6-9 mm) to medium (maximum length 15 mm) size for glossiphoniids, except for one species *Baicaloclepsis grubei*, which reaches a length of 30 to 40 mm[1] . The body surface is covered with papillae or is smooth. The papillae may be situated either on both the dorsal and the ventral surfaces, or only on the former. They vary in size from tiny "grains" to rather large bumps, being the largest on the first annuli of somites and the smallest on the first annuli, where they may be absent altogether. Except for the brown *Paratorix baicalensis*, the body color is light (whitish, pinkish, greenish, reddish). Two pairs, one pair of eyes, or no eyes at all may be present. Several species show a tendency to eye obliteration.

The structure of complete body somites is very distinctive. On the dorsal side, the somite consists of three rings of different lengths, the first being the shortest, the second the longest and the third of an intermediate length. The first ring may completely fuse with the second one. On the ventral side, the complete somite usually consists of three rings, with the biannulate somite of the genus *Oligobdella* being the only exception. The complete somite annuli on the ventral side are of one and the same length with some species, while with other species the first annulus is shorter than the other two, and the second one is slightly longer than the third. Sometimes all the three rings tend to be fused into one.

---

[1] The authors who studied species in this subfamily in the vast majority of cases were dealing with preserved worms, which often more or less contract in length. Therefore, the true length of the leeches in question is probably slightly greater than our values.

The proboscis opening is situated near the front end of the anterior sucker. The posterior sucker is either very small (far smaller than half the maximum body width) or large (far larger than half the maximum body width). The crop has six or seven pairs of caeca. In contrast to many glossiphoniids, especially *Protoclepsis, Hemiclepsis* and *Haementeria* species, the crop caeca except for the hindmost, do not ramify. Only the last pair of these processes has rounded branches. Some species show a tendency to crop caeca obliteration.

The male gonopore opens between somites XI and XII (*Mooretorix*) or X and XI (*Paratorix* and *Baicaloclepsis*), the female gonopore between a2 and a3 of somite XII (*Mooretorix*) of XI (*Paratorix* and *Baicaloclepsis*). With species from other families the location of gonopores has not been precisely studied[1] . The species investigated in this respect have 6 pairs of testes; with one species, the testes of the 5th and the 6th pair are fused on each side and therefore appear longer.

The subfamily Toricinae consists of the following species: *Torix* Blanchard, *Mooretorix* Lukin, *Oligobdella* Moore, *Oligoclepsis* Oka, *Paratorix* Lukin et Epstein and *Baicaloclepsis* Lukin and Epstein.

The way of life of this subfamily has not been adequately studied. *Paratorix* and *Baicaloclepsis* are species dwelling only in the open waters of Lake Baikal, sometimes at a considerable depth. Obviously, they can live only in cold oxygen-saturated waters. The only species of Oligoclepsis and two or three species of Oligobdella occur in mountain water bodies and also seem to be oxyphiles, with a preference for moderate temperatures. As for nutrition, it is definitely known that *Mooreotorix cotilifer* feeds on the blood (or the body juices) of a soft-shelled tortoise, while *Oligobdella* species suck the blood of amphi-

---

[1] Generally speaking, the genital system structure of Toricinae needs a meticulous reinvestigation.

bians. These species have apparently turned into true ectoparasites and leave their hosts only for the period of reproduction. No reliable evidence is available on the nutrition of other species. It is possible that dwelling in mountain water bodies and Lake Baikal, as well as the transition to permanent parasitism ensured the survival of this unusual group of leeches which, as we shall demonstrate below, may with good reason be called relict.

In terms of their geographical distribution, Toricinae are also highly distinct from other groups of leeches. Toricinae species were reported in the USSR (Lake Baikal, Lake Khanka, probably the Ussury, the island of Shikotan), the Korean Peninsula, Japan, China, North Vietnam (at the border with China), the USA (North Carolina) and Brazil. The American species of this subfamily appear to be rare, as well as *Torix mirus* from North Vietnam and *Oligoclepsis tukubana* from Japan. Therefore, the area described is a fragmented one, which is typical of relict groups. It may be assumed that Toricinae appeared very long ago, as is evidenced by the presence of species from this subfamily in Lake Baikal and their complete absence in the water bodies of Eastern Siberia. The emergence of this interesting group may well be dated back to the beginning of 278
the Tertiary period, when grounds were laid for the Baikal fauna, or to an even earlier time. Considering their geographical prevalence, Toricinae emerged on the territory of Southern Asia to spread to the water bodies of North America and further to the north of South America. As is well known, the connection between Asia and America, as well as between the two parts of the American continent, was established more than once (see, for instance, Puzanov, 1938; Strakhov, 1949). However, it is extremely difficult to establish exactly when the group of leeches in question migrated from the South-East centers of their origin to America. To solve this question one should investigate not only the geographical distribution of leeches in question but also (and even to a greater

extent) that of their hosts. These, however, have not been established for at least a half of the species belonging to this subfamily. It is possible that Toricinae spread from Eastern Asia to North America during Upper Myocene, and from North America to South America during Plyocene, when after a long break (since the beginning of the Tertiary period) the two Americas rejoined each other. However, considering that Toricinae are most likely ancient, their penetration from Asia to America may be dated back to a significantly earlier time, i.e. late Mezozoan or early Kainozoan period. It is most natural to assume that this or that group of animals is capable of wide spreading during the period of its prosperity. With the leeches in question this period, as we have already mentioned, apparently took place long ago. Therefore, it is highly probable that Toricinae were once widespread in Eastern Asia and probably in North America. Later, as conditions changed, they died out in the larger part of their maximum area.

History of investigations on Toricinae. The first species of the subfamily in question was described as early as 1871 by Grube (Grube, 1871) from Lake Baikal under the name *Clepsine echinulata*. The German zoologist paid attention to the highly unusual appearance of this leech covered with fuzzy papillae, yet took little interest in the structure of its somite, though he did note that the annuli (now called the central, i.e. second ones), on which the larger papillae are situated, are better developed than the other ones.

The peculiar somite structure of Toricinae was first reported by Blanchard in 1893. His brief description of new species and genus, *Torix mirus*, from Northern Indochina appeared in one of the proceedings of the Zoological Society of France (Blanchard, 1893o). Five years later, in an article under a meaningful title "A new type of leeches (*Torix mirus*)", he described this leech stressing that "the genus *Torix* is especially remarkable because its somite consists of two rings only; this is the first reported case of a biannulate [dimere - E.L.] leech" (Blanchard, 1898, p. 342). On the basis of this interesting discovery the French researcher developed a concept according to which the biannulate somite gave rise to those with a greater number of annuli (3,4,5, 6, etc.) and even suggested that a leech should be found whose complete somites would consist of a single somite "without any traces of annulation" (ibid, p. 344).[1] Therefore, Blanchard thought the low number of annuli in the complete somites of *Torix* was characteristic of a primitive state. Other hirudinologists, however, lent no support to this point of view, and the current opinion is that the biannulate somite of *Torix* resulted from a triannulate one after fusion of the first and second annuli. This, however, does not diminish the significance of Blanchard's discovery of a peculiar group of leeches which differ sharply from the other glossiphoniids in that the number of annuli in their complete somite is smaller than in the original triannulate state.

After the discovery of *Torix mirus*, a number of other species with a low number of somite annuli were described. They are certainly related to the leech in question. First of all, Blanchard himself (1898), in the end of his article on *Torix mirus*, reported another Torix species, *T. cotylifer*, found on the Chinese soft-shelled tortoise near Shanghai, and described certain distinctive features of this species[2] Two years later Moore (1900) gave a detailed description of an interesting leech *Microbdella biannulata* (Moore himself later changed its name to *Oligobdella biannulata*, since the genus name *Microbdella* had been used

---

[1] To an extent, this prediction was true with respect to one of Toricinae genuses, namely *Oligobdella*. In complete somites of species belonging to this genus all the annuli sometimes fuse into one. However, studies on the annulation of these species indicate this a secondary rather than a primary phenomenon (see description of *O. orientalis*).

[2] In this book, *Torix cotylifer* is ascribed to a special genus *Mooretorix* named after More, who was the first to describe this intriguing leech (Moore, 1930)

before). This leech parasitized on caudate amphibians in mountain water bodies of North Carolina (USA). After a long recess in the studies on Toricinae, Shchegolev (1922) gave a rather profound description of the endemic Baikal 279 leech *Torix baicalensis*, thus stressing its relation to the species established by Blanchard, and slightly modified the diagnosis for the genus *Torix*. Later, the renowned Japanese hirudinologist Oka described two new species of *Oligobdella, O. orientalis* and *O. tagoi* (1925a, 1925b), found in Japan and on the Korean peninsula. Finally, in 1937 Cordero reported another *Oligobdella* species, *O. brasilensis*, found in Brazil[1].

Despite the fact that the number of *Torix* species increased as a result of these discoveries, its position in the taxonomy of the family Glossiphoniidae was not seriously discussed, and no one suggested, as was in fact evident from the above-cited article by Blanchard (1898), that it should be identified as a distinct subfamily. In Autrum's review of species belonging to the family Glossiphoniidae (1836), the genus *Torix* was listed as belonging to the subfamily Haementeriinae established by Autrum in that same review. In his opinion, the distinct difference of this group from other glossiphoniids was the position of the mouth near the front end of the sucker. However, the genera *Oligobdella* and *Oligoclepsis* have the same feature, yet Autrum for some reason left them in the Glossiphoniinae family. The most serious mistake Autrum made is that he overlooked the essential similarity of all the three genera mentioned in terms of somite structure.

---

[1] In 1936 Autrum transferred *Glossiphonia novae-zelandiae* Dendy et Oliver to the genus *Oligobdella* as well. The occurrence of members of Toricinae in New Zealand would be of significant zoogeographical interest and could prove a very ancient origin of this subfamily. Unfortunately, Autrum did not give any conclusive support for his decision, and this question remains to be resolved by future investigations.

As for the first Toricinae species, *Clepsine echinulata* Grube, Blanchard (1893o) ascribed it to the genus *Haementeria* in the same year that he first described *Torix mirus*. While the French researcher did not study this leech himself, he obviously proceeded from the fact that according to Grube's description it had one pair of eyes. This unsubstantiated conclusion was supported by Livanov (1937, 1940) who apparently had access to specimens of this leech. Livanov's error was repeated by Dogel' (Dogel' and Bogolepova, 1957) who processed leech collections from Lake Baikal. It should be added that Autrum in the above-mentioned review even described *Clepsine echinulata* as a doubtful species.

The author of this book and his colleague V. M. Epshteyn (Lukin and Epshteyn, 1959, 1960a; Lukin, 1967b) studied a vast material on endemic Baikal leeches, as well as *Torix cotylifer (=Mooretorix)* from Lake Khanka and Oligobdella orientalis from the island of Shikotan. Firstly, it was demonstrated that in terms of somite structure *Clepsine echinulata* is definitely close to *Torix* species and has no relation whatsoever to *Haementeria*. Secondly, a new genus *Baicaloclepsis* was established. It includes, apart from *Clepsine echinulata*, another Baikal glossiphoniid discovered by these authors *(Baicaloclepsis grubei)*. Thirdly, the leech *Torix baicalensis* described by Shchegolev was identified as a distinct genus *Paratorix*. Finally, a special subfamily Toricinae was proposed for glossiphoniids with a smaller number of annuli in complete somites.

As we have mentioned above, the subfamily Toricinae has not been adequately studied. Thorough anatomical investigations on all the leeches in the subfamily are necessary; moreover, the first species of *Torix* described by Blanchard is generally ill studied. Any studies on these leeches should aim primarily at comparing them to other glossiphoniids in order to establish the origin of this unusual group of Hirudinea. Also highly desirable are new studies on the hirudofauna of Eastern Asia and America, which could probably discover new species of Toricinae.

Our present knowledge on the morphology of Toricinae reveals little about the phylogenetic links in this subfamily. In terms of somite structure, it appears that the most primitive members of this group are those whose somites, both on the dorsal and ventral sides, are separated into three annuli (even if they differ in length), while the most specialized species are those whose somite became bi- or even uniannulate. In this case *Baicalobdella*, whose species retain the somite division in three annuli on both sides of the body, should be considered the most primitive genus, and *Oligobdella*, whose somites on both the dorsal and the ventral side consist of two annuli tending to fuse into one, -- the most specialized genus. *Paratorix, Oligoclepsis, Torix* and *Mooretorix*, whose somite on the dorsal side consists of two annuli and on the ventral side of three annuli, should be placed between the above two genera. On the other hand, however, he most primitive glossiphoniids (*Protoclepsis, Hemiclepsis*)
t have a greater number of intestine processes than the more specialized 280
members of this family (e.g. *Glossiphonia* or *Helobdella*). From this standpoint, the more specialized members are *Baicaloclepsis* species, whose number of crop caeca is as low as 6 or even 5, while leeches in the other Toricinae genera have seven crop caeca. Since this problem is still unresolved, Toricinae species will be discussed below mainly in the chronological order which generally coincides with the distribution of these genera in terms of intestine structure.

GUIDE TO GENERA IN THE SUBFAMILY TORICINAE

1 (6). Back smooth.

2 (3). Posterior sucker small (far smaller than half the maximum width of the body)..... ....8. Genus *Torix* Blanchard (p. 280).

3 (4). Posterior sucker is large (far larger than half the maximum width of the body).

4 (5). A complete somite on the dorsal side often consists of three rings (the first one is very short, the second one is long, the third one of an intermediate length) but the furrow between the first and the second annulus may be barely visible; on the ventral side complete somites are usually triannulate. The last (seventh) crop caeca are short and bend back only slightly (Fig. 130). A parasite of soft-shelled tortoise... ....9. Genus *Mooretorix* gen. n. (p. 281).

5 (4). A complete somite on the dorsal side consists of two rings (the first one is long, the second one shorter); on the ventral side complete somites are usually biannulate and occasionally uniannulate. The last (seventh) crop caeca are long and bend back considerably, stretching along the gut (Fig. 134)................. ....10. Genus *Oligobdella* Moore (p. 286).

6 (1). Back covered with papillae or tubercles.

7 (10). Papillae on the back are approximately of one and the same size (except for tiny papillae "grainlets").

8 (9). The complete somite on the dorsal side consists of two approximately equal annuli (Fig. 138); on the ventral side complete somites are tri- and biannulate. One pair of eyes..................11. Genus *Oligoclepsis* Oka (p. 290).

9 (8). The complete somite on the dorsal side consists of two unequal annuli; the first is longer than the second one. On the ventral side the somites are triannulate(the first is very short, the second long, the third of an intermediate length). Two pairs of eyes. Endemic to Lake Baikal... ....12. Genus *Paratorix* Lukin et Epstein (p. 291).

10 (7). Dorsal papillae vary in size, with the larger ones (which in one species even turn into large bumps) forming three longitudinal rows. Endemic to Lake Baikal ....13. Genus *Baicaloclepsis* Lukin et Epstein (p. 295).

8. Genus **TORIX** Blanchard, 1893.

Blanchard, 1893o : 185; 1898 : 339 (*Torix*, part.); Shchegolev, 1922c : 141 (*Torix*, part.); Moore, 1930 : 174 (*Torix*, part.); Autrum, 1936 - 86 (*Torix*, part.); Livanov, 1940 : 245 (*Torix*, part.); Lukin and Epshteyn, 1960c : 479 (*Torix*, part.).

Standard species *Torix mirus* R. Blanchard, 1893.

These leeches are small for glossiphoniids (about 5 mm long). The body surface is smooth on the dorsal and ventral sides alike. No eyes. The posterior sucker is small (far shorter than half the maximum width of the body). The complete somite on the dorsal side consists of two annuli. The long first annulus resulted from the fusion of the first and the second annuli. The back somite is short. The front annulus on the ventral side consists of two annuli, i.e. the complete somite on this side is triannulate. The number of crop caeca appears to be seven. The only reported species is *Torix mirus* Blanchard. Geographical prevalence: North Vietnam near the Chinese border.

The only species in the genus *Torix*, *T. mirus*, has so far been found only outside of the Palaearctic (even in the broader sense, i.e. incorporating the major part of China). However, since no members of Toricinae have so far been found in the Indo-Malayan region, whereas seven species have been dis-

covered in the Palaearctic (Far East and Lake Baikal), it is not improbable that the above-mentioned location is the far Southern point of this species' area and it will possibly be found in more Northern areas, i.e. within the Palaearctic. 281
At any rate, an acquaintance with *T. mirus* is necessary to understand the phylogenetic links within the subfamily under consideration.

**Torix mirus* Blanchard, 1893 (Fig. 128).

Blanchard, 1893o : 185; 1898 : 339-342, Fig. 1-4; Moore, 1930 : 174.

Below we quote Blanchard's description of T. mirus (1898) and borrow the pictures accompanying this description.

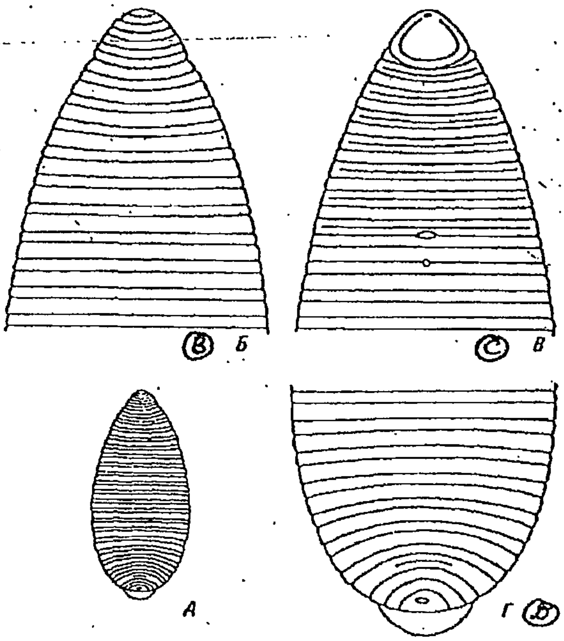


Рис. 128. *Torix mirus*. *А* — внешний вид со спинной стороны; *Б* — передний отдел тела со спинной стороны; *В* — передний отдел тела с брюшной стороны; *Г* — задний отдел тела со спинной стороны. (Blanchard, 1898).

Fig. 128. *Torix mirus*. A - dorsal view. B - dorsal view of the front body. C - ventral view of the front body. D - dorsal view of the rear part of the body (Blanchard, 1898).

"Species of a small size... 5.5 mm long, 2.5 mm wide... Four specimens were studied... which most probably have not reached maturity. The body is thin but highly convex... like a shell of a land tortoise... The dorsal side is reddish-brown with brown lines, without any trace of segmentary papillae or skin tubercles; the median line has a reddish-brown band... The ventral side is highly concave, of a uniform reddish-brown color. No eyes could be found. The total number of annuli is 49. Between the 7th and the 8th annulus there is a deeper furrow separating the head from the body. The anterior sucker is placed fairly deeply at the root and has the buccal opening in the front. The posterior sucker is round. In the back, it stretches slightly beyond the body. The anus opens in the middle of the last annulus... The four specimens studied... were collected in Kao-Bang between the body and the shell of a freshwater gastropod mollusk *Melania aubryana* Heude" (Blanchard, 1898, p. 340-342).

9. Genus MOOREOTORIX Lukin, gen. nov.[1]

Blanchard, 1898 : 343 (*Torix*, part.); Moore, 1930 : 174 (*Torix*, part.); Lukin and Epshteyn, 1960c (*Torix*, part.).

Standard species *Mooreotorix cotylifer* (R. Blanchard, 1898).

These leeches are small for glossiphoniids (7 to 9 mm long). The body surface is smooth with no papillae on the dorsal and ventral sides alike. One pair of eyes. The buccal sucker is large, as is the rear sucker (far wider than half the maximum width of the body). The complete somite on the back consists of two annuli. The front one, which resulted from the fusion of the first and second

---

[1] The name of the genus is formed from two words, i.e. the name of Moore, the well-known American hirudinologist, and the name of *Torix*, a related species. Moore gave a detailed description of the species *Torix cotylifer* Blanchard, which is isolated here in a special genus *Mooreotorix*.

annuli, is longer than the rear (second) annulus. There are seven pairs of crop 282 caeca. The processes of the first pair are long; they reach the edges of the body to open on the outside in the form of special orifices. The rear stomach processes are shortened and curve back but slightly. There are six pairs of testis sacs. The one known species is *Mooreotorix cotylifer* (Blanchard). Geographical distribution: USSR (Lake Khanka), China (Peking, Nankin, Shaghai).

The only species in this genus was described by Blanchard (1898) under the name *Torix cotylifer.* The same name was used by a number of other authors (Moore, 1900; Shchegolev, 1922c; Moore, 1930; Autrum, 1936; Lukin and Epshteyn, 1960b, etc.). However, in sharp contrast to the first species of the genus *Torix (T. mirus),* the leech in question has an enormous rear sucker and remarkable structure of front crop caeca which, according to Moore (1930), open on the outside by means of special orifices. *T. mirux* has a small rear sucker and, as established by Moore in a special study on the specimens of *T. mirus* which once were used by Blanchard to discover this species, the front crop caeca, though also fairly long, have no outside openings (Moore, 1930, p. 174). The two species most likely have other serious differences, particularly in the structure of the other stomach processes which in *Mooreotorix cotylifer* are very short. In *Torix mirus* the fusion of the first and second annuli in complete somites appears to be more pronounced than in *Mooreotorix cotylifer.* Significant differences in the size of suckers and in the structure of the digestive system in the class Hirudinea are usually generic. I believe these differences, along with some others, and the fact that *Mooreotorix cotylifer* parasitizes on a unique host, the soft-shelled tortoise *Amyda sinensis,* are substantial enough to regard this species, considering our present knowledge on the subfamily Mooretorix, as an individual genus.

Mooreotorix cotylifer (Blanchard, 1898)

Blanchard, 1898 : 344 (*Torix*); Moore, 1930 : 169-174, outline of structure, pl. 7, Fig. 1-5 (microphotographs) (*Torix*); Lukin and Epshteyn, 1960c : 479-480, Fig. 1A, 2B (*Torix*).

The following description has been compiled on the basis of evidence reported by Blanchard (1898) and Moore (1930), as well as the author and V.M. Epshteyn, who studied *M. cotylifer* from Lake Khanka. All these authors had only preserved specimens at their disposal.

Body size. According to Blanchard, the largest specimen was 7 mm long and 3 mm wide. Moore's largest specimen was 5.5 mm long and 1.2 mm wide. The largest specimen observed by the author was 9 mm long and 4 mm wide.

Body shape. It appears that the body shape of leeches in Moore's (1930) picture and microphotographs is quite close to that of live leeches at rest. Therefore, this leech has a blunt broad front end of the body, while its relative width is moderate for a glossiphoniid. Strongly contracted specimens (Fig. 129) are evidently much wider than in nature.

The front sucker is well developed, the upper lip is markedly curved. The posterior sucker is very large; the spot where it is attached to the body is considerably narrowed and in preserved specimens it curves easily to the dorsal side. With live leeches, the diameter of the posterior sucker must exceed the maximum width of the body, whereas with preserved animals, especially when they are strongly contracted, the maximum diameter of the body may be wider than the sucker.

The furrows between somites are better developed than those between the annuli. Thus body edges feature evident depressions, as is well seen in

Moore's microphotographs. However, in live leeches these depressions are probably less pronounced.

All the above authors report that the body surface is smooth, except for barely visible sensillae protuberances (mainly at the front end of the body).

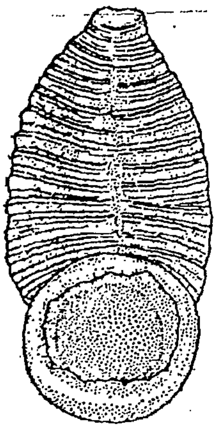
Body color, according to Moore, is greyish yellow, with a somewhat lighter ventral surface. One specimen from Lake Khanka had fuzzy dark longitudinal lines on the back and a light longitudinal band with indistinct borders along the dorsal side. Its back also featured dark spots, mainly in the middle of the body. Another specimen from Lake Khanka, when examined under the binocular microscope, revealed rather disorderly longitudinal rows of pigment cells (at least 10 rows from each side). To the naked eye, however, the Khanka specimens were yellowish grey. This evidence is incomplete to make a final judgement 283 on the color of this species. Yet there is no doubt that its integument contains little pigment, as is usual with ectoparasites which spend most of their lives on the body of their hosts.

Eyes are one pair on the second annulus of the first somite. They are rather large, obviously preserve well even in alcohol and therefore were reported by all the above authors.

Body somite composition (Fig. 130). On the back, the complete somite consists of two annuli. The front ring is longer than the back ring. However, the extent to which the first and second annulus are fused to form the long front ring varies. Accordingly, sometimes the furrow between the two annuli is barely visible and sometimes quite distinct (with preserved specimens), the first ring being considerably shorter than the second, and the second ring being slightly shorter than the third. The furrows between the last two annuli are well pronounced, though not as deep as those between somites. On the ventral side the complete somite is usually triannulate. Yet on this side as well, sometimes the above-mentioned annuli are not well separated from each other. In other words, the complete somites on the ventral side of this leech may also be biannulate[1]

Рис. 130. *Mooreotorix cotylifer*. Схема строения. *а* — рот; *б* — хобот; *в* — желудок с отростками; *г* — отверстие переднего отростка желудка; *д* — кишка с отростками; *е* — отверстие метанефридия; *ж* — семенник; *з* — семеизвергательный канал; *и* — атриум; *к* — яйцевой мешок. V, XV, XX — сомиты.

Рис. 129. *Mooreotorix cotylifer*. (Лукин и Эпштейн, 1960в).



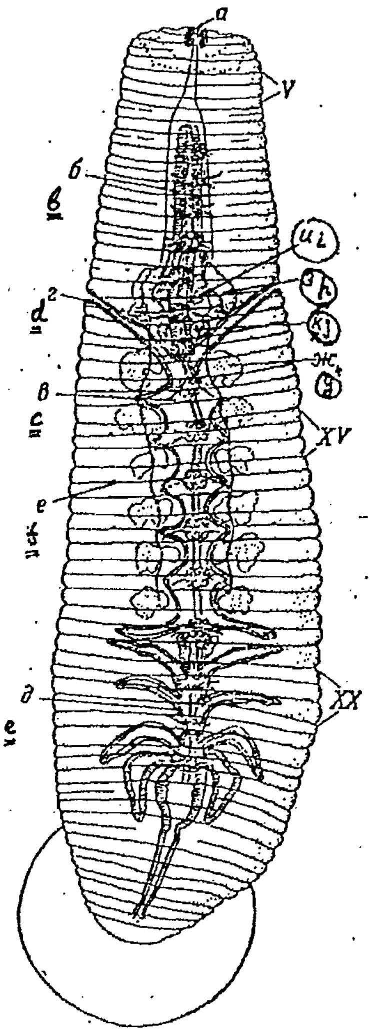


Fig. 130. *Mooreotorix cotylifer.* Schematic structure. a - mouth, b - proboscis, c - crop with caeca, d - opening of the first crop process, e - gut with processes, f - opening of the metanephridium, g - testis sac, h - vas efferens, i - atrium, j - ovisac. , XV, XX - somites.

Fig. 129. *Mooreotorix cotylifer.* (Lukin and Epshteyn, 1960c).

---

[1] These data on the annulation of *M. cotylifer* were obtained by the author and V. M. Ephteyn in the studies of specimens from Lake Khanka. Moore (1930) reports similar evidence. However, in the schematic diagram of *M. cotylifer* he for some reason represented all the somites on the dorsal side as triannulate (Fig.130).

The extent of annuli fusion varies, the visibility of furrows often depends 284 on the preservation technique, while the assessment of their depth is a somewhat subjective matter. Consequently, data on the somite composition of *Mooreotorix cotylifer* vary with the author. Moore reports the following data concerning this issue: somites I and II are uniannulate, somite III is also uniannulate but has a barely discernible transverse furrow, somite IV is entirely biannulate, but the furrow a2/a3 is very shallow and incomplete, somite V is biannulate (the a2/a3 furrow is deeper than on somite IV); somites VI and VII are biannulate with a well developed a2/a3 furrow and a hint at an a1/a2 furrow; somites VIII-XXV are biannulate with a permanently pronounced shallow furrow a1/a2, especially on the ventral side; somite XXVI is much shorter than XXV, has no a1/a2 furrow at all, and the a2/a3 furrow is much more shallow; somite XXVII consists of a sole very short annulus.

According to V.M. Epshteyn (unpublished data), who was asked by the author to investigate the annulation of one large and four small specimens from Lake Khanka, the somite composition of *M. cotylifer* on the dorsal side is as follows: I - uniannulate; II-IV - biannulate; V - biannulate (sometimes it seems uniannulate due to contraction); Vi-X are evidently biannulate and not wide; XI-XXIII are biannulate (the large specimen and one of the small specimens had an a1/a2 furrow, which suggests a transition to the triannulate somite); XXIV-XXVII are uniannulate. On the ventral side of the large specimen somites X-XXIII were triannulate.

Accordingly, there are certain disparities in the data reported by the above-mentioned authors. However, in view of the probable reasons for them (which have been cited), they should be considered minor. We just have to repeat that the tendency for fusion of the first two annuli of this species is quite distinct yet far from becoming complete. With *Paratorix baicalensis, Oligo-*

clepsis tukubana and *Oligobdella* species the process of annuli fusion has gone farther. The prostomium is small.

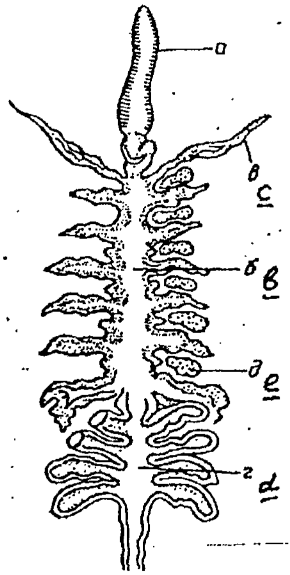


Fig. 131. *Mooretorix cotylifer.* The digestive system and testis sacs. a - proboscis, b - crop with caeca, c - front process of the crop, d - gut with processes, e - testis sacs (Lukin and Epshteyn, 1960c).

Рис. 131. *Mooreotorix cotylifer.* Пищеварительный аппарат и семенные мешки. *а* — хобот; *б* — желудок с отростками; *в* — передний отросток желудка; *г* — кишка с отростками; *д* — семенные мешки. (Лукин и Эпштейн, 1960в).

Digestive system. (Fig. 131). The structure of this system has been rather meticulously described by Moore. A short, thick proboscis at rest stretches from somites VII/VIII to somite X, while a more narrow and tortuous esophagus stretches from somite X to the front part of somite XIII. In somite XII it is enveloped in an agglomeration of esophagus glands which cover the ovisacs from the dorsal side. The stomach occupies seven somites from XIII to XIX inclusive, and has seven caeca, one per each somite. The crops of leeches studied by Moore were empty, which apparently caused the caeca to contract somewhat. The first pair of crop caeca have a highly distinct structure: very narrow and long, they start from the very front protuberances of the stomach and going upwards at an angle to open as special apertures on the outside edges of the body, in depressions between somites XI and XII. This structure of front crop caeca typified all the five specimens studied by Moore; two of these specimens came from Blanchard's collection and were *Toryx cotylifer* co-types. Moore suggests that these crop caeca serve to conduct semen to ovisacs. The semen is delivered to the openings of the caeca by spermatophores, while the caeca themselves pass in the immediate vicinity of ovisacs. This intriguing hypothesis needs careful verification using live leeches and numerous cross-sections of well-preserved worms. We should note that Moore did study the structure of the crop caeca in question on cross-sections; however, their number apparently 285 was small. In specimens from Lake Khanka studied by the author and V.M. Epshteyn (1960c), the front caeca also reached the edges of the body but they were difficult to open (Fig. 131). Initially the author could only see short processes extending from the front protuberances of the stomach and separating into two short branches. Thus in future investigations on the structure of *M. cotylifer,* it is necessary to find out whether individual semen ducts exist along with the short front crop caeca. It is also necessary to determine whether other *Toricinae* species feature similar ducts.

The other crop caeca also have a distinct structure. Pairs 2-6 are short; Moore's schematic diagram pictures them as short protuberances. However, in Lake Khanka specimens whose stomachs probably still contained some blood, they looked like real (though very short) processes. The size of these stomach appendages most probably depends on the extent to which they are filled with food. Yet they are undoubtedly shorter than in other glossiphoniids, since the presence of food can hardly cause any fundamental changes in the size of a process. The posterior crop caeca are very short too, while with the vast majority of glossiphoniids they are very long and curve backwards to pass along the gut (this is the case even with *Helobdella stagnalis*, in which the appendages in question are typically reduced).

According to Moore, they do not curve backwards at all, while in the Khanka specimens the curving was small. *M. cotylifer* obviously ows this characteristic stomach structure to the special nature of its nutrition which, however, still remains to be revealed. Could this leech, rather than being a true hematophagus, feed on the liquefied contents extracted from the tissues of tortoises? The author proposed the same hypothesis with regard to *Baicaloclepsis* species, yet no facts have been observed to support it so far.

The gut occupies somites XX-XXII, its processes are well developed. The front processes penetrate into somite XIX, while the posterior processes stretch to somite XXIV inclusive. The hind intestine is inflated in somite XXIII and then opens into the anus through a narrow tube. The anus, according to Moore, is situated on somite XXVII.

The genital system was studied by Moore. The 6 pairs of testicles are of an irregular lobe-like shape. Five of them are situated, as usual, between the crop caeca. The tortuous seminal ducts in somite XII turn into thicker appendages of testicles, while the latter transform into broad testis sacs and vas efferens connecting into a common sac (atrium) opening into the male genital orifice (between somites XI and XII). The ovisacs, which were visible and hence studied in one worm only, were small oval-shaped organs situated on the side of the esophagus along the third annulus of somite XII and the first annulus of somite XIII. The short oviducts join each other to form a very short vagina. The female gonopore is situated between a2 and a3 of somite XII. Moore thinks the shape of ovisacs to be unusual for glossiphoniids; however, this opinion can not be considered convincing enough before a larger body of material is investigated.

Life cycle. No information on this issue is available. Tortoise-sucking leeches such as *Haementeria costata* leave their hosts during the reproduction period. Whether the same is true for the species in question is not known. Though soft-shelled tortoises spend most of their lives in water, they spend hours warming in the sun and also come to the shore to lay eggs (Buldovskiy, 1936). It is quite obvious that leeches should be adapted to the excursions of their hosts ashore. Yet leech eggs and young cannot possibly withstand the absence of water even for short periods. In other words, reproducing leeches are to be looked for in water bodies, on aquatic plants, various submerged objects, etc.

Ecology. All the known specimens of *M. cotylifer* were collected on *Amyda sinensis* tortoises. In his fundamental investigation on soft-shelled tortoises, A. T. Buldovskiy writes that "Leeches are among ectoparasites capable of attacking tortoises despite their thick skin[1]. Usually they attach themselves to the soft parts of the body in its back part, between the shields and hold on so strongly that it is not always possible to tear them away by hand" (1936, p. 81).

The soft-shelled tortoise dwells in lakes, in small and big rivers. However, the same might not be true for *M. cotylifer,* since the host and the parasite may have different ecological requirements.

Geographical distribution. *M. cotylifer* has so far been reported in the 286
USSR and China (the southernmost location was Shanghai). The soft-shelled tortoise also dwells in Japan, but *M. cotylifer* has not been found there to date.

Possible errors in the identification of *M. cotylifer*. This leech may be confused only with *Oligobdella* species whose surface also has no papillae and whose posterior sucker is very large. To prevent this mistake one should bear in mind the host on which the leeches were found. *M. cotylifer* parasitizes exclusively on the Chinese tortoise, whereas *Oligobdella* species feed only on

---

[1] Buldovskiy, not being a hirudinologist, mistakenly identified the leeches under consideration as members of the genus *Glossiphonia* (which in his work reads *Clossiphonia* due a typographical error). The author and V.M. Epshteyn had an opportunity to examine leeches collected on tortoises by Buldovskiy and his associates. We found these collections to contain only *Mooreotorix cotylifer* specimens.

structure and the somite composition have to be carefully studied. All the crop caeca of *M. cotylifer* except the first ones are short, and sometimes the first and second annuli on the back (in complete somites) are distinct from each other. With *Oligobdella* species, the above-mentioned crop caeca are long, and the entire lengths of the first and second annuli are invariably fused.

10. Genus ***Oligobdella*** Moore, 1918.

Moore, 1900 : 50 (*Microbdella,* nom. praeoc.); Moore, 1918 : 654; Oka, 1925a : 311; Moore, 1930 : 175; Autrum, 1936 : 33; Ringuelet, 1944c : 33; Lukin and Epshteyn, 1960c : 480.

Standard species *Oligobdella biannulata* (Moore, 1900).

These glossiphoniids are small (5 to 6 mm long) or medium-sized (about 16 mm long). Their body surface is smooth and has no papillae. The number of eye pairs is two or one; the one-paired species has vestigial front eyes, while the front eyes of the four-eyed species are significantly smaller than those in the back pair. The anterior sucker is small. The caudal sucker is large; its diameter far exceeds half the maximum width of the body and sometimes even reaches this width. A complete somite on the back consists of two annuli. The front ring (which resulted from the fusion of the first and second annuli) is longer than the back (third) annulus. In the middle part of the body the front and back rings may be almost equal in size; in some cases the interannular furrows are almost invisible, i.e. the somites become uniannulate. On the ventral side the complete somites are also biannulate, with the front ring usually longer than the second. On this side, furrows between the annuli are more pronounced, but some somites may still be uniannulate. The crop caeca number seven pairs; the first pair has the shortest processes, the last pair the longest, bending backwards to stretch along the gut and give rise to secondary processes. The distal ends of the caeca are usually inflated. There are 6 pairs of testes (one species has 5 pairs). Species discovered in this genus include *Oligobdella biannulata* (Moore), *O. orientalis* Oka and *O. brasiliensis* Cordero. Geographical prevalence: USSR (the island of Shikotan), the Korean peninsula, Japan, USA and Brazil.

KEY TO PALAEARCTIC SPECIES OF *OLIGOBDELLA*

1 (2). Length of mature leeches about 6 mm; two pairs of eyes................

....1. ***O. orientalis*** Oka.

2 (1). Length of mature leeches about 15 mm; one pair of eyes...............

....1. ***O. tagoi*** Oka.

1. ***Oligobdella orientalis*** Oka, 1925.

Oka, 1925a : 311-315, Fig. 1-2; Autrum, 1936 : 35, Abb. 23; Lukin and Epshteyn, 1960c : 80-481, Fig. 1B, 2A and 3.

Body size. Specimens from Japan were no longer than 5 mm and no wider than 2.5 mm (Oka, 1925a). The largest specimens from the Shikotan island did not exceed 6 mm in length and 3.5 mm in width (Lukin and Epshteyn, 1960c). It should be pointed out, however, that the Shikotan leeches suffered strong contraction because of rough preservation, which means live leeches should be somewhat longer and narrower. Oka called *O. orientalis* is "certainly the smallest in the family *Glossiphoniidae*" (Oka, 1925a; p. 312). Calling it one of the smallest glossiphoniids would be more appropriate, since the size of such species as *Mooretorix cotylifer*, *Glossiphonia heteroclita* and *Helobdella stagnalis* does not differ much from that of *O. orientalis*.

Body shape of preserved specimens is illustrated in Fig. 132. The Japanese specimen was preserved in alcohol and therefore contracted less; its anterior end is rather wide. The Shikotan specimen was preserved in formalin, exhibits strong contraction, and its front end is sharper. The posterior part of the body appears to be noticeably wider than the anterior end. Generally speaking, the leech in question has a relatively wide body.

The anterior sucker is relatively small. The posterior sucker is enormous. 287 Even in strongly contracted Shikotan specimens it was larger than half the maximum body width; in less contracted Japanese specimens its diameter was even as large as the maximum body width, as is clearly seen in Oka's illustration (Fig. 132, A). In this respect the leech in question is similar to *Mooretorix cotylifer*.

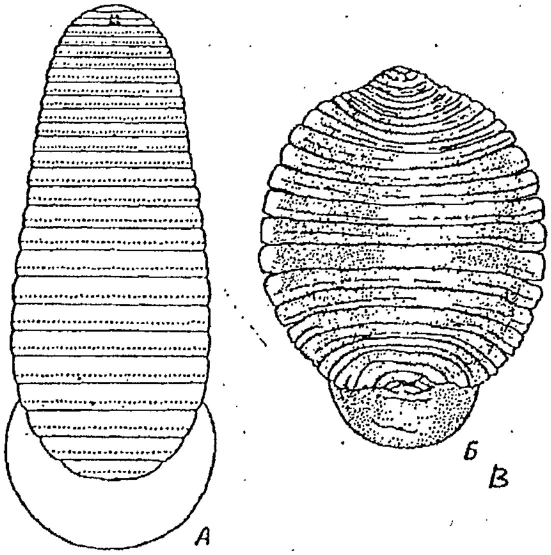


Fig. 132. *Oligobdella orientalis*. A - Oka, 1925a; B - Lukin and Epshteyn, 1960c.

Рис. 132. *Oligobdella orientalis*. *А* — Oka, 1925a;
Б — Лукин и Эпштейн, 1960в.

Body surface was smooth in all the specimens studied. Oka notes that "the surface is generally smooth, especially on the ventral side; no segmentary papillae or other tubercles have been noticed" (1925a, p. 313).

Body color. Oka reports that live Japanese specimens were dark olive green. The Shikotan specimens were depigmented after many years in the preservative.

Eyes are two pairs situated very close to each other on the second and third annuli. They are small and do not show well on preserved specimens. Oka notes that the eyes of the first pair are smaller than those of the second pair; all the four eyes form a trapeze whose front end is narrower than the back end. Since the pre-eye area is usually curved down, a dorsal view shows eyes on the very front end of the body.

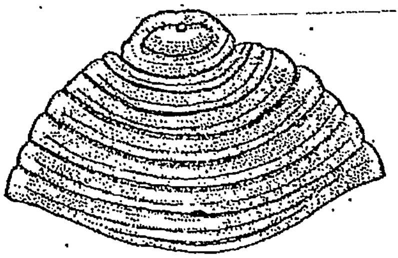


Fig. 133. *Oligobdella orientalis.* Ventral view of the front end of the body (Lukin and Epshteyn, 1960c).

Рис. 133. *Oligobdella orientalis.* Передняя часть тела с брюшной стороны. (Лукин и Эпштейн, 1960в).

Body somite composition. Oka describes the annulation of the Japanese oligobdellid as follows. "A dorsal view of the body shows 27 somites[1] clearly separated with deep furrows. Except for the [somites in the - E.L.] front end of the body, each somite is transversely divided into two unequal annuli, the large first one and a small second one, so the body appears to consist of alternating large and small rings. However, the interannular furrows are never as deep as

---

[1] It should be recalled that Oka regards the prostomium as the first somite.

those between the somites. On the ventral side all somites are uniannulate, though in strongly contracted specimens they may look bi- or triannulate due to the formation of secondary skin wrinkles" (Oka, 1925a, p. 313). 288

V.M. Epshteyn and the author found that the complete somite of oligobdellids from Shikotan (Southern Kuril islands)was biannulate both on the back and the abdomen (Fig. 133), with the front annulus (which resulted from the fusion of annuli 1 and 2) considerably longer than the hind (i.e. third) annulus. The furrows between the somites are far deeper than between the annuli so the division of the body into somites is very clear. However, it should be added that in several specimens the interannular furrows on the dorsal side were hardly developed at all, especially in the middle part of the somites, so that the latter seemed uniannulate. On the ventral side the interannular furrows are far better visible and the somites look distinctly biannulate. Oka, on the other hand, claimed that all the annuli on the ventral side are fused. This discrepancy is probably due to different preservation methods used with Japanese and Shikotan oligobdellids, and has no taxonomic significance. Moreover, the data of the Japanese researcher contradict those on the annulation of other *Toricinae* species, in which the annuli fusion on the ventral side is less pronounced than on the dorsal side (see descriptions of *Baicaloclepsis, Paratorix* and *Mooretorix* species). It is not impossible, therefore, that the description of *O. orientalis* given by Oka contains an error and that the Japanese specimens of this leech have to be carefully re-investigated.

Somite I is small and usually poorly separated from somite II, which consists of one annulus. Somites III and IV feature transverse furrows; however, it is difficult to describe them as biannulate. Somites from V to XXIV are biannulate (with the reservations made above with regard to somite fusion on the dorsal side); somites XXV-XXVII appear to be uniannulate. Thus the total number of annuli (if somites III and IV are considered uniannulate) does not exceed 46.

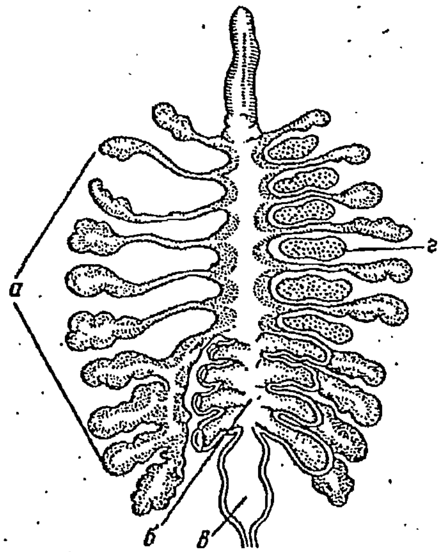


Рис. 134. *Oligobdella orientalis*. Пищеварительный аппарат и семенные мешки. а — желудок с отростками; б — кишка с отростками; в — задняя кишка; г — семенной мешок. (Лукин и Эпштейн, 1960в).

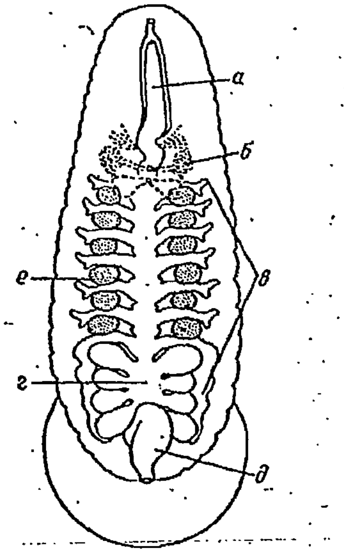


Рис. 135. *Oligobdella orientalis*. Пищеварительный аппарат и семенные мешки. а — хобот; б — слюнные железы; в — желудок с отростками; г — кишка с отростками; д — задняя кишка; е — семенной мешок (Oka, 1925a).

Fig. 134. *Oligobdella orientalis*. Digestive system and testis sacs. a - crop with caeca; b - gut with processes; c - hind intestine; d - testis sac.

Fig. 135. *Oligobdella orientalis*. Digestive system and testis sacs. a - proboscis; b - salivary glands; c - crop with caeca; d - gut with processes; e - hind intestine; f - testis sac.

Digestive system (Fig. 134, 135). The opening of the proboscis, situated as in other Toricinae, near the upper lip, is usually well visible. The crop has seven pairs of caeca. The first six pairs do not ramify. They are long and broaden towards the end. The seventh pair bends backward to run along the rest of the intestine. It has four pairs of well-developed processes which also broaden at the end. Gut processes are prominent as well. The anus is situated between somites XXVI and XXVII.

Genital system (Fig. 134, 135). Six pairs of testis sacs are situated between the crop caeca.

Life cycle has not been studied.

Ecology. All the specimens of *O. orientalis* found so far were removed from amphibians: one Japanese specimen from *Polypedates burgeri,* other Japanese specimens and all Shikotan leeches from *Rana semiplicata* Nikolsky[1].

In Shikotan the oligobdellids were found on frogs caught on the shores of brooks descending from hills. The Japanese leeches possibly live under similar conditions, which means the species under discussion appears to prefer dwelling in running water.

Geographical distribution. USSR: the Island of Shikotan, hill slopes over Mashubo Bay and the village of Tsyboi; appears to be common and numerous (on *Rana semiplicata*). Japan: the province of Nemuro (Hokkaido Island), Akame (Iga province, Honshyu Island; Yumoto (near Nikko, Honshyu Island); appear to be common.

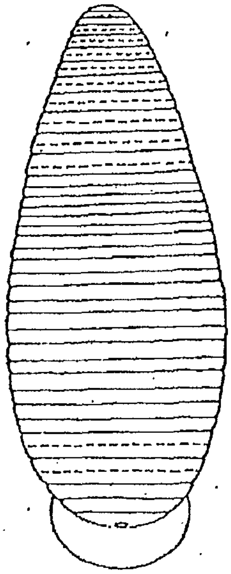


Рис. 136. *Oligobdella tagoi.* (Oka, 1925b).

Fig. 136. *Oligobdella tagoi* (Oka, 1925b).

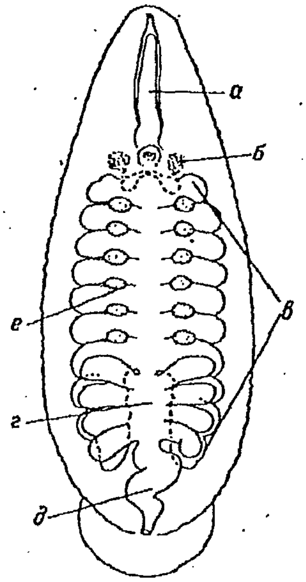


Рис. 137. *Oligobdella tagoi.* Пищеварительный аппарат и семенные мешки. Обозначения, как на рис. 135. (Oka, 1925в).

Fig. 137. *Oligobdella tagoi.* Digestive system and testis sacs. Legends the same as in Fig. 135 (Oka, 1925b).

---

[1] This species is sometimes thought to be identical with *Rana temporaria* L.

*2. *Oligobdella tagoi* Oka, 1925.

Oka, 1925b : 330-333, fig. 4-5; Moore, 1930 : 173; Autrum, 1936 : 34-35, Abb. 22.

Body size. Length 16 mm, width 6 mm. *O. tagoi,* therefore, is at least twice as large as *O. orientalis.*

Body shape as described by Oka is nothing remarkable. However, in comparison with *O. orientalis* this leech has a relatively narrow body which tapers more markedly towards the ends, especially the front end (Fig. 136).

The anterior sucker is small. The posterior sucker is large, with its 3.5 mm diameter exceeding half the maximum width of the body (6 mm). In relative terms, however, it is smaller than the posterior sucker of *O. orientalis,* whose diameter is almost equal to maximum body width.

Body surface smooth, with no visible segmentary papillae.

Body color is "nice dark green, lighter on the ventral side, without spots or stripes of a different color" (Oka, 1925b, p. 331).

Eyes. One pair of eyes on somite I (according to Oka, on the second annulus). "Under a magnifying glass they look simple, but a microscopic investigation demonstrated that directly in front of a well-developed eye there is an accessory eye of a very small size which appears to be on its way to obliteration" (Oka, 1925b, p. 332). Therefore, the eye systems of *O. tagoi* and *O. orientalis* are not very different. 290

Body somite composition. A complete somite consists of two annuli, the first one always slightly larger than the second. Somites II-III and XXIV-XXVI are uniannulate. Therefore, the body of the species in question consists of the prostomium and 48 annuli. "In some biannulate somites situated in front of the mid-body area and behind it, the interannular furrows are far more shallow than those between the somites" (Oka, 1925b, p. 332).

Digestive system (Fig. 137). Oka describes the mouth as situated in the front half of the anterior sucker. This phrase is not clear, as it fails to explain the exact position of the mouth (either near the front edge of the sucker, as in *O. orientalis,* or at a considerable distance from it, though still not in the middle of the sucker). Most probably this remark is of a general character, i.e. it states only that the buccal opening is not situated in the middle of the anterior sucker. Crop caeca, judging from Oka's drawing and description, are simple (except for the diverticula of the seventh pair which feature short round secondary processes) and well developed. Unlike those of *O. orientalis*, however, they are relatively short and have round rather than expanding ends. Differences in the digestive system structure between the two oligobdellids should be finally clarified by detailed investigations on a large body of material.

Genital system. Six pairs of testes (Fig. 137) situated between the crop caeca. Both ovisacs, as Oka puts it, are not voluminous.

Life cycle has not been studied.

Ecology. Of the six specimens at Oka's disposal three were collected on the tadpoles of *Rana temporaria* which seems to be the host of this [leech] species. However, further observations are necessary to solve the problem of nutrition of *O. tagoi.*

In Japan the leech under consideration was found in a shallow pond in a mountainous area. No evidence was available on the water body where the Korean specimens were collected.

Geographical distribution. Japan: Hida province (Honshyu island); Korean Peninsula: North-West of Seoul. This species probably dwells in

Northern China as well. It might in the future be found in the Primorsky Krai [Southern Far East - Tr.] of the USSR.

Possible errors in the identification of *O. tagoi.* Though *O. tagoi* may be confused with *O. orientalis,* it is undoubtedly an individual species distinguished from *O. orientalis* by its larger body, one rather than two pairs of eyes, a smaller posterior sucker (in relation to the maximum width of the body) and probably crop caeca of a different shape. This oligobdellid differs from *Mooretorix cotylifer* in the same ways as *O. orientalis* (see above).

11. Genus **Oligoclepsis** Oka, 1935.

Oka, 1935a : 66-68, 1 Fig.; Lukin and Epshteyn, 1960c : 479.

Standard species *Oligoclepsis tukubana* Oka, 1935.

Size medium for glossiphoniids (length 12 mm, width 6 mm). The dorsal side is covered with papillae forming no conspicuous longitudinal rows. The ventral side has no papillae. Body pigmentation bleak. One pair of conspicuous eyes. The anterior sucker is very small. The posterior sucker is small (considerably smaller than half the maximum width of the body). The prostomium (first somite) is not large. The total number of annuli on the dorsal side is sharply reduced: the complete somite consists of two equal annuli, while uniannulate front and back somites number more than 10. On the ventral side of the mid-body the somites are triannulate but towards the front and the back end the interannular furrows disappear, the front ones first (to produce a somite consisting of a longer front and a shorter rear ring) and the back ones later. One species *Oligoclepsis tukubana* Oka is known (Japan, the Tukuba mountain).

*** Oligoclepsis tukubana** Oka, 1935 (Fig. 138).

Oka, 1935a : 66-68, 1 Fig.; Lukin and Epshteyn, 1960c : 479.

The following description is based on Oka's article (1935a). The three mature specimens at his disposal were apparently received in a preserved condition.

Body size. Glossiphoniids of an average size. Length 12 mm, greatest width 6 mm.

Body shape. According to Oka, the width of the body is average for a glossiphoniid. Contrary to his own data concerning its body size presented above, [he claims that] the length exceeds the maximum width by a factor of almost three rather than two. 291

The anterior sucker is "relatively small" (Oka, 1935a, p. 66). The posterior sucker is also small (its diameter is considerably less than half the maximum width of the body).

Body surface. The entire back is covered with well-developed though rather small papillae. Oka writes that their size varies and the arrangement is "far from being very regular" (ibid). At the same time the schematic representation in his description of the species, as well as certain phrases from that same description indicates that the papillae (Fig. [1]38) are of a similar size and generally show a longitudinal arrangement. On the first annulus they are situated near the back end, on the last one in the middle. Oka regards the location of papillae on the first annulus as testifying to the fact that this annulus emerged from two original rings, so that papillae disappeared on the first and remained on the second ring. Data on *Paratorix baicalensis* (see below) whose front annulus occasionally has a row of vestigial papillae near its front edge, support Oka's opinion. As for the ventral side, the author refers to it as being "positively smooth" (ibid).

Рис. 138. *Oligoclepsis tukubana*. Строение сомита. (Oka, 1935a).

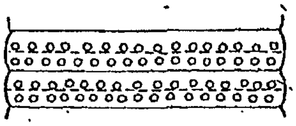


Fig. 138. Oligoclepsis tukubana. Somite composition (Oka, 1935a).

Body color is uniform grey without spots or stripes; the abdomen is somewhat lighter than the back.

Eyes. One pair of black, highly conspicuous eyes on somite II.

Body somite composition. Oka reports that a complete somite on the back consists of two "almost equal annuli". Complete somites on the ventral side are triannulate, apparently equal in length to each other (since Oka does note indicate otherwise). Regarding the body somite composition, we shall give a verbatim translation of a quote from Oka's description (1935a, p. 67). "Somites I-VII are perfectly uniannulate, without a trace of any interannular furrows. Somite VIII has a very shallow furrow and may be called intermediate between uni- and biannulate. Starting from somite IX, however, the interannular furrow becomes distinct and this condition lasts till somite XXII. [Though] somite XXIII is also biannulate, its furrow becomes considerably less deep than the preceding [furrows - E.L.]. Each of the four final somites (XXIV-XXVII) is uniannulate. On the ventral side of the mid-body, somites contain three rings but towards both ends of the body [the front and the back end - E.L.] the interannular furrows, first the front and then the back one, show gradual reduction". Since, according to Oka, the female genital opening is situated between the large and the small annuli of somite XII, the reduction of interannular furrows extends forward at least to this somite inclusive. Unfortunately, Oka does not discuss this issue in greater detail and gives no evidence on somites from which the reduction of interannular furrows starts in either the front or the back parts of the body. At any rate, Oka's description shows that the species under consideration exhibits a marked tendency for annuli fusion on the ventral as well as on the dorsal side. The number of annuli on the dorsal side of *O. tukubana* totals only 43.

Genital system. The genital openings are small. The clitellum boundaries could not be established.

Life cycle. Around 30 small leeches with pairs of black eyes already clearly visible were found on the abdomen of one of the three specimens studied by Oka. He makes no mention of the date of collection, but these specimens were delivered to him in late November.

Ecology. There is no evidence on the hosts of *O. tukubana*. The leeches were collected on stones in small brooks.

Geographical distribution. Japan (Tukuba mountain).

12. Genus **Paratorix** Lukin et Epstein, 1960.

Shchegolev, 1922c : 136-141 (*Torix*, part.); Lukin and Epshteyn, 1960a : 459 (*Torix*?); 1960b : 479.

Standard species *Paratorix baicalensis* (Stschegolew, 1922).

Leeches of a medium size for glossiphoniids (up to 12 mm long). Body 292 wide and flattened. The dorsal side is covered with papillae of approximately the same size (not considering the vestigial small papillae). The ventral side has no papillae. Body color rather intense. Two pairs of prominent eyes. Buccal sucker well developed. Posterior sucker small (far smaller than half the maximum width of the body). Prostomium (first somite) well developed. A complete somite on the dorsal side consists of two unequal rings: the long front one formed as a result of fusion of the first and second annuli, and a shorter back annulus. The crop has seven pairs of caeca. The first pair is very small, the last one is the longest; it curves backward along the gut. The male genital opening is located between somites X and XI, the female opening between the second and third annuli of somite XI. The only known species is *Paratorix baicalensis* Stschegolew (open waters of Lake Baikal).

Paratorix baicalensis (Stschegolew, 1922).

Shchegolev, 1922c : 136-142 (1 Fig. and a table of microphotographs) (*Torix*); Dogel' and Bogolepova, 1957 : 446 (*Torix*); Lukin and Epshteyn, 1960a : 459-460, Fig. 1b and 3c (*Torix?*); 1960c : 479; Kozhov, 1962 : 57-59, Fig. 33, 3 and Fig. 34, 3; 1963 : 90, Fig. 44, 2, 3 and Fig. 45, C.

The following description is based on evidence obtained with preserved specimens; no live leeches have been studied so far.

Body size. Glossiphoniids of a medium size. Large specimens may be up to 11-12 mm long and 7-8 mm wide.

Body shape. Measurements and illustrations (Fig. 139, 140) demonstrate that preserved specimens of *Paratorix baicalensis* have a very wide body.

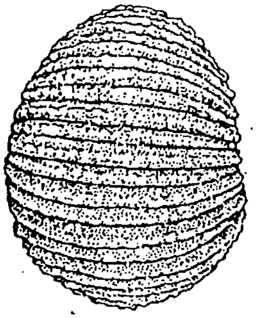


Рис. 139. *Paratorix baicalensis* (со спинной стороны). (Лукин и Эпштейн, 1960а).

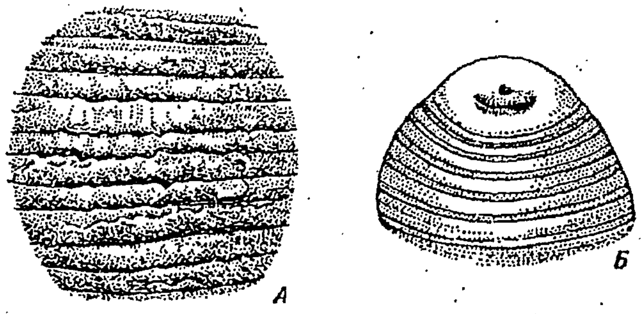


Рис. 140. *Paratorix baicalensis*. *А* — часть спины; *Б* — передняя часть тела с брюшной стороны; видно ротовое отверстие, расположенное на «верхней губе». (Щеголев, 1922в).

Fig. 139. *Paratorix baicalensis*. Dorsal view (Lukin and Epshteyn, 1960a).

Fig. 140. *Paratorix baicalensis*. A - part of the back. B - ventral view of the front part of the body; the buccal opening may be seen on the "upper lip" (Shchegolev, 1922c).

The posterior sucker is small. In a specimen 12 mm long and 8 mm wide its diameter was a mere 2 mm (Shchegolev, 1922c, p. 140). Similar data were obtained by Lukin and Epshteyn (1960a). The diameter of the caudal sucker in leeches they studied was 2.4, 1.7, 2.0 and 2.0 mm, the body width being 7.0, 5.5, 5.5 and 7.0 mm respectively. Therefore, in all the cases the diameter of the sucker was considerably less than half the maximum width of the body.

The occurrence of papillae near the body edges makes the latter rugged and wavy.

Body surface. A multitude of papillae arranged in transverse rows cover the entire dorsal side. On the longer front ring (which resulted from the fusion of the short first and long second annuli) the papillae are located closer to the back edge. Apart from this, tiny papillae may sometimes be noticed on the front ring near the furrow, separating it from the previous somite. They are obviously

situated on what used to be the first annulus, while the bigger papillae occupy the former second annulus. On the last annulus the papillae are situated in the middle of the ring. Since large papillae on the front ring are about the same size as those on the back ring, while the tiny papillae of the former first annulus are almost invisible or totally absent, the back of this leech seems to be covered with identical papillae. In this respect *P. baicalensis* may be easily distinguished from the other endemic Baikal glossiphoniids, i.e. *Baicaloclepsis* species (see below) whose dorsal side features longitudinal rows of larger papillae among the small ones. There are up to 30-32 large papillae on the front ring; on the back ring the number is smaller (20-25) because there are no papillae near body edges. The papillae at the top are smooth and have none of the sophisticated "relief" typical of *Baicaloclepsis* species, particularly *B. echinulata* 293
(see below). On the other hand, near body edges papillae do seem somewhat "fuzzy" at the top. The ventral side has no papillae at all and looks smooth even under the binocular microscope. Specimens taken out of the preservative and therefore slightly dried seem to show tiny tubercles [on the abdomen]. These formations, however, should obviously be regarded as artefacts. Shchegolev (1922c, p. 138) also notes that "the ventral side has no tubercles whatsoever".

Body consistency appears to be rather firm, though this question cannot be solved without investigations on live leeches.

Body thickness. Preserved leeches are fairly flattened. They are far thinner than *Baicaloclepsis grubei* and thinner than *B. echinulata.*

Body color. Shchegolev describes the dorsal side of *P. baicalensis* as "dark brown". All the specimens of this leech studied by E.I. Lukin and V.M. Epshteyn were rather intensely colored, though sometimes brown or brownish

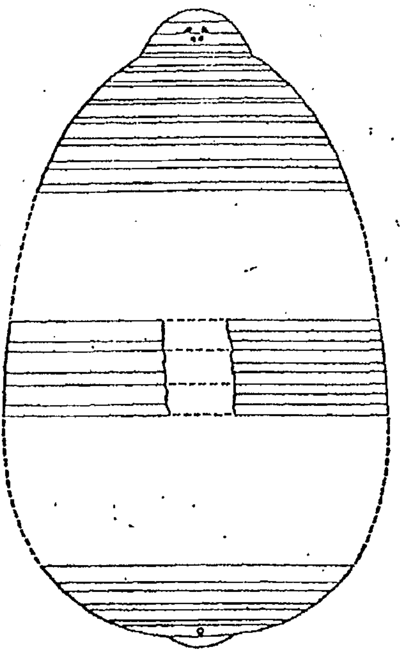


Рис. 141. *Paratorix baicalensis*. Расчленение тела. Объяснение в тексте. (Щеголев, 1922в).

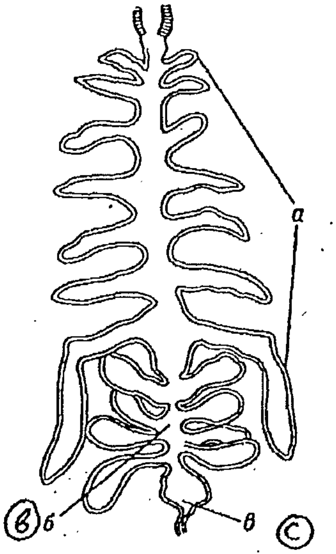


Рис. 142. *Paratorix baicalensis*. Пищеварительный аппарат. *а* — желудок с отростками; *б* — кишка с отростками; *в* — задняя кишка. (Лукин и Эпштейн, 1960а).

Fig. 141. *Paratorix baicalensis*. Body segmentation. See text for explanation (Shchegolev, 1922c).

Fig. 142. *Paratorix baicalensis*. Digestive system. a - crop with caeca, b - gut with processes, c - hind intestine (Lukin and Epshteyn, 1960a).

rather than dark brown. At any rate, *P. baicalensis* is darker than both *Baicaloclepsis* species, especially the very lightly colored*B. grubei*.

The four front annuli seem to contain no pigment and, at least in preserved specimens, are white. Shchegolev himself wrote that "...the first four rings on the dorsal side sharply differ from the other ones in having no papillae and no color" (Shchegolev, 1922c, p. 139). On a more general note, because of the presence of papillae the back is colored unevenly. The ventral side is bleak.

<u>Eyes</u>. All the specimens studied by Shchegolev (1922c), as well as by Lukin and Epshteyn (1960a), had two pairs of prominent eyes. In some leeches, they do not show very well (obviously due to intense body pigmenta-

tion), yet may easily be revealed by treating the worms with glycerin or other clarifying agents. Shchegolev mentions this fact as well. The first pair of eyes is situated on the second ring, the second on the third ring. Since the first pair is located quite close to the back border of the second somite, it may sometimes seem that both eye pairs occupy the third annulus. In each pair the eyes are rather close to each other, and there seems to be little difference in this dis- 294
tance between the first and second pairs. According to Shchegolev's illustration (Fig. 141), however, the distance between the eyes in the first pair far exceeds that in the second pair. Lukin and Epshteyn (1960a) studied a considerably larger body of material than Shchegolev and yet observed no eye arrangement reported by this author. Obviously there is an inaccuracy in the above-mentioned illustration.

Body somite structure (Fig. 141). As we have indicated in the diagnosis of the species, a complete somite consists of two annuli on the dorsal side and three on the ventral side. Of the two rings visible on the dorsal side of the somite, the front one (resulting from the fusion of the first and second annuli) is considerably longer than the back one (i.e. third annulus). Body contraction in preserved specimens obscures the section of the front ring which corresponds to the [former] first annulus and has no papillae (or just tiny ones). Thus the large papillae of the front ring (situated on the section corresponding to the second annulus) are brought close (sometimes to the point of contact) to their counterparts on the back ring of the previous somite. The result is an impression of very deep furrows between body segments. However, though these furrows are better pronounced than those between the front and the back ring, they are not truly deep, which is particularly evident on specimens showing little contraction after preservation. We should also note that the fusion of the first and second annuli on the dorsal side is incomplete: one can notice that near body edges these annuli are separated by minor furrows or, rather, wrinkles. However, these disappear towards the mid-body.

On the ventral side the furrows between the first and second annuli of complete somites occur throughout the body, i.e. the somites on this side are triannulate. On the other hand, these furrows are smaller than those between the second and third annuli; they are also far less developed than the furrows between the somites. As a rule, the first annulus is slightly shorter than the other two, while the central annulus is longer than the third one.

Prostomium (somite I)[1] is rather large (in *Baicaloclepsis* species it is small). The annulation pattern is as follows: II-III : 1 (with barely visible supplementary furrows, however); IV-VI : 2; VIII-XXII :2 on the dorsal side and 3 on the ventral side (note that in some specimens the first triannulate somite on this side is IX, X or even XI rather than VIII); XXIII : 2 on the dorsal side (in some specimens the back annulus may be reduced to an extent) and 3 or 2 on the ventral side; XXIV : 1 (dorsal side) and 2 (ventral side); XXV-XXVII : 1. The last somite (XXVII) behind the anus is poorly pronounced and G.G. Shchegolev does not mention it at all.

Therefore, the total number of annuli in *P. baicalensis* reaches 47 on the dorsal side and 64 on the ventral side[2]. According to Shchegolev, "the total number of annuli is 48" (apparently on the dorsal side). In fact, his description suggests 47 as the number of annuli. Considering that Shchegolev does not mention somite XXVII, the difference between his data and those given above for somites I-XXV is two annuli. The reason is that he believed somites XXIII and XXIV (XXIV and XXV according to our terminology) consist of two annuli rather than one, as described above. On the other hand, these differences are

---

[1] G.G. Shchegolev thinks of the prostomium as a separate segment.

[2] If the prostomium is regarded as somite I consisting of one annulus.

of little importance, especially considering that in many cases leech annuli are fairly difficult to count and their number or prominence may vary.

Digestive system. Fig. 142 gives a somewhat simplified schematic representation of this system. The number of crop caeca is seven. The processes of the first pair are considerably smaller than all the others, including even those of the second pair. In some specimens (probably depending on the extent the crop is filled with blood) the first caeca are extremely small, though still visible. The width of the processes varies. When the crop is filled with blood, they are rather wide, with the last pair of crop caeca being especially large. All the processes have smooth edges and do not branch; their distal ends in satiate leeches are usually expanded and sometimes inflated. Gut processes are well developed and also inflated at the ends.

Genital system. The male gonopore is situated between somites X and XI, the female opening between the second and third annuli of somite XI, i.e. the two openings are separated by two annuli. Since on the dorsal side the first and second annuli of somite XI are fused, a dorsal count gives just one (large) annulus between the two gonopores. Shchegolev's data on this issue are contradictory. In his diagnosis of *Torix baicalensis* (1922c, p. 137) he writes that "the male genital opening lies between the 18th and the 19th annuli[1], i.e between 295
somites IX and X, the female opening between the 20th and 21st annuli, i.e. between somites X and XI". However, in a schematic annulation diagram for this leech (ibid, p. 139) the male genital opening is situated between the 17th and the 18th annuli, and the female opening between the 19th and the 20th annuli. At the same time the right-hand side of the diagram (with somite boundaries) shows the openings in the same positions as in the diagnosis. At any

---

[1] Shchegolev includes the prostomium (which consists of one annulus) in the annuli count.

rate, Shchegolev assumes the genital openings of *P. baicalensis* are separated by one complete somite. In terms of ventral annuli count this amounts to three rings rather than the two reported by Lukin and Epshteyn, who had access to a considerably larger body of material than Shchegolev. It seems most likely that Shchegolev made an error in describing the position of the female gonopore. This assumption is supported by the fact that *Baicaloclepsis* species (undoubtedly related to *P. baicalensis*) also have the male genital opening between somites X and XI, and the female opening between the 2nd and the 3rd annuli of somite XI.

Life cycle completely unknown. Neither Shchegolev nor Lukin and Epshteyn had at their disposal small leeches which recently finished their development. Thus the breeding period of this species cannot be established even approximately.

Ecology. No evidence is available on the nutrition of this species. However, V.A. Dogel' found it appropriate to make the following suggestion: "Outside of the USSR the genus *Torix* is represented by two species dwelling on tortoises. It may thus be tentatively suggested that *Torix baicalensis* also parasitizes on vertebrates. In Lake Baikal the role of such vertebrates could be naturally played by fish" (Dogel' and Bogolepova, 1957, p.446). Dogel's reasoning does not seem very convincing. Among the two *Torix* species mentioned in the quote, only *T. cotylifer*[1] parasitizes on a tortoise (*Amyda sinensis*), while all the four reported *Torix mirus* specimens were found between the shell and body of *Melania aubryana* Heude (Blanchard, 1898, p. 342), a mollusk. It should be recalled once again that only *Toricinae* species with a large posterior sucker (from the genera *Mooretorix* and *Oligobdella*) are proven parasites of

---

[1] In the present book this species is called *Mooretorix cotylifer.*

vertebrates. *Paratorix baicalensis* may in fact feed on gobies which lead a rather immobile way of life. The same assumption is made below with regard to *Baicaloclepsis* species. However, special investigations are necessary to solve all these problems.

Shchegolev does not mention the exact origin of the specimens he studied. We only know all the three leeches came from Lake Baikal[1]. Among the four collections at Lukin and Epshteyn's disposal, three (5 specimens) were made near the Ushkun'i islands, and the origin of one collection (9 specimens) was unknown, though it probably came from Maloe More [lit., the Minor Sea - Tr.]. Therefore, current evidence indicates that *P. baicalensis* is less common and not as widespread in Lake Baikal as the species of the genus *Baicaloclepsis*.

Data on the depth at which the collections were made, were available only in one case (27 m). Taking into account that, among the three endemic Baikal glossiphoniids, *P. baicalensis* has the most intense color and its eyes are better developed than those of *Baicaloclepsis grubei*, while *B. echinulata* has no eyes at all, it seems plausible that it dwells at smaller depths than *Baicaloclepsis* species.

Geographical distribution. Lake Baikal (open waters).

Possible identification errors. *P. baicalensis* may be confused only with *Baicaloclepsis* species. Unlike the latter, however, it features biannulate somites on the back and no prominent rows of larger papillae. The absence of papillae on the ventral side and well developed eyes clearly distinguish it from *Baicaloclepsis echinulata*.

---

[1] In fact, M.M. Kozhov (1962, p. 58) writes that *P. baicalensis* described by Shchegolev was collected in Chivyrkui Bay. Even if true, this evidence adds little to the geographical area of the leech in question, since the above bay is located quite close to the Ushkan'i Islands where it was definitely found.

13. Genus **Baicaloclepsis** Lukin and Epshteyn, 1959.

Grube, 1871 : 112 (*Clepsine,* part.); Vaillant, 1890 : 519 (*Glossiphonia,* part.); Blanchard, 1893c : 93-94 (*Placobdella,* part.); Autrum, 1936 : 91-92 (*Clepsine,* part.); Livanov, 1937 : 559 (*Haementeria,* part.); Dogel' and Bogolepova, 1957 : 446-447 (*Haementeria,* part.); Lukin and Epshteyn, 1959 : 189 296

Standard species *Baicaloclepsis echinulata* (Grube, 1871).

Medium-sized (up to 15 mm long and 7 mm wide) or large (up to 30-40 mm long and 15 mm wide) glossiphoniids. Body wide (especially in preserved specimens), tapering rather strongly towards the front end. Body thickness from small to considerable. Dorsal side of the body covered with papillae of varying size, from large to tiny. The largest papillae are located on the central annuli of somites and form three pairs of longitudinal rows. Papillae often covered with secondary papillae. Ventral side of the body smooth (*B. grubei*) or covered with small papillae (*B. echinulata*). Color light: pinkish, yellowish or brownish. With one species, *B. grubei,* eyes are more or less reduced; those specimens, mostly young ones, whose eyes are visible, have two pairs. The other species, *B. echinulata,* has no eyes at all. Therefore, this genus has a tendency for eye obliteration which may at least partially be explained by the fact that leeches belonging to these species, notably *B. echinulata*, often dwell at considerable depths. The buccal sucker is small, the caudal sucker also small (far less than half the maximum width of the body). Prostomium (somite I) small. Complete somites consist of three unequal annuli, the first being the shortest, the second the longest, and the third shorter than the second yet much longer than the first one. It should be borne in mind, however, that in different parts of the body the relation between annuli lengths in complete somites may vary, and in some somites the annuli may differ more than in others. The furrow between the first and second rings on the ventral side is more prominent on the ventral than on the dorsal side. The crop has six pairs of diverticula, but the first pair is either very small or almost completely obliterated. The hind pair, as is usual in leeches featuring these processes, is long and curves back to run parallel to the gut. The male genital opening is located between somites X and XI, the female opening between the second and third annuli of somite XI. Both known species, *B. grubei* Lukin et Epstein and *B. echinulata (Grube)*, occur only in the open waters of Lake Baikal.

GUIDE TO BAICALOCLEPSIS SPECIES

1 (2) Ventral side with numerous small papillae ...1. **B. echinulata** (Grube)
2 (1) Ventral side without papillae.......................2. **B. grubei** Lukin et Epstein.

1. **Baicaloclepsis echinulata** (Grube, 1871).

Grube, 1871 : 110-112, Table IV, Fig. 2, 2a, 2b (*Clepsine echinulata*, part.[1]); Vaillant, 1890 : 519 (*Glossiphonia*); Blanchard, 1893c : 93-94 (*Placobdella*); Autrum, 1936 : 91-92 (*Clepsine*); Livanov, 1937 : 559 (*Haementeria*); Lukin and Epshteyn, 1959 : 189-190; 1960a : 458-459, Fig. 1b,

---

[1] The skin papillae in one of Grube's illustrations (Fig. 2b) are certainly typical of *B. echinulata*. At the same time he notes that the species described has two eyes, while the present author found no eyes in any of the numerous specimens of *B. echinulata* of varying age collected in various areas of Lake Baikal. However, another species of the same genus, *B. grubei*, always had eyes, though often somewhat reduced (see description of this species). It seems highly likely, therefore, that one of the *Clepsine echinulata* specimens studied by Grube belonged to *B. echinulata*, and the other one to *B. Grubei*.

3b; Kozhov, 1962 : 57-58, Fig. 33, 1 and Fig. 34, 2; 1963 : 90-91, Fig. 44, 1 and 3, and Fig. 45, b.

The following description is based on investigations of a large number of preserved leeches from the collections of the Limnological Institute of the USSR Academy of Sciences and the Biological Station of Irkutsk University in Bol'shie Koty (at Lake Baikal). No live leeches of this species have been studied to date.

Body size. Medium-sized glossiphoniids up to 15 mm long and 7 mm wide, as measured on roughly preserved specimens.

Body shape. Preserved specimens of *B. echinulata* have a rather wide body (Fig. 143, 144). Live leeches, of course, should not be that wide.

The posterior sucker, as it was mentioned in the diagnosis of the genus *Baicaloclepsis*, is small: just 1.1 mm in diameter in a leech 14 mm long and 7 mm wide, and no wider than 1.3 mm in larger leeches. 297

Owing to the complex and often large papillae situated near body edges, these feature a sophisticated "relief" (Fig. 143, 144).

Body surface. The dorsal side has a large number of papillae of varying size. The largest papillae occupy the central somite annuli. Smaller yet well developed tubercles are present on the third annuli, while the first annuli are occupied by tiny papillae which Grube compared to "grainlets" (Körnchen). In some specimens the largest papillae of the central annuli form six longitudinal rows[1]; however, in occasional specimens the differences in size between the large papillae are insignificant, and the above six rows are barely if at all visible. Instead, numerous large papillae cover the entire back, with smaller (medium-sized to tiny) tubercles between them. Regardless of their size, most papillae

---

[1] Even very young leeches already show these rows.

are located on the annuli in transverse ridges, yet there are some tubercles which seem to show no specific arrangement. Many papillae of this species, as already noted and clearly illustrated by Grube in his drawings, are covered with additional tubercles sometimes forming a semblance of "crowns" (Fig. 144). Thus the dorsal side of *B. echinulata* often has a very "fuzzy" appearance. In young leeches which recently finished development the principal features of the species are well pronounced, but their papillae are still simple, i.e. bear no additional formations.

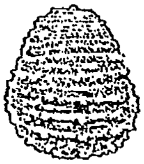


Fig. 143. *Baicaloclepsis echinulata.* Dorsal view. (Lukin and Epshteyn, 1960a).

Рис. 143. *Baicaloclepsis echinulata* (со спинной стороны). (Лукин и Эпштейн, 1960а).

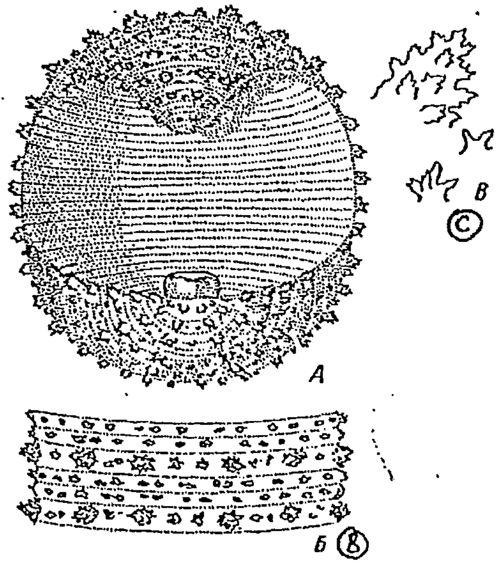


Fig. 144. *Baicaloclepsis echinulata.* Structure of integument. A - ventral and partly dorsal view of a leech. B - location of papillae on the dorsal side of two somites. C - a large skin papillae with complementary tubercles (Grube, 1871).

Рис. 144. *Baicaloclepsis echinulata.* Строение кожных покровов. *А* — пиявка с брюшной и частично со спинной стороны; *Б* — расположение сосочков на спинной поверхности двух сомитов; *В* — большой кожный сосочек с сосочками на нем. (Grube, 1871).

In contrast to *B. grubei* (and *Paratorix baicalensis*), the ventral surface of *Baicaloclepsis echinulata* is always covered with numerous tiny papillae. No exceptions to this rule were observed. Therefore, the species in question typically has numerous skin papillae on both sides of the body, with some of the papillae having a complex structure.

Body consistency appears to be moderately firm, though more firm than that of *B. grubei.* However, this question may be finally answered only after investigations on live leeches.

Body thickness. These leeches are thinner than *B. grubei* but thicker than *Paratorix baicalensis* and the common *Glossiphonia* species (*G. complanata, G. concolor, G. heteroclita*).

Body color (in fixed specimens!) is described by Grube as whitish. Rather dark specimens, however, were occasionally present in collections examined by the author and Epshteyn. In any case, this species has a darker color than *B. grubei.* The papillae, as first correctly noted by the author of the 298 species, are considerably lighter than the basic color of the body.

Eyes are absent in specimens of all ages (Lukin and Epshteyn, 1959, 1960a). No effect of preservatives can account for this, since most *Baicaloclepsis grubei* and all *Paratorix baicalensis* specimens preserved and stored under the same conditions had eyes. The author's investigations on rather recently preserved new material, obtained after the two above-mentioned articles by Lukin and Epshteyn had already been published, completely confirmed that this leech features no eyes. They obviously were obliterated due to certain conditions of life. Still, it is not improbable that an examination of a large body material will reveal specimens of *B. echinulata* with vestigial eyes. In fact, one small leech did have two eye-like spots colored reddish-brown.

Somite structure. The complete body segment as described above in the diagnosis of the genus *Baicaloclepsis* consists of three unequal annuli. The first annulus is very short, the second is 2.5 - 3 times longer than the first one, the third is 1.5-2 times shorter than the second one, yet still considerably longer than the first annulus. The relation between the annuli [lengths] in a somite depends on the position of the somite in the body and perhaps some other factors.

However, the inequality between the rings and especially the predominant development of the central annulus remain a highly typical feature of this species (and, incidentally, of*B. grubei*) which becomes clear already at a young age. On the ventral side, the annuli are approximately equal in length to each other. The prostomium (somite I) is small. The annuli distribution among the somites is as follows: II-IV : 2 (in some specimens the division of somites II and III into two annuli is rather obscure); V-VI : 2 (with another furrow becoming visible); VII : 2 or 3, VIII-XXIII - 3; XXIV : 3 or 2 (on the back the three annuli are less visible than on the ventral side); XXV : 2; XXVI-XXVII : 1. Thus the total number of annuli in *B. echinulata* varies from 64 to 68. Grube, on the other hand, assumed there was only 60 rings (*annulis completis fere 60*). Considering that some annuli are hardly discernible, the difference between the above figures and Grube's count seems to be fairly insignificant. At any rate, the complete somites of leeches studied by Grube were triannulate. As is the case with *B. grubei,* some annuli (especially the central ones) have additional transverse furrows.

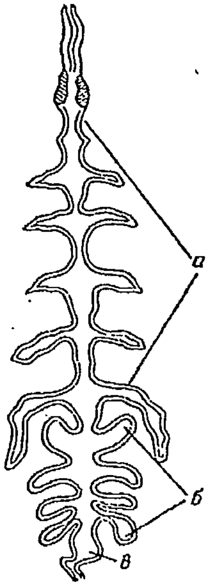


Fig. 145. *Baicaloclepsis echinulata*. Digestive system. a - crop with caeca; b - gut with processes; c - hind intestine (Lukin and Epshteyn, 1960a).

Рис. 145. *Baicaloclepsis echinulata*. Пищеварительный аппарат. *а* — желудок с отростками; *б* — кишка с отростками; *в* — задняя кишка. (Лукин и Эпштейн, 1960а).

Digestive system (Fig. 145). The shape of this system is variable, though probably less so than with *B. grubei.* There are six crop caeca, with the first pair small to the point of being almost unobservable. The second pair is better developed, though it can be vestigial as well. Generally speaking, all crop caeca in this species usually seem to be shorter and thinner than in *B. grubei,* perhaps due to the smaller size of *B. echinulata.* The ends of the processes are whole and have no branches.

Genital system. The position of the gonopores is indicated in the diagnosis of the genus. The structure of the genital system has not been studied.

Life cycle. Grube found on a specimen of *Clepsine echinulata* (length 11 mm, maximum width 6 mm) 8 young leeches attached to their mother's body by means of rear suckers. A collection made in 1925 (the exact date is not known) near the Olkhon island contained 5 tiny leeches which obviously had recently hatched from eggs. They were 2 mm wide and no more than 5 mm long. They possibly belonged to the brood of a mature *B. echinulata* (13 mm long and 8 mm wide) found in the same collection. A collection made on July 16, 1963 in the southern part of Lake Baikal contained a leech with a number of embryos attached to its ventral side. These embryos had a large rear sucker and a wide front end of the body.

Ecology. No reliable evidence on the nutrition of *B. echinulata.* is available.

This leech was found in Dagarskaya Guba [Bay], in various areas of Maloe More, near Listvennichnoe and Solzan. Therefore, it occurs from the north (Dagarskaya Guba) to the utmost south (Solzan) of Lake Baikal inclusive. This does not necessarily mean that it dwells throughout the open waters of the lake (like other endemic Baikal leeches, this glossiphoniid avoids bays and stagnant water areas). Nevertheless, it seems much more common than *B. grubei* (found 299 to date only in Maloe More) and *Paratorix baicalensis* (reliably reported to date only in collections from the Ushkun'i Islands area).

The author examined a total of about 90 specimens of *B. echinulata* from collections made at 6 to 635 m depths. It seems that this leech occurs at 30-40 m depths less frequently than at 40-60 m. Generally speaking, the information available suggests that *B. echinulata* prefers greater depths than *B. grubei* and *Paratorix baicalensis,* which may well account for the absence of eyes in this species.

Geographical distribution. Lake Baikal (open waters).

Possible errors in identification. *B. echinulata* may be confused with other Toricinae from Lake Baikal, i. e. *B. grubei* and *Paratorix baicalensis.* However, it may easily be distinguished from these species by the presence of small papillae on the ventral side of the body.

2. Baicaloclepsis grubei Lukin et Epstein, 1959.

Grube, 1871 : 110-112 (*Clepsine echinulata,* part.)[1]; Dogel' and Bogolepova, 1957[2] : 446-447 (*Haementeria echinulata*)[3]); Lukin and Epshteyn, 1959 : 189-190; 1960a : 458, Fig. 1a, 2, 3a; Kozhov, 1962 : 57-58, Fig. 34, 3; 1963 : 90-92, Fig. 45.

---

[1] We have already noted in the description of *B. echinulata* (p. 296) that Grube described two leeches under the name *Clepsine echinulata*; one of them was likely *B. echinulata*, the other one *B. grubei.*

[2] A heading on page 446 of this article has a typographical error. The species under discussion is called *Haementeria costata* Grube. In fact, in the description itself it is called *Haementeria echinulata* Grube, while *Haementeria costata*, a leech of Mediterranean origin which does not live in Siberia and Lake Baikal, is mentioned by Dogel' only in the discussion of possible hosts of *Haementeria echinulata.*

[3] Unfortunately, the collection of leeches processed by V.A. Dogel' did not survive. Yet the leeches he described under the name of *Haementeria echinulata* should undoubtedly be identified as *Baicaloclepsis grubei*, since he notes that the have eyes and four rows of large tubercles on the dorsal side. These features typify precisely *Baicaloclepsis grubei* rather than *B. echinulata.*

The following description refers to a large number of preserved leeches and several live specimens investigated by the author and V.M. Epshteyn.

Body size. Glossiphoniids of a considerable size: length up to 30-40 mm, width up to 15 mm (measured on preserved but previously anaesthesized specimens which retained natural body shape). Strongly contracted preserved leeches from regular hydrobiological collections had the following dimensions: large specimens 24-28 mm long and 12-14 mm wide; mid-size specimens 10-14 mm long and 7-8 mm wide; small specimens 5-7 mm long and 2-3 mm wide. Preserved small leeches which appeared to have finished their development cycle recently were about 3 mm long and 1 mm wide.

Body shape (Fig. 146). Both in live leeches and in preserved specimens which retained an almost natural body shape due to previous anaesthesia, the body shows marked gradual tapering towards the front, so that its length is three or even more times greater than its width. Roughly preserved leeches shorten drastically and therefore appear very wide.

The rear sucker, as mentioned in the diagnosis of the genus, is small. In large, roughly preserved specimens whose length varies from 34 to 43, and maximum width from 10 to 12 mm, the diameter of this sucker is 3 mm. The rear sucker seems very big in Fig. 146 because the leech was photographed from the side. V.A. Dogel' also notes the small size of this sucker (Dogel and Bogolepova, 1957, p. 447). The three leeches he investigated were 15-18 mm long and 10-11 mm wide and had a rear sucker 2.5-3 mm in diameter. Judging by observations on live leeches which were in a rather stressed condition, the sucking power of this organ is not very great. However, a final answer to this question requires observations on animals retaining their normal viability after being captured.

Body edges in live specimens are very thin and examining them with the 300 naked eye gives an impression of a transparent trimming along the sides of the body. Marginal rows of large papillae make the body edges rugged and wavy.

Body surface. The dorsal side has three pairs of longitudinal rows of large papillae (Fig. 146) which may be large enough to be called bumps. These papillae are located on the central (i.e. the longest) annuli and seem especially large on strongly contracted preserved specimens. In live leeches they are less prominent and their size appears to vary depending on the anatomical and physiological condition of the worms. In two previously anaesthesized preserved specimens the papillae were very small and almost did not show above the body surface. In roughly preserved leeches of various age (from regular hydrobiological collections) the papillae were invariably well visible. The largest papillae are those from median rows, the smallest from marginal rows. They start growing bigger approximately from somite VI and may be clearly seen even on small leeches. The surface of the papillae, especially on the top, is covered with tiny tubercles and looks fimbriate. Apart from these tubercles, there is a number of tiny papillae which Grube called "grainlets". They are situated [mostly] on the second and third annuli of somites, being inconspicuous on the first annuli. The difference in size between the large papillae (for all their variation in dimensions) and these grainlets is very sharp, and no intermediate papillae are present. The ventral side has no papillae whatsoever, and its surface is smooth.

Body consistency of live leeches is moderately firm or rather semi-soft. Bodies of roughly preserved large leeches resemble sacks with soft contents and empty spaces. Therefore, pressing these worms with one's fingers leaves depressions on their body.

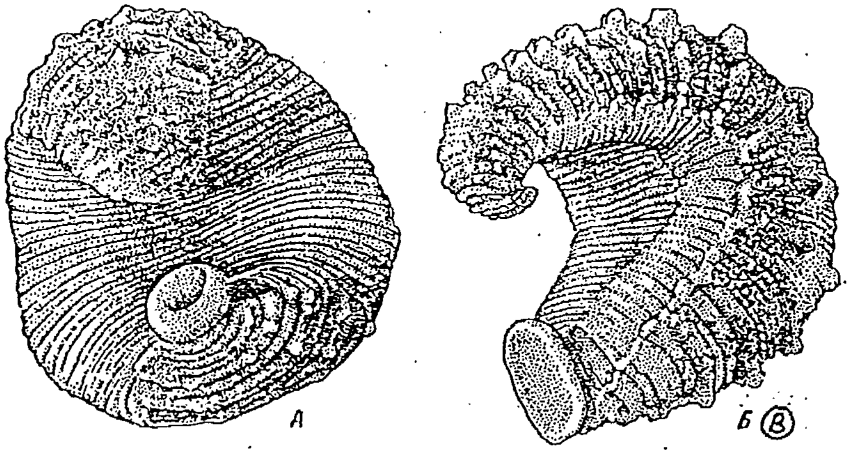


Рис. 146. *Baicaloclepsis grubei.* *А* — с брюшной стороны; *Б* — сбоку. (Лукин и Эпштейн, 1960а).

Fig. 146. *Baicaloclepsis grubei.* A - ventral view. B - lateral view (Lukin and Epshteyn, 1960a).

Body thickness, compared to , *Haementeria costata* and some other *Glossiphonia* species is quite considerable, which means *B. grubei,* particularly large specimens, cannot be called leaf-like.

Body color of live leeches is gentle, light and uniform. The color is pale yellow or pale yellowish-brown with a greenish tint between the median row papillae and a pinkish tint on body edges and the ventral side. Upon preservation leeches instantly start loosing color and finally become yellowish-white.

Eyes are featured by all the specimens examined, though in mature leeches they exhibit a strong tendency for obliteration and their number is difficult to determine. Young specimens, however, clearly show two pairs of eyes, with a scattered accumulation of pigment behind the second pair. Could this formation be a vestigial third pair of eyes? Eyes in both pairs are situated on the second or the second and third annuli of the body.Occasionally, young 301 leeches also have their eyes reduced; as for mature worms, we have already mentioned that their eye boundaries become obscure and sometimes it seems there is just one pair of eyes (such leeches were apparently investigated by Dogel' and, earlier still, by Grube).

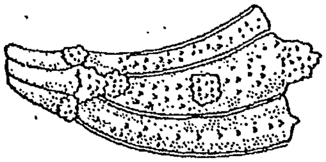


Рис. 147. *Baicaloclepsis grubei.* Строение сомита. (Лукин и Эпштейн, 1960а).

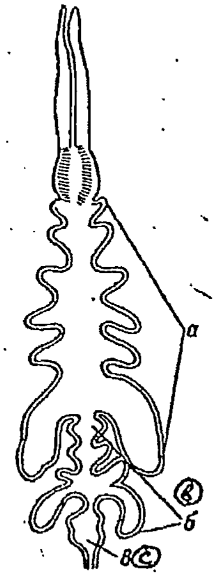


Рис. 148. *Baicaloclepsis grubei.* Пищеварительный аппарат. Обозначения, как на рис. 145. (Лукин и Эпштейн, 1960а).

Fig. 147. *Baicaloclepsis grubei.* Somite structure (Lukin and Epshteyn, 1960a).

Fig. 148. *Baicaloclepsis grubei.* Digestive system. Legends as in Fig. 145 ((Lukin and Epshteyn, 1960a).

Somite structure. The structure of the complete somite (Fig. 147) was described in the diagnosis of the genus *Baicaloclepsis*. In all complete somites the central annulus is larger than the third and especially the first one. However, the relation between annuli varies in different parts of the body and probably in different leeches. For instance, one preserved specimen had the following relation between annuli length in different parts of the body:

Part of body	First annulus	Second annulus	Third annulus
Anterior	1.5	3.0	1.7
Middle	1.7	5.0	2.5
	2.5	6.0	3.0
Posterior	1.2	3.0	2.0

Thus in the middle part of the body the difference in length between the central annulus and the other somite annuli is far greater than elsewhere. In all instances, however, the front annulus was the shortest, and the furrow between the first and second annuli was not as deep as between the second and third annuli. The central annuli of somites may be rather clearly divided by secondary furrows into three additional rings.

The prostomium (somite I) is small. The distribution of annuli in the somites is as follows: II-III : 1 (with a small transverse furrow on each ring); IV-V : 2; VI: 2 or 3; VII : 3 (on the back the three annuli are less prominent than on the ventral side); VIII-XXIII : 3; XXIV : 3 (ventral) and 2 (dorsal); XXV-XXVII : 1. Therefore, the total annuli count varies from 64 to 66. Investigations of a larger number of leeches might reveal greater variations in the number of annuli.

Digestive system shows significant variability which apparently depends on the extent to which it is filled with food and on the age of the leech. The number of crop caeca is six. However, the first pair of processes is either very short or looks like a small round protuberance on the central channel. The other processes, when filled with blood, are rather thick and apparently never have any branches so typical of glossiphoniids, including *Haementeria* species. Empty intestine processes are thin and also have no branches.

Genital system. The location of gonopores was indicated in the diagnosis of the species. The structure of the genital system has not been investigated.

Life cycle. Available material gives little indication as to when *.B. grubei* 302
breeds and how many eggs it deposits. A collection made on June 6, 1954 with the help of a dredger at a 19 m depth contained two large (24 and 26 mm long, 12 and 14 mm wide) and 17 very small specimens (about 3 mm long and 1 mm wide). It seemed that the latter had just completed their development, while one of the former (or both) was their parent. As many as 14 small leeches (about 5

mm long and 2 mm wide) were found in a collection made on August 27, 1951 at a depth of 10 , (Zogduk-Budun cross-section) along with one large leech (28 mm long and 14 mm wide). However, it remains unknown whether it was their parent. In another August collection (August 26) made at a depth of 23 m across from Cape Yadyrtui , about ten tiny leeches were accompanied by a very large leech (30 mm long and 18 mm wide) and 18 small ones (6-10 mm long and 2-5 mm wide). One small leech was found in a collection made on October 7, 1951 at a depth of 5.5 m (near Cape Yadyrtui). Even without access to winter collections, as was the case, we could conclude that the breeding period of *B. grubei* spans at least from June to October.

Ecology. As far as the nutrition of this leech is concerned, the following suggestions were made by V.A. Dogel' (Dogel' and Bogolepova, 1957, p. 447): "The biology of *Haementeria echinulata* [we have already noted that under this name Dogel' in fact describes *Baicaloclepsis grubei* - E.L.] so far has remained unknown. Using the collection of ZIN AN SSSR [The Institute of Zoology of the USSR Academy of Sciences - Tr.] we have managed to cast some light on an essential biological issue, i.e. the source of nutrition of this species. The label on a jar with three mature *H. echinulata* collected by I. D. Kuznetsov on June 27, 1908 says they were recovered from Arctic cisco nets put at a depth of 15 m in Maloe More. A more common *Haementeria* species, *H. costata,* dwells mostly in the southern areas of the European part of the USSR and feeds on the blood of tortoises (*Emys europaea*). This circumstance alone indicated a possible vertebrate host for *H. echinulata*. This proved to be case. The leeches caught on the nets obviously found their way there from the body of fish". Five leeches removed from the anchors of fishing nets on July 25, 1958 in Khuzhir (Maloe More) were at the disposal of the author and V. M. Epshteyn. However, we cannot consider the *B. grubei* parasitizing on fish a proven fact. First, the leech in question, as well as *Baicaloclepsis echinulata,* does not belong to the genus *Haementeria*, which means the reference to *Haementeria costata* has little validity. Second, a leech more closer to *Baicaloclepsis* species, *Torix mirus* Blanchard, was found in Southern Asia on a mollusk *Melania aubriana.* Third, only 5 out of the 67 specimens of *B. grubei* we investigated came from the anchors of fishing nets. Fourth, their occurrence on the nets does not prove they were brought there by fish.

Speaking of possible hosts for *B. grubei,* one should bear in mind that this leech does not swim and generally appears to move slowly. Its rear sucker is small and, as we have already said, it can hardly ensure a strong attachment to a host. Moreover, this species apparently spends most of its life unattached. and therefore must be a parasite of relatively inactive animals abundant in Lake Baikal. Of the fish species, such animals probably include gobies but not such strong fish and good swimmers as Arctic cisco. Note that in late July, 1958, V.M. Epshteyn examined about 500 specimens of Arctic cisco in Khuzhir (Maloe More) and did not find a single leech, though it was there that *B. grubei* were removed from nets used to catch this fish. Moreover, old endemics of Lake Baikal such as *Toricinae* leeches are unlikely to parasitize on fish (Arctic cisco, grayling, etc.) which penetrated into Lake Baikal rather recently. Gobies, on the other hand, are known to belong to a major endemic [animal] groups in the lake. It is also not improbable that *B. grubei* also feeds on some inactive invertebrate endemics of Lake Baikal. This dual nutrition is characteristic of an endemic Baikal ichthyobdellid *Baicalobdella torquata* which parasitizes on gobies and hammaridia. Finally, there is a proposition, though less plausible, that *B. grubei* feeds exclusively on invertebrates, which seem to be the only source of nutrition for another Baikal ichthyobdellid, *Codonobdella truncata.* This leech is found especially often in collections containing numerous specimens of certain hammaridia species (Epshteyn, 1961b). However, endemic Baikal mollusks may be too small to provide nutrition for *B. grubei.* Certain Baikal turbellarians may be quite large but they belong to parenchymatose worms having no blood and coelomic fluid. Nevertheless, this hypothesis requires further investigations, since the leeches under discussion may probably suck the relatively loose parenchyma of these worms. Indeed, some common glossiphoniid species (e.g. *Helobdella stagnalis*) suck out the entire body content of mollusks and other prey. This type of nutrition, if confirmed for *B. grubei* and other Toricinae, could account somewhat for the shape of their crop caeca, which have no small branches typical of true sanguivorous glossiphoniids. Studies on the stomach 303 content of freshly collected leeches and observations in aquariums could contribute to the solution of this problem.

The author examined a total of 70 specimens from 20 collections made in various areas of Maloe More: Yadyrtuy, Budunskaya Bay, Ulan-Khyn, between the Olkhon and the Ulungoi islands, Sergit, Kharin-Irgi Bay, middle of the Yelgai--Ulan-Khyn cross-section, Semisosenskaya, Tutyrkheyskaya and Kharin-Irgi Bays, Mukhor-Khave Strait and Khuzhir. It is not known whether this leech dwells outside Maloe More. We should mention, however, that the author has recently processed a number of collections from the southern part of Lake Baikal which contained numerous specimens of *Baicaloclepsis echinulata* but not a single *Baicaloclepsis grubei.*

Most leeches were found in dredging samples, some were present in collections made with a fry trawl net on various types of sandy bottoms. Ten collections were made at depths from 5.5 to 12 m, six at depths from 20 to 29 m, one at 90 m. The depth at which other collections were made was not known. This means *B. grubei* probably lives at relatively low depths, considering that Baikal is an extremely deep lake. On the other hand, according to observations made by the author and V.M. Epshteyn in Bol'shie Koty, this leech does not live near the shore.

Geographical distribution. Lake Baikal (open waters).

Possible identification errors. *B. grubei* may be confused only with other Toricinae from Lake Baikal, i.e. *B. echinulata* and *Paratorix baicalensis.* The absence of papillae on the ventral side and the presence of large papillary tubercles, however, make it easy to distinguish it from the former and the latter species respectively.

AN ADDITION TO THE SUBFAMILY TORICINAE

In 1962 Y. Chen described a new leech species *Placobdella sinensis* which he found in large numbers (114 specimens) on a soft-shelled tortoise *Amyda sinensis* near Nankin. It is very doubtful, however, that this species indeed belongs to the genus *Haementeria (Placobdella).* The diagnosis of *.P. sinensis* specifies that "In all complete somites the first annulus is considerably longer than the following two" (Chen, 1962, p. 322-323). At the same time the complete somite of *Haementeria (Placobdella)* species consists of three equal annuli with a tendency for further separation into two rings, while in *P. sinensis* "annuli ii and iii show no lateral division" (ibid). Moreover, Chen notes that the first pair of crop caeca is "directed forward to the 25th annulus" (ibid). These circumstances suggest that the Chinese zoologist was dealing with a new Toricinae species. In contrast to*Mooretorix cotylifer,* which also parasitizes on *Amyda sinensis, P. sinensis* is a large leech (up to 25 mm long) with a relatively small caudal sucker (whose diameter is half the maximum width of the body) and numerous papillae on the dorsal side of every annulus. It is therefore quite possible that a new species from the subfamily Toricinae parasitizes on soft-shelled tortoises in southern China. Detailed studies on the leech described by Chen are therefore highly desirable.