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Larvae of Caddisflies (Insecta: Trichoptera) from the Mesozoic of Siberia

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Abstract—Body fossils of caddisfly larvae are described for the first time based on material from the Lower Cretaceous of Siberia (Baissa locality, Neocomian). The material includes a fully grown larva of *Baissoplectrum separatum* gen. et sp. nov. (Brachycentridae), *Creterotesis coprolithica* gen. et sp. nov. (Leptoceridae), and *Cretolype minuta* gen. et sp. nov., a tiny larva probably belonging to an uncertain family of the suborder Annulipalpia (Hydropsychina). *C. coprolithica* built unusually soft larval cases of pellets; these cases are described as a separate new indusigenus and indusispecies *Coprindusia pallida* gen. et sp. nov. Bionomics, taxonomy, and evolution of the Mesozoic larvae of Trichoptera are discussed.

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INTRODUCTION

Until recently, fossil caddisfly larvae have only been known from traces of their life activity, i.e., cases, which are abundant in Mesozoic (from Middle Jurassic) and Cenozoic lacustrine deposits. In addition, compression fossils of wings of adult caddisflies and rare inclusions in Upper Cretaceous fossil resins are known (Sukacheva, 1982; Ivanov and Sukacheva, 2002). The relative scarcity of adult stages of these amphibiotic insects in deposits where larval cases dominate, the rapid evolution of larval building behavior, and the scarcity of larval bodies in spite of the abundance of fossilized larval cases, characterize the end of the Jurassic–the beginning of the Cretaceous as a special and very unusual stage in the caddisfly evolution.

The abundance and diversity of fossil larval cases led to the creation of a special nomenclature of ichnotaxa for larval cases of the suborder Phryganeina (Vjalov and Sukacheva, 1976; Sukacheva, 1982) that includes a number of indusigenera with numerous indusispecies. The absence of larval bodies prevents these cases from being assigned to any of the caddisfly families, since the building behavior and the structure of the cases show numerous parallelisms within and between families. Since the bodies of fossil larvae have not been described, the nomenclature of cases does not correlate directly with the system of the suborder Phryganeina that apparently included the building larvae.

The study of numerous fossil caddisfly cases from the Mesozoic of Siberia commenced by Sukacheva at the Laboratory of Arthropods, Paleontological Institute, Russian Academy of Sciences (PIN) revealed that rare remains of larval bodies occur both inside and outside cases. A considerable amount of this material has been made available to the author. A preliminary report on larval bodies discovered from deposits on the left bank of the Vitim River near the Baissa stream was published previously (Ivanov, 1998). Most of records are from bed 31, the others are from bed 22; beds are numbered according to Martinson (1961), see also Zherikhin *et al.* (1999). These deposits are dated to the beginning of the Early Cretaceous (Early Neocomian); however, this date is disputed (Rasnitsyn and Zherikhin, 2002). Lithological characteristics of the Baissa locality favored the preservation of larval bodies both inside and outside their cases. Some fossil larvae are completely concealed by their shelters and can only be seen as shadows through the case wall. Larval material of this kind can be neither identified nor described; hereafter, they will not be taken into consideration, although, judging from the material and the structure of cases, some of them belong to the same indusispecies as the larvae inside and, probably, to the same biological species. Nonetheless, in some instances the anterior part of a larva is protruding out of its case, which makes its study feasible. Among the material, there are three larvae without their cases.

Comparison of fossil larval bodies with preimaginal stages of modern Trichoptera shows the presence of larvae belonging to at least three species of three families in the Cretaceous deposits of the locality of Baissa. One of these species represents an autochthonous case dweller; details of its body structure allow its allocation to the family Leptoceridae. The cases of leptocerid larvae that are described below as a new indusispecies are included into a new monotypic indusigenus based on the uniqueness of the material they are built of. There is an extraordinary situation when the larval body is known for an indusitaxon. The new indusigenus and indusispecies are described simultaneously to, but sep-

arately from, the description of the larval body, and have been given separate names to facilitate further study of empty caddisfly cases of unknown species affiliation. Some leptocerid larvae are found as fragments of the anterior parts of their bodies outside their cases. The other two species have been found outside their cases; the body structure of one of them indicates that it belongs to the suborder Phryganeina (Integripalpia), the other species more likely belongs to Hydropsychina (Annulipalpia). It cannot be excluded that the bodies of the larvae without their cases drifted downstream to the place of their burial from nearby streams. These three new species are described below; each of them has been assigned to a separate new genus of its own, since no reliable characters showing their connection with any extant or extinct genera have been established. Interestingly, none of the fossil wings found in the same beds on the Baissa River belongs to the families represented by the larvae under consideration. Most specimens belong to members of the families Vitimotauliidae and Baissoferidae. These are rather primitive forms that became extinct during the Cretaceous. The same beds yielded an immense number of empty larval cases made of sand grains and plant fragments, which probably belonged to the above-mentioned imagoes.

Although the first records of adults of archaic caddisflies (to be more precise, common ancestors of the evolutionary lineage leading to caddisflies and lepidopterans) are dated to the Early Permian, no preimaginal stages (caddisfly cases) of these insects have been found as fossils from rocks younger than Middle Jurassic (Ivanov and Sukacheva, 2002). By the end of the Jurassic such fossil remains became more abundant, during the Cretaceous they are common and, occasionally, even abundant in lacustrine deposits. Remains of adults suggest that some modern families already existed in the Cretaceous; these are Polycentropodidae, Philopotamidae, Hydrobiosidae, Rhyacophilidae, Plectrotarsidae, Phryganeidae, Lepidostomatidae, Brachycentridae, Helicophidae, Odontoceridae, Calamoceratidae, and Leptoceridae. In addition, Mesozoic deposits have yielded the extinct families Vitimotauliidae, Taimyrelectronidae, Baissoferidae, Necrotauliidae, Dysoneuridae, and Electralbertidae. Analysis of the taxonomic structure of more recent, Paleogene caddisfly faunas (Ulmer, 1912; Sukacheva, 1982; Ivanov and Sukacheva, 2002) shows that the majority of modern families already existed by the beginning of the Paleogene. However, the discovery of such specialized larvae in the Cretaceous suggests that the main stage in the formation of caddisfly families occurred during the Jurassic, since their larvae were highly specialized even at the beginning of the Cretaceous.

Indeed, the Cretaceous integripalpian larvae described below are unexpectedly highly specialized for their time. This specialization is expressed, first of all, in the presence of complex sclerites on their head and thorax. Carinae on the head and thorax occur in a number of modern larvae inhabiting fast streams. They strengthen the skeleton and, probably help defending against predators attacking the soft body through the opening of the case; the larva, fixed in its case, may use incisions and carinae on its head to repel such a predator.

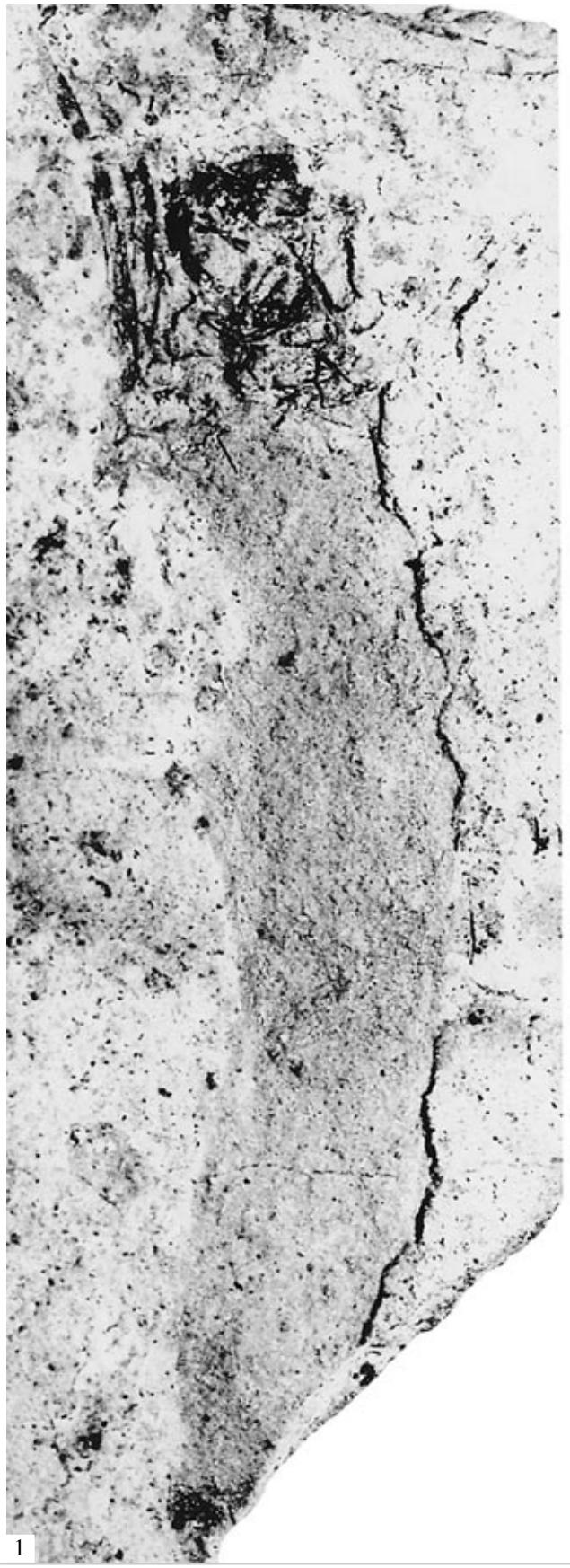
Besides the head, the prothorax (frequently) and mesothorax (much more rarely) are modified with heavily sclerotized and posteriorly bordered shields. This adaptation is an effective defense for free living, stream dwelling larvae against small zoophages with chewing mouthparts, such as predaceous stonefly and mayfly larvae. Predaceous vertebrates are capable of swallowing the entire caddis case or destroying its wall; defending the entrance only becomes ineffective in this instance. In the modern fauna, "stopping devices" occur, as a rule, in larvae inhabiting flowing waters, especially among Hydropsychidae, Apataniidae, Brachycentridae, Goeridae, and Limnephilidae. It could be presumed that larvae of *Baissoplectrum separatum* with carinae on the head and thorax lived in a stream feeding a paleolake and drifted to its point of eventual burial; caddisfly larvae often leave their cases under unfavorable conditions and migrate downstream.

The appearance of a specialized mesonotal shield in *Creterotesis coprolithica* is much more difficult to explain. Although modern leptocerid larvae do have sclerotized areas on the mesonotum, hypertrophic bordered mesonotal sclerites in the Cretaceous larvae outreach similar structures in modern species in their size and complexity. Defensive structures on the mesonotum of *C. coprolithica* were for protection against predaceous benthic insects.

Another series of specializations is connected to the food adaptations of larvae. They are most remarkable in *B. separatum*, with the middle and hind legs of the larva being very long and with very robust and long forked chaetae on the thoracic sclerites. In general, such body structure corresponds to or even exceeds specialization of the highest modern Brachycentridae, the larvae of which collect food in flowing water with their legs. In this instance, the larva remains in its case, which is firmly attached to the substrate; having stretched the anterior part of its body out of the tubular case, it catches drifting particles using its middle and hind legs, collecting them also with chaetae situated on the coxae and on the thoracic pleurites. However, specialized ventral forked chaetae developed on special sclerites are absent from modern Brachycentridae.

Larvae of *C. coprolithica* fed on abundant and readily accessible food; traces of organic matter are constantly present in their guts. The structure of the mandibles, which is scoop-like with marginal teeth; the small degree of specialization of the legs (the forelegs are thin and cursorial, not raptorial as in predators; the hind legs are relatively thick, without swimming or sensorial specializations occurring in modern leptocerids); burial alive inside the case in lacustrine deposits, and the abundance of this species all suggest that it was a very abundant benthic lacustrine detritivorer. Modern

Plate 8



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representatives of Leptoceridae are usually adapted to a high water temperature and readily inhabit lakes, including in the tropics. As is shown by numerous records of larvae, this life style began to evolve as early as the beginning of the Cretaceous.

The material of the *C. coprolithica* cases is very unusual. The cases were so soft that they became strongly flattened during fossilization; particles disintegrated almost everywhere except for the area around the gut of the larva that was inside the case. The gut was filled with food and served as a kind of "air-bag" securing the preservation of the material of the case. Robust setae on the end of the larval body are visible through the material of the case. Modern caddisfly species often select and sort building material; however, examples of soft pellets are unknown. Probably, this construction served for camouflage, and for arranging circulation of water around the body to ensure respiration in warm, oxygen poor water, rather than for mechanical protection.

MATERIAL

All specimens are housed in the Laboratory of Arthropods, PIN.

SYSTEMATIC PALEONTOLOGY

Order Trichoptera

Suborder Integripalpia

Infraorder Plenitentoria

Superfamily Limnephiloidea Kolenati, 1848

Family Brachycentridae Ulmer, 1903

Genus *Baissoplectrum* Ivanov, gen. nov.

Etymology. From the locality and Greek *plectrum* (striker).

Type species. *B. separatum* sp. nov.

Diagnosis. Large, body length over 10 mm, length and width of head capsule over 1.5 mm. Body slightly narrowing posteriorly, head and pronotum well sclerotized, other segments mainly membranous, with sclerites on meso- and metanotum and on abdominal segment 9. Head and pronotum with carinae, areas separated by arched ridges from rest of sclerite. Forelegs short; midlegs and hindlegs long, without projections on tibiae and tarsi; middle and hind tibiae noticeably shorter than head capsule, with dark dorsal stripes. Prothoracic sternite sclerotized, with small prosternal horn. Lower surface of meso- and metathorax with a pair of robust forked chaetae, each of them situated on small sclerite near inner corner of corresponding coxa. Upper surface of mesothorax with mesonotal sclerite divided by longitudinal sutures into four lobes; medial suture of mesonotum fully developed, lateral sutures developed in posterior part only. On metathorax, anterior medial sclerites (sa_1) absent, posterior medial sclerites (sa_2) weakly sclerotized, lateral sclerites (sa_3) poorly preserved and, probably, weakly developed compared to modern brachycentrids. Anal legs very short, with elongated narrow lateral sclerite and wedgelike narrow ventral sclerite; abdominal segment 9 with few chaetae ventrally near claws, dorsal sclerite of this segment with few chaetae.

Comparison. The new genus differs from the modern brachycentrid genera in the combination of features: it differs from the genus *Brachycentrus* in the absence of projections on tibiae and in the presence of a well-developed carina on its head and from the other brachycentrid genera in the long mid- and hindlegs with elongated tibiae and claws, large size, and capturing chaetae.

Remarks. The structure of the anal legs and body proportions indicate that this genus belongs to the suborder Phryganeina. The presence of an arched projection on the pronotum, peculiarities of sclerotization of the thoracic segments, trapping structures, chaetae situated on the generally soft lower surface of the thorax, and the absence of distinct tubercles on the first abdominal segment allow attribution of this genus to the family Brachycentridae. The presence of a small prosternal horn is not inconsistent with this systematic position, since a weakly developed horn is present in some modern Nearctic brachycentrids of the genera *Eobrachycentrus* and *Brachycentrus* (Wiggins, 1977).

The presence of robust forked chaetae on small sclerites on the ventral side of the thorax is an autapomorphy of this genus, whereas weak sclerotization of the larval meso- and metanotum and the presence of the sclerotized prosternum are plesiomorphies in caddisflies. The larval case is unknown.

***Baissoplectrum separatum* Ivanov, sp. nov.**

Plate 8, figs. 1, 2

Etymology. From the Latin *separatus* (separate).

Holotype. PIN, no. 3064/8270, part and counterpart; Buryatia, Sosnovo-Ozersk District, left bank of the Vitim River downstream of the Baissa stream mouth; Lower Cretaceous, Zaza Formation, bed 31.

Description (Fig. 1). The head and pronotum are dark. The carina on the head is distinct in the upper portion, regularly arched. The posterior margin of the pronotum is weakly concave, the transverse suture is deep and arched. The femora and tibia have dark rings at the apices. The abdominal segments have indistinct short gills that form no fascicles.

Explanation of Plate 8

Figs. 1 and 2. *Baissoplectrum separatum* sp. nov., holotype PIN, no. 3064/8270, part (1) and counterpart (2), ×16.

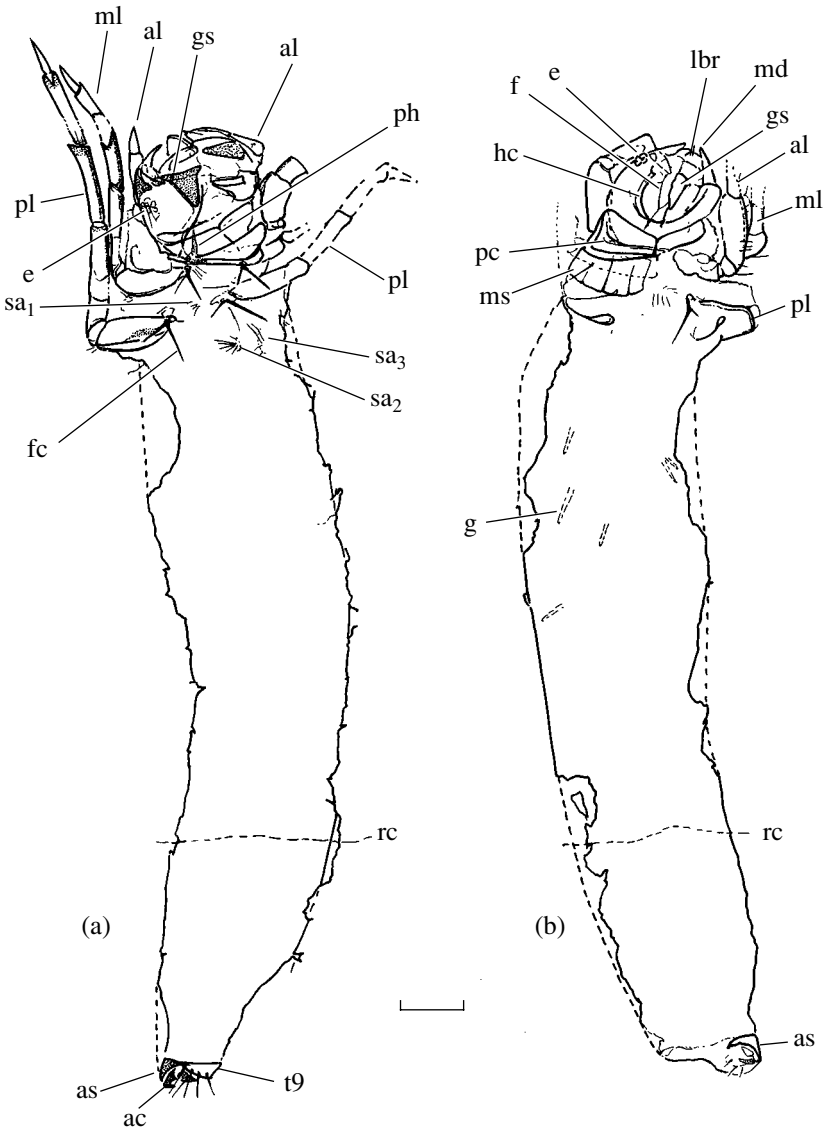


Fig. 1. *Baissoplectrum separatum* gen. et sp. nov., holotype PIN, no. 3064/8270, part (a) and counterpart (b). Abbreviations: (ac) anal leg claw, (as) lateral sclerite of anal leg, (lbr) labrum, (fc) forked chaetae on ventral surface of thorax, (e) eye, (gs) gular sclerite, (g) gill, (pl) hindleg, (hc) head carina, (pc) pronotum carina, (md) mandible, (ms) mesonotal sclerites, (al) foreleg, (ph) sternal horn on prothorax, (ml) midleg, (t9) abdominal tergite 9, (rc) rock crack, (f) frontoclypeus, (sa_1–sa_3) mesonotal groups of setae: (sa_1) anteromedial, (sa_2) posteromedial, and (sa_3) lateral. Scale bar 1 mm.

Measurements, mm. Body length, 15.5: head capsule length, 1.75: head capsule width, 1.80; hind femur length, 1.6; hind tibia length, 2.3; hind claw length, 1.0.

Remarks. Larvae of modern species of Brachycentridae are insufficiently known; their identification is possible only if their chaetotaxy, which is poorly preserved in fossils, is taken into account. Given this, the above description may be improved in future as new material becomes available.

Material. Besides the holotype, specimen no. 3064/8263 from the same bed, probably belongs to this species. It is represented by a poorly preserved larva without its case with forked chaetae on the thoracic segments, a feature characteristic of the genus *Baissoplectrum*.

Superfamily Leptoceroidea Leach, 1815

Family Leptoceridae Leach, 1815

Genus *Creterotesis* Ivanov, gen. nov.

Etymology. From the Latin *creta* (chalk) and *Erotesis*, a modern genus in the family Leptoceridae.

Type species. *C. coprolithica* sp. nov.

Diagnosis. Medium-sized larvae with narrow head and prothorax and broad meso- and metathorax. Head semi-hypognathous, looks prognathous in fossils.

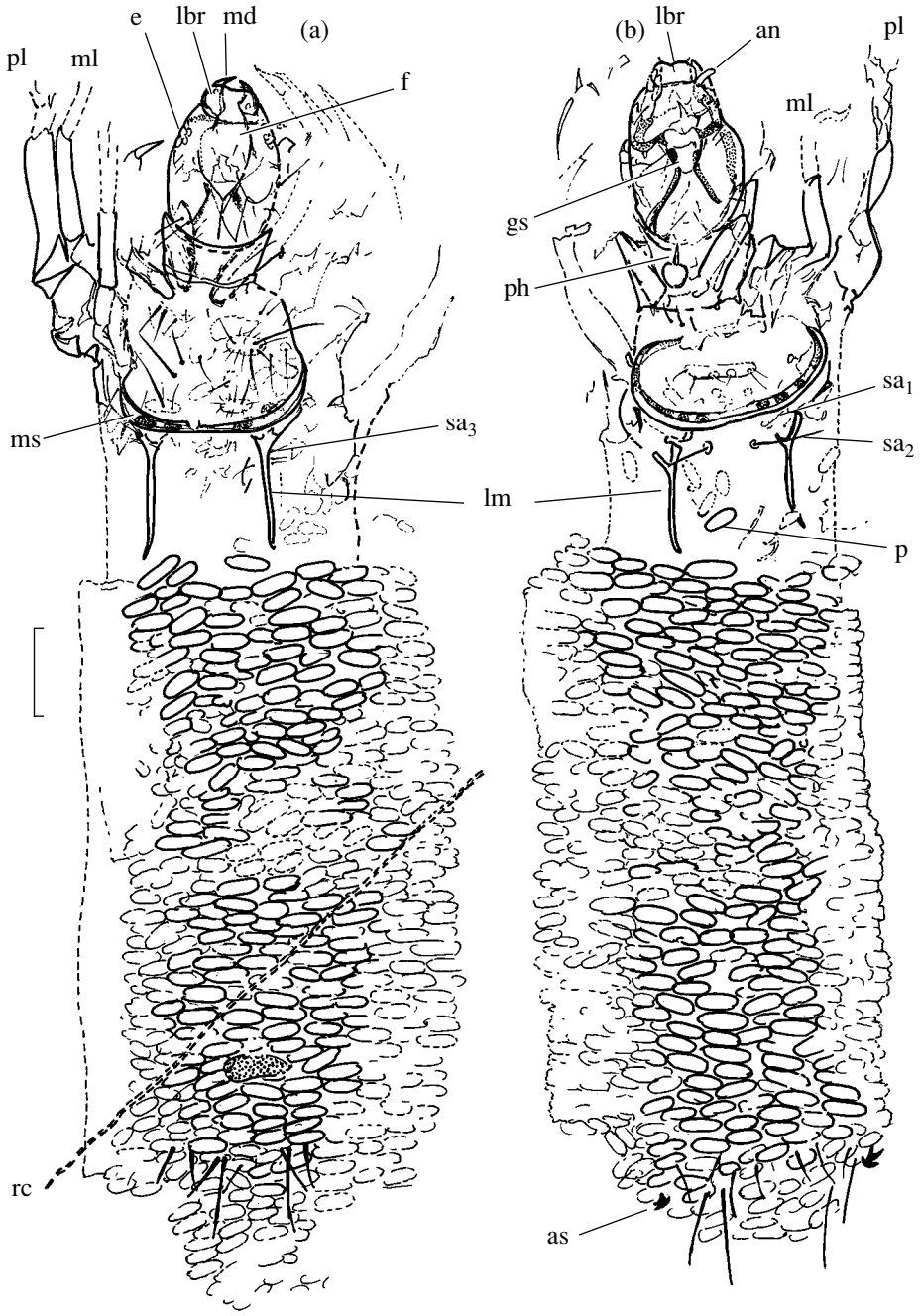
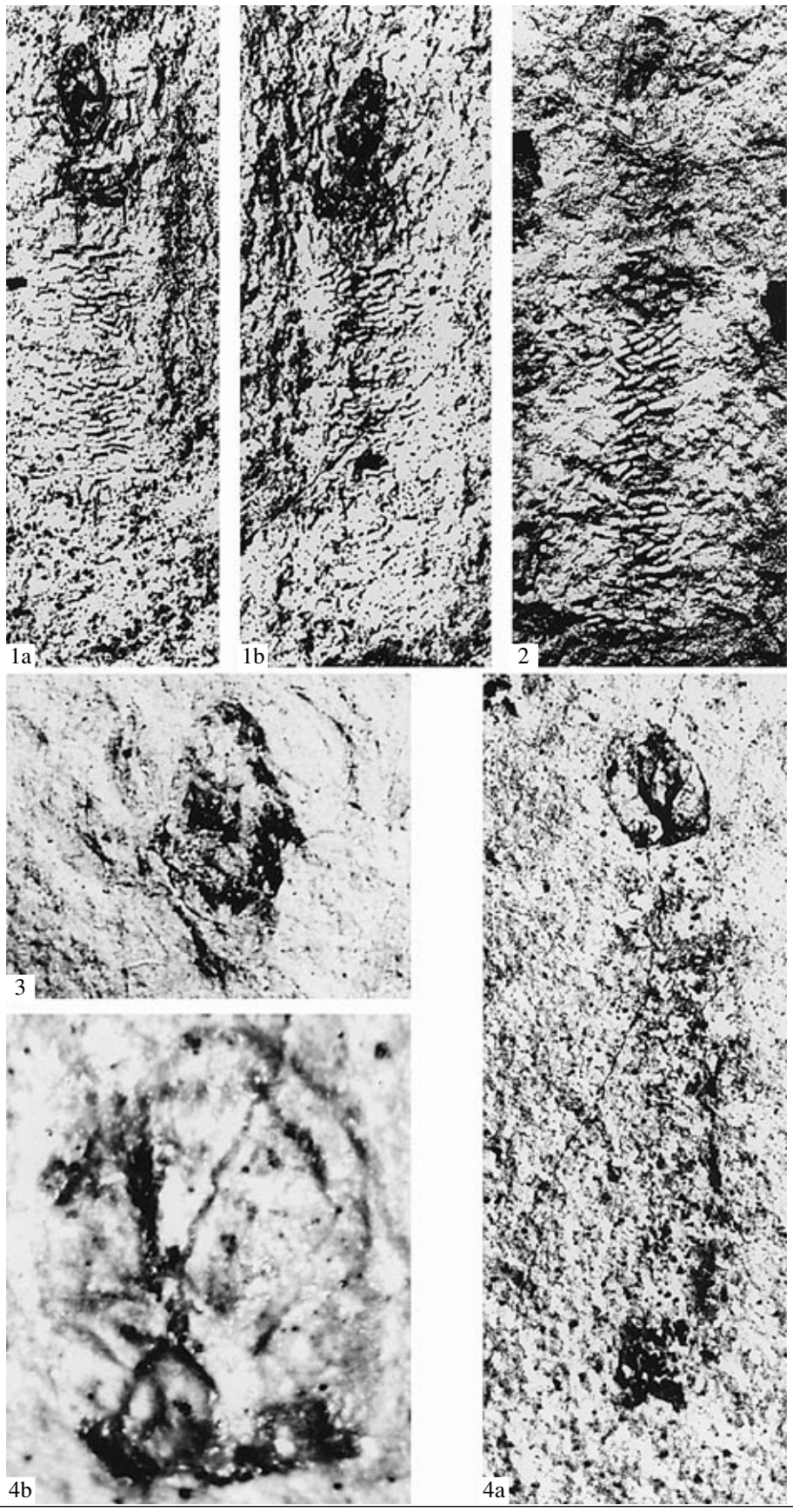


Fig. 2. *Creterotesis coprolithica* gen. et sp. nov., holotype PIN, no. 3064/8264 (8265), part (a) and counterpart (b). Abbreviations: (an) antenna, (lm) lateral metathoracic sclerite, (p) isolated pellets; other abbreviations as in Fig. 1. Scale bar 1 mm.

Labrum oval-shaped, broad. Mandibles spoonlike, with cuplike grating surface and widely spaced lower and upper chewing ridges ornamented with teeth. Frontoclypeus long, coronal suture short. Pronotum distinctly narrowing posteriorly, with slightly acuminate anterior corners. Mesonotum almost entirely sclerotized, shaped like very large shield with rounded and bordered posterior margin, with longitudinal suture that separates more elevated and more sclerotized areas on each side of it. Metanotum membranous, with group of setae near anterior medial sclerites (sa_1), isolated setae on posterior medial sclerites (sa_2), and fascicles of setae near lateral sclerites (sa_3); however, these sclerites not expressed. Metathoracic pleurites long, protracted anteriorly; in dorsal aspect, developed as narrow weakly sclerotized depressions with broadened and curved anterior part. Leg length increasing from forelegs to hindlegs; hindlegs situated on parts of pleurites projecting anteriorly and laterally, as with larvae of higher modern leptocerids of genera *Leptocerus, Oecetis*, and

Plate 9



Mystacides. Thickness of all legs subequal, hindlegs with no swimming or sensorial specialization, typical of hindlegs of modern leptocerid larvae. Tip of abdomen with long setae and short anal legs without distinct sclerites.

Comparison. *Creterotesis* differs from the other genera known from larvae in the structure of the very large mesonotum, which is developed in the form of a shield with a semicircular bordered posterior margin, and in the low degree of specialization of the larval hindlegs.

Remarks. This genus is included in the family Leptoceridae on the basis of the structure and sclerotization of the thorax, legs, anal legs, and, especially, the presence of long metanotal pleurites that are protracted anteriorly and support the bases of the hindlegs, which are shifted anteriorly. The elongated larval antennae characteristic of leptocerids have not been recognized because of the poor preservation of the material.

Creterotesis coprolithica Ivanov, sp. nov.

Plate 9, figs. 1–3

Etymology. From the Greek *copros* (dung) and *lithos* (rock), after the material of larval cases.

Holotype. PIN, no. 3064/8264 (8265), part and counterpart of larva; Buryatia, Sosnovo-Ozersk District, left bank of the Vitim River downstream of the Baissa stream mouth; Lower Cretaceous, Zaza Formation, bed 31.

Description (Figs. 2, 3). The head and sclerotized parts of thorax are pale; the head with poorly defined longitudinal stripes on each side of the frontoclypeal sutures. The upper surface of the pronotum has a longitudinal medial depression that is sclerotized more heavily than the surrounding areas; the posterior margin is bordered, with a small central incision. The posterior bordered margin of the mesonotal shield has three to five characteristic dark sclerotized spots on each side of the axial line. The posterior end of the body carries two thick medial and two or three shorter lateral setae. The case is like that of *Coprindusia pallida* gen. et sp. nov.

Measurements, mm. Body length, 8.5; head capsule length, 1.5; head capsule width, 1.2; pronotum length, 0.4; mesonotum length, 0.8; metanotum length, 1.2; pronotum width, 1.1.

Material. Besides the holotype, paratypes PIN, nos. 1668/1936, 3064/8259, 3064/8262, 3064/8268, and 3064/8269± (the latter is represented by a part and a counterpart) from the same locality and bed. Specimen PIN, no. 4210/2421 (part and counterpart) from bed 22 probably also belongs to the same species, but has not been included in the type series, since it was collected separately and is not fully preserved.

Indusigenus *Coprindusia* Ivanov, gen. nov.

Etymology. From the Greek *copros* (dung) and the Latin *induo* (to dress).

Type species. *C. pallida* sp. nov.

Diagnosis. Cases tubular, slightly broadening anteriorly. Material of cases represented by pellets (fecal particles) of aquatic animals; pellets regular cylindrical, with rounded ends, composed of light-colored (dirty white, rusty, light gray), soft, finely grained material. Pellets arranged perpendicular or at an angle to axis of case, with tendency to regular arrangement.

Comparison. It differs from the closely related genera *Terrindusia* and *Folindusia* in the material of the case. The presence of a well-preserved central part of the case and a squashed peripheral part may suggest a similarity to the genus *Molindusia*; the difference is in the absence of a cap over the entrance, as well as in the peculiar material and its arrangement in *Coprindusia*.

Remarks. The preservation of the material of the case is better in the area of the gut of the larva, which is clearly defined as a dark longitudinal stripe (this area was used for taking measurements of the material), and worse within the rest of the larval body, which is poorly preserved inside the case. Parts of the case situated lateral to the gut are often heavily damaged, the material is squashed. The existence of the case beyond the larval body is traceable due to the pale substrate strongly impoverished in organic material, and, in some instances, due to preserved pellets.

Coprindusia pallida Ivanov, sp. nov.

Plate 9, figs. 1, 2

Etymology. From the Latin *pallidus* (pale), after the coloration of cases.

Holotype. PIN, no. 3064/8264 (8265), part and counterpart of case of *C. coprolithica*; Buryatia, Sosnovo-Ozersk District, left bank of the Vitim River downstream of the Baissa stream mouth; Lower Cretaceous, Zaza Formation, bed 31.

Description (Figs. 2, 3c). The case is almost cylindrical, with a broad posterior end. The material of the case is represented by cylindrical pellets with rounded ends that are soft, friable, paler than the enclosing sediments and the body imprint, low in organic material, and similar to the enclosing sediments in the size of microparticles. The arrangement of pellets

Explanation of Plate 9

Figs. 1–3. *Creterotesis coprolithica* sp. nov., holotype PIN, no. 3064/8264 (8265), part (1a) and counterpart (1b), ×10; paratype PIN, nos. 1668/1936 (2), ×12; and 3064/8268 (3), ×20.

Fig. 4. *Cretolype minuta* sp. nov., holotype PIN, no. 3064/8267, general appearance (4a), ×23; and head (4b), ×60.

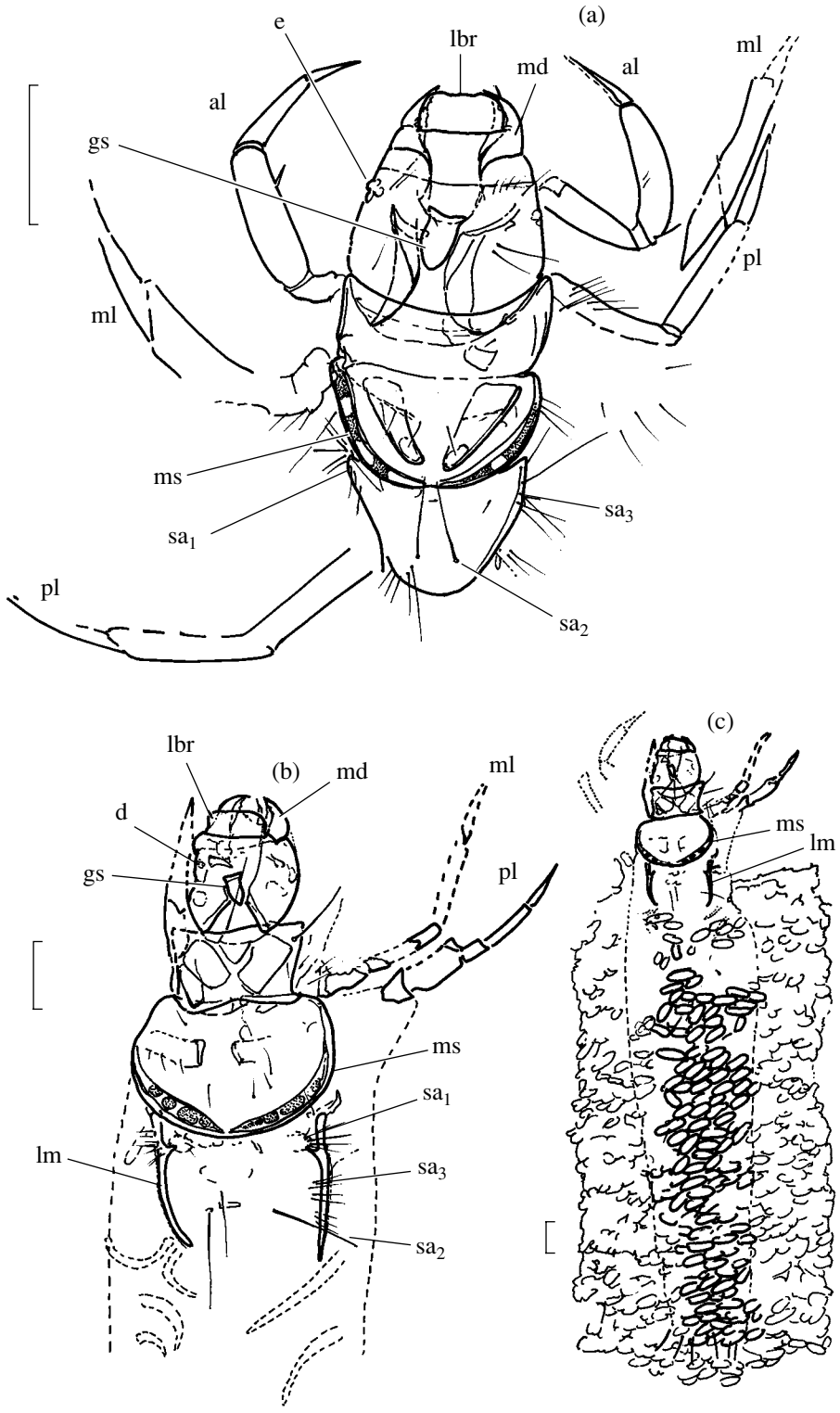


Fig. 3. *Creterotesis coprolithica* gen. et sp. nov.: (a) paratype PIN, no. 3064/8268; (b, c) paratype PIN, no. 1668/1936: (b) anterior end of the body, (c) general appearance. Abbreviations as in Figs. 1, 2. Scale bar 1 mm.

is close to perpendicular, dense, without spiral structures and regular rows; residues of fastening silk are apparent between pellets. Very rarely (specimen no. 3064/8261), the posterior part of the case contains inclusions of elongated plant fragments oriented in a direction parallel to the pellets.

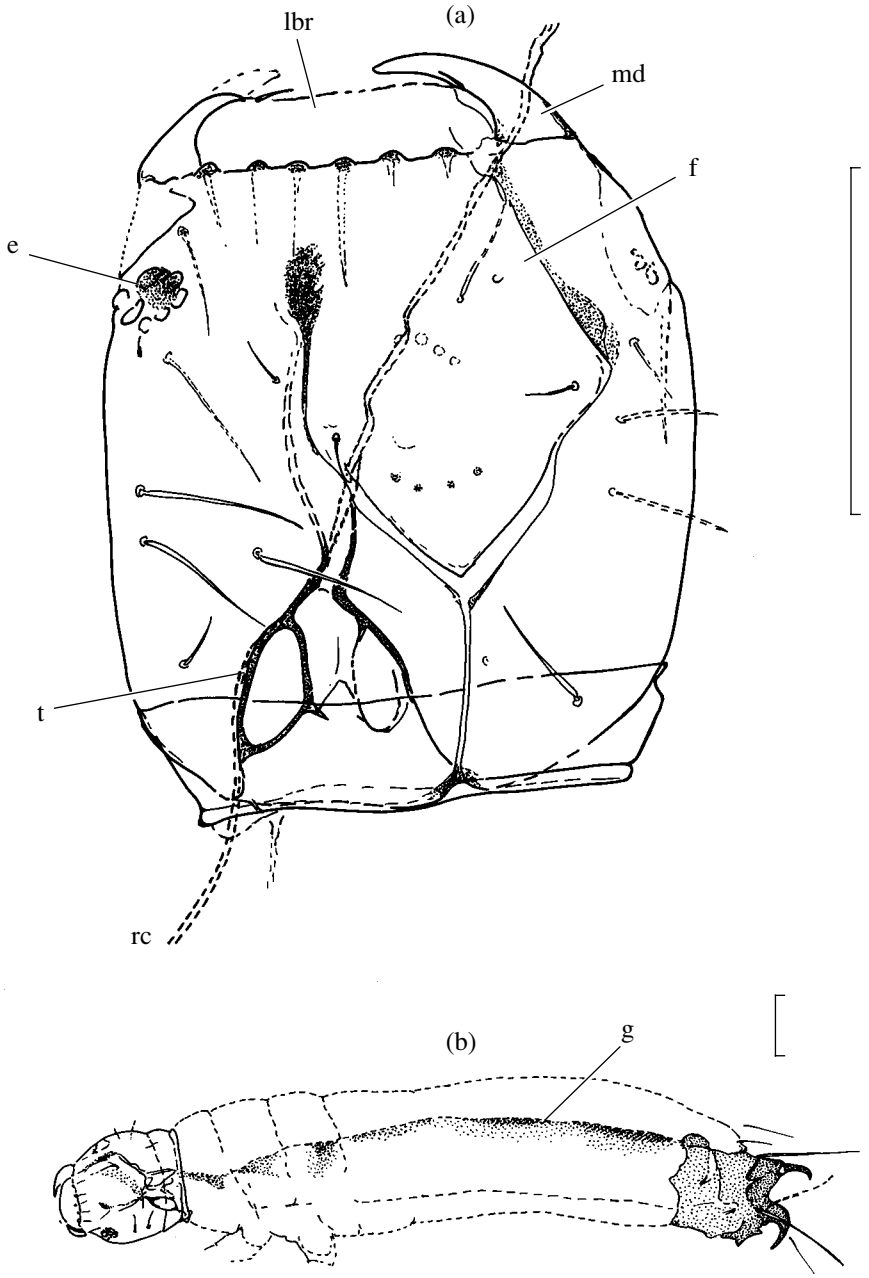


Fig. 4. *Cretolype minuta*, sp. nov. holotype PIN, no. 3064/8267: (a) head, (b) general appearance. Abbreviations: (t) tentorium, (g) gut. Other abbreviations as in Fig. 1. Scale bar 0.5 mm.

R e m a r k s. One of the specimens (no. 3064/8262) is abnormally long (14 mm) and has an admixture of mineral grains at the posterior end; this is probably a case in the course of construction, with an undetached posterior part of the case of the previous stage. If this assumption is correct, larvae may have changed building materials during their development, with more mature larvae more selective than younger ones in choosing building particles.

Probably, the building material was produced by pelophages (possibly, annelids), since isolated pellets occur in small numbers at a distance from the cases, they are formed by fine grains and are low in organic material compared to the surrounding silt that formed the host rocks. They could not have been produced by caddisfly larvae, since they are much narrower than the presumed lumen of their rectum. In addition, the contents of the larval gut is dark and rich in organic material, whereas the pellets are paler.

M e a s u r e m e n t s, mm. Case length, 8.0–14.0; width of anterior end, 3.3–4.1; width of posterior end, 3.1–3.9; pellet length, 0.3–0.6; pellet width, 0.1–0.3.

Material. Beside the holotype, paratypes PIN, nos. 1668/1936, 3064/8259, 3064/8261, 3064/8262, and 3064/8263 from the same locality and bed.

Suborder Annulipalpia

Genus *Cretolype* Ivanov, gen. nov. incertae familiae

Etymology. From the Latin *creta* (chalk) and *Lype*, generic name of caddisflies of the family Psychomyiidae.

Type species. *C. minuta* sp. nov.

Diagnosis. Head massive, rounded (length barely exceeding width), prognathous, with straight anterior and convex posterior margins, partly inserted into the thorax. Labrum short, sclerotized, with weakly prominent anterior margin, not wider than head. Frontoclypeus wedgelike. Eyes shifted anteriorly. Pronotum weakly sclerotized, mesonotum with barely noticeable sclerotization, metanotum membranous. Abdomen cylindrical, with distinct intersegmental constrictions, segment 9 with sclerotization. Anal legs short, directed backwards, with robust strongly downcurved claws, basal segment of anal legs extending beyond segment 9.

Remarks. Judging from a set of distinguishing characters represented mainly by plesiomorphies, this genus cannot be reliably attributed to any of the modern families of caddisflies. It differs from the above genera of Mesozoic larvae in being primitive and in the absence of specializations. The massive, backwardly directed, weakly stretched, anal legs with sharply downcurved long claws, weakly sclerotized pronotum without a distinct sclerotization of its posterior margin, and prognathous head partly inserted into the prothorax indicate affinity with the family Psychomyiidae of the superfamily Psychomyioidea, suborder Hydropsychina; however, the absence of data on the structure of the labium and legs, chaetotaxy, and the presence of the sclerotization of segment 9 prevents this species from being included in Psychomyiidae.

There are two extinct psychomyioid families in Cretaceous caddisfly faunas, small Upper Cretaceous Electralbertidae from the Canadian amber and Dysoneuridae from the Lower Cretaceous of Asia described from imagoes. The absence of morphotypes prevents a direct correlation between larval and imaginal stages of fossil caddisflies.

***Cretolype minuta* Ivanov, sp. nov.**

Plate 9, fig. 4

Etymology. From the Latin *minutus* (small).

Holotype. PIN, no. 3064/8267, counterpart of larva (head capsule surface concave), body from anterior third of prothorax to abdominal segment 9 visible as faint shadow, legs and chaetotaxy lost; Buryatia, Sosnovo-Ozersk District, left bank of the Vitim River downstream of the Baissa stream mouth; Lower Cretaceous, Zaza Formation, bed 31.

Description (Fig. 4). Larval body without case. The frontoclypeus is large, 0.75 times as long as the head. The lateral margins of the frontoclypeus are indistinct, but probably had incisions near one-third of the length from the anterior margin of the head, with a transverse row of dark round spots behind them on the frontoclypeus. There is a black V-shaped structure inside the head, which is probably formed by the anterior and upper tentorial arms. The posterior tentorial arms are distinct, diverging backward and laterally and broadening toward the posterior margin of the head, and a short corpotentorium. The eyes are small and close to the anterior margin (0.12 mm). The labrum is short, with its margins being more heavily sclerotized than its central part. The mandibles have a massive molar blade and an attenuated inwardly curved apex, which are partly covered by the labrum. The head surface has ridgelike asymmetrical elements, which are probably related to the remains of setae; if this assumption is correct, the chaetae are heavily affected during fossilization. The pronotum is tightly adjacent to the head, forming a small collar around its posterior part. The thorax and abdomen are weakly sclerotized, only the posterior end of the abdomen is firmer. Abdominal segment 9 has a wide sclerite (probably a tergite on the upper surface of the body); each of the backwardly directed anal legs has a massive basal segment and a backwardly directed claw, which is subequal to the former. The middle part of the claw of the anal leg is sharply bent, the tip of the claw is directed downward at almost a right angle; the lower surface of the claw has no projections.

Measurements, mm. Body length, 5.7; head capsule width, 0.7; length of head including labrum, 1.0.

Remarks. The weak degree of sclerotization of the head and pronotum indicates recent molting. No adaptation for carrying a case is apparent. Probably, this larva did not build a transportable cylindrical case, which would be typical for higher annulipalpian caddisfly larvae.

Material. Holotype.

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