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VALDIVELATER, A NEW GENUS OF PROTELATERINI (ELATERIDAE: LISSOMINAE) FROM THE FORESTS OF CENTRAL AND SOUTHERN CHILE

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Abstract.— *Valdivelater* **gen. nov.**, with two included species, *V. krahmeri* **sp. nov.** and *V. oncolensis* **sp. nov.** are described from the Valdivian region of Chile. The relationships of this genus to other Protelaterini and the position of the tribe within the family Elateridae are discussed, and a key to protelaterine genera and related tribes is provided.
Resumen.— Se describe *Valdivelater* **gen. nov.**, el cual incluye dos especies *V. krahmeri* **sp. nov.** y *V. oncolensis* **sp. nov.** del Centro Sur de Chile. Se discuten las relaciones de este y otros géneros de Protelaterini, y su posición sistemática en la familia Elateridae, se proporciona además una clave de los géneros de Protelaterini y de las tribus relacionadas con este.

Key words.— Chile, Coleoptera, Elateridae, Lissominae, Protelaterini.

INTRODUCTION

The tribe Protelaterini was described by Schwarz (1902) for the Chilean genus *Anaspasis* Candèze and the New Zealand genera *Protelater* Sharp and *Sphaenelater* Schwarz. During recent expeditions to central and southern Chile (Arias *et al.* 2008), two new species were discovered belonging to an interesting new genus which appears to be related to *Anaspasis* and *Protelater* but lacks some of the more obvious features of these taxa and is characterized by an unusual type of antennae in the male.

MATERIAL AND METHODS

This study is primarily based on the specimens from the multiple collecting trips of the Essig Museum of Entomology, University of California, Berkeley (led by E. T. Arias) and subsequently deposited in several institutions. Types and other specimens have been deposited in the following collections:

ANIC – Australian National Insect Collection, CSIRO Entomology, Canberra, Australia;
EMEC – Essig Museum of Entomology, 210 Wellman Hall, University of California, Berkeley, USA;
MNNC – Museo Nacional de Historia Natural, Santiago, Chile;
UAC – Universidad Austral de Chile, Valdivia, Chile;
CAS – California Academy of Sciences;
GUI – B. Guińez Private Collection, Temuco, Chile;
UCCH – Universidad de Chile, Antumapu, Chile.

Wing vein nomenclature follows that of Kukalová-Peck and Lawrence (1993, 2004) with some modifications from Lawrence *et al.* (2009). The terms mesoventrite and metaventrite were proposed as replacements for mesosternum and metasternum, respectively, following Lawrence (1999), Beutel and Haas (2000) and Lawrence *et al.* (2009).

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TAXONOMY

Valdivelater gen. nov.

Type species. *Valdivelater krahmeri* sp. nov., here designated.

Etymology. The generic name Valdivelater (gender masculine) is derived from the combination of the city of origin of the genus, Valdivia, and the Greek for driver, elater.

Diagnosis. This genus differs from all other elaterid genera in the structure of the male antennae, which bear long, subcylindrical, articulated rami on antennomeres 4–10. It is similar to *Anaspasis* and *Protelater* in having a long, narrow prothorax and to these plus *Sphaenelater* and *Austrelater* Calder et Lawrence in having a truncate chin-piece, mesally bowed pronotosternal sutures and membranous lobes on tarsomeres 1–4. The weakly developed, laterally oriented antennal fossae distinguish the genus from *Sphaenelater*, *Protelater* and *Anaspasis*, as do the obliquely oriented metacoxae, narrowly separated mesocoxal cavities, and weakly developed metacoxal plates; the last two features are also occur in *Austrelater* species, which lack antennal fossae and have a prothorax which is wider than long, with barely diverging posterior angles, and a very short prosternal spine.

Description. Body about 4.0–5.55 times as long as wide, widest at junction of pronotum and elytra, sides slightly narrowing posteriorly towards elytral apices, more strongly so anteriorly from tips of hind angles to posterior third or fourth of pronotum, then subparallel to slightly widened towards anterior edge. Dorsal vestiture of fine, densely distributed hairs.

Head strongly declined at base, transverse, ratio of median length to greatest postocular width 0.75–0.80; distance behind eyes about 0.13 times same width. Eyes large, and strongly protuberant in both sexes, very finely facetted, without interfacetal hairs. Posterior edge of head capsule above occipital foramen with two deep impressions for attachment of head muscles. Vertex slightly declined, with shallow impression; supra-antennal ridges weakly to strongly raised above weakly developed, saucer-like fossae, which face laterally or anterolaterally, with antennal sockets barely exposed from above head (anteriorly with respect to body axis), each antennal fossa with deep, curved invagination between antennal insertion and eye; short, broad, shallow subantennal groove below and continuous with antennal fossa; frontoclypeal region strongly, abruptly declined forming a nasale, which is more or less flattened with a short, weak transverse carina, not continuous with supra-antennal ridges; clypeal apex slightly concave. Labrum strongly transverse, heavily sclerotized, except for basal portion, which is on a slightly lower plane so that a distinct groove is formed between main body of labrum and edge of clypeus, labral apex broadly rounded to subtruncate. Antennae in male strongly ramose beginning on antennomere 4; scape 2–3 times as long as pedicel and slightly curved; antennomeres 4–10 elongate, 7–10 times as long as wide, not or only slightly wider at apex, and bearing at base a slender, articulated ramus, which is more than twice as long as antennomere and more or less circular or slightly flattened in cross-section; antennomere 11 slightly longer than preceding ones; all antennomeres densely clothed with moderately long, erect hairs. Female antennae somewhat shorter, very weakly serrate and appearing more or less filiform with antennomeres similar in shape, with obliquely truncate apices, and with vestiture more recumbent. Mandible about 1.6 times as long as wide at base, its apex bidentate and moderately broad, but with dorsal tooth smaller and slightly subapical; dorsal surface of mandible with sharp curved ridge delimiting a concavity which receives lateral edges of labrum; prostheca consisting of simple fringe of hairs; mandi bular base simple, without mola or brush of hairs. Maxilla with galea and lacinia short, broad, equally wide, the former with simple or spatulate hairs, the latter with simple hairs and no uncus; apical maxillary palpomere slightly to strongly expanded and securiform. Labium with mentum about 0.6–0.7 times as long as wide, widest basally, convex apically; prementum with bilobed ligula; apical labial palpomere slightly to strongly expanded apically. Head ventrally with distinct subgenal ridges; gulamentum about 0.23–0.33 times as long as head length as seen from above, slightly concave; gular sutures converging anteriory. Anterior tentorial arms broadly expanded and almost meeting at midline; corpotentorium narrow and straight.

Prothorax elongate, about 1.05–1.6 times as long as greatest width; sides almost straight or slightly expanded anteriorly, strongly so posteriorly; lateral carinae sharp posteriorly but variously weakened anteriorly, not visible for their entire lengths from above, and not or barely reaching anterior edge, which is slightly to strongly produced and rounded or truncate; posterior angles narrowly acute, produced posterolaterally; posterior edge with scutellar notch broad and sharply defined; ventral accessory ridge with distinct sublateral projections; disc with weak longitudinal furrow or series of irregular longitudinal impressions and elevations. Prosternum in front of coxae more than 3 times as long as diameter of coxal cavity, with anterior edge produced forward to form short, truncate chin piece, above which is an oblique head rest; surface strongly convex along midline, without paired longitudinal carinae. Prosternal process slightly expanded near base, then gradually narrowed posteriorly, slightly, sinuately curved in lateral view with small to moderately large

notch at apex, which is narrowly rounded in ventral view, extending well behind procoxae, so that prosternal spine is about 1.2 times as long as diameter of coxal cavity. Notosternal suture complete, distinctly curved mesally, slightly open at anterior end, abruptly curved mesally at posterior end, without antennal cavity. Hypomeron simple, only slightly impressed posteriorly, with weak posterior projection. Procoxae subglobular; procoxal cavities separated by less than 0.75 times diameter of a cavity, internally open; postcoxal projection very short; trochantin completely concealed.

Scutellar shield abruptly elevated, slightly oblique, anteriorly simple, posteriorly broadly rounded. Elytra about 3.80–4.45 times as long at midline as greatest width and 3.45–4.25 times as long as pronotum; anterior edge carinate; humeri well developed; sides more or less straight anteriorly, slightly, gradually converging posteriorly; apices independently rounded; disc with 10 weakly defined puncture rows sometimes more or less obscured by numerous, irregular, elevations and depressions or well defined punctate striae with simple intervals; epipleura narrow, slightly concave and more or less complete.

Mesoventrite on same plane as metaventrite, anteriorly with small, moderately oblique procoxal rests separated by anteriorly notched prosternal rest; mesanepisterna each with deep, transverse cavity for reception of sublateral pronotal projections; mesoventral cavity moderately large and deep, lateral edges anteriorly obscure, posteriorly sharply defined and subparallel, posterior edge broadly rounded to subtruncate. Mesoventral process short, notched at apex. Mesocoxae slightly projecting, with large exposed trochantins. Mesocoxal cavities narrowly separated, partly closed laterally by both mesepimeron and mesanepisternum. Mesometaventral junction forming a monocondylic fitting. Metaventrite moderately elongate and strongly convex; discrimen long; exposed portion of metanepisternum more than 10 times as long as wide and not or only slightly widened at anterior end; metepimeron not visible. Metacoxae subcontiguous, obliquely oriented, with plates weakly developed but extending to lateral edges of coxae. Metendosternite with long stalk, short lateral arms, moderately developed ventrolateral processes and short to moderately long anterior process bearing moderately widely separated anterior tendons.

Hindwing about 2.5 times as long as wide; apical field about 0.35 times as long as total wing length, with one or two lightly pigmented oblique linear sclerites; radial cell well developed, elongate, with inner posterobasal angle right; cross-vein r3 moderately long, horizontal and arising well away from r4, which is straight and complete; base of RP very long, extending almost to wing base; R-M loop forming narrowly acute angle; medial spur slightly curved, reaching wing margin where there is a distinct embayment; medial field with five free veins; MP_{3+4} with distinct basal cross-vein and basal spur; CuA_{1+2} forking about half way between wedge cell and wing margin; CuA_2 meeting MP_4; wedge cell well developed and apically truncate; anal lobe well developed; anal embayment absent (Fig. 5.).

Trochanterofemoral joint on fore leg transverse, on mid leg slightly oblique and on hind leg strongly oblique; hind legs distinctly longer than anterior two pairs; tibiae not strongly widened, with simple outer edge and outer apical angle; tibial spurs all double. Tarsomeres 1–3 elongate and more or less equal in length, 4 only half as long as 3; 1–4 each with anteroventrally projecting, membranous lamella, those on 1 and 2 very small and sometimes barely indicated, that on 3 larger, that on 4 about as long as basal portion of tarsomere; pretarsal claws simple; empodium short. not extending between claws.

Abdomen with first four ventrites connate; abdominal process on first ventrite (sternite III) narrowly acute; ventrites 1–4 and anterior half of 5 each with pair of broad, lateral impressions and with slender, strongly recurved laterosternites; ventrite 5 almost twice as long as 4, apically subtruncate; anterior edge of sternite IX in male (subgenital plate) broadly rounded; tergite IX moderately deeply emarginate; tergite X well developed and free. Aedeagus symmetrical; phallobase broadly rounded or truncate; parameres each with small to large lateral hook at apex. Penis attached to parameres both dorsally and ventrally, with well developed paired anterior struts. Sternite VIII in female (*krahmeri*) about as long as wide, with long, fixed spiculum ventrale and pair of shorter anterolateral struts. Ovipositor 12 times as long as wide, depressed; paraprocts moderately sclerotized and about 4 times as long as gonocoxites, which are more heavily sclerotized, undivided and narrowed apically, with styli represented by a group of subapical setae. Internal female tract with paired lateral colleterial glands located between common oviduct and base of anteriorly truncate bursa; a slender sclerite at the base of each colleterial gland and a small, unsclerotized spermatheca arising in between these and terminating in a forked spermathecal gland (Fig. 6).

Key to species of *Valdivelater*

1. Elytral punctures not forming clearly impressed striae, the punctures smaller, more widely and unevenly spaced and intervals interrupted by numerous depressions and elevations; eyes extending laterally beyond anterior pronotal angles; pronotum longer and narrower (PL/PW more than 1.2), its surface uneven with several longtidudinal depressions; anterior edge of pronotum more strongly produced

forward; lateral pronotal carinae extending almost to anterior edge of pronotum; supra-antennal ridges more strongly elevated; apical field of hind wing with anterior and posterior oblique linear sclerites; total length of males 13–14.5 mm .... ***krahmeri*** sp. nov.

–. Elytral punctures forming distinct striae, the punctures larger, elongate and very closely spaced and intervals simple, even and flattened or slightly convex; pronotum shorter and broader (PL/PW less than 1.2), its surface more or less even, with single median longitudinal impression and its anterior edge less strongly produced; lateral pronotal carinae ending well before anterior edge of pronotum; supra-antennal ridges less strongly elevated; apical field of hind wing with anterior oblique linear sclerite only; total length of males 9.6–12.5 mm ..... ***oncolensis*** sp. nov.

Valdivelater krahmeri sp. nov.
(Figs 1, 4, 5, 8)

Etymology. This species is named in honor of Ernesto Krahmer for his efforts in building an excellent insect collection of Valdivian insects currently housed at the Universidad Austral de Chile, Valdivia.

Diagnosis. Distinguished from *V. oncolensis* by the characters given in the key and by the finer punctation and less well developed posterior pronotal angles not extending beyond elytral humeri.

Description. Total length about 13.0–16.5 mm. Head and mandibles dark brown, prothorax dark reddish-brown, sometimes yellowish anteriorly; elytra yellowish-brown with irregular daker patches; ventral surfaces mainly dark brown; most of legs and antennae yellowish-brown; palps, tarsi and antennal rami yellow. Most surfaces densely clothed with fine, decumbent yellow setae; most elytral setae very short and decumbent, but mixed with longer, suberect setae.

Head including eyes distinctly wider than anterior edge of prothorax, surface finely, densely, evenly punctate; frontal ridges moderately elevated with antennal insertions facing anterolaterally, area between antennal insertions distinctly concave, without distinct transverse carina at point of clypeal declination, but with short, transverse carina at middle of nasale, which is distinctly longer than labrum. Antennomere 3 much longer than 2. Apical maxillary palpomere 2.43 times as long as wide and 1.48 times as long as preapical one.

Pronotum 1.47–1.57 times as long at midline as its greatest width; sides subparallel for most of their lengths, strongly widened posteriorly to form hind angles, which do not reach outer edges of elytral humeri and are subacute in lateral view; anterior edge strongly produced forward and truncate; lateral pronotal carinae extending almost to anterior edge; disc relatively uneven, with median longitudinal furrow and at least two sublateral furrows; punctation fine and dense, irregularly confluent. Prosternal process in lateral view with small notch at apex.

Elytra 4.18–4.43 times as long as wide and 4.09–4.23 times as long as pronotum; elytral punctures closely aligned in rows but not forming striae, the intervals highly irregular, with numerous depressions. Posterior edge of mesoventral cavity broadly rounded. Apical field of hind wing with anterior and posterior oblique linear sclerites. Aedeagus (Fig. 7) with phallobase broadly rounded anteriorly, penis almost as wide as a paramere and parameral apex weakly hooked and asetose.

Distribution. Chile. Central and Southern Chile. Specimens have been collected in winter.

Type material. Holotype ♂: CHILE: X Region, Entre lagos, Trampa 07.99, Leg. M. Artacho. (Ernesoctenus krahmeri) [Not a valid species name] det R. Rothmann T. 1999. Coleccion Servicio Agricola y Ganadero, Lo Aguirre, Santiago, Chile (MNNC).

Paratypes: CHILE: IX Region: Cautín: Monumento Nacional Cerro Ñielol, Temuco, 28.v.2000, B. Guiñez L. (1♀, GUI); same locality, 1.vii.1990, B. Guiñez L. (1♂, completely dissected, ANIC); Cauquenes, Reserva Nacional Los Queules, Julio 2005, Trampa de Intercepción en follaje. Leg. L. Jofré (3♂♂, 1♀, UCCH, EMEC, ANIC); Valdivia: Sto. Domingo, 27.viii.1989, E. Krahmer (1♀, UAC); same locality, 9-4-78, E. Krahmer (1♀, UAC).

Valdivelater oncolensis sp. nov.
(Figs 2, 8)

Etymology. The name is derived from the region where this species was originally collected. The name "oncol" is derived from the mapudungun word "wingkul" meaning little mountain.

Diagnosis. Distinguished from *V. krahmeri* by the characters given in the key and by the coarser punctation and more well developed posterior pronotal angles which extend beyond elytral humeri.

Description. Male. Total length about 9.6–12.0 mm. Head and mandibles dark brown, prothorax reddish-brown, anterior edge of pronotum with slender yellow margin; elytra, pterothorax, abdominal ventrites, most of legs and antennae yellowish-brown; palps, tarsi and antennal rami yellow. All surfaces densely clothed with fine, inclined to suberect yellow setae, most of which are at least twice as long as longest elytral puncture diameter.

Head including eyes not wider than anterior edge of prothorax, surface densely, evenly punctate; frontal ridges slightly elevated; antennal insertions facing

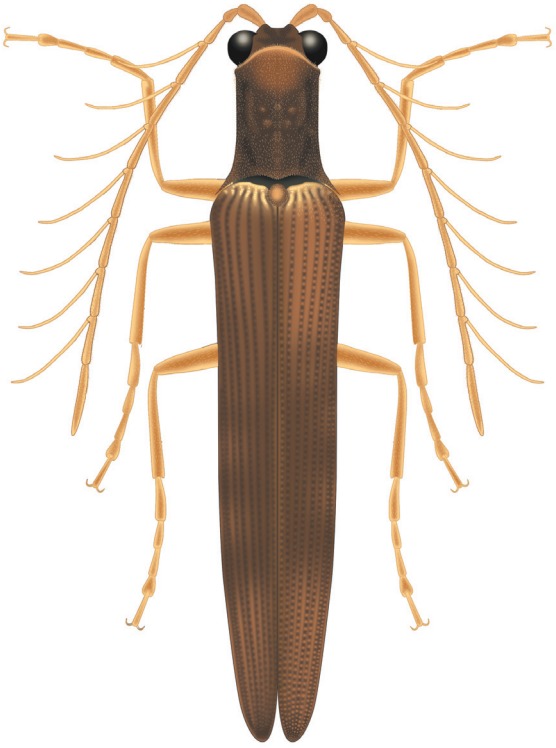


Figure 1. *Valdivelater krahmeri*, male, dorsal. Length = 14 mm.

laterallyregion between antennal insertions somewhat flattened or very slightly concave, with distinct transverse carina anteriorly, abruptly curved ventrally on either side to form nasale, which is about as long as labrum. Antennomere 3 only slightly longer than 2. Apical maxillary palpomere 2.2 times as long as wide and 1.83 times as long as preapical one.

Pronotum 1.08–1.16 times as long at midline as its greatest width; sides very slightly, gradually widened anteriorly from narrowest point (at posterior third) to anterior angles and strongly widened posteriorly to hind angles, which extend well beyond elytral humeri and are subtruncate in lateral view; anterior edge slightly produced forward and broadly rounded; lateral pronotal carinae incomplete, extending anteriorly just beyond middle; disc more or less even, except for weak longitudinal furrow which expands to form shallow concavity just behind middle; punctation coarse and dense, the punctures tending to be longitudinally confluent. Prosternal process in lateral view with moderately large notch at apex.

Elytra 3.80–3.87 times as long as wide and 3.45–3.58 times as long as pronotum; elytral punctures closely aligned in rows and intervals convex and even, so that distinct striae are formed. Posterior edge of mesoventral cavity subtruncate. Apical field of hind wing one anterior oblique linear sclerite. Aedeagus (Fig. 8) with phallobase anteriorly subtruncate, penis much narrower than a paramere and parameral apex strongly hooked and provided with several coarse setae. Female. Unknown.

Distribution. Southern Chile. Specimens have been collected in summer.

Type material. Holotype ♂: CHILE: X Region, Oncol Park, 13.xi.2005, Malaise trap, E. Arias, coll. (MNNC). Paratypes: CHILE: X Region: same locality, 18.xi–6.xii.2005, Malaise trap T2, E. Arias & C. Ruiz, coll. (♂, completely dissected, ANIC); Valdivia, La Estancilla, VIII.2006, under bark of dead ulmo, A. Fierro, coll. (♂, CAS).

Discussion

Although this new genus appears to be most closely related to the Protelaterini, the position of this tribe within the family and its relationship to Lissomini and Oestodini are still somewhat contentious. Although Schwarz (1902) considered the genera *Protelater*, *Anaspasis* and *Sphaenelater* to form a group sufficiently distinct from other Elateridae to be considered as a separate family, Protelateridae, he abandoned this view in the elaterid volumes of Wytsman's *Genera Insectorum* (Schwarz 1906a, 1906b, 1907), including

Figure 2. *Valdivelater oncolensis*, male, dorsal. Length = 9.6 mm.

all three in a tribe Steadoderini (along with many genera now placed in one or more tribes of Elaterinae), while in the *Coleopterorum Catalogus* (Schenkling 1925, 1928), *Anaspasis* was included in Agrypninae, *Protelater* in Pomachiliini (Elaterinae Pomachiliini) and *Sphaenelater* (as *Geranus* Sharp) in Ludiinae (Elaterinae, Elaterini).

The elaterid subfamily Oestodinae, proposed by Hyslop (1917) for the North American genus *Oestodes* LeConte plus the widely distributed genus *Drapetes* Dejean (previously included in the family Throscidae), was based primarily on a suite of unique larval features. This concept was followed by Böving and Craighead (1931) but ignored by most workers. Crowson (1961) added the genus *Protelater* to this group based on examination of a New Zealand larva associated with a pupa, and the monophyly of a clade containing *Protelater*, *Drapetes* and *Oestodes* was supported by Guryeva (1974) and Dolin (1975) based on the structure of the adult thorax and hind wing, respectively. Although Crowson (1961) retained the genus *Lissomus* Dalman in the family Throscidae, Burakowski (1973, 1975) proposed that Lissomidae Laporte (1835) be recognized at the family level, and the description of a *Lissomus* larva (Costa *et al.* 1988) confirmed the close relationship of this genus to *Drapetes*. Cladograms produced by an analysis of adult and larval characters (Calder *et al.* 1993) supported a monophyletic group including the exemplar genera *Oestodes*, *Austrelater*, *Sphaenelater*, *Protelater*, *Lissomus* and *Drapetes*, and by implication the related genera *Anaspasis*, *Paradrapetes* Fleutiaux and *Hypochaetes* Bonvouloir. This broad concept of Lissominae has been followed by Lawrence and Newton (1995), Calder (I996) and Costa *et al* (2009).

It was noted by Calder *et al.* (1993) that the Lissominae clade is very difficult to define solely on the basis of adult characters and that most, if not all, of those synapomorphies involving no homoplasy are larval. This was also emphasized by Muona (1995) in his critique of the 1993 paper. The suite of larval attributes which characterize this clade includes the following (with numbers indicating figures from Calder *et al.* 1993):

1) anterior edge of head capsule (31) deeply emarginate between a prominent pair of paranasal lobes;

2) nasale (31) simple, more or less acute, usually reduced and sometimes absent;

3) antennal sensorium (33) dome-like and complex (consisting of numerous subdivisions);

4) mandibles (35) short and stout, unidentate, with a prominent retinaculum, which is usually subdivided, and a distinct brush of hairs between this and mandibular base;

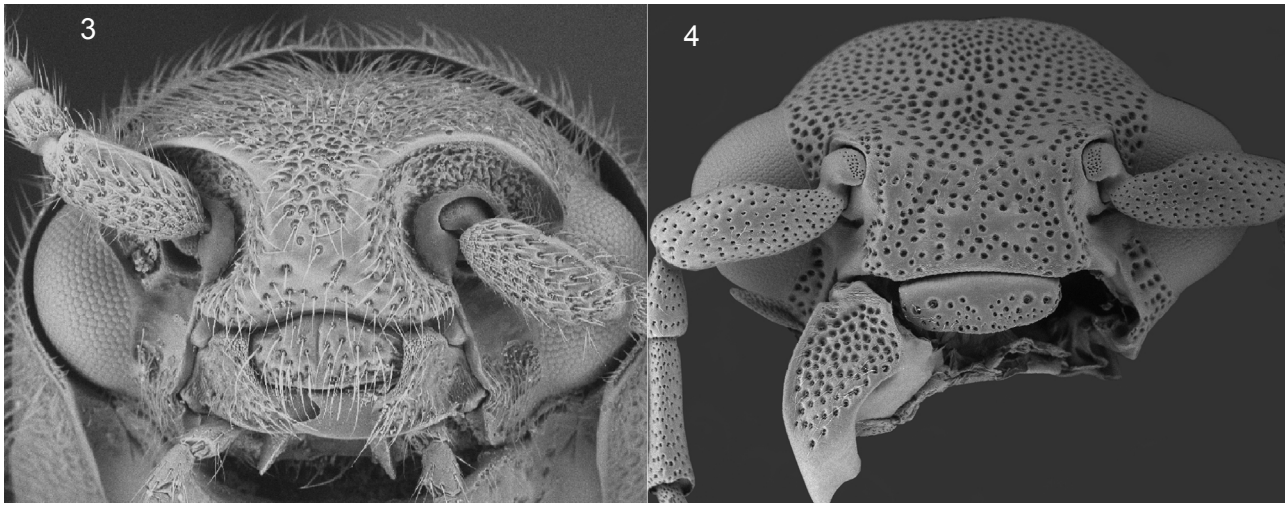
5) posterior edge of postmentum (32) narrowly rounded and usually extending well beyond the stipital bases, separating the cardines, which are more or less triangular with a longitudinal internal ridge;

6) presternal plate (36) always divided longitudinally into two subtriangular plates with a sclerotized rod along the outer edge of each, and also with a slender posterior sclerite, usually a similar anterior sclerite, and a median sclerotized rod, which may be simple, T-shaped, V-shaped or Y-shaped;

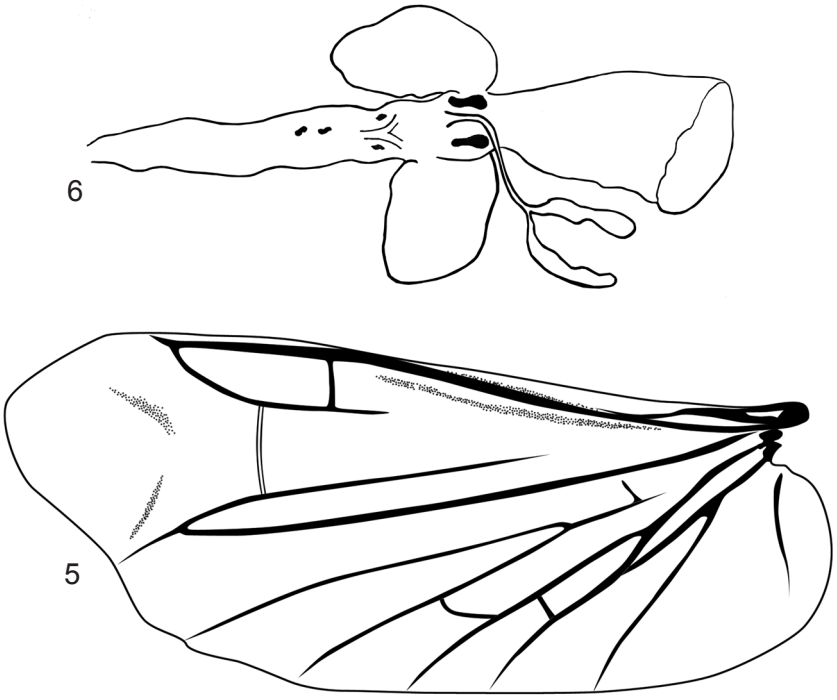
7) legs (36) short, moderately stout and clothed with short, stout spine-like setae;

8) abdominal terga II to V, VI, VII or VIII almost always with patches of spine-like setae (29, 34) each of which arises from a special type of attachment allowing free movement forward or backward;

9) tergum IX (29, 37) with a pair of mesally or downwardly curved spines arising from the bases of the



Figures 3–4. Heads, frontal view. (3) *Anaspasis parallela* (Solier); (4) *Valdivelater krahmeri*.



Figures 5–6. *Valdivelater krahmerii*. (5) Hind wing; (6) female genital tract.

short "urogomphi" formed on either side of the posterior notch at the apex of the tergum;

10) sternum IX (30, 38) U-shaped, sometimes with a posterior tooth at each end of the U;

11) segment X (30, 38) ventrally oriented, bearing at its center or at anterior or posterior end a very short cylindrical pygopod at the apex of which is a pair of lateral, subovate anal pads on either side of the longitudinal anal opening.

Most of these features occur in all described or illustrated lissomine larvae, including those of *Oestodes tenuicollis* Randall (Hyslop 1930; Böving and Craighead 1931; Glen *et al*. 1943), *Drapetes mordelloides* (Host) (Burakowski 1973, 1975), *D. geminatus* (Say) (Böving and Craighead 1931), *Lissomus* sp. (Costa *et al*. 1988), *Austrelater* spp. (Calder *et al*. 1993), *Protelater* sp. (Crowson 1961) and *Sphaenelater lineicollis* (White) (Hudson 1934), plus several unassociated larval types from New Zealand, Australia and Chile.

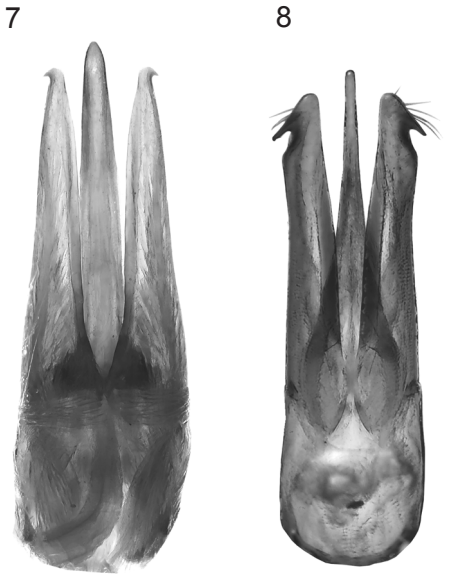
The larva of *Oestodes tenuicollis* differs from all others in this group in lacking the specialized tergal spines and in having a simple retinaculum, and the genus consistently formed the base of the lissomine clade in the cladograms of Calder *et al* (1993). Adult Oestodini have the truncate chin piece and mesally bowed pronotosternal sutures, but differ from other members of the clade with respect to characters given in the key below. The tribe contains *Oestodes* and *Bladus* LeConte, both of which are restricted to North America (Johnson 2002).

Based on adult features, members of the tribe Lissomini are very distinctive and were formerly placed in the family Throscidae. They have a very different shape than most Elateridae, in that the prothorax and elytra are tightly joined together and not narrowed at the junction of prothorax and elytra. They also differ from members of the other tribes in having very long trochanters and extensive antennal cavities beneath the hypomeral surfaces (also occurring in the elaterid subfamily Thylacosterninae). Lissomine larval characters, on the other hand, tend to overlap with different members of the third tribe Protelaterini. The structure of tergum IX in *Lissomus* resembles that in *Austrelater* and *Sphaenelater* while *Drapetes* larvae resemble those of *Protelater* in this respect. However, as indicated below, clear cut associations with determined adults are still lacking for most protelaterine species. Lissomini are widely distributed, particularly in tropical and subtrop-ical regions, and the tribe includes over 100 species in the genera *Lissomus*, *Drapetes*, *Paradrapetes* and *Hypochaetes*, plus *Osslimus* Calder (1996).

The third group is less clearly defined based on adult characters, and while the relatively sharply declined frontoclypeal region between large antennal fossae (surrounding the actual antennal sockets and often including one or more deep pits) characterizes species of *Protelater* and *Sphaenelater*, these are reduced in *Valdivelater* and virtually absent in *Austrelater*; however the last genus appears to belong to this group based on the obvious larval similarities. As thus constituted, the tribe Protelaterini has a typical south temperate distribution with species in Australia, New Zealand and Chile. Although *Austrelater*, *Valdivelater* and at least *Sphaenelater lineicollis* (White) are clearly distinct at the generic level, the relationships among the remaining species of *Sphaenelater*, *Protelater* and *Anaspasis* need clarification, and characters used in the key below are based on a relatively limited sample.

Key to tribes of Lissominae and genera of Protelaterini

1. Base of pronotum with paired sublateral incisions; frontal region at midline gradually declined; tarsomeres simple; antennal serrations or rami beginning on antennomere 3; North America . . . . . **Oestodini**
–. Base of pronotum without sublateral incisions; frontal region at midline more abruptly declined; tarsomeres with membranous lobes; antennal serrations or rami beginning on antennomere 4 . . . . . **2**
2. Prothorax on each side with deep antennal cavity opening at anterior end of notosternal suture and extending laterally beneath the surface of the hypomeron; prosternal chin piece well developed and rounded; pro- and mesotrochanters at least 3 times as long as wide; tarsomeres 1–4 with long membranous lobes, those on 2–4 usually longer than base of tarsomere . . . . . **Lissomini**
–. Prothorax without deep antennal cavities; prosternal chin piece short and truncate; pro- and mesotrochanters less than twice as long as wide; membranous lobes on tarsomeres shorter, those on 1 and 2 sometimes highly reduced **[Protelaterini]** **3**
3. Prothorax distinctly wider than long, with posterior angles not or barely diverging, without sublateral carinae; antennal fossae absent; antennomeres 4–10 in male each with a flattened ramus about twice as long as antennomere; prosternal spine distinctly shorter than coxa; Australia . . . . . ***Austrelater*** Calder et Lawrence
–. Prothorax usually longer than wide or, if not, then sublateral carinae present; posterior pronotal angles distinctly diverging; antennal fossae at least weakly developed; antennomeres 4–10 either serrate or with long subcylindrical rami; prosternal spine distinctly longer than coxa **4**
4. Antennal fossae weakly developed, its edges not carinate, and more or less laterally oriented; nasale more or less flattened; mesocoxal cavities separated by less than 0.33 times shortest diameter of a cavity; antennomeres 4–10 in male each bearing a subcylindrical ramus, articulated at base and more than twice as long as antennomere; those in female very weakly serrate, almost filiform; Chile . . . . . ***Valdivelater*** gen. nov.
–. Antennal fossae distinct, with edges at least partly carinate, and anteriorly oriented; nasale convex; mesocoxal cavities separated by at least 0.4 times shortest diameter of a cavity; antennomeres 4–10 serrate in both sexes **5**
5. Prothorax not or only slightly longer than wide; posterior pronotal angles with distinct sublateral carinae; mesal edges of antennal fossae not at all carinate; nasale strongly and evenly convex; sides of mesoventral cavity curved and weakly defined; New Zealand . . . . . ***Sphaenelater*** Schwarz
–. Prothorax distinctly longer than wide; posterior pronotal angles with or without sublateral carinae; mesal edges of antennal fossae at least partly carinate; nasale convex to somewhat flattened; sides of mesoventral cavity subparallel and sharply defined **6**
6. Mesal edges of antennal fossae sharply carinate; nasale evenly convex; elytra distinctly wider than narrowest width of pronotum, the posterior pronotal angles strongly diverging to encompass elytral humeri; New Zealand . . . . . ***Protelater*** Sharp
–. Mesal edges of antennal fossae not sharply carinate; nasale more abruptly declined and flattened to slightly convex; elytra only slightly wider than narrowest width of pronotum, the posterior angles less strongly diverging to encompass elytral humeri; Chile . . . . . ***Anaspasis*** Candèze



Figures 7–8. Aedeagi. (7) *Valdivelater krahmeri*, length = 2.3 mm; (8) *V. oncolensis*, length = 1.53 mm.

Monophyly of the Lissominae is still somewhat questionable and relationships among the included genera are poorly understood. DNA sequence data would be particularly useful for this group, but that produced so far (Sagegami-Oba *et al.* 2007) have included no members of this group. Additional immature data would also be useful, but the number of reliable associations are limitied. One further group which should be examined carefully to assess its relationship to the lissomine complex is the tribe Senodoniini, currently included in the subfamily Diminae by Cate (2007) or Denticollinae: Dimini by Costa *et al.* (2009).

Larvae from Sabah and the Malay Peninsula closely matching that of *Senodonia sculpticollis* (Fairmaire) (Dolin 2000) have the modified setae described above (but located on both terga and sterna of segments I–VIII) and most of the other lissomine features, but with a more well developed tridentate nasale and a differently modified segment X with three teeth at its posterior edge.

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