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Redescription of adult *Bledioschema schweigeri* (Coleoptera: Staphylinidae: Oxytelinae) with description of its presumed larva and taxonomic comments

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Abstract. The monotypic oxyteline *Bledioschema* Smetana is widely distributed in the *Rhododendron* forests of northern Anatolia. The description of its adult characters are complemented, the larval characters are described and the phylogenetic relationships are discussed. Based on adult characters, *Bledioschema* is more closely related to *Aploderus* than to *Bledius* as has been assumed. The larval characters of *Bledioschema* show a relationship to the *Oxytelus-Anotylus-Platystethus* lineage.

INTRODUCTION

The description of *Bledioschema schweigeri* Smetana, an unusual oxyteline from the Pontic region of Anatolia (Turkey), was based on one male and four females found in deep layers of moist humus. It was published prior to Herman's (1970) revision of the genera of Oxytelinae. Thus, although fairly detailed, it lacks information on several characters considered important by Herman (1970) and Newton (1982). Hammond (pers. comm.) supposed closer relationship of *Bledioschema* Smetana to *Aploderus* Stephens than to *Bledius* Leach, as Smetana (1967) suggested.

Numerous adults of *Bledioschema*, including teneral specimens, were collected in northern Anatolia (Turkey), together with several oxyteline larvae which could not be assigned to any known genus. Most were taken from deep layers of moist humus under dense stands of rhododendron. The knowledge of the staphylinid larvae is far behind that of adult stages, although they may be collected easily, and may contribute significantly to a better understanding of phylogeny and biology (Newton, 1990). While the larval characters of more diverse staphylinid subfamilies have been described (e.g., Frank, 1991; Ashe & Newton, 1993), information concerning lower taxonomic level remains highly incomplete. According to Newton (1990), from 32,236 named Staphylinidae (excluding Scaphidiinae and Pselaphinae), larvae of only 561 species have been described. As far as the Oxytelinae are concerned, from some 40 genera recognized as valid, relevant information on larvae of members of 12 genera is available (Kasule, 1968; Pototskaya, 1967; Newton, 1982). The aim of the present paper is to supplement the description of adult *Bledioschema schweigeri*, to describe its presumed larva, and to discuss briefly the relationships of this taxon.

MATERIAL AND METHODS

Material was collected in Turkey at the following localities: Bolu, between Konuralp and Akçakoca, 17 km from Akçakoca, 400 m, 15.v.1976, in *Fagus-Rhododendron* leaf litter (adults); Zonguldak,

between Eregli and Baliköy, 15.v.1976, ravine near sea, sifting *Quercus* leaf litter (adults and larvae); Kastamonu, above Inebolu, 600 m, 18.v.1976, sifting leaf litter and humus in a *Fagus orientalis-Rhododendron* forest (adults and larvae); and Sinop, at Lala near Sinop, near sea level, 20.v.1976, sifting leaf litter and old stump in a mixed broad-leaved forest (adults) (all leg. I. Löbl, C. Besuchet). Voucher specimens are in the Muséum d'histoire naturelle, Geneva, The Natural History Museum, London, Field Museum of Natural History, Chicago, and in Ján Kodada private collection. Adults were cleared in cold KOH, partially dissected, stained with Congo Red and examined as glycerine slides. Specimens used for scanning electron microscopy were dehydratated in graded ethanol series and air-dried, mounted on stubs with Tempfix and gold coated. Larvae were cleared in lactic acid, stained in Congo Red and examined under compound microscope. The terminology of larval morphology follows Lawrence (1991) and Newton (1982). The adult character set follows Herman (1970) and Newton (1982).

Bledioschema schweigeri Smetana, 1967

Redescription of adult

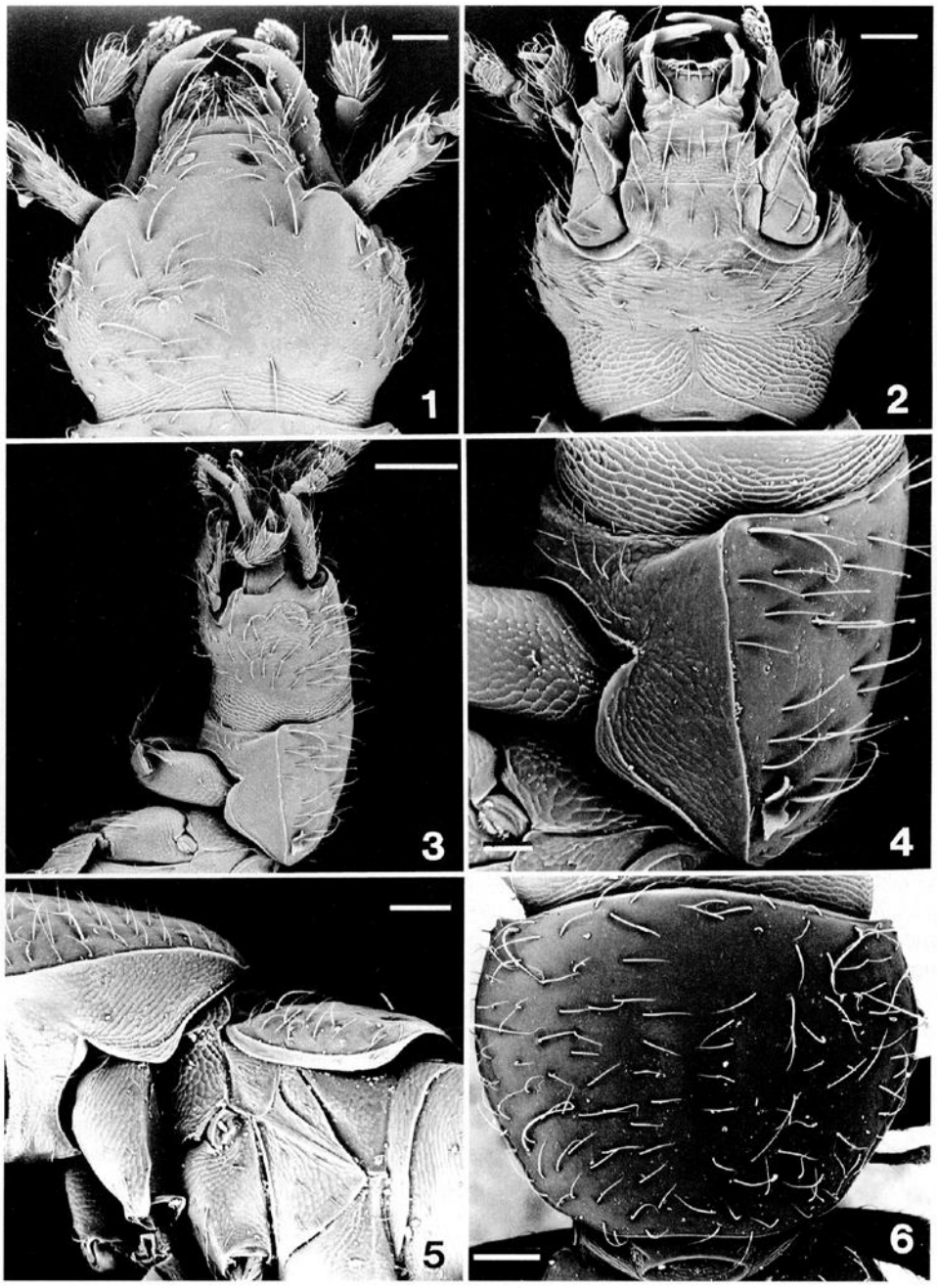
Length 2.5–3.5 mm. Body elongate, slender, flat; surface smooth, without coating of detritus. Pubescence consisting of two types of hair-like sensilla. Scale-like setae absent.

Head (Fig. 1) large, without protuberances. Neck region broad, about as large as 2/3 of head, fairly well defined. Eyes very small, flat, not extending onto ventral portion of head, situated about the level of middle of head, visible in dorsal view. Swelling over antennal base low. Antennal fossa lateral, situated close to dorsal edge of cranium (Fig. 3). Anterior portion of frons narrowed, with rounded margin. Epistomal suture arcuate, rather indistinct. Clypeolabral membrane relatively broad. Clypeus with membranous rim. Labrum short, not prominent laterally, with anterior margin slightly emarginate. Epipharynx with multifid sensilla on lateral lobes, thick sensilla inserted near apical margin becoming abruptly very slender distally. Gular sutures (Fig. 2) strongly diverging on neck, narrowly separated from middle portion. Posterior tentorial pits situated slightly in front of level of neck constriction.

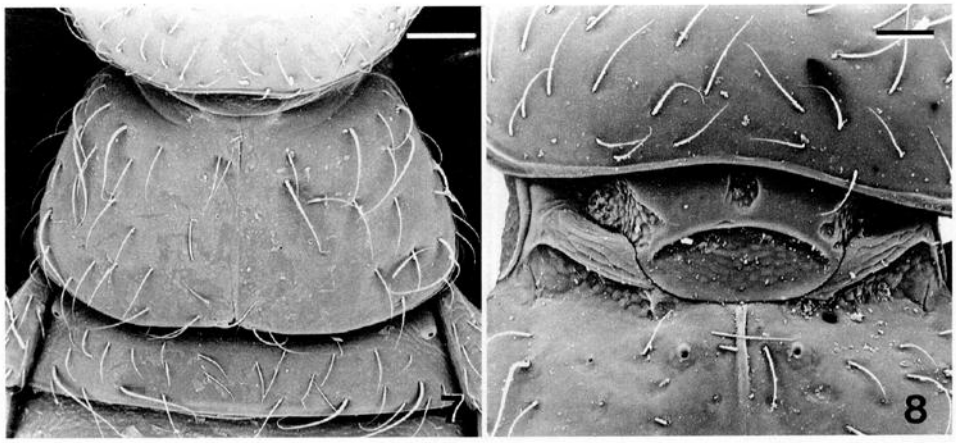
Antenna long, geniculate, 11-segmented, not clubbed. Each segment with short and long erect hair-like sensilla. Scape elongate, widened apically, slightly flattened, with shallow dorsal impression in apical third. Antennomeres 2 to 11 with rough microsculpture, apical segments lacking digitiform sensilla.

Mandibles prominent, asymmetrical. Right mandible with four teeth, molar lobe concave, prostheca bearing row of dense multifid setae and simple setae along mesial edge. Left mandible with three teeth, molar lobe convex, simple setae along mesal edge of prostheca distinctly shorter than those on right mandible. Proximal teeth on both mandibles small, molar lobes sclerotized strongly, finely grooved transversely; prostheca well developed, narrow. Lacinia setose near apex. Galea with dense brush of simple sensilla at apex and oblique setal row in middle. Maxillary palp with fourth segment subulate (Fig. 10). Hypopharynx with a comb-like dense row of setae. Prementum with adoral surface bilobed, several peg-like sensilla and simple long setae. Mentum trapezoidal, with truncate anterior margin (Fig. 9). Tentorium with dorsal arms well developed, anterior arms absent. Cervical sclerites well developed, not flattened.

Pronotum (Fig. 6) wider than long, evenly, strongly narrowed toward base; with strongly arcuate lateral margins; apical margin weakly arcuate; basal margin trunctate. Disc with a pair of admesal depressions. Lateral margin not explanate. Protergosternal suture indicated by a fine line (Fig. 11). Procoxal fissure nearly closed (Fig. 4).



Figs 1–6: *Bledioschema schweigeri*. 1 – head dorsal; 2 – head ventral; 3 – head and prothorax lateral; 4 – prothorax lateral; 5 – thorax lateral; 6 – pronotum. Scale bars: 1, 2, 5, 6 = 0.10 mm; 3 = 0.2 mm; 4 = 0.05 mm.



Figs 7, 8: *Bledioschema schweigeri*. 7 – elytra; 8 – scutellum and elytral base. Scale bars: 7 = 0.10 mm; 8 = 0.05 mm.

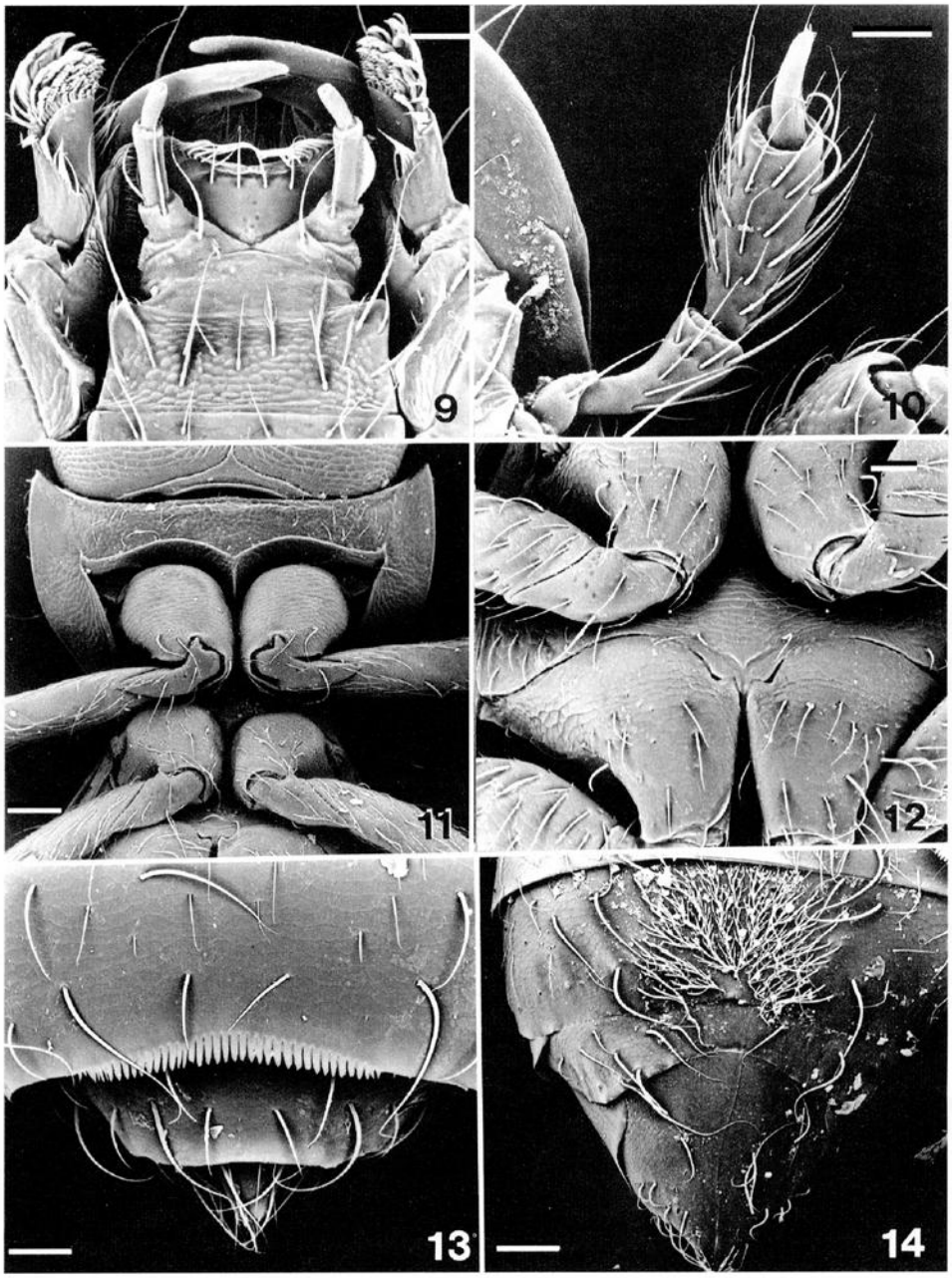
Protrochantin exposed (Fig. 11). Procoxal process carinate. Procoxal cavities widely open behind. Spiracular peritremes oval, fairly large.

Scutellum (Fig. 8) with transverse, arcuate ridge forming large posterior impression, and with three small anterior impressions; surface between impressions smooth, microsculptured in impression.

Elytra (Fig. 7) small, narrowed strongly basally, with even discal surface, lacking adsutural stria. Epipleuron almost evenly broad, epipleural stria entire. Elytra-metanotal interlocking devices wide; mesal elytral edge bearing row of minute lobes functioning as a locking device. Hind wings including axillary sclerites absent. Mesosternum small. Mesocoxae projecting, contiguous, mesosternal process short. Mesotrochantin exposed (Fig. 11). Metasternum (Fig. 12) small, about as long as mesosternum, not projecting between mesocoxae, with metacoxal process. Metendosternite with long, narrow stalk and long arms.

Legs long, slender. Procoxae strongly projecting (Fig. 5). Tibiae densely setose, without rows of spines. Metatibiae without ctenidium. Tarsi 3-segmented; segments 1 and 2 short, not lobed ventrally, not closely associated, bearing fairly long ventral setae. Third segment longer than first two together, with a pair of large claws. Empodial setae absent.

Abdomen widened toward segment 5, then narrowed. Abdominal tergum 1 membranous, spiracles small. Tergum 2 sclerotised, not covered by elytra, strongly narrowed basally, 1.25 times as wide as combined apical width of elytra. Terga 2 to 7 with transverse ridges, lacking patches of wing-folding setae. Tergum 3 about 1.5 times as wide as combined apical width of elytra. Tergum 7 fringed apically (Fig. 13). Segments 2 to 7 with two pairs of laterosclerites. Sternum 1 short, fused to sternum 2. Sterna 1 and 2 without intercoxal processes. Sterna 2 to 7 with transverse ridge, 2 and 3 of similar length, with long connecting membranes. Spiracles (Figs 15, 17, 19) situated at edges of terga. Intersegmental membranes with an extremely fine brick-wall-like surface structure, tergal

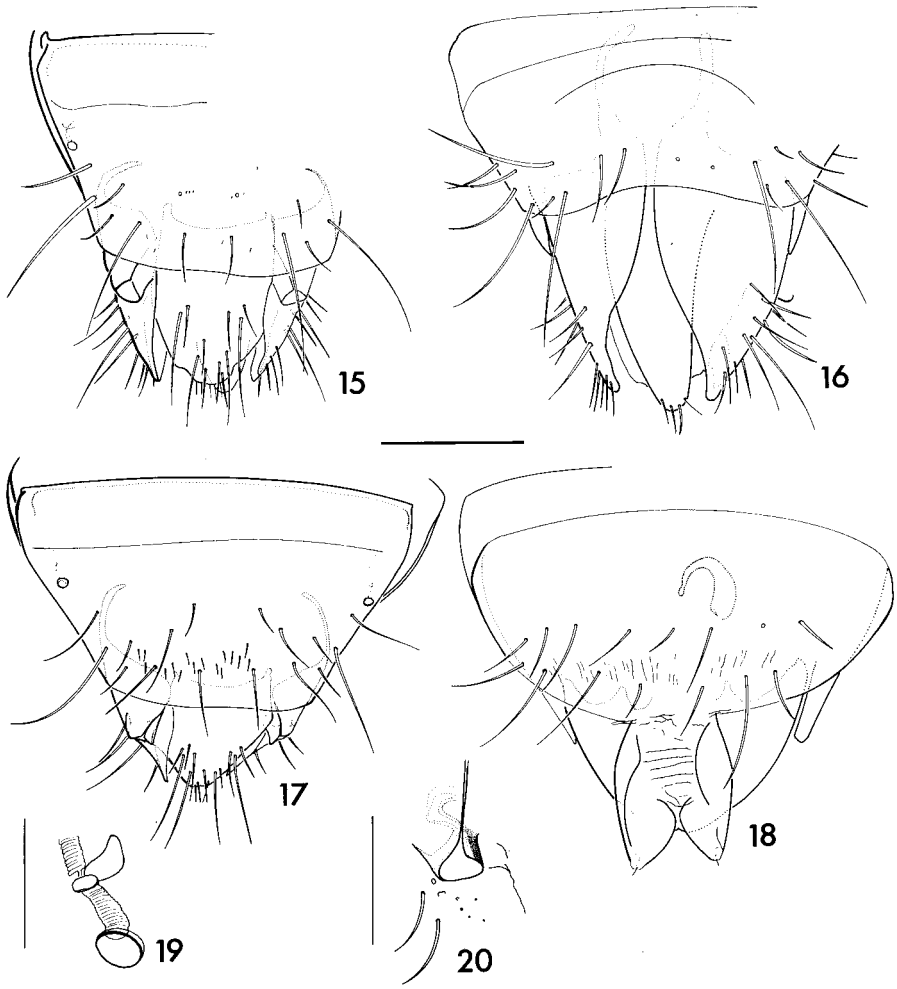


Figs 9–14: *Bledioschema schweigeri*. 9 – mouth parts ventral; 10 – maxillary palp; 11 – thorax ventral; 12 – mesocoxae, metacoxae, metasternal process; 13 – apical abdominal terga; 14 – male apical abdominal sterna. Scale bars: 9, 10, 12, 13 = 0.05 mm; 11, 14 = 0.10 mm.

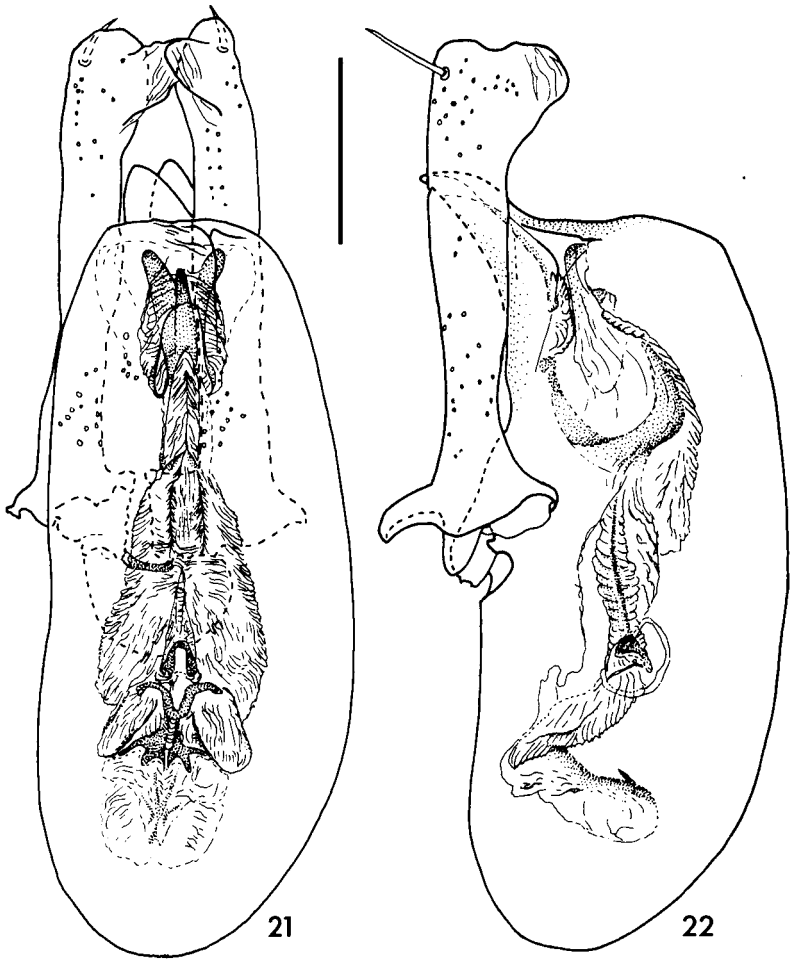
membranes also with tranverse striae.

Genital segment small. Tergum 9 completely divided medially, with two large orifices (Figs 15, 17, 20) of gland reservoirs extending to segment 7.

Male. Abdominal sternum 7 with large median setose patch (Fig. 14). Sternum 8 short, emarginate. Tergum 9 (Fig. 15) with very long anterolateral projections. Sternum 9 (Fig. 16) large, asymmetrical. Tergum 10 with short anterolateral projections. Aedeagus (Figs 21, 22) small, symmetrical, lying in repose with parameres facing left side of abdomen; median lobe with short, complex, divided apical portion; parameres with numerous pores,



Figs 15–20: *Bledioschema schweigeri*. 15 – male abdominal terga 8, 9 and 10; 16 – male abdominal sterna 8, 9 and 10; 17 – female abdominal terga 8, 9 and 10; 18 – female abdominal sterna 8 (with spermatheca), 9 and 10; 19 – spiracle of abdominal segment 8; 20 – glandular opening on abdominal tergum 9. Scale bars: 15–18 = 0.20 mm; 19, 20 = 0.05 mm.



Figs 21, 22: *Bledioschema schweigeri*, aedeagus dorsal and lateral. Scale bar = 0.10 mm.

each paramere bearing a single, large, hair-like sensillum near apex; basal piece of tegmen absent.

Female. Abdominal sternum 7 apically fringed. Apical margin of sternum 8 sinuate. Gonocoxae (Fig. 18) wide, with 1 apical seta and a large field of pores; styli absent. Spermatheca (Fig. 18) a simple, strongly sclerotised sac.

Gut contains solid anorganic particles and fungal spores.

Description of larva

Body elongate, nearly parallel-sided, widest at abdominal segments 5 and 6, dorsoventrally slightly flattened. Length of examined specimens about 3 mm. Body ochraceous or yellow, legs paler, maxillae and urogomphi darker, almost brown.

Vestiture consisting of two types of regularly disposed, dark, hair-like sensilla: one is conspicuous and erect, 170–220 μm long; the second is thin and about 50–80 μm long. All sensilla arising from distinctly bordered, shallow sockets.

Cranium rounded, 0.48 mm broad, dorsoventrally flattened. One stemma on each side posteroventrally to antennal insertion. Ecdysial lines shortened, ending far behind antennal base and not reaching basal head margin. Glandular area absent.

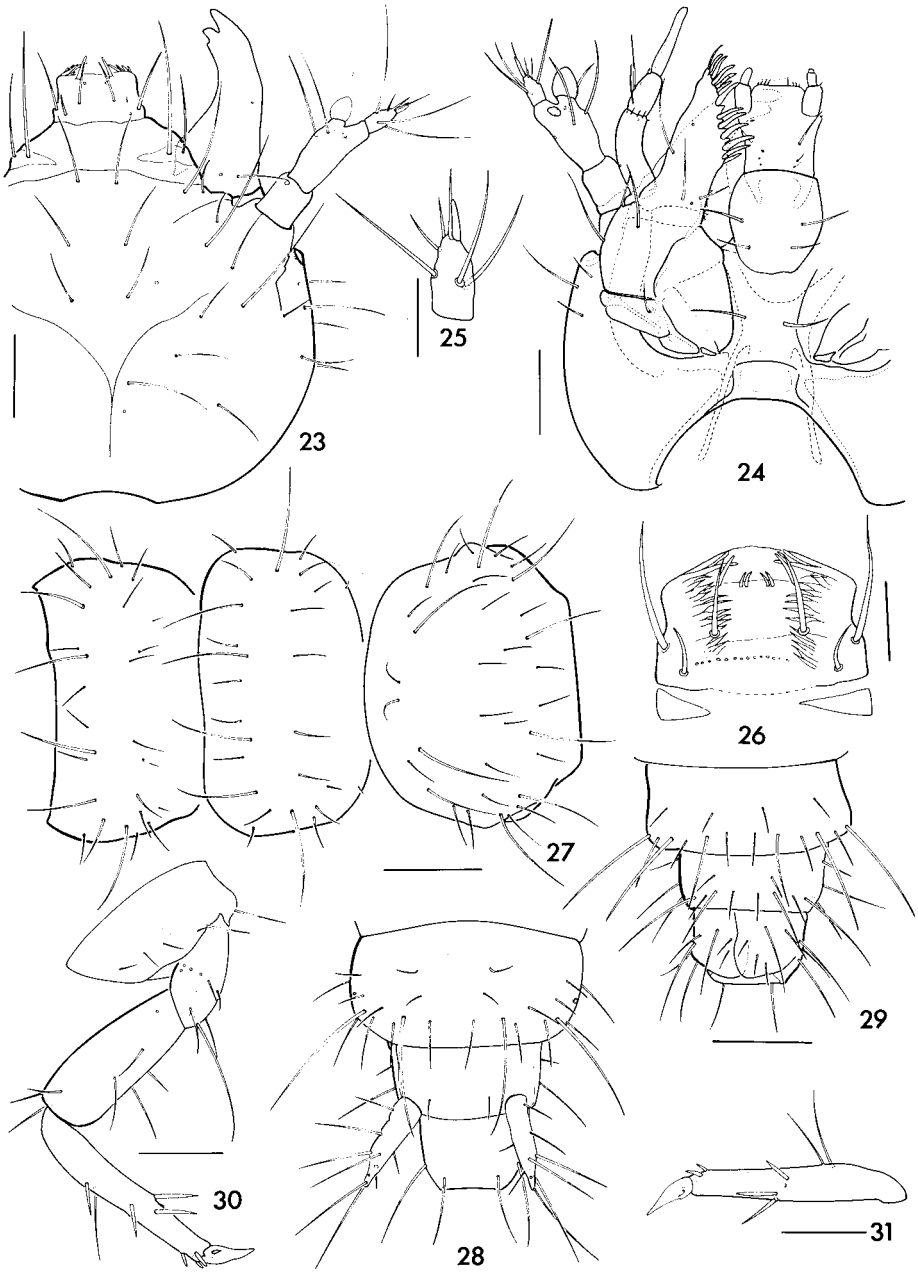
Antenna (Figs 23, 24, 25) three-segmented. First antennomere glabrous, slightly longer than wide, with a few round apical microdepressions. Second antennomere about twice as long as first, slightly more than twice as long as wide, in apical half with three hair-like sensilla (= TL) about as long as the segment, one large and one small vesicular sensory appendage, one very short, bluntly tipped peg-like sensillum and one round distal microdepression situated apico-externally. Third antennomere short, nearly conical, with apical, bluntly tipped peg-like sensillum (= P) shorter than antennomere, two short subterminal hair-like sensilla about as long as sensillum P, one long subterminal hair-like sensillum about 1.7 times as long as sensillum P, and one inner and two outer sensilla TL.

Labrum (Fig. 26) short, with three sclerotised areas, without internal apodemes; slightly emarginate laterally, truncate anteriorly, bearing dorsal hair-like and peg-like sensilla. Anterior angles with cluster of close, sharply tipped peg-like sensilla. Epipharynx with lateral field of very thin, short, mesally directed hair-like sensilla; regular transverse row of sunken sensilla situated near basal margin and a few sunken sensilla distributed in apical half. Epipharynx with four hair-like sensilla, anterior margin bearing microtrichia.

Mandibles (Fig. 23) symmetrical, each with four teeth (dorsoproximal one minute) and one dorsobasal hair-like sensillum. Inner mandibular edge not serrate.

Maxilla (Fig. 24) with cardo consisting of very small triangular basicardo, and large disticardo, bearing a transverse internal ridge and two hair-like sensilla. Stipes with two hair-like sensilla, not separated from mala. Maxillary articulating area broad, weakly sclerotised. Mala not divided at apex, ventrally with three long hair-like sensilla, along mesal edge with row of slightly bent strong peg-like sensilla (= PS) in shallow sockets, a few short spines lacking sockets situated in basal half of the row of PS, several moderately long hair-like sensilla situated behind PS, and a few apically bent hair-like sensilla situated at tip. Palpifer minute, with one hair-like sensillum. Maxillary palp three-segmented. First segment bent, about 2.9 times as long as broad, with few micro-depressions and a row of very thin, short apicodorsal microtrichia (sensilla?). Second segment about 0.5 times as long as first segment, with two long outer hair-like sensilla and a few apical micro-depressions. Third segment thin, about as long as first, with one prone long peg-like sensillum near base.

Labium (Fig. 24) consisting of ligula, prementum, mentum and postmentum. Ligula short, truncate apically, with a few short peg-like sensilla; ventral surface with transverse row of short papillae. Prementum fused with ligula; with one long and two short admesal hair-like sensilla on each side of the midline; lateral apodemes moderately long, slightly bent. Labial palp two-segmented; first segment with an oblique row of short, thin, sharply tipped, peg-like sensilla; second segment with apical cluster of very small sensilla. Mentum about as long as broad, bordered by suture anteriorly and posteriorly, with one long and one short admesal hair-like sensilla on each side of the midline. Submentum as long as mentum, with two long hair-like sensilla. Gula short and transverse.



Figs 23–31: *Bledioschema schweigeri*, larva. 23, 24 – head dorsal and ventral; 25 – distal antennomere; 26 – labrum; 27 – thoracic segments; 28, 29 – apical abdominal segments, dorsal and ventral; 30 – right fore leg; 31 – left mesotibiotarsus and pretarsus with tarsungulus. Scale bars: 23, 24, 30, 31 = 0.10 mm; 27, 28, 29 = 0.2 mm; 25, 26 = 0.05 mm.

Tentorium (Fig. 24) robust, consisting of large corporotentorium and robust pretentorial and metatentorial arms; supratentorial arms slender, directed posterodorsally.

Prothorax slightly longer than meso- and metathorax (Fig. 27). Protergum simple, consisting of sclerotized plate. Thoracic venter lightly sclerotised, with subdivisions obscure. Propleuron consisting of episternum and epimeron (sensu Lawrence, 1991), separated from central sclerites; propleural apophyses about as long as pleural suture. Propresternum large and subtriangular. Two small sclerites situated between propresternum and a relatively large sclerite lying between coxae (= basisternum?). Posterior sclerite (= sternellum?) subtriangular. Meso- and metasternum with fine lines difficult to observe and with hair-like sensilla. Mesothoracic spiracle situated on spiracular sclerite between pro- and mesothorax. All thoracic terga with very fine midlongitudinal ecdysial line.

Legs (Fig. 30) long, slender. Coxa, trochanter and femur with several hair-like sensilla. Tibiotarsus about as long as femur, with hair-like sensilla, sharply tipped, moderately long peg-like sensilla near middle, and few short, sharply tipped apical sensilla. Protibiotarsus with one and meso-and metatibiotarsus with two long hair-like sensilla (Figs 30, 31).

Abdominal terga 1 to 8 similar in distribution of sensilla. All abdominal spiracles annular, situated at tergal edges. Ninth segment small, about 2.5 times as wide as long, with a suture between tergum and sternum. Urogomphus (Fig. 28) one-segmented, about 1.3 times as long as ninth segment, widest at base, bearing long hair-like sensilla. Tenth abdominal segment as long as ninth, about 1.6 times as wide as long (Figs 28, 29).

Gut contains a few fungal hyphae and numerous spores.

The association of the larvae with adults is based on the following facts: (1) they were found in the same samples; (2) many adults were teneral; (3) with the exception of one *Anotylus* sp. and several *Bledius* sp., no other oxytelines were present in the samples; and (4) the larvae are distinct from those so far described.

DISCUSSION

Adult *Bledioschema* appear very distinct from other Oxytelinae by the shape of the body, particularly strongly narrowed anterior of the abdomen. In addition, they may be distinguished readily from most other oxytelines by their very small elytra and very short metasternum. *Bledioschema* has been placed close to *Bledius* (Smetana, 1967). They share many diagnostic characters, including the subulate fourth segment of the maxillary palp, the presence of procoxal fissures, abdominal segments 3 to 7 each possessing two pairs of laterosclerites, the apically fringed abdominal tergum 7, and the contiguous mesocoxae. However, *Bledioschema* differs from *Bledius* by the three-segmented tarsi and the pro- and mesotibiae lacking a row of spines.

Bledioschema would run in Herman's (1970) key to the oxyteline genera to couplet 16, i.e., to *Parosus* Sharp and *Aploderus*. *Parosus* is distinguished from both *Aploderus* and *Bledioschema* by the posterior margin of the abdominal tergum 7, which is serrate and not fringed. *Aploderus* has "normal" long metasternum and elytra, and the abdomen slightly narrowed basally.

Newton (1982) used 15 larval synapomorphies to hypothesise the relationships of the 12 oxyteline genera which are known adequately. The larva of *Bledius*, having three stemmata, single subapical mandibular tooth, apex of mala with a group of setae and an abdomen with lateral sclerites, does not share any apomorphy with *Bledioschema*. The larval

characters of *Bledioschema* indicate possible relationship with *Platystethus* Mannerheim, *Oxytelus* Gravenhorst and *Anotylus* Thomson, all of which possess a single stemma, and have the ligula and prementum fused. The mandible with three subapical teeth and the wide tentorial bridge distinguish *Bledioschema* from *Platystethus*, *Oxytelus* and *Anotylus*. A possibly significant feature of *Bledioschema* is also the cranium with shortened ecdysial suture. Paulian (1941) based the description of the monobasic *Gardnerianus* Paulian on exuviae of one specimen in poor condition, and described the larva of *Oxytelopsis* Fauvel. Although these descriptions lack details, *Oxytelopsis* appears to be similar to *Oxytelus* while *Gardnerianus* is quite distinct in the mouthparts and antennae from other oxytelines.

The adult and larval characters of *Bledioschema* indicate a possible close relationship to *Oxytelus*, *Anotylus* and *Platystethus*, but definitively not to *Bledius*. Adults appear to be more similar to those of *Aploderus*, the larva of which is unknown, than to other oxytelines.

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