

TWO NEW SPECIES OF MESOZOIC DYSTICOID BEETLES FROM ASIA

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Dytiscoid beetles, particularly coptoclavids, are the most common Mesozoic aquatic beetles; their larvae are found by the thousands. At the same time, their diversity is not great; only one species of larvae and one or just a few species of adult beetles are always present in a single locality. In the latter instance, the beetles are never closely related so there is no basis for postulating that the larvae belong to different species that cannot be distinguished based on the larvae. It should be noted also that considerably more coptocladid species are described from the imago than from larvae. This is due in part to the fact the flying adult beetles lived and were buried in water bodies where the larvae did not occur, and, in part, because closely related species are difficult, and larvae as a rule all but impossible, to distinguish in the fossil record. Therefore, the report by A. P. Rasnitsyn and P. Vengerek of the well-known Novospasskoye fossil locality in western Transbaykal from which numerous coptocladid larvae of *Stygeonectes jurassicus* have been described [1], was entirely unexpected. An entirely different coptocladid was found which was almost indistinguishable from *Bolbonectes intermedius*, known from the Bolboy locality in eastern Transbaykal [2]. The latter species is considerably more advanced than the former and is transitional to the most advanced and last of the known Early Cretaceous coptoclavids *Coptoclava longipoda*. The Novospasskoye locality belongs to the Ichetuy Formation, usually considered as Lower to Middle Jurassic. The presence here of *Stygeonectes*, known from many Jurassic deposits, is entirely natural whereas the record in the same deposit of *Bolbonectes*, which is closely related to *Coptoclava*, was unexpected. True, in eastern Transbaykal these genera are known from the Ayryk and Bolboy localities from the same Byakin Formation, but, based on the presence of various coptoclavids, the beds were considered to be of different age [3]. The insect-bearing layers of the Ichetuy Formation are bottom deposits of small lakes forming a coarse volcanogenic stratum. It is believed that the layers with *Stygeonectes* and *Bolbonectes* at Novospasskoye are also of different ages, with the former being the older. Such an explanation is preferred because the deposits at these points are lithologically similar, and the differences cannot be reduced to a difference in conditions of the water bodies where these coptoclavids lived.

A second species is described from several larvae found recently in the Kenderlyk locality in East Kazakhstan from the Upper Triassic Tologoy Formation. The larvae have an abdomen with eight segments and fully segmented legs; therefore, these are larvae of the oldest dytiscoid beetles.

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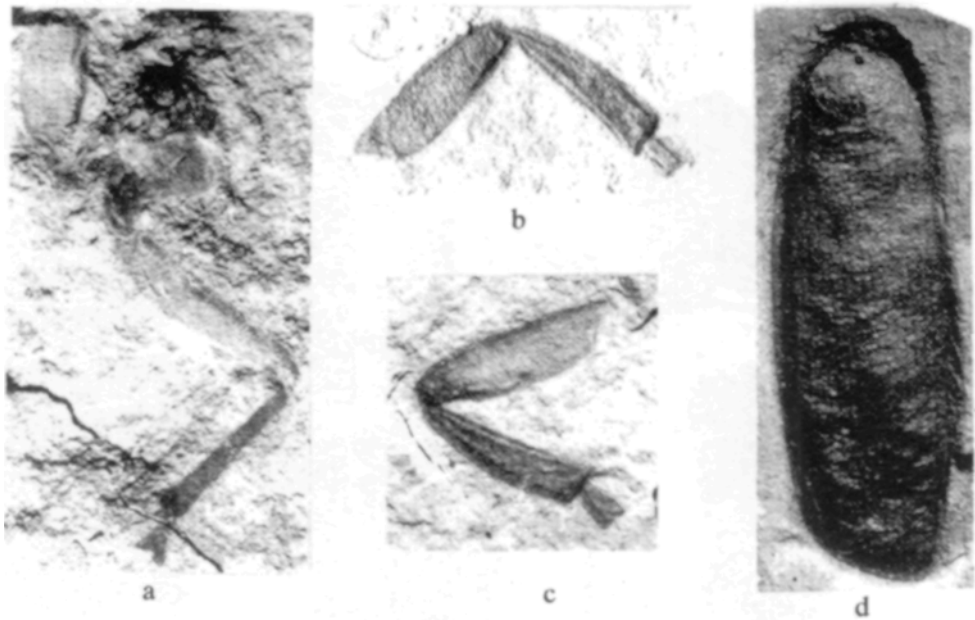


Fig. 1. *Bolbonectes occidentalis* sp. nov.; beetles, a - holotype PIN, No. 3000/3277 (X5.5), b-d - paratypes: b - PIN, No. 3000/3276 (x6.2), c - PIN, No. 3000/3275 (x6.5), d - PIN, No. 3000/3274 (x5.2). Transbaykal, Novospasskoye; Jurassic.

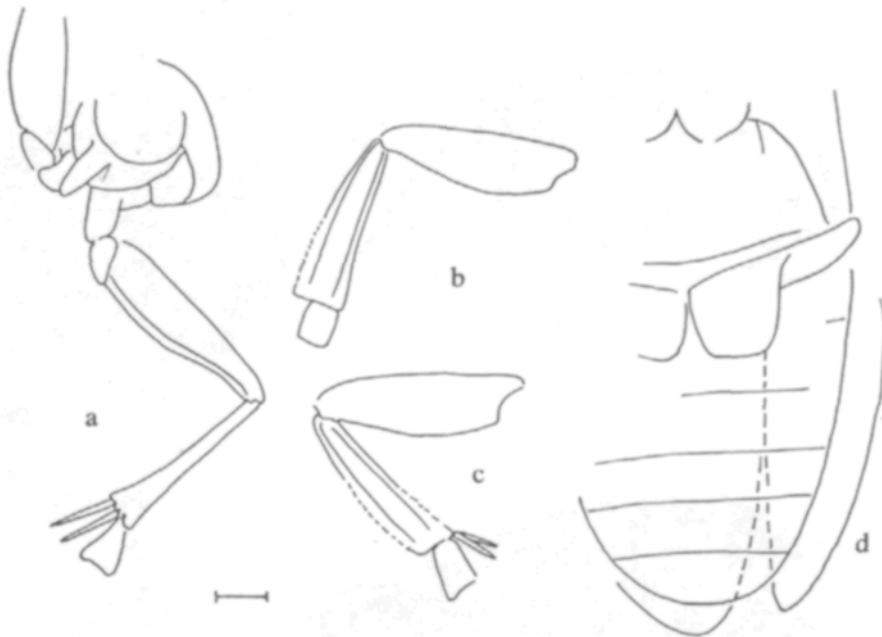


Fig. 2. *Bolbonectes occidentalis* sp. nov.; beetles a - holotype PIN, No. 3000/3277, prothorax with fore leg, b - paratype PIN, No. 3000/3276, middle leg, c - paratype PIN, No. 3000/3275, hind leg, d - paratype PIN, No. 3000/3284, body. Transbaykal, Novospasskoye, Jurassic. Scale for all figures = 1 mm.

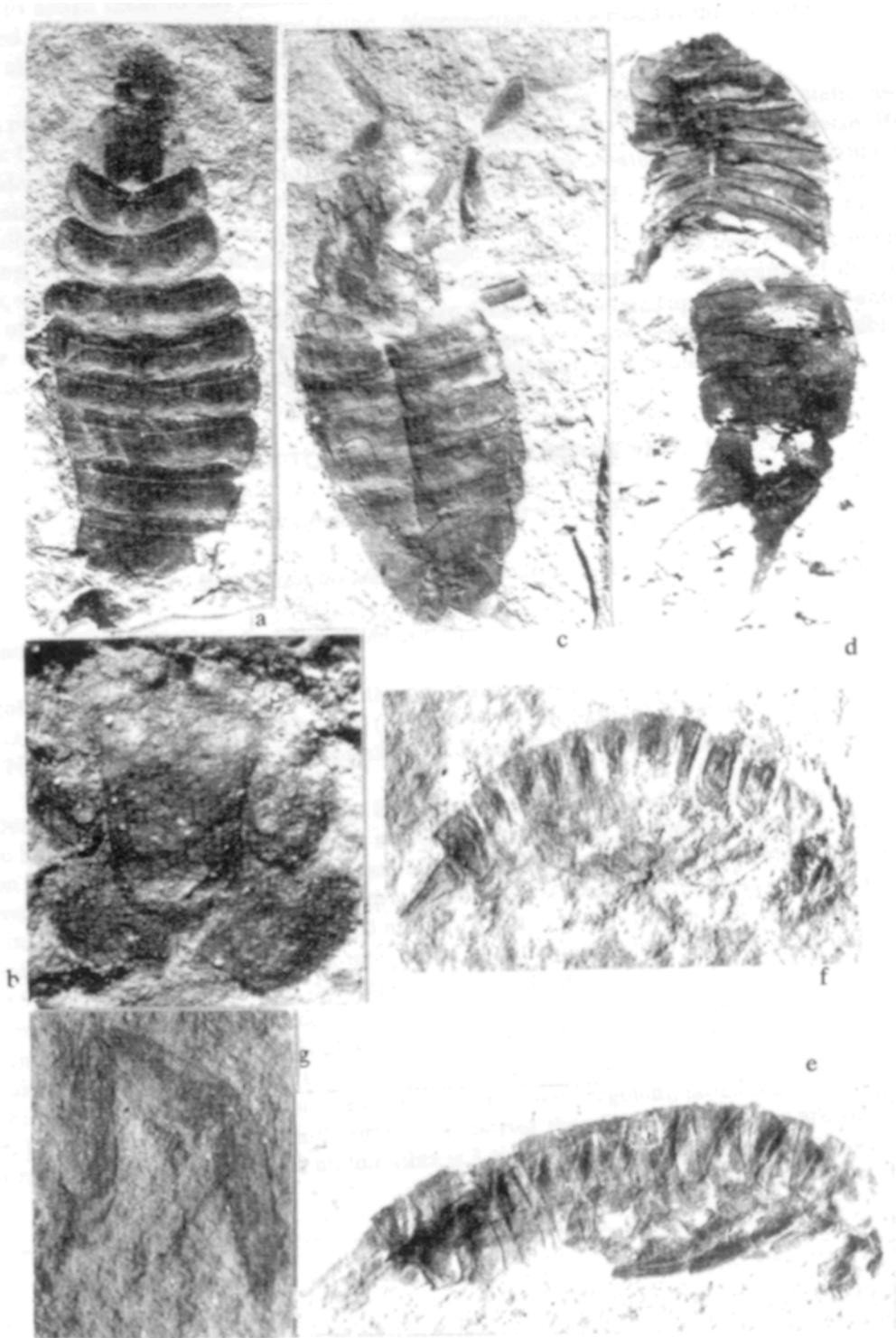


Fig. 3.

Short walking legs and mandibles with well-developed teeth in the molar area do not make it possible to assign them to any known family of beetles. Adult beetles that could be definitely associated with these larvae were not found. *Necronectulus*, described from the same bed and perhaps also a dytiscoid, is too small.

It is possible that similar larvae have already been described. The larva of an aquatic insect from the Upper Triassic of the Eastern USA has been described as the larva of the alderfly *Mormolucooides* [4]. The descriptions and drawings, made in the nineteenth century, are so incomplete that it cannot be ruled out that these forms are congeneric with ours. Professor F. M. Carpenter has kindly made it possible to study several specimens identified as *Mormolucooides* but not belonging, however, to the type material for the single species. All are weak impressions on black argillite, and it is not possible to examine any kind of detail on them. Still, because of the great density of deposition—an area of less than 1 square decimeter contains up to ten larvae—and the absence of distinct sclerotized tergites and appendages on body segments, it is possible to postulate that these are more likely dipteran than megalopteran or beetle larvae.

FAMILY COPTOCLAVIDAE PONOMARENKO, 1961

Genus *Bolbonectus* Ponomarenko, 1987 *Bolbonectes occidentalis*

Ponomarenko, sp. nov. **Name of species.** From Latin, *occidentalis* (western).

Holotype. PIN, No. 3000/3277; prothorax of male with fore leg; Buryat, Mukhorshibirskiy District, Tugnuy Depression, ditch 3316 (point 9-19 V. M. Skoblo) 2 km W of Novospasskoye, 4 km N of Lake Tsagan-Nur (Novospasskoye II Fossil Bed); Jurassic, Ichetuy Formation.

Description (figs. 1>4). Rather large beetle has elongate oval body, its widest part at the level of the hind coxae, from where the body narrows rather weakly, and is subterminally sharp. Pro- no turn is short, no more than 0.16 times as long as elytra; fore coxae are small, prosternum between them has process. Metasternum is transverse, its length 2.3 times its width on posterior margin, strongly rounded and narrowed anteriorly; its anterior margin between inner angles of metepisterna half as wide as posterior one; posterior margin angularly projects back. Hind coxae are 0.55 times as long as wide, femoral covers are large, a little longer than wide, sharply shortened slightly lateral of middle of coxa. Abdomen narrows from base of 4th sternite, its tip is rounded; base of last sternite is almost half as wide as base of abdomen. Fore legs are large; in male, femur is a little longer than tibia, narrowed in apical half. Tibia is slender, expanded subapically, with pair of large spurs longer than first tarsal segment, latter is a little longer than wide, triangular. Middle and hind femora are shorter than fore femur; tibiae are shorter than femora, flattened and expanded; middle tibia is 3 times and hind 4 times as long as wide. First

Fig. 3. *Bolbonectes occidentalis* sp. nov.; larvae, paratypes: a, b - PIN, No. 3000/3205, a - overall view (X5.3), b - head (x24.0), c - PIN, No. 3000/3241 (x5.0), d - PIN, No. 3000/3254 (x5.0), e - PIN, No. 3000/3263 (x7.3), f - PIN, No. 3000/3255 (x 15.0), g - PIN, No. 3000/3265 (x8.6).
Transbaykal, Novospasskoye; Jurassic.

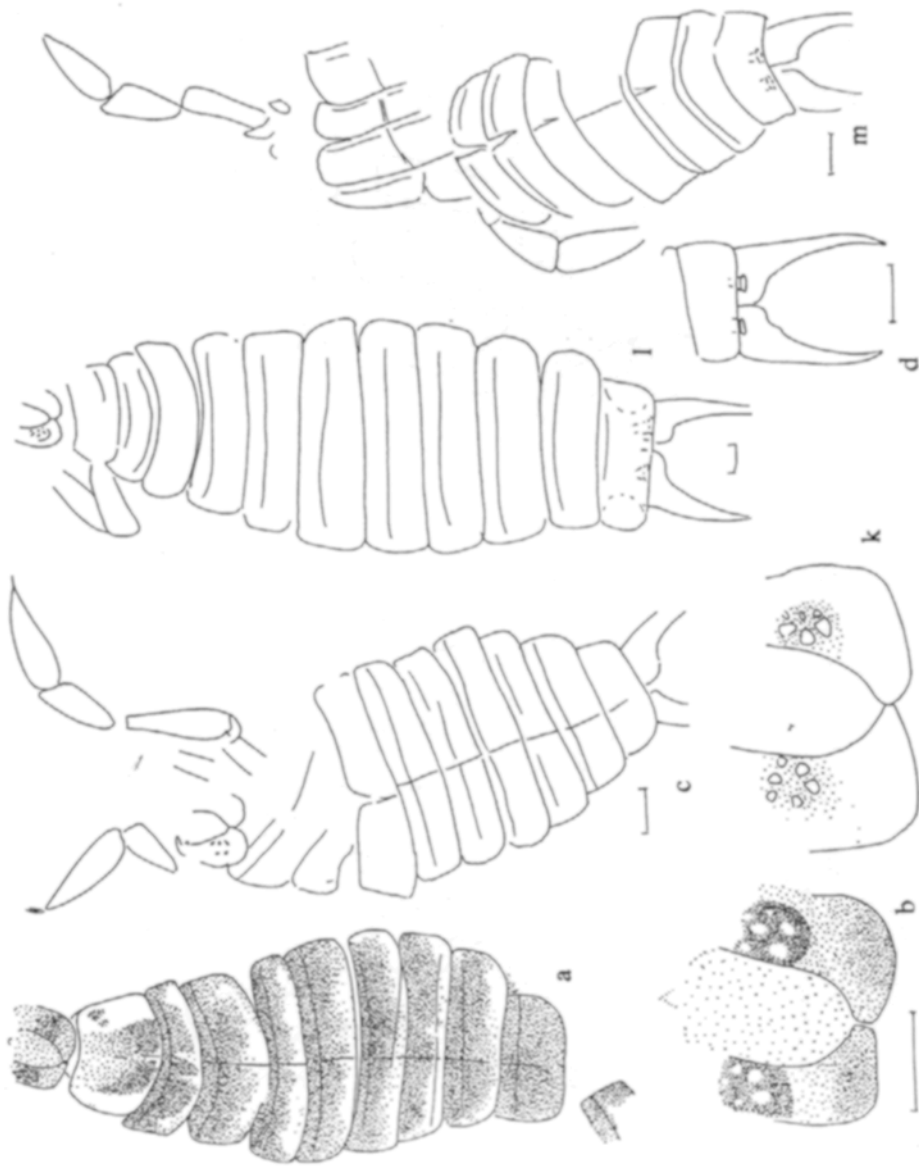


Fig. 4 (continued).



Fig. 4. *Bolbonectus occidentalis* sp. nov.; larvae, paratypes, a, b - PIN, No. 3000/3205, a - overall view, b - head, c - PIN, No. 3000/3241, d - PIN, No. 3000/3254, e - PIN, No. 3000/3263, f - PIN, No. 3000/3216, g - PIN, No. 3000/3240, h - PIN, No. 3000/3258, k - PIN, No. 3000/3222, l - PIN, No. 3000/3261, m - PIN, No. 3000/3213, Transbaykal, Novospasskoye; Jurassic.

segment of middle tarsus is almost as long as wide, that of hind tarsus is longer than wide and longer than spur of hind tibia. Elytra are long, narrowed sub basally and subapically, 3.5 times as long as wide; sutural margin is edged by groove, surface is rather coarsely rugose, with indistinct longitudinal grooves.

Larva is broadly fusiform, body widest in second and third abdominal segments. Head is almost 1.5 times wider than long. Distance between branches of "epicranial suture" is a little greater than lateral sections of head. Prothorax is markedly longer than head, almost twice as long as mesothorax, narrower than other segments. Meso- and metathoracic segments are longer than abdominal segments; 8th abdominal segment is much narrower than mesothoracic segment, about half as wide as second abdominal segment. Urogomphi are large, with broad bases, sickle-shaped. Legs are half as long as body; femur, tibia and tarsus are of approximately equal length; tibia is strongly expanded apically, at tip 0.40-0.50 times as wide as long, tarsus with straight inner and convex outer margins. Head is dark, with dark spot in central part of prothorax; ; remaining thoracic tergites and basal abdominal tergites, anterior 2/3 are darkened; other tergites are dark.

Measurements, mm: Length - about 15, width - 8-9, elytral length - 11.5-13.6 (mean 12.6) length of 1st instar - 5-7, length of its head, prothorax and tarsus ~ 1.0, of mesothorax - 0. length of 2nd instar larvae - 7-9, length of head, prothorax and tarsus ~ 1.5, mesothorax -1.0-1.2 3rd instar length - 12-15, head and prothorax - 2.0, tarsus ~ 2.5, mesothorax - 1.2.

Comparison. New species is very close to the type species, differing in slightly larger measurements, in body being more weakly narrowed toward ends, in larger femoral covers, relatively longer fore leg in the male with a more slender and apically sharply expanded tibia with larger spurs. Larva differs in having a longer and narrower prothorax, narrower ultimate abdominal tergite and sickle-shaped urogomphi.

Remarks. Almost all characters that distinguish the described species from the type species place it close to the *Coptoclava*.

Material. Holotype and fragmentary remains of 12 adult beetles, are exactly from the same place. Thorax and abdomen, poorly preserved; middle and hind femora, tibiae and first tarsal segments; 5 complete and 2 fragmentary elytra; 115 larvae, most of which are older instars. Part of the remains are exuviae.

FAMILY COLYMBOTETHIDAE PONOMARENKO, FAM. NOV.

Diagnosis. Larva. Body fusiform, abdomen with 8 segments. Head with Y-shaped epicranial suture, mandibles short, with teeth on the molar area. Urogomphi short, without distinct segmentation. Legs short, entirely segmented, walking.

Composition. Monotypic genus described below from larvae. It is possible that this family also includes *Necronectulus*, described from the same locality, but it is too small to be the imago of the larvae described below.

Comparison. Differs from all Adephaga, except dytiscoids, in having an 8-segmented abdomen; from all dytiscoids, except the coptoclavids, in having mandibles with teeth in the molar area; and from coptoclavids in having non-swimming legs.

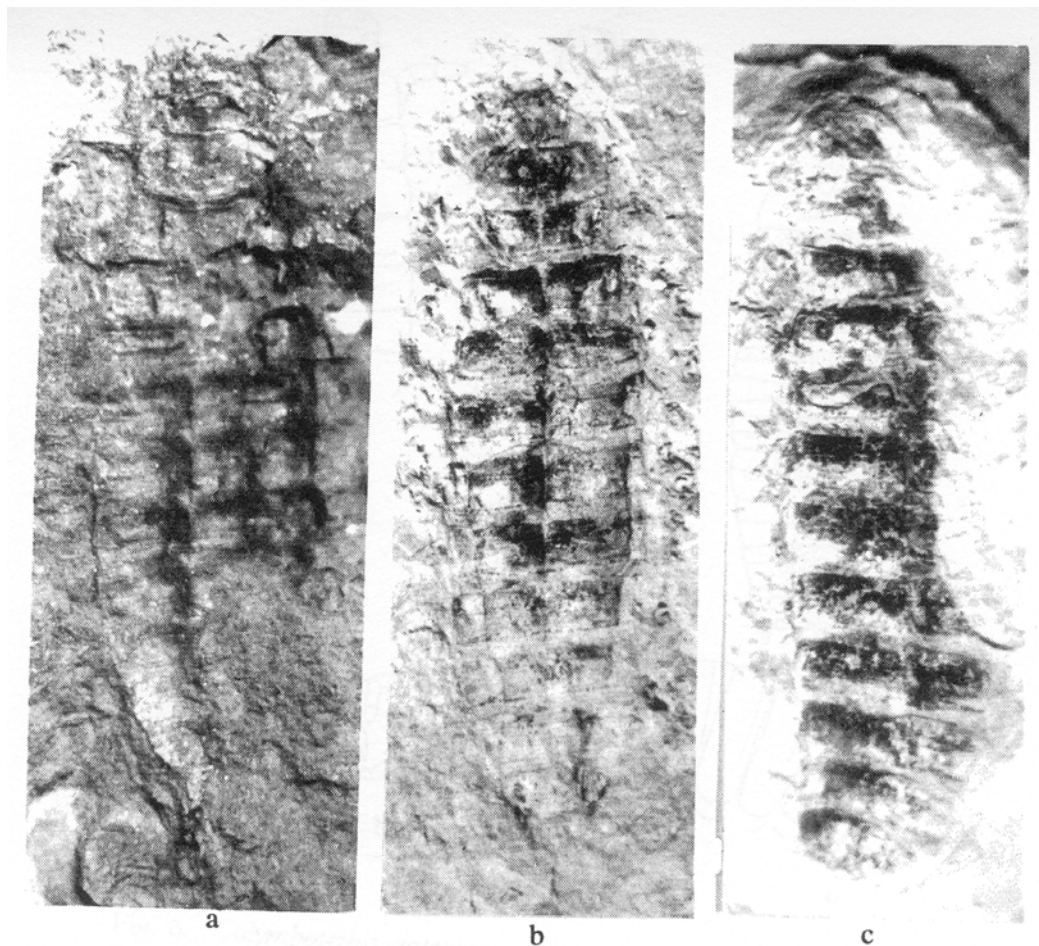


Fig. 5. *Colymbotethis antecessor* sp. nov.: larvae, a - holotype PIN, No. 2497/13 (x11.1), b, c/- paratypes: b - PIN, No. 2497/11 (x10.0), c - PIN, No. 2497/15 (x11.5). Eastern Kazakhstan, Kenderlyk; Upper Triassic.

Remarks. Larvae of the most primitive coptooclavids such as *Amblycephalonius*, *Coptoclavella*, and *Coptoclavisca*, remain unknown, and it cannot be ruled out that their structure may be similar to that of the larvae described below and that they also had walking legs.

Genus *Colymbotethis* Ponomarenko, gen. nov.

Name of genus. From Greek, *kolymbos* (swimmer) and *tethe* (grandmother).

Type species. *C. antecessor* sp. nov.

Diagnosis. Mandibles of similar length and width, head subquadrate, epicranial suture branching close to its center. Legs about 1/4 body length; their segments, except for trochanter, almost equal; ultimate abdominal tergite not longer penultimate; urogomphi of same length.

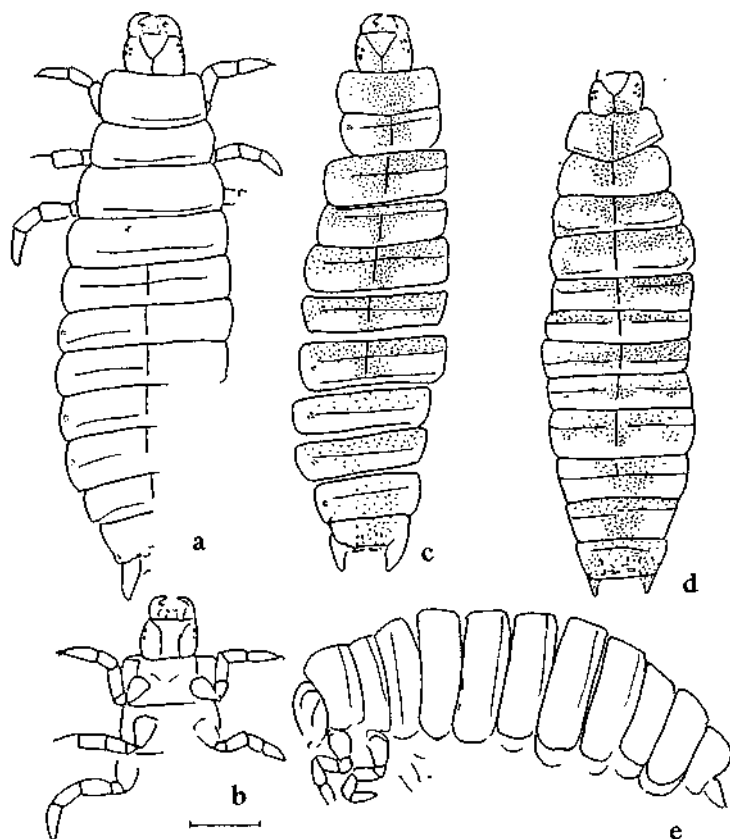


Fig. 6. *Colymbotethis antecessor* sp. nov.: larvae, *a, b* - holotype, PIN, No. 2497/13, *a* - overall view, *b* - head and sternum ventral view, *c-e* paratypes: *c* - PIN, No. 2497/11, *d* - PIN, No. 2497/12, *e* - PIN, No. 2497/14. Eastern Kazakhstan, Kenderlyk, Upper Triassic.

Composition. Type species.

Colymbotethis antecessor Ponomarenko, sp. nov.

Name of species. From Latin, *antecessor* (ancestor, predecessor).

Holotype. PIN, No. 2497/13, mold of larva; East Kazakhstan, Zaysan District, Saykan Range, left bank of Akkolka River (Kenderlyk locality); Upper Triassic, Tologoy Formation.

Description (figs. 5, 6). Larva is fusiform, 4 times as long as wide, widest at base of abdomen. Head capsule length is barely less than width. Common stem of "epicranial suture" is shorter than branches. Pigment spot with ocelli on side of head is approximately in middle. Apical teeth of mandible are separated and pointing at each other. Pronotum is markedly longer than head, a little longer than mesonotum and other subequal segments. Fore leg is as long as

two body segments, hind leg a little longer than three; femur and tibia are cylindrical, tarsus conical in apical half. Urogomphi are conical, as long as last abdominal segment, and may partially fit into them. On abdominal segments 4-7 small, rounded spiracles are visible; the 8th spiracles, located terminally, are much larger than the others. Anterior margins of thoracic tergites and of the five anterior abdominal tergites are darkened, as are the central areas of all tergites. Last tergite and urogomphi are almost entirely darkened.

Measurements, mm: Length of impressions - 5.5-10.0; length and width of head - 0.6-1.0; length of 4th abdominal tergite - 0.5-1.2, its width - 2.5-4.0.

Material. Holotype, and 16 paratypes from the same locality, impressions of larvae and larval exuviae in different stages of preservation. Evidently the larvae of two different instars are represented, but it is impossible to separate them because of limited nature of the material.

REFERENCES

1. Ponomarenko, A. G., 1977, Coptoclavidae Ponomarenko, 1961. In: Mezozoyskiye zhestkokrylyye (Mesozoic Coleoptera). Moscow: Nauka, pp. 22-37. (Tr. Paleontol. In-ta AN SSSR, Vol. 161).
2. Ponomarenko, A. G., 1977, New Mesozoic aquatic beetles (Insecta, Coleoptera) from Asia. Paleontol. Zhurn., Vol. 2, pp. 83-97.
3. Ponomarenko, A. G., 1990, Coptoclavidae Ponomarenko, 1961. In: Pozdnemezozoyskiye nasekomye Vostochnogo Zabaykal'ya (Late Mesozoic Insects of Eastern Transbaykal). Moscow: Nauka, pp. 42-44. (Tr. Paleontol. In-ta AN SSSR, Vol. 239).
4. Hitchcock, E., 1858, Ichnology of New England. Boston.